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Foreword

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U.S. Senate

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Sheldon Whitehouse*

One of my favorite stories is about the response of Rhode Island's former Senator Theodore Francis Green when teased about the geographical size of Rhode Island by some of his Senate colleagues. He was asked, "Theodore, how big is that little state of yours anyway?" With a scowl, Senator Green responded, "that depends. . .high tide or low tide?" Senator Green's comment was prescient of present-day threats to the Ocean State from global warming. Many scientists are predicting that the earliest impacts of climate change will be evident in our ocean and coastal areas through a combination of sea level rise, increased storm frequency and inundation, and altered ecosystems from warming waters and increasing ocean acidification.[1] Indeed, coastal areas in the United States and around the world have already begun to experience the early stages of these impacts—and Rhode Island is no exception.

Rhode Islanders know firsthand that small changes in our oceans can have enormous effects. Many years ago, my wife Sandra, who is a marine biologist, and her colleagues at the University of Rhode Island's Graduate School of Oceanography, started to observe increases in the average winter temperature of Narragansett Bay. The mean winter water temperature in the Bay has increased by several degrees over the past 40 years.[2] I argued, "Well, when I jump in the water, I can't tell the difference

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1. *See generally* NEIL ADGER ET AL., SUMMARY FOR POLICYMAKERS, CONTRIBUTION OF WORKING GROUP II TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (2007).

2. Barry A. Costa-Pierce & Alan Desbonnet, *A Climate Changed Bay*, 41°N. 4(1):14-16 (2007).

between 66 and 70 degrees, so why is that a big deal?" But for the marine life that live in Narragansett Bay, that change of a few degrees amounts to an ecosystem shift. The fish species now coming to dominance within the Bay are fundamentally different than those that were present just a few decades ago.[3] Unfortunately, and not surprisingly, more recent scientific analyses have shown that the Bay continues to warm today.[4]

This continuing trend is underscored and supported by the latest science from the World Wildlife Fund, warning that global warming is occurring at an even faster rate than "worst case" scenarios originally projected by the United Nations Intergovernmental Panel on Climate Change.[5] And each day we delay, each day we fail to take the serious action needed to combat its effects, those consequences get worse and worse. We may not yet have reached the tipping point of irreparable harm, but we are perilously close.

The most serious effects of climate change in our oceans are sea level rise and polar and glacial melting. Each has enormous implications for coastal residents, communities, and economies.

Sea level rise poses serious threats to the very existence of places in Rhode Island and the Gulf Coast, and to low-lying islands in the Indian Ocean and South Pacific. Some island nations are literally fighting for their survival as sea levels rise, and formulating plans to move their citizens when the ocean fully engulfs them.[6] Other places see coastal erosion claiming more and more of their already limited land, and entire communities are being forced to retreat from the encroaching waters. Here in the United States, coastal towns in Alaska have had to relocate or literally face falling into the sea.[7]

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3. *See* Anna Pfeiffer-Herbert, Op-Ed, *Invasion of Tropical Fish Could Threaten Native Species*, NEWPORT DAILY NEWS, June 2007, *available at* http://www.ci.uri.edu/CIIP/Publications/PfeifferHerbert_OpEd_Jun07.pdf.

4. Beth Daley, *Rising Temperatures Throw Nature a Curve: Species in Narragansett Bay are in Midst of a Wide Change*, BOSTON GLOBE, Nov. 13, 2007, Metro, at 1A.

5. Matthew Knight, *Climate Changing 'Faster, Stronger, Sooner,'* CNN (Oct. 20, 2008), *available at* http://www.cnn.com/2008/TECH/science/10/20/wwf.climate.report/index.html.

6. REUTERS, *Taiwan Offers Hand to Sinking South Pacific Island* (Feb. 18, 2009), http://www.reuters.com/article/latestCrisis/idUSTP161893.

7. David Wells, *Sea Engulfing Alaskan Village* (July 30, 2004),

In Rhode Island, even a small amount of sea level rise equates to major damage when combined with a storm surge.[8] Just a half-inch of sea level rise, spread out over the whole of Narragansett Bay may not seem like much – but when it is piled on top of itself and pushed up against the Providence hurricane barrier by a major storm, it becomes a serious threat to our capital city.

Even conservative scientific models now project that sea levels are likely to rise between 8 and 24 inches by the end of the century as a result of greenhouse gases already in the atmosphere.[9] Reality could be much higher. In fact, the Rhode Island Coastal Resources Management Council has estimated that taking into account regional isostatic effects, by 2100 the sea level in Rhode Island could likely be 3 to 5 feet above current levels.[10]

A second effect of climate change is accelerated polar and glacial melt. During the summers of 2007 and 2008, the Arctic ice cap shrunk to its smallest size since satellite record-keeping began.[11] As a result, we have set in motion a series of events that will continue to alter ocean ecosystems and affect coastal communities for years to come. As sea ice melts and greater areas of open ocean are exposed, the darkness of the ocean water traps rather than reflects the heat from the sun; this in turn makes more ice melt and the waters continue to warm even faster.[12] It is a positive feedback loop, but with very negative consequences, as it accelerates atmospheric warming even if greenhouse gas levels remain constant.

The carbon loading of our oceans leads to another effect – a somewhat less talked-about result of increasing greenhouse gas

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http://news.bbc.co.uk/2/hi/europe/3940399.stm.

8. *See* Ted Nesi, *Whitehouse, Experts Warn of Local Climate Change*, PROV. BUS. NEWS, Aug. 21, 2008, *available at* http://www.pbn.com/stories/34571.html.

9. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY 40, 322-4 (Martin L. Parry et al. eds., 2007), *available at* http://www.ipcc.ch/ipccreports/ar4-wg2.htm.

10. Peter B. Lord, *With a Forecast of Rising Tides, State Readies New Coastal Rules*, PROV. J., Oct. 17, 2007, at A1.

11. Deborah Zabarenko, REUTERS. *Artic Ice Melts to Second-Lowest Level*, Sept. 17, 2008, http://www.reuters.com/article/environmentNews/idUSN1630231020080917.

12. Mark Serreze, *Why is the Arctic so Sensitive to Climate Change and Why do We Care?* NOAA, Aug. 28, 2008, http://www.arctic.noaa.gov/essay_serreze.html.

emissions, but one that may prove to be the most dangerous manifestation of our ever-increasing output of carbon dioxide: ocean acidification. Oceans help remove more carbon from the atmosphere than all other natural systems combined; that's one of their innate functions.[13] But they can only absorb so much before their chemistry begins changing.

As the oceans absorb greater amounts of carbon dioxide, the water becomes more acidic and pH levels decrease. Even slight changes in ocean acidity cause major disruptions in ocean life, to the point where marine mollusks cannot use calcium carbonate to form shells, coral reefs die and crumble, and critical algae cannot multiply.[14] Krill, a staple diet of some of the world's most threatened marine mammals, is expected to show significant decline[15] as the phytoplankton which form the base of the marine food chain find the oceans too hostile of an environment in which to survive. The coral reefs which provide essential habitat for critical marine life are also under significant risk. As a result, ocean acidification could cause an unprecedented and unpredictable collapse of our ocean ecosystem upon which nearly one billion people depend to provide their main source of protein.[16]

If we do nothing, we voluntarily accept this risk of irreversible harm to our oceans, our coastlines, and our own communities and people. But if we act quickly and decisively, we have a chance to avoid the worst consequences.

As a member of the Senate Environment and Public Works (EPW) Committee for the past two years, I've been closely involved in efforts to combat global warming and reduce global greenhouse gas emissions. In that capacity, I have focused heavily on protecting our oceans and coasts. During debate in the

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13. *See generally* R.A. HOUGHTON, BALANCING THE GLOBAL CARBON BUDGET, 313-47 (2007), *available at* http://www.whrc.org/resources/published_literature/pdf/HoughtonAnnRevEarthPlanet.07.pdf.

14. ELLYCIA HARROULD-KOLIEB & JACQUELINE SAVITZ, ACID TEST: CAN WE SAVE OUR OCEANS FROM CO_2? (2008), *available at* http://www.oceana.org/fileadmin/oceana/uploads/Climate_Change/Acid_Test_Report/Acidification_Report.pdf.

15. GRAEME C. HAYS ET. AL., CLIMATE CHANGE AND MARINE PLANKTON 338 (2005), http://www.swan.ac.uk/bs/turtle/reprints/Hays_etal_TREE_2005.pdf.

16. Rachel Oliver, *All About: Global Fishing,* CNN (Mar. 29, 2008), *available at* http://edition.cnn.com/2008/WORLD/asiapcf/03/24/eco.aboutfishing/index.html.

Senate last year on America's Climate Security Act, more commonly referred to as the Warner-Lieberman bill, I fought successfully to include more resources to help wildlife, including marine species, adapt to and survive the effects of climate change. I also insisted that coastal communities receive the resources necessary to prepare for the impact of global warming on both the built and natural environment. We must not forget that our natural systems, our wetlands, estuaries, beaches, barrier islands, and other natural features, are our greatest defense against encroaching seas and intensifying storms. Unless we protect that natural buffer, we will find our homes, businesses, and the public infrastructure along our coasts at greater and greater risk.

The path to enacting climate legislation in the 111th Congress remains uncertain at this point. But President Obama recognizes the dangers of global warming and has committed America to the fight to protect our planet. Under President Obama's leadership, along with EPA Administrator Lisa Jackson, CEQ Chair Nancy Sutley, and the chair of the Senate EPW Committee, Barbara Boxer, I have great comfort that the last eight years of denial and inaction are now behind us, and we can now look forward to the necessary and decisive action that is so long overdue.

Unfortunately, the halls of Congress are the last redoubt of those who deny that global climate change is an urgent threat. But the denyers in Congress are quickly finding themselves on the wrong side of the overwhelming body of scientific evidence – and, indeed, on the wrong side of the American people, who are demanding that their leaders in Congress step forward, take the necessary precautions, and lead the fight.

Among the proactive steps we can take to help protect our oceans and coasts from climate change and other threats is the establishment of an Ocean and Coastal Investment Fund, to be used exclusively to finance projects that protect the environmental integrity of our ocean and coastal areas. As a member of the Senate Budget Committee, last year I successfully expanded a reserve fund in the federal budget to explicitly include ocean protection as an eligible funding area. This was a small step, but a beginning in the effort to create ways to protect our oceans.

Another man-made threat facing our oceans and coasts is the threat of oil and gas drilling. First and foremost, we must reevaluate having allowed the moratorium on expanded oil and

gas drilling in the U.S. outer continental shelf to expire. The United States consumes over 25% of the world's oil supply, yet has less than 3% of its known reserves.[17] We are not going to drill our way out of our dependence on oil. The energy company lobbyists will tell you drilling is completely safe and that the likelihood of a major spill is minimal. However, over half the population of the United States lives along the coast[18], and our coastal economy is dependent on clean water and beaches for boating, tourism, fishing, and a myriad of other essential economic drivers. This is not a risk we can afford to take.

The oceans can provide energy without the need to drill for oil. In many coastal areas, the major energy source offshore is wind. Oceans also have energy in the form of waves and currents. We can harness this energy. We can do it in a thoughtful way that does not cause environmental harm, including to the ocean's beauty. We can ensure that the development of offshore renewable energy projects does not preclude other valuable uses such as fishing, aquaculture, and shipping. Rhode Island, along with Massachusetts and Oregon, is developing a comprehensive plan to evaluate and find locations for all these uses. Just as there will be renewable energy projects on land that must be sited appropriately, there will be those in water with similar responsibilities. As we strive to meet this challenge, we will face legal and policy questions that must be answered – questions that as members of the Roger Williams law school community, you can help answer.

As the manifestations of global warming increase and compound, Rhode Island must be prepared to respond. We are fortunate to have world class universities, law schools, and research institutions helping determine how to protect our Ocean State and our globe. This is an opportunity we must not let pass us by. Specifically, as lawyers in a new era of energy and environmental transformation, you will be at the forefront of creating and perfecting new regulatory structures in the coming years and advancing the emerging body of law on these topics. I

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17. National Resource Defense Council, *Reducing US Oil Dependence: A Real Energy Security Policy*, http://www.nrdc.org/air/energy/fensec.asp#note2.

18. *Population Trends Along the Coastal United States: 1980-2008*, NOAA, Jan. 9, 2009, http://oceanservice.noaa.gov/programs/mb/supp_cstl_population.html.

am proud that Roger Williams University School of Law is positioning itself as a leader in this field. Senator Green would be proud to know that Rhode Island's reach goes far beyond the water's edge.