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CLEANING UP THE OCEANS: HOW TO REDUCE THE IMPACT OF MAN-MADE TRASH ON THE ENVIRONMENT, WILDLIFE, AND HUMAN HEALTH

HEARING

BEFORE THE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS UNITED STATES SENATE

ONE HUNDRED FIFTEENTH CONGRESS

SECOND SESSION

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COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

ONE HUNDRED FIFTEENTH CONGRESS
SECOND SESSION

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THURSDAY, SEPTEMBER 26, 2018

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
Washington, DC.

CLEANING UP THE OCEANS: HOW TO REDUCE THE IMPACT OF MAN-MADE TRASH ON THE ENVIRONMENT, WILDLIFE, AND HUMAN HEALTH

Wednesday, September 26, 2018

U.S. Senate

Committee on Environment and Public Works

Washington, DC.

The committee met, pursuant to notice, at 10:05 a.m. in room 406, Dirksen Senate Office Building, Hon. John Barrasso (chairman of the committee) presiding.

Present: Senators Barrasso, Carper, Inhofe, Boozman, Wicker, Fischer, Rounds, Ernst, Sullivan, Cardin, Whitehouse, Gillibrand, Booker, and Van Hollen.

OPENING STATEMENT OF HON. JOHN BARRASSO, U.S. SENATOR FROM THE STATE OF WYOMING

Senator BARRASSO. I call this hearing to order.

Today the Committee will examine the issues of man-made trash that is polluting the oceans, also known as marine debris.

While marine debris can range from metals, glass, rubber, paper, and textiles, the vast majority of marine debris is plastic.

Plastic plays an incredibly important role in our lives. As a doctor, I have seen firsthand how plastic can be indispensable in the field of medicine and healthcare. Similarly, plastic is crucial in virtually every aspect of modern society and economy, including the field of environmental protection. This doesn't mean, of course, that plastics should end up in our rivers, in our lakes, in our streams, and in our oceans.

It is estimated that around 8 million metric tons of plastic waste ends up in the world's oceans each year. While some of this plastic is dumped directly into the ocean, like discarded fishing nets, most of the plastic flows from rivers.

Experts believe that about 90 percent of all plastic pollution flows into the oceans from just ten rivers, eight of which are in Asia. It is estimated that Asia contributes to about 80 percent of

all ocean plastic. Specifically, China, Indonesia, the Philippines, Thailand, and Vietnam are responsible for more plastic pollution than the rest of the world combined.

By now, many Americans have heard of the Great Pacific Garbage Patch. This is an area in the Pacific Ocean where currents have concentrated plastic and other man-made trash. It now stands as the world's largest concentration of marine debris.

Similar debris concentrations exist elsewhere throughout the world. In fact, plastic has been found in almost all corners of the ocean.

Plastic takes at least 450 years to degrade completely; sometimes much longer than that. In the meantime, the debris will continue to entangle and kill marine wildlife, as well as threaten human health. If little is done to stem the accumulation of plastic in the ocean, experts believe that by 2050 there will be more plastic in the ocean than fish, as measured by weight.

Earlier this summer, National Geographic dedicated its June issue to this problem. It is a remarkable cover where it looks like it is an iceberg, but actually it is an upside-down plastic bag. And I don't know is responsible for this, but Senator Whitehouse and I both had this on our desks in our offices and pointed to this as he and I were talking about another issue.

I think it is a remarkable effort by National Geographic to display in picture form something that we know is a major problem affecting——

Senator WHITEHOUSE.

[Comment made off microphone.]

[Laughter.]

Senator BARRASSO. I defer to my colleague from Rhode Island.

Senator WHITEHOUSE. Isn't this bipartisanship?

[Laughter.]

Senator WHITEHOUSE. Here is a visual demonstration.

Senator BARRASSO. Well, it says, "Some people see ocean plastic as a looming catastrophe worth mentioning in the same breath as climate change." I have it from the plastic standpoint. I am glad, Jonathan, that you, Dr. Baillie, National Geographic's Executive Vice President and Chief Scientist, are able to join us here today.

Environmentalists aren't alone in recognizing this problem. Plastic manufacturers also acknowledge we need to address this problem.

Earlier this summer, another one of our witnesses today, Cal Dooley, announced that he would extend his tenure atop the American Chemistry Council, as he said, to "fight the spread of mismanaged plastic waste and help lay the foundation for a sustained global industry effort to address it." Thank you.

Likewise, Coca-Cola, which is also represented here today and one of the world's biggest producers of plastic bottles, has taken steps to confront the problem. In January this year, Coca-Cola announced that it would "help collect and recycle a bottle or can for every one it sells by 2030."

Today the Committee will want to hear what more can be and should be done. Specifically, we want to know what private industry, what local and State governments, what the Federal Govern-

ment, and what international institutions should help do to address the crisis.

I would like to point out that today's hearing follows one that Senator Sullivan held as Chairman of the Subcommittee on Fisheries, Water, and Wildlife in May 2016. It also follows the efforts, as well, as those of Senator Whitehouse to pass the Save Our Seas Act, which I understand is under consideration as we speak.

I want to thank them for their leadership on this issue.

I am going to give each of you an opportunity to say what you would like, a few words, about that after I turn to Ranking Member Carper. This issue is very important to the Ranking Member, to whom I now turn for his opening comments.

OPENING STATEMENT OF HON. THOMAS R. CARPER, U.S. SENATOR FROM THE STATE OF DELAWARE

Senator CARPER. Thanks so much, Mr. Chairman. Thank you very much for holding this hearing.

I really want to say to Sheldon and to Dan, thank you for your wonderful leadership. Thank you for demonstrating how we can work across the aisle on really important issues. I think we are going to make some real progress, including today. So, thank you both.

This is actually a timely issue for us in Delaware. Every year for 31 years we have done something called the Annual Delaware Coastal Cleanup. We start just north of Ocean City, Maryland all the way up to Pennsylvania, about 100 miles, and we pick up trash, all kinds of trash. This is a photograph that was taken at Fox Point State Park, not too far from actually Martha and I live in Wilmington.

We had a lot of kids who showed up. There were scouts and there were people who were just there for a good time and, frankly, for a good cause, and we netted about four tons of trash going up and down the Delaware coast on Saturday.

You might not believe the types of items we cleanup. No, you probably would believe it. From tennis balls, plastic water caps, lip balm containers, a metal baseball bat, and a whole lot more. Four tons is a massive amount of marine debris, and that is just from one cleanup weekend along Delaware's 100-mile coast.

Those numbers pale in comparison to the amount of trash in our oceans. As the Chairman has already mentioned, the infamous Great Pacific Garbage Patch, the largest mass of marine debris floating in the ocean, is over 300 times the size of Delaware and nearly the size of Alaska.

If you were able to lift Alaska up off the face of the earth and put one end of it on the U.S.-Canadian border, the other end would stretch all the way to Mexico. Imagine that. There is a massive marine debris floating in the ocean that is that big.

As we all know, all this debris has serious impacts on our water quality, on our wildlife, on our food chain, and while the extent of its impacts are not fully known, we know that hundreds of species interact with plastics. Plastic consumption can harm wildlife and all states of life. Recent research suggests it can also decrease reproduction rates. We also know that tiny plastic particles called

microplastics may be present in our drinking water and in the food that all of us consume.

Cleanup efforts like the Delaware Coastal Cleanup provide hands-on opportunities for citizens of all ages to learn about this global problem and to contribute to the solution. Not just talk about it, not just worry about it, but to do something about it. However, most environmental experts agree that stopping debris from ending up in our waters in the first place is more of an urgent priority.

We thank all of our witnesses for coming today. We are going to hear about potential solutions from our esteemed panel this morning.

As Co-Chair and Co-Founder of the Bipartisan Senate Recycling Caucus, along with my Republican partner, Senator John Boozman, I want to mention recycling is one such solution.

Delaware is a little State. It doesn't have a whole lot of space for landfills, so we had to get serious not too long ago about recycling. As Governor, I signed two executive orders to improve and promote recycling. The first established a citizens' workgroup on recycling to evaluate recycling in our State. The second established a goal of a 30 percent diversion rate for recyclables from Delaware's solid waste stream.

Delaware's recycling activities continue to grow with the implementation of the universal recycling law in 2010, which eventually led to curbside recycling collection for all single-family households and commercial businesses. These practices work for both our environment and for our economy.

I am proud of our State's work, but while Delaware has made some strides, good strides, other States struggle. I will just say it is a mixed bag. I think we were late to the game. Other States were a little bit ahead of us. But we are making great strides now. Some other States and communities, frankly, aren't doing their share; they are not doing enough. Maybe we can inspire them.

In many places it is cheaper to dispose of recyclable materials in landfills. These items can then make their way into our waters, unfortunately. This problem worsened when China announced earlier this year that it would no longer accept plastic waste from other countries to convert into new plastic-containing products.

Why is that a big deal? Because China was previously taking 30 percent of U.S. plastic waste for recycling. We, as a Nation, will need to invest in better waste management and recycling infrastructure to address challenges like this. We also need to find creative ways to finance these investments. Further, we may want to consider proposals to incentivize the use of recyclable plastics for manufacturing purposes.

All that said, the Federal Government cannot undertake this effort alone. In the last several years, corporations and industry partners have stepped up and really led the way. Good for you.

To our witnesses today testifying on behalf of these partners, we are truly grateful for your work and for the commitments that you have already made to recycling and help prevent debris from entering our oceans.

Agreeing on solutions and figuring out how to implement them will not be easy, but I am encouraged by the strong bipartisan sup-

port and leadership of our two colleagues from Alaska and from Rhode Island. With their continued resolve and with the help of the rest of us, I believe we can put our heads together, put our hands together and make a real difference on this issue, and I look forward to doing so.

Thank you one and all.

Senator BARRASSO. Thank you, Senator Carper.

Senator Sullivan, anything you would like to say?

OPENING STATEMENT OF HON. DAN SULLIVAN, U.S. SENATOR FROM THE STATE OF ALASKA

Senator SULLIVAN. Thank you, Mr. Chairman and Ranking Member Carper, for holding this very important hearing today. This is important for the Country, for the world, for Rhode Island, for New Jersey. It is certainly important for my State, Alaska, which has more coastline than the rest of the lower 48 States combined.

The prevalence of marine debris on our shores is a chronic issue. As noted, this marine debris results from a number of man-made sources, including derelict fishing gear, poor solid waste management practices, major storm events, and everyday litter.

But, as the Chairman mentioned, this is a preventable issue. Of the plastics that enter the oceans from land, more than half comes from just five developing countries. In Asia, ten river systems, eight in Asia and two in Africa, contribute almost 90 percent of land-based ocean plastics. To me, this presents a huge opportunity to curb this issue at its source globally.

I want to emphasize what has already been stated, but for the media covering this hearing, hold your breath. This is a fiercely bipartisan issue.

[Laughter.]

Senator SULLIVAN. It does happen here. Matter of fact, it happens quite a lot. Senator Whitehouse, I am going to talk about all the great work he has done. Senator Booker also has been a huge champion of this.

To just give you a little sense of the work that has been done, this past year, Senator Whitehouse and I have engaged early and often with the EPA, the Commerce Department, the U.S. Trade Representative's Office, the State Department, the American Delegation to the G7, other countries in the G7, countries in the G20; and what has resulted is a growing strong commitment to pursue marine debris prevention goals through future international trade agreements and development aid agreements.

This is an important step forward, actionable step to impact curbing this man-made plight on our oceans that we all agree is a big problem.

Last Congress, Senator Whitehouse and I, in this Committee, as Chair and Ranking Member of the Wildlife Subcommittee, held a hearing on the issue of marine debris. Much of which came out of that hearing is now in our Save Our Seas Act, the SOS Act, which I am happy to report we think is going to be hot-lined and passed today, we hope, in the Senate.

It has already passed once. The House liked it so much they added a bunch of other elements to it, and we are going to try to repass it again here in the Senate today.

This bill would serve to strengthen the Federal response capabilities to marine debris disasters, combat land-based marine debris resources, and encourage interagency coordination in stemming the tide of ocean plastics and, importantly, encourage the Trump Administration to pursue international agreements with regard to this challenge. And I think, talking to the senior members of the Administration, they are already there, so we are hopeful this is going to become law soon.

Senator Whitehouse and I are also talking about an SOS 2.0 bill, and I know Senator Booker is interested in that as well. It is my hope that this hearing will help provide ideas and momentum for the goals on what we think would be a good followup bill.

Finally, again in the spirit of bipartisanship, last night I had the honor of presenting the International Conservation Caucus Foundation, the ICCF, Teddy Roosevelt International Conservation Award to Senator Whitehouse at an annual gala event. Although to make sure it stays a little partisan, I was glad to note that this was an award named after one of America's great Republican presidents.

Thank you again, Mr. Chairman, for holding his hearing and giving me an opportunity to speak on this issue. We look forward to a very good, robust discussion today.

Senator BARRASSO. Thank you, Senator Sullivan.

Congratulations, Senator Whitehouse. The floor is yours.

OPENING STATEMENT OF HON. SHELDON WHITEHOUSE, U.S. SENATOR FROM THE STATE OF RHODE ISLAND

Senator WHITEHOUSE. Thank you, Chairman Barrasso. I will note that Senator Sullivan, my friend and colleague, was quite restrained last night in his comparisons of the relative size of his State and mine, which I thought was a kindness certainly appreciated by the Senator from Rhode Island.

Let me first thank you, Chairman, for holding this hearing. You and the Ranking Member have been very great to work with. I appreciate your focus on this. It is, I think, a really productive opportunity for us and I am grateful to you.

I want to also thank you and the former Chairman, Senator Inhofe, sitting beside you, because both of you have been able to overcome the disability of living in landlocked States in order to take a very positive interest in the marine debris problem.

I want to particularly thank Senator Inhofe, who became an original co-sponsor of the SOS bill that Dan and I worked on. I appreciate his support and leadership for it. Senator Inhofe is a powerful legislator, and when he puts his shoulder behind something, it tends to happen, so I give him a lot of credit for his support for our Save Our Seas bill.

Senator Sullivan has been an incredible partner in all of this, and I want to pay a lot of respect to him for his work. We wouldn't have even had the original hearing had Senator Sullivan not been able to successfully negotiate with the Commerce Committee, particularly the Fisheries Subcommittee of the Commerce Committee, to allow this to go forward, because there are turf issues involved.

Fortunately, the chairman of the Fisheries Subcommittee of the Commerce Committee is also Dan Sullivan, so he was able to have

that conversation with himself and reach an agreement to go forward in the Environment and Public Works Committee and have that hearing. It is from that hearing that the interest of Senator Inhofe and others was provoked, and from that hearing that the SOS bill went forward.

We do expect that it will pass the Senate by unanimous consent again today, with some of the additions that our friends who see a bill moving want to take an opportunity to add things to. That has been what has slowed it down. It has not been a lack of enthusiasm for the underlying bill; it has been other people saying, wow, something good is happening, let's see if I can get my thing on it.

So it has been a very, very positive experience and Dan's leadership has been phenomenal not only legislatively, but also with pushing really hard on the Administration to make this a policy priority in the Administration. He has been harassing the trade representative, the White House, the Department of Commerce. He has been very, very energized, and I appreciate that very much.

I also want to express my appreciation to our former colleague in Congress, Cal Dooley, who is here for the American Chemistry Council, and I would like to put into the record the press release that the American Chemistry Council put out when it announced the extension of Mr. Dooley's tenure.

The reason I want to put it into the record is that in one small page it has four separate mentions of how important the American Chemistry Council thinks solving the marine debris problem is and very strong personal statements of commitment and determination by Mr. Dooley, so I think that puts us in a very good opening position.

Senator BARRASSO. Without objection, submitted.

[The referenced information follows:]

Dooley to Remain at ACC Through the End of 2019

WASHINGTON (June 11, 2018) – The American Chemistry Council (ACC) today announced that Cal Dooleyhas agreed to delay his retirement and extend his tenure as President and CEO through 2019. In April, Dooley announced his intention to retire at the end of 2018. The decision to delay retirement comes after ACC's Annual Meeting which took place June 4th through June 6th in Colorado Springs, CO, where the board of directors agreed that the chemicals and plastics industry must take a global leadership role to reduce and ultimately eliminate plastic waste.

"Cal's leadership at ACC has been essential to the industry's success in recent years. As ACC membersembark on an effort to reduce and eliminate plastic waste in the years to come, the ACC officers felt strongly that Cal's experience and leadership were essential to aligning the global industry around a coordinated strategy," said Bob Patel, ACC Chairman and Chief Executive Officer of LyondellBasell. "With a little arm twisting and agreement from his gracious wife Linda, we were able to convince Cal to stay on to lead the development of this critical effort."

"The global chemicals and plastics industry has an imperative to fight the spread of mismanaged plastic waste that is increasingly littering our rivers, oceans and landscapes. While plastic products provide countless health, safety, lifestyle and sustainability benefits, those benefits cannot be fully realized unless we take swift and aggressive actions to make the most of all resources and leverage technology to dramatically increase rates of reuse, recycling and recovery of all plastic products," said Dooley. "Ending plastic waste is an issue of personal, as well as professional interest, and I am excited to help lay the foundation for a sustained, global industry effort to address it."

Korn Ferry International was retained to conduct the search for Dooley's replacement when his retirement was announced in April 2018. With Dooley's announcement today, Korn Ferry's efforts have been suspended, but they will resume their search in mid-2019.

Senator WHITEHOUSE. We clearly need to do things to clean up our oceans and to clean up the rivers; there are a few of them that are flowing this into our oceans. We have a map here of some of the places around the world which are the top 10 sources, as you will see. They focus on the Pacific, which is one of the reasons that Senator Sullivan has been so strong on this and Senator Murkowski has pledged to work on this through our Oceans Caucus as well.

Senator Carper showed the beach cleanup in Delaware. We do beach cleanups in Rhode Island as well. We do our beach cleanups with trash bags. Senator Sullivan and Senator Murkowski have beach cleanups in Alaska where they have to use front-end loaders, dumpsters, barges because they are on a very, very burdened Pacific coast.

So, it is a few countries and it is a few rivers that are the main sources, and we can do a lot to try to clean that up through trade policy treaties and simple public shaming and friendly persuasion.

We also need to work, and this is where the American Chemistry Council will come in so strongly, on trying to find ways to actually have plastic biodegrade in the oceans. It breaks down into smaller and smaller bits, but it doesn't actually biodegrade into natural elements. It can do that often in a landfill because the composting heat will help it break down, but in the ocean that doesn't happen; and we need to do research in order to find products that will allow that to happen without undercutting the fundamental value of plastic, which is that it lasts a bit.

We need to worry about entanglements and try to help our fishermen cleanup the oceans as they are out there. We see too much marine life dying from ghost fishing gear that still sweeps the ocean and kills, but with no gain to anyone because nobody ever recovers it.

Finally, I think we need to understand the consequences for human health of plastic at the micro level beginning to get into the human diet in a way that the human species has never experienced before through our long history. We have eaten a lot of things through our long history, but it has all been stuff that fundamentally came back to certain natural elements. To have microscopic plastic now in our diet is something new that we need to undertake health research into.

So, I appreciate this going forward and I thank very much my friend, Senator Sullivan, for what a superb leader and partner he has been on this, and I look forward to working with him productively on SOS 2.0, along with all who are present here today. Thank you.

Senator BARRASSO. Thank you very much, Senator Whitehouse, for your leadership.

Thank you, Senator Sullivan.

We now will hear from our witnesses. Today we are joined by four: Dr. Jonathan Baillie, Executive Vice President and Chief Scientist of the National Geographic Society; Hon. Cal Dooley, President and Chief Executive Officer of the American Chemistry Council; Mr. Bruce Karas, who is Vice President of Environment & Sustainability at Coca-Cola North America; and Dr. Kara Lavender

Law, who is Research Professor of Oceanography at the Sea Education Association.

I want to remind the witnesses your full written testimony will be made part of the official hearing record today. Please keep your statements to 5 minutes so we will have plenty of time for questions.

I look forward to hearing the testimony and I would like to begin with Dr. Baillie.

STATEMENT OF JONATHAN BAILLIE, EXECUTIVE VICE PRESIDENT AND CHIEF SCIENTIST, NATIONAL GEOGRAPHIC SOCIETY

Mr. BAILLIE. Good morning. Thank you, Chairman Barrasso, Ranking Member Carper, and the distinguished members of the Committee. I would like to thank you for holding this timely hearing on cleaning up the world's oceans. I would also like to congratulate Senator Whitehouse on his award last night. Congratulations.

The Committee's leadership on this global crisis is critical, and I am grateful to have the opportunity to share my expertise as a representative of National Geographic.

I am going to talk about the scale of the crisis; then I am going to discuss the implications for wildlife, for people, and for the economy; and then I am going to close discussing what National Geographic is doing and what we can do better as a Nation.

The use of plastics is rapidly increasing throughout the world and is now a major threat to the environment, to marine species, human health, and the economy. As you can see on this map, over here and over here, the problem of plastics is global, is visible, and it is harmful. But it is also solvable.

Today there are 9.2 billion tons of plastics in this world, and annually we are producing about 500 million tons of plastics, 40 percent of which is just used once and then discarded. There is estimated to be about 150 million tons of plastics just floating around our oceans and our marine environment, and no one knows really how long it takes for these plastics to biodegrade. Of course, it depends on the particular plastics, but estimates range between 450 years to never.

This leaves our world with an ever-increasing amount of plastic waste. It is a problem we can no longer ignore.

Research indicates that hundreds of marine species consume plastic or become entangled in it. The animals confuse plastic bags or small plastic fragments for food, and it is absolutely devastating to see a sea bird fly in and feed it chick plastic waste unknowingly.

Species face entanglement in plastic packaging such as six-pack rings, as well as ghost nets, fishing nets that have been cut loose or are simply lost.

And we know that plastics have already entered the food chain. Microplastics have been found in 114 aquatic species, more than half of which we actually consume. Organic pollutions also fasten on to these plastic particles. And then there are nanoplastics.

Now, this is concerning, as the full implications are unknown. We, however, do know that plastics are linked to everything from weight gain to brain development impairment in humans.

Now, ocean plastic waste is also a threat to our economy. The ocean supports over 28 million American jobs. One in six U.S. jobs is marine-related. And coastal areas account for 85 percent of the U.S. tourism revenue.

I could give you many more statistics, but it is clear that unchecked plastic pollution poses a major threat to this important component of the U.S. economy.

Now, National Geographic is stepping up. We are using our combined power of our cutting-edge science and exploration and our storytelling to draw attention to this critical issue and to help people understand all over the world what they can do.

In May 2018, we launched Planet or Plastic?, which has already been referred to. This is a multiyear initiative that is focusing on the plastic crisis and how we can stop single-use plastics entering the oceans. We also give out many awards to explorers around the world, many of which are working on this particular issue, explorers like Heather Koldewey, who is working in the Philippines to help remove these ghost nets from the oceans and have them turned into carpet tiles. It is innovations such as this that we find very encouraging.

Can we please play the film?

[Video played.]

Mr. BAILLIE. That is just one of our amazing explorers. Heather said there is hope, but not without major change, and that change has to start right here, right now, in the United States.

We are one of the most developed Nations in the world, and we have to ask ourselves why are we sending over half our plastic recyclables overseas instead of developing our own robust recycling capability? Why do we continue to use multilayer plastics like disposable coffee cups that can't be recycled? And why are we creating recycling standards that reduce confusion and address the fact that 91 percent of recyclable plastic is not being recycled?

Now, while federalism and regulations make addressing this issue challenging, we must shift how our Nation manages plastic design and recapture, a task that only the U.S. Federal Government is able to take on. To support this, National Geographic would like to offer to convene a summit in Washington, DC. to bring together policymakers, to bring together industry leaders, and to bring together other stakeholders to have a critical discussion about how the U.S. can take a leadership position in this space.

Now, imagine a future where we don't address this solvable issue. Imagine a future with billions of tons of plastics floating around the oceans, the impacts on species, the impacts on people and the economy. This is unthinkable. It is time for us to address this head-on. It is time for bold decisions and bold action. And it is time for the United States to take a leadership position to demonstrate best practice and to continue to drive innovation.

Thank you.

[The prepared statement of Mr. Baillie follows:]

WRITTEN TESTIMONY OF DR. JONATHAN BAILLIE

Executive Vice President and Chief Scientist
National Geographic Society

Before the United States Senate Committee on Environment and Public Works
"Cleaning Up the Oceans: How to Reduce the Impact of Man-Made Trash on the Environment, Wildlife, and Human Health?"

26 September 2018

Chairman Barrasso, Ranking Member Carper, and distinguished members of the Committee, I would like to thank you for holding this timely hearing about cleaning up our world's oceans. The Committee's leadership on this global crisis is critical, and I am grateful for the opportunity to share my expertise on behalf of National Geographic and to assist with your mission.

As my testimony will further demonstrate, understanding and addressing how man-made trash reaches and impacts our oceans is a top priority for National Geographic. Our world's oceans are deeply impacted by human activities, including overfishing, man-made pollutants, and beyond.

Due to its widespread and consistently increasing use, plastic is one of the top threats to the environment, marine wildlife, human health, and the economy. Whether it takes the form of abandoned fishing nets or litter making its way into our oceans, and whether the pieces are large or small, the world's unchecked use of plastics has sparked a global crisis.

PLASTICS: A GLOBAL CRISIS

There are about 9.2 billion tons of plastic in the world today. And nearly 500 million tons of plastic continue to be produced annually.

About 40 percent — or roughly 180 million tons — of this annual total is only used once before being discarded. This leaves more than 6.9 billion tons, or over 75 percent of the plastic existing globally, as plastic waste.

Unlike most other consumer materials, no one knows how long it takes plastic to biodegrade completely, with estimates ranging from 450 years to never. This leaves our world with an ever-increasing amount of plastic waste.[1]

[1] Laura Parker, "Plastic: We made it. We depend on it. We're drowning in it." *National Geographic*, June 2018, 40-69.

An estimated 150 million tons of plastic are currently circulating in our marine environments.[2] And a 2015 study found that between 5.3 and 14 million additional tons of plastic enter the ocean each year.[3]

Due to plastic's relatively recent introduction, more research into its impact on our oceans is needed. However, some alarming consequences have already been identified.

Impact of Plastic Debris on Marine Wildlife[4]

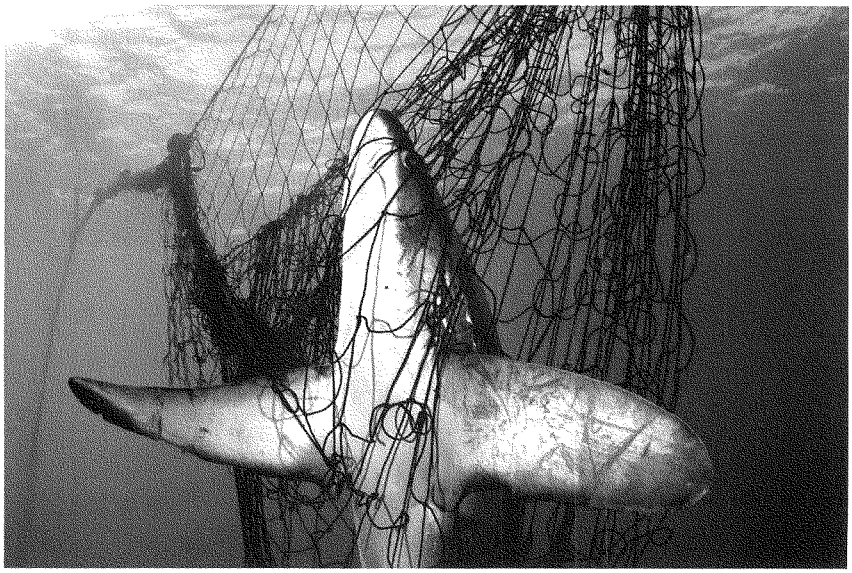

Photo by Brian Skerry, National Geographic

There is a large body of evidence demonstrating that plastic debris is often deadly to marine wildlife. Unfortunately, the durability of plastic ensures that its presence in marine ecosystems is persistent at all levels, ranging from large marine mammals to the smallest krill.[5]

Research indicates that at least 700 marine animal species have consumed or become entangled in plastics. They face entanglement in plastics such as "ghost nets" — fishing nets

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[2] Oceans Caucus Foundation. "Marine Debris." Published March 15, 2015. http://www.ocfoundation.us/the-issues/marine-debris

[3] Jenna Jambeck et al, "Plastic waste inputs from land into the ocean," *Science* 347, no. 6223 (2015): 768-771. http://science.sciencemag.org/content/347/6223/768

[4] Natasha Daly, "A Toll on Wildlife," *National Geographic*, June 2018, 80-84.

[5] Amanda Dawson et al, "Turning microplastics into nanoplastics through digestive fragmentation by Antarctic krill," *Nature Communications* 9, Article number 1001 (2018). https://www.nature.com/articles/s41467-018-03465-9

that have been left or lost in the ocean by fishermen — or six pack rings. The animals confuse plastic bags or smaller plastic fragments with food. Plastics of all sizes are tied to everything from digestive track blockages to immediate death.[6]

Plastic debris not only exists in forms that we can see, such as bottles and plastic bags, but is also broken down into much smaller pieces by light exposure, ocean drift, and marine organism digestion. These microplastics — or pieces smaller than one-fifth of an inch — linger for centuries.[7] Scientists have already found microplastics in 114 aquatic species, more than half of which are consumed by humans.[8]

In addition, microplastics cause physiological issues in marine species. Pollutants that wash off the land and into the sea adhere to microplastics, causing problems ranging from organ damage to reproductive abnormalities in the marine organisms that consume them.[9]

We do not yet understand the full implications of plastic debris on marine wildlife. However, National Geographic and scientists around the world are working every day to better understand this issue.

Impact of Plastic Debris on Humans

Photo by Randy Olson, National Geographic

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[6] Elizabeth Royte, "A Threat to Us?" *National Geographic*, June 2018, 84-87.

[7] Ibid.

[8] GESAMP, "Sources, fate and effects of microplastics in the marine environment: part two of a global assessment" (Kershaw, P.J., and Rochman, C.M., eds). (IMO/FAO/UNESCO-IOC/UNIDO/WMO/IAEA/UN/UNEP/UNDP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection). Rep. Stud. GESAMP No. 93 (2016): 220.

[9] Elizabeth Royte, "A Threat to Us?" *National Geographic*, June 2018, 84-87.

Research has demonstrated that many of the fish and shellfish humans eat are consuming microplastics. It has also tied plastics to issues ranging from weight gain to brain development impairment.

We do not yet know at what quantity human consumption of microplastics will have adverse effects and how other factors such as food preparation affect microplastic toxicity.[10] However, we do know that microplastics have entered our food chain.

Scientists are expressing additional concern about the potential impact of nanoplastics on human health. Nanoplastics are less than 100 billionths of a meter in size and are created as microplastics continue to degrade. Their miniscule size makes them impossible for scientists to trace in the seafood humans consume. However, scientists worry that these tiny nanoplastics, which can penetrate cells and move into tissues and organs, pose a risk to humans.

Despite the scientific questions that remain at the micro- and nanoscales, the impact of marine plastic is evident at the macroscale. Oceans and coastal ecosystems provide an irreplaceable benefit to the U.S. economy. Our oceans support over 28 million American jobs. In fact, between the fishing, boating, tourism, recreation, and ocean transport industries combined, one in six U.S. jobs is marine-related. Additionally, U.S. consumers alone spend over $55 billion on fishery products, and coastal areas account for 85 percent of U.S. tourism revenue.[11]

Scientists are still in the early phase of studying how extensively the global plastic crisis has impacted and will continue to impact our world. However, they have already demonstrated that plastic pollution poses a tremendous threat to our oceans, the marine wildlife that inhabits them, and the U.S. economy.

My Background on the Issue

Prior to joining National Geographic in 2016, I spent 20 years at the Zoological Society of London (ZSL) working on projects focused on threatened species and their habitats in over 50 countries.

While at ZSL, I helped develop the Living Planet Index, Sampled Red List Index, and Wildlife Picture Index. I also worked with a network of 8,000 scientists to produce the first International Union for the Conservation of Nature (IUCN) Red List of Threatened Species using quantitative criteria to assess extinction risk. I then partnered with IUCN to produce the first list of the 100 most threatened animals, plants, and fungi and co-chaired the IUCN Regional Red List working group and the IUCN Special Survival Commission Pangolin Specialist Group.

I led the ZSL team that founded the EDGE of Existence program, which focuses on Evolutionarily Distinct and Globally Endangered (EDGE) species and supporting young

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[10] Ibid.

[11] U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service. "What does the ocean have to do with human health?" https://oceanservice.noaa.gov/facts/ocean-human-health.html

scientists around the world working to protect animals facing extinction. While at ZSL, I also founded the Conservation Technology Unit and the Business and Biodiversity Programme.

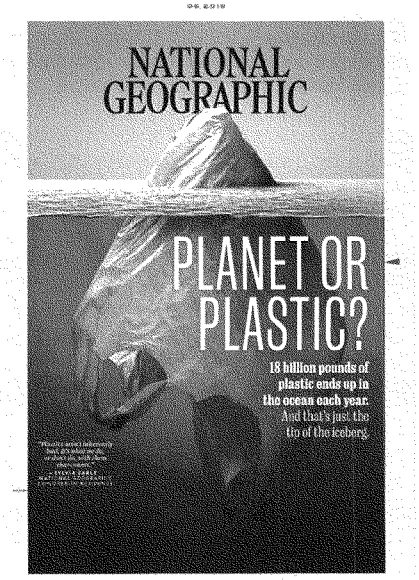
I helped initiate United for Wildlife, a collaboration of seven of the most influential conservation organizations working to address illegal wildlife trade at scale. Under this collaboration, I led the development of the award-winning digital conservation leadership training platform, the Rhino Impact Investment, and the development of technology for nature.

It was also during this time that I co-led the first large-scale retail activism project to focus on ocean conservation: Project Ocean. The partnership between ZSL and Selfridges, a chain of high-end department stores in the United Kingdom, highlighted the unthinkable prospect of the world's major fisheries collapsing by 2050.

The retail platform provided the opportunity for conservationists from ZSL to reach a wider audience and have a global impact. Twenty-two non-governmental organizations (NGOs) dedicated to environmental and sustainable issues embraced the initiative, leading to public discussions between political figures at Selfridges on World Oceans Day 2011. Project Ocean culminated with a long-term joint project between Selfridges and ZSL: a 50-hectare, or 124-acre, marine protected area in the Philippines, aiming to safeguard fish species and their coral reef ecosystem.

The success of this initiative demonstrated the effect that public awareness initiatives can have on major global problems. Now, as National Geographic's Executive Vice President and Chief Scientist, I have access to an unparalleled media megaphone to address the issues facing our oceans today.

Planet or Plastic?



June 2018 issue of National Geographic Magazine

For 130 years, National Geographic has pushed the boundaries of exploration to further our understanding of the planet and empower us all to create a healthy and sustainable future for generations to come. We do this by investing in bold people and transformative ideas and sharing what we learn with audiences around the globe. Our ultimate goal is to achieve a planet in balance, one that provides for humanity and the untold millions of other species with which we live.

Today, our brand reaches millions of people of all ages in 172 countries every month. National Geographic publishes in 37 languages, our broadcast channels air in 43 languages, and our social media channels reach 436 million.

Through the power of our scientific research and storytelling, the integrity of our brand, and the reach of our global media platforms, we are uniquely positioned to engage with the public, to educate and raise awareness, and to build consciousness and help drive change.

In May of 2018, National Geographic launched *Planet or Plastic?*, a multiyear initiative aimed at raising awareness about the global plastic waste crisis and reducing the amount of single-use plastic that enters the world's oceans. The initiative was showcased in the June 2018 "Planet or

Plastic?" issue of National Geographic magazine and across our digital platforms to educate our audiences about the crisis and to show them how to take accountability for this global emergency.

We're encouraging our audiences to pledge to take small, attainable steps, such as using reusable shopping bags, skipping straws, carrying a reusable bottle, and properly disposing of trash. We are demonstrating that when we work together, we can reduce single-use plastics and make a lasting impact on the global plastic crisis.[12]

As of last month, our *Planet or Plastic?* education initiative had already generated over 938 million content views across our digital platforms. And our worldwide reach has prompted 47,000 people to take the pledge to reduce single-use plastics.

INVESTING IN CHANGE

National Geographic's commitment to addressing this issue goes beyond storytelling. It also includes grants to support hundreds of National Geographic Explorers. Through the power of our grants program, these bold individuals are changing the world by furthering the collective understanding of our planet and empowering the global community to generate solutions for a healthier and more sustainable future.

Stopping Plastic Pollution at its Source[13]

Inland plastic can travel many miles to enter our world's oceans. A combination of direct dumping of waste into rivers and litter flowing from land to local waterways during rainstorms creates an unintentional plastic waste conveyor system. The waste from local waterways feeds into larger tributaries and rivers that ultimately transport the inland waste into our oceans. Via this mechanism, polluted rivers deliver a significant portion of the millions of tons of plastic that enter oceans annually.[14]

Through our grants program, we are partnering with scientists and innovators who are working diligently to find ways to keep plastics from ever reaching the ocean. To better understand how plastic waste flows to the ocean in the first place and to prevent it from ending up there, National Geographic Explorers will be journeying from the source of the plastic in the rivers to the ocean. Their goal: to understand the types and pathways of plastic in a river system and to provide science-based information that will engage citizens and help policymakers, businesses, and NGOs implement solutions to this growing crisis.

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[12] National Geographic. "Planet or Plastic?" https://www.nationalgeographic.com/environment/plasticpledge/
[13] National Geographic. "Plastics: Source to Sea." https://www.nationalgeographic.org/projects/ocean-plastics/
[14] Laura Parker et al, "What Happens to the Plastic We Throw Out," *National Geographic*. https://www.nationalgeographic.com/magazine/2018/06/the-journey-of-plastic-around-the-globe/

Improving Plastics Waste Management[15]

Approximately 80 percent of marine debris comes from land-based sources.[16] Improved solid waste management reduces the amount of plastics entering the oceans annually.

Award-winning National Geographic Explorer and environmental engineer Jenna Jambeck has researched marine debris since 2001 and has raised awareness via her research on plastic waste leakage into water systems. In her 2016 testimony before the Senate Committee on Environment and Public Works Subcommittee on Fisheries, Water, and Wildlife, Jambeck pointed to plastic pollution's economic and environmental impact as well as the ability to combat widespread plastic pollution via well-researched and culturally appropriate strategies.[17]

Today, Jambeck advances her work on finding scientifically supported and culturally relevant solutions with funding from National Geographic's grants program. She works in Vietnam — a country with an often-informal solid waste management system — to better understand and improve waste management, and to ultimately reduce the quantity of plastics entering water systems via local partnerships and education.

Cleaning Up Plastic Fishing Gear Pollution[18]

National Geographic Explorer Heather Koldewey works with ZSL to help communities clean up ocean plastic as part of the National Geographic Ocean Plastics Initiative. Through interdisciplinary research and conservation action at the interface between communities and the environment, Koldewey drives real change in the communities she touches.

Today, Koldewey works in the Philippines and beyond to combat ocean plastics, starting with ghost nets. Abandoned fishing gear comprises around 10 percent of all plastic trash in the oceans. More than 705,000 tons of fishing nets are lost yearly, according to the United Nations,[19] and nearly half the weight of the Great Pacific Garbage Patch's surface debris is fishing gear.

Abandoned fishing gear is directly connected with a disproportionately large number of marine wildlife fatalities. World Animal Protection estimates that more than 100,000 large whales, sea lions, and seals are killed every year by fishing gear, in addition to an "inestimable" number of sea birds, turtles, and fish.

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[15] National Geographic. "Grants Across the Globe: Working With The Independent Waste Collector Community In Vietnam To Reduce Leakage Of Plastic To The Ocean." https://www.nationalgeographic.org/grants/where-we-work/A1228097?filter=activity_status:All&q=Jenna%20Romness%20Jambeck

[16] Oceans Caucus Foundation. "Marine Debris."

[17] *Marine Debris and Wildlife: Impacts, Sources and Solutions: Hearing before the U.S. Senate Committee on Environment and Public Works*, 114th Cong. (2016) (written testimony of Jenna R. Jambeck, Ph.D., Associate Professor of Environmental Engineering, College of Engineering, University of Georgia).

[18] Laura Parker, "These Communities Turn Discarded Fishing Nets Into Carpets," *National Geographic*, Published June 13, 2018. https://news.nationalgeographic.com/2018/06/heather-koldeway-explorer-nets-plastic-philippines-ocean-culture/?beta=true

[19] Eric Gilman et al, Food and Agriculture Organization of the United Nations, *Abandoned, lost or otherwise discarded gillnets and trammel nets: Methods to estimate ghost fishing mortality, and the status of regional monitoring and management*, 2016, FAO Fisheries and Aquaculture Technical Paper No. 600, Rome, Italy.

Koldewey saw this critical issue as an opportunity for partnership. By developing Net-Works, a collaboration between global carpet tile manufacturer Interface, Inc. and ZSL, she developed a successful community-based supply chain for retrieving and discarding fishing nets. Net-Works partners with coastal communities to collect discarded fishing nets, convert them into nylon yarn, and sell them to Interface to create carpet tiles. So far, the initiative has collected and recycled 208 tons of discarded fishing nets, removing these dangerous threats to marine wildlife from our oceans and empowering local communities with economic opportunity.[20]

Partnership for Change[21]

National Geographic is also partnering with Sky Ocean Ventures to create the largest global media campaign to reduce plastic litter in the ocean. We've committed $10 million to bring our scientific expertise, grants, and media reach to the partnership.

The partnership will make grants available to proposals that will measurably reduce plastic pollution before it reaches the ocean, including improved recycling, waste management, stakeholder engagement, and more. It will also convene a series of Innovation Challenges, uniting the best international minds around technologies designed to reduce plastic waste and its impact on oceans. Additionally, the partnership will create an event series engaging industry leaders, corporations, institutions and foundations around the issue of marine plastic pollution.

AN OPPORTUNITY FOR U.S. LEADERSHIP

Our planet is at a crossroads. World plastic production is increasing exponentially. In 1950, 2.3 million tons were produced. In 1993, 162 million tons were produced. And in 2015, 448 million tons were produced.[22] As plastic production grows, so does the threat plastic waste poses to our oceans and the wildlife and economies that depend upon them.

However, as Laura Parker wrote in the June National Geographic magazine cover story, plastics have been a boon to humanity. They helped the Allies win World War II, "eased travel into space, and revolutionized medicine ... In airbags, incubators, helmets, or simply by delivering clean drinking water to poor people in those now demonized disposable bottles, plastics save lives daily."[23]

Now, it's a matter of learning to balance the potential provided by plastic with the threat plastic waste poses to our world. We know that the ocean's currents ensure that marine plastic pollution will never be just one nation's problem. Any plastic waste that is introduced to the system will impact wildlife and economies around the globe.

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[20] Zoological Society of London. "Asia: Net-Works." https://www.zsl.org/conservation/regions/asia/net-works

[21] National Geographic 2018. "Sky and National Geographic Work Together to Fight Ocean Plastic." http://press.nationalgeographic.com/2018/04/16/sky-and-national-geographic-work-together-to-fight-ocean-plastic/

[22] National Geographic. "10 Shocking Facts About Plastic." https://www.nationalgeographic.com/environment/plastic-facts/

[23] Susan Goldberg, "The Plastic Apocalypse," *National Geographic*, June 2018, 6.

This is why National Geographic launched the *Planet or Plastic?* initiative and why we are dedicated to encouraging consumers to end their reliance on the single-use plastics.

National Geographic is committed to continuing to raise international awareness through our media and education arms and to better understanding and addressing the issue through research and community partnership. We are working with corporations, NGOs, and other institutions around the world to eliminate single-use plastic and promote recyclability.

However, addressing this issue will require true global partnership. In this process, it's important to remember that our work must start with evaluating our own practices.

With *Planet or Plastic?,* we hope to do nothing less than transform consumer behavior — and we're starting at home. To kick off this multiyear initiative, National Geographic is conducting an internal audit of our headquarters in Washington, D.C., to assess how our own operations and supply chain use plastic. From the plastic wrappers in which our magazines were formerly distributed to the materials we use in our cafeteria, we're identifying and eliminating single-use plastics.

Now, it's time for the United States to do the same. The United States is one of the most developed nations in the world. So why aren't we addressing this issue head-on? Why are we relying on sending our plastic recyclables overseas instead of developing a robust recycling capability of our own? And why do we continue to use plastics that can't be recycled at all?

U.S. Plastic Waste

Today, an estimated 94 percent of Americans have access to recycling. However, our nation lacks standardization on which materials are considered recyclable and what community collection practices look like.[24] This contributes to this shocking metric: In the United States, 91 percent of recyclable plastic is not actually recycled.[25]

Additionally, more than half of plastic waste that is recycled in the United States has been exported to hundreds of countries around the world because our own recycling sector is under resourced. Historically, China has been responsible for recycling 45 percent the world's plastic and paper products.

However, this year, China stopped accepting recycling from abroad. This is related to the fact that many countries, including the United States, transitioned to single-stream recycling. Single-stream recycling was designed to streamline recycling and reduce consumer burden by allowing all recyclables — from paper to plastic to glass — to go into the same bin. However, this streamlining process means that much of the waste reaching China is too contaminated with non-recyclables to provide China with the profit margin needed to continue processing the world's recyclables. As a result, estimates predict that 122 tons of potentially recyclable plastic

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[24] Drew Desilver, "Perceptions and realities of recycling vary widely from place to place," *Pew Research Center*, Published October 7, 2016. http://www.pewresearch.org/fact-tank/2016/10/07/perceptions-and-realities-of-recycling-vary-widely-from-place-to-place/

[25] Faye Flam, "The Recycling Game Is Rigged Against You," *Bloomberg*, Published June 27, 2018. https://www.bloomberg.com/view/articles/2018-06-27/plastic-recycling-is-a-problem-consumers-can-t-solve

will be diverted from Chinese recycling facilities, likely ending up in landfills.[26] However, the global shortage in recycling capabilities is only one piece of the issue.

Some plastics are too difficult to recycle in the first place. Due to their prevalence in our daily lives, multilayer plastics, which are used in products ranging from disposable coffee cups to snack packaging, are particularly problematic. Multilayer plastics incorporate materials such as paper or aluminum, tightly stacking thin layers of the materials alongside plastic and making the separation and processing of these materials nearly impossible. While material production advancements make these multilayer plastics cheap, readily available, and utilitarian, the non-recyclable nature of these single-use materials is a major contributor to the global plastic crisis.[27]

Unfortunately, this means that our nation's plastic waste footprint is an issue that consumers and individual organizations cannot solve alone. It requires a shift in how our nation as a whole manages plastic design and recapture, a task that only the U.S. federal government is able to take on.

Model Nation and Innovation

I understand that federalism and regulation concerns make addressing this issue challenging. However, we cannot stymie the global plastic crisis without U.S. federal government involvement.

The U.S. government can play a stronger role in addressing the global plastic crisis by convening conversations with industry leaders and encouraging them to present solutions and commit to targets. The United States is a global leader in innovation. Our government continuously invests in American ingenuity. Now, it must invest in solutions to the global plastic crisis through private sector and entrepreneurial innovation around better material design and recapture.

Only the federal government is positioned to implement the solutions developed by private sector leaders at a nationwide scale. But as part of our *Planet or Plastic?* initiative, National Geographic would like to offer our support to U.S. policymakers as they address this issue.

On behalf of National Geographic, I would like to offer to convene a summit in Washington, D.C., to bring together policymakers, industry leaders, and other essential stakeholders for a critical discussion about how the United States can lead in this space. The *Planet or Plastic?* Summit will ensure that the right voices are in the room as we look at the current state of plastic waste in the United States and, in turn, how to advance the American recycling industry, move away from non-recyclable and single-use plastics, and find better alternatives to plastic where possible. And equally importantly, National Geographic wants to bring our powerful storytelling to bear to amplify the results of this conversation and to raise awareness of what the United States is doing to address the global plastic crisis.

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[26] Amy Brooks, Shunli Wang, and Jenna Jambeck, "The Chinese import ban and its impact on global plastic waste trade," *Science Advances* Vol. 4, no. 6 (2018). http://advances.sciencemag.org/content/4/6/eaat0131

[27] Lilly Sedaghat, "7 Things You Didn't Know About Plastic (and Recycling)," *National Geographic*, Published April 4, 2018. https://blog.nationalgeographic.org/2018/04/04/7-things-you-didnt-know-about-plastic-and-recycling/

While the plastic crisis has no boundaries, the U.S. government must first take its own steps to protect the oceans and marine wildlife upon which one in six American jobs depend.[28] Perhaps the time has come to examine the feasibility of a federal regulatory approach that would provide minimum standards on plastic use and recycling. The approach could provide incentives and mandates — carrots and sticks — for states to adopt the right recycling protocols and provide national standards for plastic import, manufacturing, and use.

It's a bold solution, but this crisis requires one. It's time to stop the plastic pollution that got us into this mess in the first place — and to step up and be a true global leader on this issue.

[28] U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service. "What does the ocean have to do with human health?" https://oceanservice.noaa.gov/facts/ocean-human-health.html

APPENDIX

World Map Display of Plastic Waste in Oceans via National Geographic

"Drowning in Plastic," *National Geographic*, June 2018. 55-57. https://www.dropbox.com/sh/gdcr7416n8gpfxl/AAAHejRDyj9XCPnAuKvSBc3Za?dl=0&preview=00_MAP+plastics_grfx_map.jpg

Recent Editorial Co-Authored by Jonathan Baillie

Jonathan Baillie and Ya-Ping Zhang, "Space for Nature," *Science* 361, no. 6407 (2018): 1051. http://science.sciencemag.org/content/361/6407/1051

Senate Committee on Environment and Public Works
Hearing Entitled, *"Cleaning Up the Oceans: How to Reduce the Impact of Man-Made Trash on the Environment, Wildlife, and Human Health?"*
September 26, 2018

Questions for the Record for
Dr. Jonathan Baillie
Executive Vice President and Chief Scientist
National Geographic Society

Chairman Barrasso:

1. Experts seem to agree that stopping the flow of debris into the ocean is a bigger priority than cleaning up the debris already in the ocean. Is this an assessment that you agree with? If not, why not?

Yes, I agree. Studies have found that approximately 80 percent of marine debris comes from land-based sources. While stopping the flow of plastic debris from land into waterways and cleaning up the debris that already pollutes the world's oceans are important from an environmental and economic standpoint, addressing the origins of plastic pollution would provide a major boost to combating this issue.

2. We know that five countries in Asia bear much of the responsibility for the increase in ocean plastic. That does not mean that we in the United States do not have a critical role to play. What additional steps can local and state governments as well as the federal government take to address this problem?

The U.S. government can play a stronger role in addressing the global plastic crisis by convening conversations with industry leaders and encouraging them to present solutions and commit to targets. The federal government has an advantage in that it maintains the capability to implement solutions developed by the private sector on a nationwide scale. I suggest that the federal government explore a federal regulatory approach that would provide minimum standards on plastic use and recycling. Local and state governments can also examine and address their waste management practices to stymie the paths by which plastics flow from land in their jurisdiction into waterways.

3. On January 24, 2018, the *Financial Times* published an article, by Clive Cookson, entitled, "The problem with plastic." It explained that:

> "While the personal-care industry is phasing out microbeads, concern is growing about another ubiquitous micropollutant: plastic fibres. Analysis shows these to be present in streams, rivers, lakes, and seas worldwide, as well as household drinking water. Their main source seems to be clothing and textiles made from synthetic fibres, which become detached in washing machines and are not filtered out by water-treatments plants."

Do you agree with this assessment? If so, how do we begin to address this issue?

We know that microplastics such as plastic fibers have already entered our food chain and that pollutants adhering to these microplastics can cause issues like organ damage and reproductive abnormalities in the marine organisms that consume them. We also know that as microplastics degrade, they become nanoplastics, which have the ability to penetrate cells and move into tissues and organs. Per GESAMP, potential avenues of addressing the fiber issue could specifically involve enhanced washing machine filters or other new technologies that would limit the release of these microplastics during washing, such as laundry detergent additives and textile finishing treatments.[1]

In addition, there are companies that are looking into design-based solutions. For example, some fleece manufacturers are working to design materials that shed fewer fibers.

4. What regions of the world are the least studied when it comes to plastic pollution?

Plastic use and the problem of plastic waste have grown exponentially in a very short period of time. While there are regions of the world that may be less studied, the National Geographic Society is focusing initially on areas where plastic use is high and where high levels of plastic waste are seeping into the environment.

In fact, National Geographic is already taking steps to study plastic pollution in several of these areas by investing in the work of our scientists and explorers. Through our grants program, we partner with scientists and innovators who are working diligently to find ways to keep plastics from ever reaching the ocean.

For example, National Geographic Explorer Jenna Jambeck works in Vietnam, which has an often-informal solid waste management system, to better understand and improve waste management. Explorer Heather Koldewey works in the Philippines to help communities clean up ocean plastic as part of the National Geographic Ocean Plastics Initiative.

We have found that even highly remote areas — like the uninhabited Henderson Island in the Pacific — can play host to what is estimated to be the highest concentration of debris anywhere in the world. Further research could and should be conducted around the world on the plastic crisis. This is a global issue that affects the world's connected waterways and oceans.

Ranking Member Carper:

5. Stopping the flow of marine debris into the ocean — and mitigating its impacts — are not problems that can be solved overnight. Long-term, thoughtful, and collaborative solutions are necessary in order to address the full scope of the issue. Solutions that have been discussed included: improving recycling; incentivizing the use of recycled materials in the global supply chain; developing more biodegradable alternatives; and changing

[1] http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/pdf/GESAMP_microplastics%20full%20study.pdf

manufacturing protocols. What steps can this Committee and the Congress take now to advance these potential solutions here in the United States?

The federal government should explore a federal regulatory approach that would provide minimum standards on recycling and the recyclability of plastic products. The approach could provide incentives and mandates — carrots and sticks — for states to adopt the right recycling protocols and provide national standards for plastic import, manufacturing, and use. Only the federal government is able to implement change now on a nationwide scale.

6. Now that China has implemented its "Green Fence Policy," a ban on importing plastic waste, our market for these materials in the United States is flooded. China previously accepted 30 percent of our plastic waste. Local municipalities are now having even more trouble breaking even when collecting and recycling this waste. In your opinion, what are the best ways for the United States to address this new challenge?

Many countries, including the United States, use single-stream recycling. Single-stream recycling was designed to streamline recycling and reduce consumer burden by allowing all recyclables — from paper to plastic to glass — to go into the same bin. However, this streamlining process means that much of the waste reaching China is too contaminated with non-recyclables to provide China with the profit margin needed to continue processing the world's recyclables. Many of the recycling facilities in the United States are facing the same issue now.

Our nation lacks standardization on which materials are considered recyclable and what community collection practices look like. This contributes to this shocking metric: In the United States, 91 percent of recyclable plastic is not actually recycled.

This can be addressed via a three-pronged approach:

1. **The United States must streamline its recycling standards and practices to reduce contamination.** I understand that federalism and regulation concerns make addressing this issue challenging. However, an effort on this scale is something that only the federal government — with the help of participatory stakeholders — can manage. Our nation must explore a federal regulatory approach that would provide minimum standards on plastic use and recycling. The approach could provide incentives and mandates — carrots and sticks — for states to adopt the right recycling protocols and provide national standards for plastic import, manufacturing, and use.
2. **We must move away from non-recyclable plastics that have no value to the recycling industry.** The U.S. government can play a stronger role in addressing the global plastic crisis by convening conversations with industry leaders and encouraging them to present solutions and commit to targets. The United States is a global leader in innovation. Our government continuously invests in American ingenuity. Now, it must invest in solutions to the global plastic crisis through private-sector and entrepreneurial innovation around better material design and recapture.
3. **We must educate consumers about what is recyclable and how it should be recycled**. Once recycling practices are standardized, the United States will need to engage in a nationwide education campaign to raise awareness, highlight recycling

myths versus facts, and ensure consistency in our nation's consumer recycling practices. National Geographic is committed to using our media reach to aid in this education process.

Senator Markey:

7. For the past 25 years, China has imported 45 percent of the world's plastic waste, over 100 million tons every year. From the United States, about 3,700 shipping containers of recycling went to China on a daily basis. That changed this past January, when China closed its borders to 24 categories of solid waste, leaving the United States and Europe without a market for much of our plastic trash. Municipal waste managers in the United States may now have to put recyclable plastic in landfills as falling prices and lack of demand for recyclables could also lead to recycling centers closing.

    a. Does the closing of China's borders to many kinds of plastic waste force a fundamental shift in the U.S.'s recycling economy?

Yes, China's decision to stop accepting plastic recyclables from abroad requires a major shift in our nation's recycling economy. In addition to the three essential steps I outlined in question 6, we need to improve the design of plastics in the United States to ensure that they are recyclable in the first place.

One way to do this is by reducing our reliance on multilayer plastics, used in products ranging from disposable coffee cups to snack packaging, as they are particularly problematic. Multilayer plastics incorporate materials such as paper or aluminum, tightly stacking thin layers of the materials alongside plastic and making the separation and processing of these materials nearly impossible. While material production advancements make these multilayer plastics cheap, readily available, and utilitarian, the non-recyclable nature of these single-use materials is a major contributor to the global plastic crisis. We must find recyclable alternatives to multilayer plastics as well as better substitutes for single-use plastics wherever possible.

    b. Will this increase the risk of more U.S. plastic ending up in the oceans in addition to landfills?

Yes, a global analysis of all plastics ever made showed that only 9 percent were recycled. The vast majority (79 percent) accumulated either in the environment or in landfills. Estimates predict that 122 tons of potentially recyclable plastic will be diverted from Chinese recycling facilities.[2] In all likelihood, this break in the global recycling system will lead to an additional influx of marine plastic pollution in our oceans.

Senator Merkley:

8. In your testimony, you spoke about the need for U.S. leadership on marine debris. What are the most important policy steps the United States should be taking to address marine debris on an international scale?

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[2] https://news.nationalgeographic.com/2017/07/plastic-produced-recycling-waste-ocean-trash-debris-environment/

Much of my background on this issue comes from my decades of experience as a scientist and from leading advocacy projects that convened a variety of business, conservation, and non-governmental organization (NGO) stakeholders in order to enact meaningful change on a large scale. Through this lens, and as I've outlined above, I believe the United States should explore methods for advancing the American recycling industry, moving away from single-use plastics, looking for plastic alternatives, where possible, and providing incentives and mandates for states to adopt the right recycling protocols and provide national standards for plastic import, manufacturing, and use.

Senator Whitehouse:

9. During your testimony, you offered to convene a summit of essential stakeholders in Washington, D.C., to discuss U.S. leadership in this area. Do you see a role for the federal government in this discussion? What other sectors and stakeholders will be involved?

The federal government has a vital role to play in this process as a convener of conversations with industry leaders in order to encourage them to present solutions and commit to targets to address the crisis. Members and senators, as well as their staff, on and beyond the committees of jurisdiction are important participants in the ongoing dialogue to resolve this issue. Industry leaders, NGOs, and other organizations are also key components of this process.

10. National Geographic magazine's recent marine debris issue punctuated the crisis with poignant photos and articles. What role do these stories and images play in encouraging change and support for marine debris solutions?

At National Geographic, we take our role in addressing this issue very seriously, whether through scientific research or storytelling. Our global reach across numerous media channels allows us to engage and educate audiences on issues affecting a planet we all share. By raising public consciousness and consumer awareness, National Geographic helps shine a light on global issues like plastic pollution. Increased public awareness leads to individuals making changes in their own lives and expanding those choices among their family, friends, and communities. Poignant storytelling and striking images are effective tools in illustrating issues that may otherwise go overlooked, and the global plastic crisis is a perfect example of that.

11. What misconceptions remain among the general public about marine debris?

A common misconception among the general public is that the biggest issue we face is the type of marine debris that we can see, such as bottles and plastic bags. Awareness is often low about the risk imposed by plastics breaking down into much smaller pieces by light exposure, ocean drift, and marine organism digestion. These microplastics — or pieces smaller than one-fifth of an inch — linger for centuries. Scientists have already found microplastics in 114 aquatic species, more than half of which are consumed by humans. In addition, microplastics cause physiological issues in marine species. Pollutants that wash off the land and into the sea adhere

to microplastics, causing problems ranging from organ damage to reproductive abnormalities in the marine organisms that consume them.

Research has demonstrated that many of the fish and shellfish humans eat are consuming microplastics. It has also tied plastics to issues ranging from weight gain to brain development impairment. We do not yet know at what quantity human consumption of microplastics will have adverse effects and how other factors such as food preparation affect microplastic toxicity. However, we do know that microplastics have entered our food chain.

Scientists are expressing additional concern about the potential impact of nanoplastics on human health. Nanoplastics are less than 100 billionths of a meter in size and are created as microplastics continue to degrade. Their miniscule size makes them impossible for scientists to trace in the seafood humans consume. However, scientists worry that these tiny nanoplastics, which can penetrate cells and move into tissues and organs, pose a risk to humans.

12. National Geographic launched its *Planet or Plastic*? campaign this summer. The initiative asks people to pledge to reduce their use of single-use plastics.

    a. How many people have taken the pledge so far?

As of November 1, 2018, our *Planet or Plastic?* education initiative had already generated more than 972 million content views across our digital platforms. And our worldwide reach has prompted more than 91,000 people to take the pledge to reduce single-use plastics.

    b. How will Nat Geo track the effect of this campaign on plastics reduction?

National Geographic is sharing metrics on its *Planet or Plastic?* pledge campaign online at www.nationalgeographic.com/environment/plasticpledge. Our goal is to prevent 1 billion items from reaching the ocean by 2020, and we are using our global media platform to provide updates on the campaign, share resources, and help inspire others to reduce their use of single-use plastics.

In addition, we will be advancing education initiatives, citizen science efforts, and innovation challenges. We will also be developing a global framework to enable better selection and siting of interventions. Finally, we will be hosting convenings and will continue to shine a light on plastic pollution through our unparalleled storytelling and global media platforms.

    c. What role can these voluntary campaigns play in changing consumer and producer or retailer behavior?

These campaigns can play a large role in changing consumer, producer, and retailer behavior. For more than 130 years, National Geographic has sought to further our understanding of the planet and empower us all to create a healthy and sustainable future for generations to come.

By leveraging our brand, we are able to reach millions of people in 172 countries and educate them on this issue. We are also able to share tips for consumers to take actionable steps in order to reduce plastic waste.

13. How do voluntary actions by corporations and individuals support marine debris reduction?

About 40 percent of the nearly 500 million tons of plastic produced annually is only used once before being discarded. Voluntary actions by corporations and individuals can play a major role in reducing this number.

This is why to kick off our multiyear *Planet or Plastic?* initiative, National Geographic is conducting an internal audit of our headquarters in Washington, D.C., to assess how our own operations and supply chain use plastic. From the plastic wrappers in which our magazines were formerly distributed to the materials we use in our cafeteria, we're working to identify and eliminate single-use plastics. Actions such as these are an essential first step toward the broader nationwide and international reform needed to combat the global plastic crisis.

14. As we work on the next iteration of the Save Our Seas Act, do you have any additional recommendations or comments you would like to share to inform our development of this bill?

The Save Our Seas Act is a powerful piece of legislation. I am glad to see that Congress is taking bipartisan steps to address the global plastic crisis and understands the need to improve international waste management practices to reduce the influx of plastics into our world's oceans.

I recommend a companion piece of legislation that would focus not only on reforming international plastic waste management, but also on addressing what the United States can do within our nation's borders. This legislation could further study the impacts of plastics — at both the micro and macro scales — on our waterways; invest in private-sector and entrepreneurial innovation around better material design and recapture in the United States; and provide incentives and mandates — carrots and sticks — for states to adopt the right recycling protocols and provide national standards for plastic import, manufacturing, and use.

Senator BARRASSO. Thank you so much for your testimony and your leadership on this.

Mr. DOOLEY.

STATEMENT OF HON. CAL DOOLEY, PRESIDENT AND CEO, AMERICAN CHEMISTRY COUNCIL

Mr. DOOLEY. Thank you, Mr. Chairman and members of the Committee. I am delighted to be joining you all.

ACC represents a diverse set of companies engaged in the U.S. business of chemistry, and the chemical industry is at the forefront of developing the innovations, the technologies, and the products that are essential to advancing global environmental sustainability.

If you look at the increased fuel efficiency in our vehicles, they are really a function of the plastics and the composites that are contributing their light-weighting.

When we look at the enhanced energy efficiency of our built environment, our homes, our offices, and our factories, it is the products of chemistry that are increasing their energy efficiency and reducing greenhouse gas emissions. Even when we look at the plastic packaging that is reducing the weight of consumer products, that is reducing emissions.

So, there is a lot of really positive contributions that the products of chemistry are making to enhance sustainability. Unfortunately, we have too many plastics that are entering into the environment where they clearly do not belong.

As many of you already noted, the first step to ending plastic waste in the environment starts with understanding the sources. Twenty countries account for 83 percent of plastic waste entering into the ocean. The largest sources are rapidly developing economies, mainly in Asia, where basic plastic waste management infrastructure has not kept pace with the rise in demand for consumer goods.

Studies by The World Bank and McKinsey have identified that the most cost-effective investments to reduce plastic waste in the environment are the implementation of waste collection infrastructure and improved processing of collected waste in source countries.

ACC applauds the efforts of Senator Sullivan and Senator Whitehouse for leading efforts to secure the passage of the Save Our Seas Act. It is a good first step.

But ACC and our value chain partners are excited about the opportunity to provide private sector support that would complement a bigger, bolder, and more effective Save Our Seas Act 2.0.

There is a unique opportunity to build bipartisan congressional and Administration support for increasing the U.S. global leadership in advancing policies that will significantly reduce man-made waste from entering into the environment.

We would encourage your consideration of policies that would include encouraging The World Bank and international development banks and USAID to prioritize waste collection and management. According to the International Solid Waste Association, waste management accounts for only .3 percent of development aid assistance.

We also would encourage promotion of public-private partnerships and business-led efforts to fund waste management in the developing world. We encourage the Department of Defense and other

agencies to fund waste management pilot projects at their facilities, particularly in the Asia Pacific region, to transform plastic waste into fuels, feedstocks, and infrastructure materials.

In addition to policies designed to reduce waste in the developing world, there are domestic policies that can enhance waste management systems in the U.S. and also contribute to the development and implementation of new technologies that can capture the value in plastic waste. Plastic waste has more captured energy than coal, and many of ACC's companies are investing in developing technologies that can unlock the captured energy, transforming non-recycled plastics into alternative fuels and feedstock materials for new manufacturing. But current regulations do not specifically recognize these emerging technologies as recycling, which is an impediment to capturing the value of plastic waste.

Some specific opportunities to address this issue include: providing guidance to States recognizing pyrolysis and gasification facilities which take waste plastics and convert them back to chemicals or fuels as manufacturing and not hazardous waste facilities; revise EPA's guidelines for the assessment of environmental performance standards and equal labels for Federal procurement to prefer products and services that utilize recovered plastics as recycled content; partner with the Department of Energy and Department of Transportation and other appropriate agencies to research opportunities that utilize plastic waste and innovative construction materials in transportation and water infrastructure projects nationwide; and, finally, designating fuel derived from plastic waste as a renewable fuel.

We have a great opportunity to create a global public-private initiative to eliminate man-made waste in the environment. ACC and our partners in the plastic value chain are committed to working with you and environmental organizations to identify the policies and the most cost-effective investments of public and private resources that will eliminate man-made waste from entering into the environment.

Thank you.

[The prepared statement of Mr. Dooley follows:]

American Chemistry Council
Statement for the Record
Senate Committee on Environment and Public Works

"Cleaning Up the Oceans: How to Reduce the Impact of Man-Made Trash on the Environment, Wildlife, and Human Health"

September 26, 2018

The American Chemistry Council (ACC) is pleased to submit this Written Testimony to the Senate Committee on Environment and Public Works regarding the September 26, 2018 hearing, "Cleaning Up the Oceans: How to Reduce the Impact of Man-Made Trash on the Environment, Wildlife, and Human Health."

While marine debris is a huge problem, it is also a solvable one. ACC, together with America's Plastics Makers®, are committed to ending plastic waste in the environment. We are proud to have partnered with governments, NGOs, and the private sector to deliver sustainable solutions to marine debris. Hundreds of projects are underway or already completed, but we know that there is much more to be done.

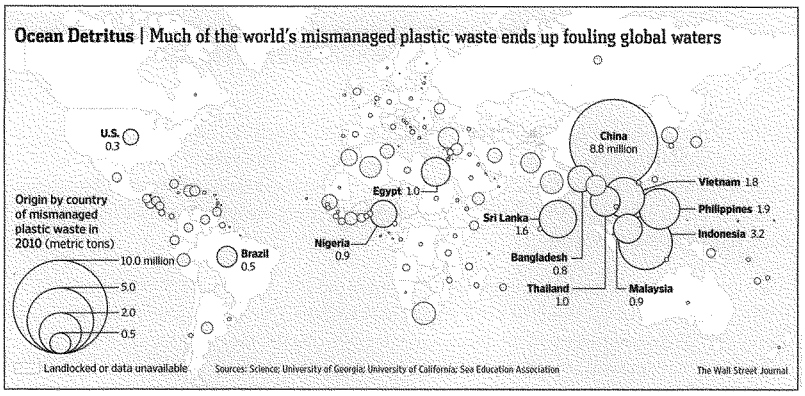
ACC represents a diverse set of companies engaged in the U.S. business of chemistry, a $768 billion enterprise that is helping to solve the biggest challenges facing our country and the world. Chemistry touches 96 percent of all manufactured goods, and the use of plastics in modern automotive, building and construction, and food packaging industries is helping to create a more sustainable society.

- *Automotive*: Today's plastics make up 50 percent of the volume of new cars but only 10 percent of the weight. Lighter cars are more fuel efficient, and as a result, emit fewer CO2 emissions.
- *Building and Construction*: Architects and designers rely on plastics to help maximize energy efficiency, durability and performance of our homes, offices, and schools.
- *Food Packaging*: Plastics help keep our food fresh and clean with less packaging while reducing food waste. Reducing food waste is important because EPA estimates that more food reaches landfills and incinerators than any other single material in our everyday trash, constituting 22 percent of discarded municipal solid waste.

Although plastics provide important benefits to society, plastics and other trash don't belong in our waterways or the environment. That's why ACC and our members are actively engaged in concrete, well-researched, and sustainable actions to reduce litter and prevent marine debris.

The first step to ending plastic waste in the environment starts with understanding the sources. A number of scientific studies have concluded that plastic litter in the ocean is the result of poor or insufficient waste management and lack of sufficient collection, recycling and recovery facilities infrastructure in rapidly developing countries.

Twenty countries account for 83 percent of the mismanaged plastic waste available to enter the ocean.[1] The largest sources are rapidly developing economies, mainly in Asia, where basic waste management infrastructure has not kept pace with the rise in demand for consumer goods. Over half of land-based plastic waste leaks from just five countries: China, Indonesia, the Philippines, Thailand, and Vietnam.



A recent World Bank study confirms that root cause. Human trash in Indonesian rivers includes 53 percent organic waste, 13 percent diapers, 29 percent plastic and the remainder other debris.[2] Although consumer plastics are a large fraction of the waste stream, holistic solutions are needed to keep plastics out of our oceans and waterways.

The World Bank finding is also consistent with McKinsey's analysis for Ocean Conservancy's Trash Free Seas Alliance® which identified the need to immediately accelerate implementation

[1] J. R. Jambeck, R. Geyer, C. Wilcox, T. R. Siegler, M. Perryman, A. Andrady, R. Narayan, and K. L. Law, "Plastic waste inputs from land into the ocean," Science, 2015, Volume 347, Number 6223

[2] The World Bank Group, Indonesia Marine Debris Hotspot Rapid Assessment Synthesis Report, April 2018

of waste collection infrastructure, plug post collection leakage, and improve processing of collected waste in source countries.[3]

S. 756, "The Save our Seas Act", first passed in the Senate in 2017 and later by the House in 2018, is a well-designed and thoughtful piece of bipartisan, bicameral legislation. ACC and our members have long supported S. 756 for three important reasons:

- first, it emphasizes greater engagement with the key source countries;
- second, the bill would help ensure that precious waste management resources, technologies and investments are allocated to where they are needed most; and
- third, it reauthorizes the Marine Debris Act, which provides provisions to further study land-based waste management solutions and causes of marine debris, as well as increase investment and technical assistance to help expand waste management systems and best-practices in rapidly industrializing nations.

We are pleased that Senate passage of S. 756, with House amendments, is imminent and will allow for expeditious passage in the House before being sent to the President for his signature.

Legislation is one part of the answer. ACC and our members are working with governments, NGOs, and our industry peers to deliver sustainable solutions to marine debris. In 2011, ACC helped lead the development of the Declaration of the Global Plastics Associations for Solutions on Marine Litter.[4] The Global Declaration obliges signatories to commit to action in six areas: education, research, public policy, best practices, recycling/recovery, and product stewardship.

Attached to this Testimony are two documents which highlight work both completed and underway on several marine debris projects across each of the six focus areas:

- "America's Plastics Makers Contribute to Solutions on Marine Litter" (*See Appendix A*);
- "The Declaration of the Global Plastics Associations for Solutions on Marine Litter, 4th Progress Report – Executive Summary" (*See Appendix B*).

75 plastics associations in 40 countries have signed the Declaration since its launch. More than 355 marine litter projects are planned, underway, or have been completed around the globe. Each of them helps to forge cooperation and continuous progress to prevent, reduce, and improve understanding of marine litter.

One of those projects involves a unique partnership between ACC and Circulate Capital, an investment management firm dedicated to financing innovation, companies, and infrastructure that prevent the flow of plastic waste into the world's oceans. Starting initially with Southeast

[3] Ocean Conservancy, McKinsey Center for Business and Environment, "Stemming the Tide: Land-based strategies for a plastic-free ocean," Oct. 2015
[4] www.marinelittersolutions.com

Asia, Circulate Capital will provide capital investments to improve collection, sorting and recycling markets, particularly across the plastic value chain. This emphasis on international cooperation on waste management in the largest source countries is critical to reducing trash in our oceans.

ACC and America's Plastics Makers® are also taking important steps in the United States. In May, ACC's Plastics Division announced three ambitious goals that crystalize U.S. plastics resin producers' commitment to recycle or recover all plastic packaging used in the United States by 2040 and to further enhance plastic pellet stewardship by 2022.

Specifically, members of ACC's Plastics Division have set the following goals for capturing, recycling, and recovering plastics:

- 100 percent of plastics packaging is re-used, recycled or recovered by 2040.
- 100 percent of plastics packaging is recyclable or recoverable by 2030.

Circularity at its core is about reducing waste, promoting reuse, increasing recycling rates and developing new recovery technologies. Achieving a more "circular economy" for plastics will enable society to continue to harness plastics' essential benefits, like enhancing the safety and sanitary packaging of food and personal care products, while helping to protect and restore the environment for future generations.

It's important to note that achieving a circular economy does not mean eliminating plastics, since plastics serve an essential role in helping to accomplish ambitious goals in sustainability across all three pillars – social, environmental, and economic. Many proposals to restrict or eliminate certain plastics fail to consider how they can help reduce environmental costs.

For example, a July 2016 study by Trucost found that replacing plastics in consumer products and packaging with a mix of alternative materials with the same function would increase environmental costs from $139 billion to $533 billion annually.[5] The higher environmental cost of alternatives to plastic is a function of the increased quantity of materials needed to fulfill plastic functions. Every material has a cost, including plastics, but the Trucost study tell us that using alternatives to plastic has costs that are almost four times higher.

Another important feature of plastics that is not commonly known is that their "captured energy" is greater than wood, paper or even coal. Today, an emerging set of technologies has begun to unlock that captured energy, transforming non-recycled plastics into alternative fuels and feedstock materials for new manufacturing. In fact, established energy recovery facilities can reduce by 80 percent the volume of waste that goes to landfill.

[5] Trucost, "Plastics and Sustainability: A Valuation of Environmental Benefits, Costs and Opportunities for Continuous Improvement," July 2016

Plastics that go on to become fuel and other forms of energy are plastics that do not end up in our oceans. Some of the most widely used and rapidly emerging technologies include plastics-to-fuels, pyrolysis, gasification, solid recovery fuels, and waste-to-energy. With the rise of these new technologies comes new jobs and economic growth.

Together with the Trucost findings, the increased recycling and the potential shift toward greater recovery of plastics serves as another example for why product-specific restrictions do not advance social, environmental, or economic goals. Contrary to popular opinion, product bans are not sustainable solutions. Legislation like the "Save Our Seas Act" recognizes this important fact.

Innovations in plastics have helped improve the lives of billions of people around the globe. At the same time, the problem of marine debris is one that businesses, environmental groups, policymakers, and citizens around the globe have become all too familiar with.

ACC believes that awareness, deep appreciation and understanding of the marine debris problem now serves as the necessary prologue to embark on a journey toward creating and implementing sustainable solutions.

We thank you for the opportunity to testify today and look forward to our continued partnership in protecting and restoring the environment for future generations.

The American Chemistry Council (ACC) represents the leading companies engaged in the business of chemistry. ACC members apply the science of chemistry to make innovative products and services that make people's lives better, healthier and safer. ACC is committed to improved environmental, health and safety performance through Responsible Care®; common sense advocacy designed to address major public policy issues; and health and environmental research and product testing. The business of chemistry is a $768 billion enterprise and a key element of the nation's economy. It is among the largest exporters in the nation, accounting for fourteen percent of all U.S. goods exports. Chemistry companies are among the largest investors in research and development. Safety and security have always been primary concerns of ACC members, and they have intensified their efforts, working closely with government agencies to improve security and to defend against any threat to the nation's critical infrastructure.

Senate Committee on Environment and Public Works
Hearing entitled, *"Cleaning Up the Oceans: How to Reduce the Impact of Man-Made Trash on the Environment, Wildlife, and Human Health?"*
September 26, 2018
Questions for the Record for the Honorable Cal Dooley

Chairman Barrasso:

1. Experts seem to agree that stopping the flow of debris into the ocean is a bigger priority than cleaning up the debris already in the ocean. Is this an assessment that you agree with? If not, why not?

Yes, we agree that priority should be given to stopping the flow of debris into the ocean. While there is a need to clean up debris that is presently in the ocean, the highest priority is to stop leakage of additional plastic into the ocean.

A broad coalition of non-governmental organizations, academics, and private sector stakeholders brought together by the Ocean Conservancy, supported the development of *Stemming the Tide*[1], and *The Next Wave*[2]. The reports looked closely at all options to reduce marine debris and concluded that waste management is the critical measure, while finding that bans on plastic products would not solve the problem.

The reports identify solutions for reducing plastic inputs to the ocean and recommend a program for global action to solve the problem. Here are some of the major recommendations from *Stemming the Tide*:

- Close leakage points within local collection systems by optimizing transport systems to eliminate illegal dumping

- Close or improve dump sites located near waterways, and increase waste collection rates by offering expanded services

- Keep leakage points closed by increasing the value of waste, and manually sort waste in rural areas to extract high value plastic waste for recycling

2. Five countries in Asia – China, Indonesia, the Philippines, Thailand, and Vietnam – bear much of the responsibility for the increase in ocean plastic. What steps is the private sector taking to reduce plastic waste coming from these countries?

The private sector is engaged in various efforts across the Asia-Pacific region to address leakage of waste into the ocean. Some of these efforts include supporting Circulate Capital, developing of a new global effort to eliminate plastic waste, and engaging in the Asia Pacific Economic Cooperation Forum.

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[1] Ocean Conservancy, 2015. http://www.oceanconservancy.org/our-work/marine-debris/mckinsey-report-files/full-report-stemming-the.pdf

[2] https://oceanconservancy.org/wp-content/uploads/2017/05/the-next-wave.pdf

Circulate Capital – In 2017, ACC and the World Plastics Council joined a coalition of partners to support Closed Loop Ocean (CLO), a $150 million fund to support waste management in key source countries. The objective is to absorb some of the risk associated with waste management infrastructure projects in developing countries. The fund also serves as catalytic capital to attract other investors such as multi-national development banks, sovereign wealth funds, and private investors.

In 2018, CLO became Circulate Capital, a separate entity to manage investments in waste management infrastructure in developing countries. Initially, Circulate Capital will focus on waste infrastructure solutions in Southeast Asia. Circulate Capital investments will be provided to improve collection, sorting and recycling markets, particularly across the plastic value chain.

Circulate Capital recently announced the creation of an Incubator Network in partnership with SecondMuse to rapidly scale the number of innovators in the sector in South and Southeast Asia, building out their capacity, and providing acceleration support for those innovations.

Asia Pacific Economic Cooperation (APEC) – ACC has been engaged in the APEC for over 20 years and specifically on marine debris issues since 2015. Our work has focused on prioritizing investment in waste management. In 2016, ACC helped to organize a high-level APEC workshop with the Government of Japan on de-risking investment in waste management infrastructure. From the workshop, we helped develop policy and practice recommendations for overcoming barriers to financing waste management systems and reducing marine litter. Since 2016, we have continued to work through various APEC working groups to support investment in waste management, as well as support the development of projects to address marine debris.

3. We know that five countries in Asia bear much of the responsibility for the increase in ocean plastic. That does not mean that we in the United States do not have a critical role to play. What additional steps can local and state government, as well as the federal government, take to address this problem?

The United States has an important role to play in addressing sources of marine debris. The Save Our Seas Act is an excellent step and positions the United States to lead in the global effort to address marine debris. There are many domestic companies with technology solutions that can be deployed to help address the lack of waste management infrastructure and especially waste treatment infrastructure.

Focusing on domestic efforts, the Congress can encourage investment in technologies that repurpose used plastics into a wide range of raw materials, chemical and plastic feedstocks, and lower carbon fuels. The U.S. EPA can communicate a more circular vision of plastics materials management via the use of new technologies and strategies for converting plastics to raw materials, feedstocks, and fuels. If Congress reauthorizes the alternative fuel tax credit and alternative fuels mixture credit, it can make promote fairness by including fuels derived from post-use plastics. If Congress decides to reauthorize the Renewable Fuels Standard, it should also look at the role alternative fuels derived from plastics play in conserving energy and water and reducing greenhouse gas emissions and reducing waste to landfill or litter. Local and state

governments can support programs to address littering behavior, improve recycling access and infrastructure, and optimize public services such as collection and street sweeping to reduce littering.

Local governments can also work with groups such as The Recycling Partnership[3] to take advantage of funding to move communities into lidded recycling carts. The program reduces littering, while increasing the volume of recycled material collected.

Plastics recycling and recovery is not only good for the environment but also creates manufacturing jobs. A critical missing piece of the puzzle is our lack of good infrastructure. As part of any infrastructure discussion, Congress should consider how it can incentivize investment in collection (especially in more rural areas) as well as investment in newer and more technologically proficient sortation and processing of post-use materials including plastics.

4. In an answer to one of my questions, you said that:

> "there are some simple things that Congress could do that would not treat plastic waste and the recovery of it as a 'hazardous waste' because that is stemming the flow of investment dollars in the development of new technologies that could advance the value of that waste stream and recapture some of the value…"

Are there specific provisions in statute or specific regulatory provisions that Congress should re-examine and consider addressing? If so, please identify those provisions.

At the federal level, we could ensure that regulations do not impede innovative, readily available alternative uses to non-recycled plastics. We already know that plastics can be reused in a wide variety of ways, from use as fuel to reinforcing roadways and making decking and fencing. One simple change would be to classify plastics used as fuel to make cement as categorical non-hazardous secondary materials (NHSM), which would ease regulatory burden and cost for these facilities. To make this simple change, Congress could direct EPA to add plastics to an existing regulatory list of authorized alternative fuels.

In the past year alone, states such as Florida, Wisconsin, and Georgia overwhelmingly approved legislation to treat post-use plastics as valuable feedstocks for manufacturing and ensured that newer technologies such as pyrolysis and gasification would be regulated as manufacturing and not waste disposal. Congress should work to understand what these states have done and see if there is equivalent legislation at the federal level. Led by Senators Wyden and Cassidy, S. 1460 Energy and Natural Resources Act of 2017, included a provision for the Department of Energy to study how to utilize post-use plastics as a valuable source of domestic energy and raw materials for remanufacturing.

[3] https://recyclingpartnership.org/

5. On January 24, 2018, the *Financial Times* published an article, by Clive Cookson, that was entitled, "The problem with plastic." It explained that:

> "While the personal-care industry is phasing out microbeads, concern is growing about another ubiquitous micro pollutant: plastic fibers. Analysis shows these to be present in streams, rivers, lakes and seas worldwide, as well as household drinking water. Their main source seems to be clothing and textiles made from synthetic fibers, which become detached in washing machines and are not filtered out by water-treatments plants."

Do you agree with this assessment? If so, how do we begin to address this issue?

Effective filtration – and then treatment – of wastewater is important. New technologies are now being developed to help washing machines more effectively remove microfibers from home laundry wastewater, and that's a great start. In the meantime, we need to continue work to better understand potential sources of microfibers; how to detect them with accuracy; and to evaluate whether they pose a risk in drinking water or to humans from seafood.

With respect to foods, Congress could ask the federal Food and Drug Agency and U.S. Department of Agriculture – experts in understanding whether water or food are safe – to confirm that seafood's are currently safe for human consumption while undertaking targeted studies. Congress could also direct USDA to increase its inspection of shellfish and to specifically document any incidence of microfibers. With respect to drinking water, Congress could direct EPA to review the state of technology for dirt and particle removal from drinking water, and provide additional funding if needed to improve technologies for coagulation and flocculation (removes dirt and other particles through the addition of alum (or other metal salts) to form coagulated masses called floc that attract other particles); sedimentation (sifts coagulated, heavy particles through gravity to the bottom of a basin) and filtration (channels water after sedimentation through sand, gravel, coal, activated carbon, or membranes to remove smaller solid particles not already removed).

Ranking Member Carper:

6. Stopping the flow of marine debris into the ocean – and mitigating its impacts – are not problems that can be solved overnight. Long-term, thoughtful, and collaborative solutions are necessary in order to address the full scope of the issue. Solutions that have been discussed included: improving recycling, incentivizing the use of recycled materials in the global supply chain, developing more biodegradable alternatives, and changing manufacturing protocols are potential solutions to help address this issue. What steps can this Committee and the Congress take now to advance these potential solutions here in the United States?

We agree that improving recycling is important. Congress could encourage investment in recycling and modernizing materials recovery facilities to capture more recyclable materials. Congress could also incentivize innovative technologies that convert plastics to monomers or

fuels through including fuels made from otherwise unrecycled plastics in the renewable fuel tax credit.

Congress can signal that technologies that convert plastics to raw materials, chemical and plastic feedstocks and lower carbon fuels are part of the circular economy. As noted in response to question 4, Congress could work with EPA to classify plastics used as fuel to make cement as categorical non-hazardous secondary materials (NHSM), which would ease regulatory burden and cost for these facilities. This would be done through the addition of plastics to an existing regulatory list of authorized alternative fuels.

Congress could also work to understand state legislation to treat post-use plastics as valuable feedstocks for manufacturing and see if there is equivalent legislation at the federal level to ensure that newer technologies such as pyrolysis and gasification would be regulated as manufacturing and not waste disposal.

7. Now that China has implemented its "Green Fence Policy," a ban on importing plastic waste, our market for these materials in the United States is flooded. China previously accepted 30% of our plastic waste. Local municipalities are now having even more trouble breaking even when collecting and recycling this waste. In your opinion, what are the best ways for the United States to address this new challenge?

Education of Consumers – There is a need to better education consumers regarding how to properly recycle used plastics to reduce contamination and increase value. A good example is the How to Recycle® label placed on many packages, which provides easy-to-follow directions on proper recycling and disposal of used packaging. Other programs such as ACC's Wrap Recycling Action Program[4] (WRAP) educate consumers on how to properly recycling used bags and films by taking them back to over 18,000 locations across the United States.

Investment in technology and infrastructure – Investing in the domestic recycling industry will help to create new market opportunities for material previously sent to China for recycling. By upgrading sortation equipment at material recovery facilities, we will reduce contamination and increase value of used plastics. Chemical recycling and recovery of used plastics through pyrolysis, gasification, and other technologies will create additional markets for used plastics. Increased consumer and brand demand for recycled content in plastic packaging will help to drive investment in needed technologies.

Senator Whitehouse:

8. ACC has been a leading voice among the plastics industry in support of both domestic and international marine debris efforts. What are some of the initiatives ACC is leading or supporting that aim to reduce the flow of plastic from land into the oceans?

ACC appreciates the compliment and takes great pride in helping to address the sources of marine debris. The following fact sheet, America's Plastic Makers Contribute to Solutions on

[4] https://www.plasticfilmrecycling.org/

Marine Litter[5], and the 4th Progress Report for The Declaration of the Global Plastics Associations for Solutions on Marine Litter[6] provide additional information on ACC's domestic and international efforts to address marine debris. Below are some examples of projects,

Save the Bay Narragansett Bay, Rhode Island - America's Plastics Makers® are partnering with Save the Bay® on the City of Warwick Shoreline Trash Reduction & Prevention project. This initiative aims to reduce littering behavior with a combination of cleanups, community engagement and education. The project is utilizing lessons learned from other efforts to reduce litter and marine debris.

Keep It Beachy Clean (Virginia Beach) - Keep it Beachy Clean is an education and outreach program aimed at reducing beach litter. Clean Virginia Waterways developed the program, which provides Virginia Beach's resort community with anti-litter messaging. Following a successful first year, the program is expanding to capture a wider segment of the Virginia Beach resort community.

Circulate Capital - In 2017, ACC and the World Plastics Council (WPC) joined a coalition of partners to support Closed Loop Ocean (CLO). In 2017 WPC and CLO announced the creation of a $150 million fund to support waste management in key source countries. In 2018, CLO became Circulate Capital, a separate entity to manage investments in waste management infrastructure in developing countries. Initially, Circulate Capital will focus on waste infrastructure solutions in Southeast Asia. Research indicates that the majority of plastic debris originates from five fast growing economies in Asia—Indonesia, the Philippines, Vietnam, Thailand and China. Circulate Capital investments will be provided to improve collection, sorting and recycling markets, particularly across the plastic value chain.

9. Is there a role for materials innovation in reducing the risks plastics pose to wildlife and ecosystems if they enter the oceans?

Material innovation may play a role in reducing the impact of marine debris on wildlife. For example, a marine degradable part was developed for a crab trap to cause a pot to stop catching crabs if it is lost for a significant period of time. Innovations like this are important but are challenging and must still meet the original function of the product. Plastics makers continue to look for new materials as well as improvements to existing materials in an effort to balance material use, performance, and recyclability.

10. Is there a role for materials innovation in increasing the value of plastics to ensure they are collected for reuse and recycling?

We are already seeing great potential for increasing the value of used plastics through the development of compatibilizers. This family of technologies improves performance of recycled resins; enables recycling of multi-material, multi-layer pouches; and allows for higher

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[5] https://plastics.americanchemistry.com/fact-sheets-and-infographics/Americas-Plastics-Makers-Contribute-to-Solutions-on-Marine-Litter.pdf

[6] https://www.marinelittersolutions.com//wp-content/uploads/2018/04/Marine-Litter-Report-2018.pdf

incorporation rates of post-consumer recycled resin into new products.

11. Is ACC investing in any cleanup solutions, including improving wastewater management to better collect microplastics and microfibers from water supplies?

ACC staff participate in annual International Coastal Clean-up events, although our investments related to address marine debris are focused on infrastructure and education. For example, we have provided funding for trash and recycling bins; consumer education regarding proper recycling of plastics wrap, bags, and film; and anti-litter and litter reduction programs; among other projects. As noted above, the following fact sheet, America's Plastic Makers Contribute to Solutions on Marine Litter[7], and the 4th Progress Report for The Declaration of the Global Plastics Associations for Solutions on Marine Litter[8] provide additional information on ACC's domestic and international efforts to address marine debris.

ACC has not invested into projects to better collect microplastics and microfibers from wastewater management systems. We are aware of several efforts to address the issue of microfibers such as the Cora Ball[9] and Guppy Friend[10]. That said, industry efforts to improve the technology to filter microfibers at the source—in wastewater from washing machines—is well-documented.

12. As we work on the next iteration of the Save Our Seas Act, do you have any additional recommendations or comments you would like to share to inform our development of this bill?

We welcome the opportunity to work with you and your staff as the next iteration of the Save Our Seas Act is developed. The Save our Seas Act of 2018 included new language to coordinate with developing countries which are the largest sources of marine debris. This assistance will be the highest priority to solve this problem for the foreseeable future. Unfortunately only a very small fraction of development finance goes to improve waste management (0.3%). There may be a way for the US to encourage development financing agencies to prioritize waste management.

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[7] https://plastics.americanchemistry.com/fact-sheets-and-infographics/Americas-Plastics-Makers-Contribute-to-Solutions-on-Marine-Litter.pdf

[8] https://www.marinelittersolutions.com//wp-content/uploads/2018/04/Marine-Litter-Report-2018.pdf

[9] https://coraball.com/

[10] http://guppyfriend.com/en/

Senator BARRASSO. Thank you so much for your testimony, Mr. Dooley.

Mr. KARAS.

STATEMENT OF BRUCE KARAS, PRESIDENT OF ENVIRONMENT AND SUSTAINABILITY, COCA-COLA NORTH AMERICA

Mr. KARAS. Chairman Barrasso, Ranking Member Carper, and members of the Committee, thank you for the opportunity for inviting me before you to discuss the very issue of marine debris.

Our world has a waste problem. According to the Ocean Conservancy, scientists estimate that more than 8 million metric tons of plastic is entering our ocean every year. From our perspective, it is unacceptable that packaging ends up in the wrong place, in our oceans and waterways or littering the communities where we work and live.

As a total beverage company, we bring people drinks that make life's everyday moments more enjoying, create a shared opportunity for people and communities we call home. While growth is important, we cannot grow at any cost. We believe in doing business the right way, not just the easy way. For us, that means continuously working to reduce our environmental impact by collecting and recycling our packaging footprint, providing access to clean drinking water, supporting women's economic empowerment, and strengthening local communities.

We are a global company operating in more than 200 countries and territories, but through our bottling partners we also have deep, local connections and relationships that offer a unique ability to make a meaningful difference. The key areas where we strive to lead are clean, sustainable water for communities and women's economic empowerment.

A third area we launched just this year is our new packaging vision, World Without Waste. The goal is to rethink how bottles and cans are designed and made, as well as how they are recycled and repurposed. The centerpiece is a bold, ambitious goal to help collect and recycle the equivalent of every bottle or can we sell globally by 2030. The Coca-Cola system intends to back World Without Waste with a multiyear investment that augments ongoing work to make our packaging 100 percent recyclable by 2025.

When it comes to PET, we believe that every package has value and a life beyond its initial use, and should be collected and recycled into either a new package or another beneficial use. We aim to be part of collaborative solutions that prevent waste from getting to the ocean in the first place.

Regardless of where it comes from, we want our packages to have more than one life. To date, all 17 of our geographic business units have developed local plans to address our three strategic pillars: design, collect, and partner.

Design means we aspire to create packaging that is at least 50 percent recycled material by 2030; continue working to make all consumer packaging 100 percent recyclable by 2025.

Collect means to collect and recycle the equivalent of 100 percent of the primary packaging we sell by 2030. Partner means we will work together to support a healthy debris-free environment at both the land and the sea.

In the context of design, our research and development team is working with chemical recycling technologies toward future piloting or partnerships. Additionally, our procurement team is working with our suppliers to advance progress on and increase availability of recycled PET, known as rPET.

In Mexico, our bottled water brand seal is now available in 100 percent rPET bottle as a result of strong collection and conversion infrastructure that our system has partnered in over the past decade. We are also looking at 100 percent rPET bottle in the Hong Kong market later this year. We will pilot the use of rPET in several other Asia Pacific markets in 2019. The increased use of rPET is crucial to accelerate a transition to a true circular economy for plastics.

In the innovation space, we have expanded our package-less delivery model for beverages with both our freestyle touchscreen operated dispenser and our innovative Dasani pure fill.

In the context of collect, marine plastic is driven in larger part by limited collection and waste management infrastructure in many emerging markets. That is why our second strategic pillar centers on improving packaging collection.

We are working around the world to have an up-to-date understanding of collection recycling data and approaches. Where systems do not exist is where we are focusing. Cities with a very active informal sector, like unofficial, small-scale businesses, have high rates of collection. There are correspondingly lower rates of collection for recycling in more developed cities where there is less incentive for small-scale collectors.

We will use the data we collect to partner with government, industry, civil society, and local communities to tailor, co-create, and roll out the type of collection recycling models that have been successful in developing markets in other parts of the world and scalable models that will improve collection rates.

Last is partner. We recognize that although we are part of a problem, we cannot solve the packaging waste problem alone. It is for that reason we have established, joined, and expanded cross-sectoral partnerships around the world. We intend to do all of this not just in a cross-sector way, but in a scalable way that drives systemic change.

We are working with groups from the international level to the very local level, from the Ocean Conservancy Trash for Seas Alliance, the Ellen MacArthur Foundation, to the Closed Loop Fund and local chambers of commerce.

Thank you for your time. I look forward to answering your questions.

[The prepared statement of Mr. Karas follows:]

Testimony of Bruce Karas,
Vice President of Environment & Sustainability,
The Coca-Cola Company North America
before
The United States Senate
Environment & Public Works Committee hearing on Marine Debris
September 26, 2018

Good Morning Senators. Thank you for inviting me before you today to discuss the very real issue and concern of Marine Debris. Our world has a waste problem. According to the Ocean Conservancy, scientists estimate that more than 8 million metric tons of plastic is entering our ocean every year. From our perspective, it is unacceptable that packaging ends up in the wrong place, in our oceans and waterways or littering the communities where we work and live.

As a total beverage company, we bring people drinks that make life's everyday moments more enjoyable, to create shared opportunity for the people and communities we call home. While growth is important, we cannot grow at any cost. We believe in doing business the right way, not just the easy way. For us, that means continuously working to reduce our environmental impact by collecting and recycling our packaging footprint, providing access to clean drinking water, supporting women's economic empowerment, and strengthening local communities.

We may be a global company operating in more than 200 countries and territories, but through our bottling partners we also have deep, local connections and relationships that offer a unique ability to make a meaningful difference. The key areas where we strive to lead are clean, sustainable water for communities, women's economic empowerment, and to working to create a world without waste by collecting and recycling the equivalent of our bottles and cans in the marketplace.

In 2010, The Coca-Cola Company made a commitment to be water neutral by 2020 – a goal we achieved in 2015. Through projects implemented by the end of 2017, The Coca-Cola Company is replenishing an estimated 248 billion liters per year through community and watershed projects globally. We are also working to improve our water-use ration 25% over 2010 levels. To date we have made a 15% improvement and continuing to do more.

At the same time, our commitment to strengthening communities by empowering women has never been stronger. Our 5by20 initiative, also launched in 2010 to enable economic empowerment to 5 million women by 2020 has to date enabled more than 2.4 million women entrepreneurs across 75 countries.

This year, to help tackle the world's packaging problem, we launched our new packaging vision, World Without Waste. It involves rethinking how bottles and cans are designed and made, as well as how they're recycled and repurposed within our system around the world. The centerpiece of this vision is a bold, ambitious goal to help collect and recycle the equivalent of every bottle or can we sell globally by 2030. The Coca-Cola system intends to back World Without Waste with a multi-year investment that includes ongoing work to make our packaging 100 percent recyclable by 2025.

When it comes to PET, we believe every package has value and life beyond its initial use and should be collected and recycled into either a new package or another beneficial use. We aim to be part of collaborative solutions that prevent waste from getting to the ocean in the first place.

Regardless of where it comes from (i.e. whether the package is made by Coca-Cola or one of our competitors), we want it to have more than one life. To date, all 17 of our geographic business units have developed local plans to address our (3) strategic pillars – Design, Collect and Partner:

- **Design** - Aspire to create packaging that is at least 50% recycled material by 2030; continue working to make all consumer packaging 100% recyclable by 2025
- **Collect** - Collect and recycle the equivalent of 100% of the primary packaging we sell by 2030
- **Partner** - Work together to support a healthy, debris-free environment (land & sea)

Design

Our Research and Development team is working with chemical recycling technologies towards future partnerships or piloting. Additionally, our Procurement team is working with our suppliers to forward progress on and increase availability of rPET.

In Mexico, our bottled water brand, Ciel, is now available in a 100% rPET bottle, which builds on the extremely strong collection and conversion infrastructure that our system has financed over the past decade. In Australia, our Mount Franklin water brand is also now available in 100% rPET, and we are launching our water brand in Hong Kong in 100% rPET later this year. We will pilot the use of rPET in a number of ASEAN markets beginning in 2019 and we believe this is going to be very important to accelerate a transition to a true circular economy for plastics.

In the innovation space, we have expanded our "package-less" delivery model for beverages, our innovative Freestyle technology to more than 50,000 machines serving 14 million drinks daily, with continued expansion in North American and moving to Europe and Latin America. Freestyle is a touchscreen-operated dispenser that uses "micro-dosing" technology to deliver nearly 200 beverage options – including 117 low/no-calorie beverages and more than 100 varieties, with only a cup.

Collect

We are keenly aware from research conducted by the Ocean Conservancy and others that marine plastic is primarily a land-based issue, driven in large part by limited collection and waste management infrastructure in many emerging markets. That's why our second strategic pillar centers on improving packaging collection. We are working around the world to have an, up-to-date understanding of existing collection and recycling data and approaches, as you would expect some parts of the world have much stronger systems in place than others. Where the systems do not exist is where we are focusing our efforts.

Data on solid waste management collection and recycling is a significant challenge in ASEAN (governments and civil society don't have this kind of date on PET collection rates) and so we've commissioned a Singapore-based circular economy advisory and action company to conduct baseline research for us in six markets across Southeast Asia. What we've seen from the research is high rates of collection for recycling for PET in cities like Myanmar (estimated 82% collection for recycling rate for PET in Mandalay, 74% in Yangon) or Jakarta (estimated 69% collection for recycling rate for PET) with a very active informal sector (i.e. unofficial small-

scale businesses such as street scavengers, recycling pickers and junk shops) and correspondingly lower rates of collection for recycling in more developed cities like Kuala Lumpur (estimated 23% collection for recycling rate for PET) where there's less incentive for waste collectors and recycling pickers with higher incomes to collect recyclables.

As ASEAN develops, driving source segregation will be the only way to capture recyclables. This will require government conviction that segregation is necessary and government commitment to implement and enforce source segregation initiatives. We will be using the data to tailor, co-create and roll-out with government, industry, civil society and local communities the type of collection and recycling models that have been very successful in developing markets in other parts of the world (e.g. Mexico) and scalable models that improve collection rates by empowering and strengthening the informal collection sector. We see extensive opportunity to do this starting in major cities and tourist destinations in the ASEAN region and we already have a number of industry alliances set up in ASEAN. A few examples are:

- **Indonesia** is the second largest global contributor to issue of ocean plastic, with plastic waste a serious threat to the economy (particularly industries like tourism and fishery) as well as the environment. In 2017, the government launched a *National Plan of Action Against Marine Debris*, developed by a task force led by the Coordinating Ministry for Maritime Affairs. Ahead of National Waste Awareness Day in February, and as part of industry efforts to step up and contribute to solutions, six companies, including Coca-Cola Indonesia, jointly announced the formation of the Packaging and Recycling Alliance for Indonesia Sustainable Environment (PRAISE). The vision of PRAISE is to establish best practices that support sustainable and integrated packaging waste management solutions in Indonesia. This approach to waste management aligns with the government's move towards a circular economy and PRAISE has engaged on a regular basis with the Ministry of Environment and Forestry and the Coordinating Ministry for Maritime Affairs. By contributing to research, education, collaboration and engaging stakeholders in government and civil society, PRAISE is an important industry platform to help advocate for a circular economy and drive industry efforts to reduce impacts of packaging waste on the environment. PRAISE was represented last year at the World Ocean Summit in Indonesia, the first-ever ASEAN Conference on Reducing Marine Debris held in Thailand, the APEC High-Level Meeting on Accelerating Waste Management Solutions to Reduce Marine Litter in Bali and the Responsible Business Forum on Sustainable Development in Singapore. This year, as part of an agreement with the Coordinating Minister of Maritime Affairs, PRAISE commissioned a study in Bali to look at the value chain of Plastic Waste in order to obtain better data on plastic waste and subsequently to implement a pilot project on Sustainable Plastic Waste Management using the data collected. In parallel, this year PRAISE is also starting to implement a Drop Box program in Jakarta, through which 100 drop boxes are being distributed in public as well as retail spaces.

- **Philippines** - Coca-Cola Philippines is a member and active supporter of The Philippine Alliance for Recycling and Materials Sustainability (PARMS) a non-profit industry organization incorporated in 2015 to bring together stakeholders in the recycling value chain, including manufacturers, industry groups, retail groups, waste consolidators and haulers, recyclers and non-government and government entities. The objective of PARMS is to develop and implement holistic and comprehensive programs to increase waste recovery and reduce landfill dependence towards zero waste through strategic partnerships. PARMS recently entered into a Memorandum of Understanding with the Local Government Unit of Paranaque (a fully urbanized city in Metro Manila) to build a plastics recycling facility towards the implementation of a Full Waste-Recovery Program within this year. Once fully operational, this facility will be able to process approximately

365 tons of waste per annum – waste diverted from landfills, from water streams, and the like. During the Earth Day celebration in April 2018, PARMS formally turned over the proposed recycling facility design to the chief executive of Paranaque City. The project is supported by 8 leading fast-moving consumer goods companies including Coca-Cola and many of our competitors and leading local industry organizations

- **Vietnam** - we are now advancing a partnership with Unilever, Dow and the Vietnam Chamber of Commerce and Industry to implement a circular economy approach in Ho Chi Minh City. The partnership is still in its infancy, but we will be working together to strengthen recycling infrastructure. We are also getting ready to launch a new community-focused program focused on the iconic tourist area of Ha Long City, working with a local NGO called Green Hub to empower 250 women waste pickers and raise awareness across stakeholder groups and decision-makers about the importance of tackling plastic waste.

Partner

We recognize that although we are a part of the problem, we cannot solve the packaging waste problem alone. It is for that reason we have created, established, joined and expanded cross-sectoral partnerships around the world. We intend to do all of this not just in a cross-sector way but in a scalable way that drives systemic change – to do so will take catalytic funding. Some of our other partners in driving this change are:

- **The European Union Beverage Industry:** Beverage packaging is already the most collected packaging in the European Union, but the beverage industry just announced a new set of EU-wide ambitions:
  - By 2025 100% of soft drinks primary plastic packaging will be recyclable;
  - By 2025 soft drinks PET bottles will contain a minimum of 25% recycled material on average;
  - Collection rates of soft drinks primary plastic packaging for recycling will be further increased and optimized in all EU markets in collaboration with other packaging recovery actors;
  - Soft drinks primary plastic packaging will be reused – including refillable bottles – where it makes environmental and economic sense.

- **The Ocean Conservancy/Trash Free Seas Alliance:** A partner since 1995, our partnership activities range from participation in the annual International Coastal Cleanup to supporting recycling infrastructure. Together with the Ocean Conservancy and others, we launched the Trash Free Seas Alliance in 2011 to advance the scientific understanding of marine debris globally, including research to determine the regions contributing the most waste to the oceans.

- **Closed Loop Fund:** We have worked with the Closed Loop Fund since its inception, predominantly through Coca-Cola North America (as most of its first efforts were focused in the U.S.). More recently, we joined a new initiative of Closed Loop Partners called Closed Loop Ocean that will target innovative approaches on funding waste management and recycling solutions in Southeast Asia.

- **Circulate Capital** we are an early-stage supporter of the just-announced Circulate Capital initiative established to advance the circular economy – it builds on our long partnership in North America with the Closed Loop Fund. Circulate Capital is focused on catalyzing investments in ocean plastic solutions in

Southeast Asia and India. Priority markets are Indonesia and India. Secondary markets are the Philippines, Vietnam and Thailand.

- **Ellen MacArthur Foundation (EMF) New Plastics Economy initiative:** The Company is a founding partner of the New Plastics Economy initiative, which includes leading consumer goods companies and other plastics users and producers. The Company continues to work closely with EMF on the development of our packaging strategy and metrics. EMF is a leading voice supporting the circular economy and pushing for private sector led innovations and solutions to the addressing plastic waste.

- **World Economic Forum Platform for Accelerating the Circular Economy (PACE) initiative** is a public-private multi-stakeholder platform focused on shaping global policy and accelerating targeted action towards the circular economy. Plastics is a core focus area with specific project work underway in ASEAN. We are actively engaged in shaping the agenda at both the strategic and tactical levels. Our CEO James Quincey serves on the PACE Leadership Board.

Senate Committee on Environment and Public Works
Hearing entitled, *"Cleaning Up the Oceans: How to Reduce the Impact of Man-Made Trash on the Environment, Wildlife, and Human Health?"*
September 26, 2018
Questions for the Record for Mr. Bruce Karas

Chairman Barrasso:

1. **Experts seem to agree that stopping the flow of debris into the ocean is a bigger priority than cleaning up the debris already in the ocean. Is this an assessment that you agree with? If not, why not?**

Agree – as The Coca-Cola Company, we believe that the most effective way to impact change is to address the problem of waste before it reaches waterways and ultimately, oceans. That is where our efforts are focused.

2. **Five countries in Asia – China, Indonesia, the Philippines, Thailand, and Vietnam – bear much of the responsibility for the increase in ocean plastic. What steps is the private sector taking to reduce plastic waste coming from these five countries?**

The Coca-Cola Company is one example of one private sector organization, and our efforts are focused around our World Without Waste vision. We've set an ambitious goal to help collect and recycle the equivalent of a bottle or can for everyone we sell by 2030 and to make all of our packaging 100% recyclable by 2025.

We are working to accomplish this industry-first, ambitious goal through 3 main pillars:

- **Design** - Aspire to create packaging that is at least 50% recycled material by 2030; continue working to make all consumer packaging 100% recyclable by 2025
- **Collect** - Collect and recycle the equivalent of 100% of the primary packaging we sell by 2030
- **Partner** - Work together to support a healthy, debris-free environment (land & sea)

Our goal is not only a worldwide goal, but also a local goal. We have strategies, partnerships and engagements in each of the five countries listed above that are tailored to the not just the country, but the needs of the cities within each of those countries as the needs vary depending on locality. Across the Asia-Pacific region our local teams are focused on addressing PET collection systems, raising public awareness, creating and promoting public-private partnerships and establishing recycling infrastructure. We won't reach solutions overnight or by ourselves, but they must come, and we aim to play an important role in achieving progress.

China: Using cutting-edge facial recognition technologies and a voice interactive system, the new VenCycling machine both dispenses beverages and collects used packaging for recycling. In exchange for returning used cans or plastic bottles into the machine, consumers receive credits, primarily via mobile devices, for products made from recycled plastics. These innovative vending machines are helping to build a circular pathway for our packaging while educating and incentivizing recycling behaviors. We have also partnered with the One Foundation in China to work on public education around recycling.

Indonesia: We are an early-stage supporter of the just-announced Circulate Capital initiative that is focused on catalyzing investments in ocean plastic solutions in Southeast Asia and India. It is an initiative to advance the circular economy and builds on our contribution to and work with the Closed Loop Fund over the last few years in the United States.

In 2007, Coca-Cola Amatil Indonesia and Quiksilver Indonesia initiated the Bali Beach Clean Up (BBCU), a daily clean-up program in five main beaches of Bali. Ten years later, the Bali Beach Clean Up teams have removed more than 34 million kg of rubbish from 9.7 kilometers of shoreline in Bali. The program is powered by 150 new bins per year, 4 beach tractors, 2 barber surf rakes, 3 garbage trucks, and 78 crews from local communities surrounding the beaches. BBCU crews also act as ambassadors to promote the importance of taking care of the environment. Complementing the daily BBCU program, Bali's Big Eco Weekend is an annual festival to drive more support from everyone to keep Bali beaches clean and green

The Coca-Cola Company is contributing our marketing and communications expertise to public campaigns that bring awareness to the importance of recycling and circular economy solutions. For example, in Jakarta, Coca-Cola Indonesia has launched a program called "Plastic Reborn: Give your Plastic Bottle A Second Life" targeted at millennials and showing that "Recycling can be cool". Plastic Reborn is increasing awareness about responsible waste management and the importance of a circular economy. The program has deployed 100 bins in 77 schools/universities/public places in Jakarta and already collected 1.8 tons of post-consumer PET bottles. These bottles are then shredded into PET flakes and then the process of upcycling turns the flakes into fashionable multi-function bags. 5000 bags already produced through this program.

Philippines: Coca-Cola Philippines is a member and active supporter of The Philippine Alliance for Recycling and Materials Sustainability (PARMS), a non-profit industry organization incorporated in 2015 to bring together stakeholders in the recycling value chain, including manufacturers, industry groups, retail groups, waste consolidators and haulers, recyclers and non-government and government entities. The objective of PARMS is to develop and implement holistic and comprehensive programs to increase waste resource recovery and reduce landfill dependence towards zero waste through strategic partnerships. PARMS recently entered into a Memorandum of Understanding with the Local Government Unit of Paranaque (a fully urbanized city in Metro Manila) to build a materials recovery facility towards the implementation of a Full Waste-Recovery Program within this year. Once fully operational, this facility will be able to process approximately 365 tons of waste per annum – waste diverted from landfills, from water streams, and the like. During the Earth

Day celebration in April 2018, PARMS formally turned over the proposed recycling facility design to the chief executive of Paranaque City. The project is supported by leading fast-moving consumer goods companies including Coca-Cola, Liwayway Marketing Corporation, Monde Nissin, Nestle Philippines, Pepsi-Cola Products Philippines, Procter & Gamble Philippines, Unilever Philippines, and Universal Robina Corporation. Other alliance members are Philippine Chamber of Commerce and Industry, Philippines Business for the Environment, the Zero Waste Recycling Movement, Department of Trade and Industry, Department of Science and Technology, Department of Environment, Philippine Plastics Industries Association, Philippine League of Environment and Natural Resource Officers.

Thailand: Coca-Cola supported the first-ever ASEAN Conference on Reducing Marine Debris hosted by the government of Thailand, the ASEAN Secretariat and UN Environment with participation from ASEAN member governments, civil society and private sector. The theme of partnership was pervasive throughout the conference –, "The Time Is Now" with an emphasis on partnerships across the plastic value chain.

Vietnam: We are now advancing a partnership with Unilever, Dow and the Vietnam Chamber of Commerce and Industry to implement a circular economy approach in Ho Chi Minh City. The partnership is still in its infancy. We are also getting ready to launch a new community-focused program focused on the iconic tourist area of Ha Long City, working with a local NGO called Green Hub to empower 250 women waste pickers and raise awareness across stakeholder groups and decision-makers about the importance of tackling plastic waste.

3. **We know that five countries in Asia bear much of the responsibility for the increase in ocean plastic. That does not mean that we in the United States do not have a critical role to play. What additional steps can local and state governments as well as the federal government take to address this problem?**

The Coca-Cola Company has long championed public-private partnerships, or what we call the Golden Triangle consisting of private companies, non-profits and government working together to solve a problem. Recycling systems and infrastructure need to be improved throughout the US which is the best way to impact national recycling rates. We believe that working with the broader waste management sector in transitioning from a landfilling approach for all waste to a more refined system that builds an infrastructure that increases recycling is key to the success of recycling. Additionally, education on proper waste management, and innovation when it comes to our packaging are areas where we as a Company will continue to focus our efforts.

4. **In an answer to one of my questions, you mentioned "waste infrastructure 2.0." How would you (Coca-Cola) design "waste infrastructure 2.0" to ensure that we in the United States collect materials that are not currently recycled?**

Waste infrastructure 2.0 is a transition to an infrastructure that reflects more of a circular economy that captures commodities that do have intrinsic value and can be re-used. It is a closed loop. The 2.0 system will have an increased capability to identify, select, sort and

bale commodities that can be re-used in a meaningful way. In today's system we are essentially retiring the carbon consumed in making materials in the ground, when recycling and reuse can significantly reduce our carbon emissions. In the beverage sector, glass PET and aluminum are highly recyclable commodities that represent future supply in a circular economy. If we have an updated system, a steady supply of used PET and high demand for recycled PET is achievable.

Ranking Member Carper:

5. **Stopping the flow of marine debris into the ocean – and mitigating its impacts – are not problems that can be solved overnight. Long-term, thoughtful, and collaborative solutions are necessary in order to address the full scope of the issue. Solutions that have been discussed included: improving recycling, incentivizing the use of recycled materials in the global supply chain, developing more biodegradable alternatives, and changing manufacturing protocols are potential solutions to help address this issue. What steps can this Committee and the Congress take now to advance these potential solutions here in the United States?**

   The Coca-Cola Company believes that we need to focus on designing better packaging, collecting the packaging that we sell and partnering in order to achieve both of those goals. Improving recycling infrastructure both in the US and globally is an immediate first step toward improving recycling rates which will ultimately reduce the flow of marine debris into the ocean. It is absolutely critical that in considering the necessary infrastructure thought is given to the economic incentive of creating fully functional end markets that convert the recycled commodities into future products. These end markets represent green jobs and incentivize the infrastructure as it is a viable business.

   Now that China has implemented its "Green Fence Policy," a ban on importing plastic waste, our market for these materials in the United States is flooded. China previously accepted 30% of our plastic waste. Local municipalities are now having even more trouble breaking even when collecting and recycling this waste. In your opinion, what are the best ways for the United States to address this new challenge?

   Recycled PET (rPET) has a value on the market. One reason The Coca-Cola Company has set the target of making our bottles out of 50% rPET by 2030 is that will further drive the rPET market. The challenge in the US is that our recycling stream has high levels of contamination that impacts the productivity of the recovery facilities (MRFs). When we improve and update MRFs, we will have a rPET product for which there is a market, one that is in fact growing and becoming more competitive. This is one example of the importance of a viable end market that has a demand for the recycled material.

6. **In your testimony, you mentioned Coca-Cola's three strategic pillars for recycling as part of the "World Without Waste" campaign: one of them is "collect." I agree that improving our nation's recycling practices is vitally important. However, many**

local communities and states do not have sufficient waste management and recycling infrastructure. From your perspective, what can local and state governments do to build this capacity? How might this Committee and the federal government support them?

Business must collaborate with governments, communities, the private sector and NGO's to establish or further develop recycling programs. One example of such is our partnership with the Closed Loop Fund. We are working to advance recycling technologies and partnering with local communities to improve their recycling infrastructure. Aluminum and PET are the two highest value commodities in the waste stream today. There is an opportunity to created viable businesses and green jobs that harvest recyclables. Our work with the Closed Loop Fund has shown that often the ROI for investments in the local infrastructure is positive. We welcome the opportunity to participate in more such partnerships.

Senator Markey:

7. **The Ocean Plastics Charter was agreed to in June 2018 by five of the G7 countries to encourage a more sustainable approach to the management of plastics. The United States and Japan did not join. But on September 20, Coca-Cola and several other large corporations pledged to help reduce plastic pollution in support of the Ocean Plastics Charter.**

    a. **How important is it for the United States and the private sector to get on board with reducing plastic waste if we are truly going to address the marine debris crisis on a global scale?**

As a company headquartered in the United States, we know that our actions, commitments and progress impact movement on a global scale. For our part, as a global business operating in 200 countries and territories, we will continue to work to address our contributions on a global scale. Our World Without Waste commitment is a global commitment because marine debris is a global issue. We believe it is of vital importance that this continue to be an area of international focus.

Senator Merkley:

8. **To achieve your goal of recycling all your bottles, you have commented that you will need help collecting them. What challenges has Coca-Cola faced in increasing collection rates abroad?**

Today, in some countries, our packaging and collection rates are high while in others, there is still a lot of work to be done. It's a huge challenge and there are a lot of moving targets. We operate in 200 countries and territories, and each of them has its own government, regulatory system, and collection and recycling infrastructure challenges. Measurement and data that pertain to recycling is also lacking in many parts of the world. Certain parts of the world have no infrastructure for collecting and recycling packaging,

and others have minimal infrastructure. In these cases, sometimes the market for recycled material doesn't exist. Creating a valuable "end market" component is key. To achieve our goals, we will need the support of many cross-sector partners.

9. **Will Coca-Cola support bottle deposit arrangements in the United States, to work in conjunction with curbside recycling?**

For many years, we have favored a holistic recycling approach.

We are open to further looking at deposit programs that are non-discriminatory and fair, on a case-by-case basis, to determine whether they may be the most effective and sustainable option for some communities.

Despite our belief that deposit programs are not suitable for every society or economy, and are not always the most efficient solution, we have organized some fair and efficient deposit programs in some of our markets. The rate of recycling has not increased which is why it is time to try new solutions, deposit programs are one of multiple way to do this.

Senator Whitehouse:

11. **What lessons has Coca-Cola learned through its other sustainability and resource management work within its supply chain and distribution network that can be applied to plastics?**

From our water stewardship work, we know that business must collaborate with governments, local communities, the private sector and NGO's to establish or further effective programs. It takes many partners to be successful. We are also acutely aware that when we harness our entire supply chain we have the ability to affect real change with compounded results. That is our goal with World Without Waste.

12. **This year, Coca-Cola launched its "World Without Waste" initiative which sets the goal of collecting and recycling every bottle and can Coca-Cola sells by 2030. It also aims to make all Coca-Cola products recyclable by 2025.**

    a. **What types of initiatives are Coca-Cola programs already undertaking or likely to undertake to implement the World Without Waste goals?**

The Coca-Cola Company is building partnerships, creating initiatives and joining collaborations for localized programs around the world. Two good examples of collaboratives are Closed Loop Partners ("CLP") and The Recycling Partnership ("TRP"). CLP includes the Closed Loop Fund, a $100 million fund delivering solutions that remove recycling bottleneck with technology. TRP is a collaboration of over 40 companies and enterprises that is working on increasing curbside collection in the U.S. There is no one solution or silver bullet to improving recycling, which is why we are working within cities, towns and counties to find the solution that best fits, but also sharing best practices around the globe.

b. What investments is Coca-Cola making in improving collection and recycling infrastructure in the over 200 countries and territories it operates in?

The Coca-Cola Company has become and is becoming financial partners with organizations that are focused on recycling: from Keep America Beautiful, The Recycling Partnership and Ocean Conservancy, to the Closed Loop Fund and Circulate Capital, a venture loan fund established to address plastics in the Asia-Pacific oceans. Every country in which Coca-Cola operates will make investments to support World Without Waste.

c. What is the role of the private sector, especially in developing countries, in improving waste infrastructure?

The role of the private sector is to work with the local governments. Because we are a global company, The Coca-Cola Company can bring expertise and best practices to contribute to the expansion (or creation) of recycling infrastructure.

d. **As part of this initiative, does Coca-Cola plan to redesign its packaging to reduce plastic composition?**

By 2030, we will have no single use primary packaging, as we will collect 100%, incorporate at least 50% recycled content in each package, and ensure the balance is recycled in other ways. We will also continue to innovate to lightweight the plastic that is used to further reduce the amount of virgin plastic in our bottles.

13. **What other areas of materials innovation or packaging design is Coca-Cola investigating to minimize its waste production?**

Our focus is on our packaging materials, primarily PET plastic. We are innovating new packaging that will include 50% recycled PET (rPET) by 2030. We have pledged that our packaging will be 100% recyclable by 2025. Additionally, we are looking at future process innovations such as chemical recycling and package-less delivery of beverages. We will continue to design and innovate new packaging that meets our goals.

14. **Does China's new prohibition on imported waste alter Coca-Cola's ambitions at all?**

No, our World Without Waste goals exist independent of governmental action. In order to meet our World Without Waste goals, we need to collect and reuse PET. Having a strong local supply of pure rPET is an asset to our business in the U.S. and throughout the world.

15. **As a user of plastic materials, what pressure can Coca-Cola exert on plastic producers and product developers to innovate and minimize the harm these materials can cause if they end up in the oceans?**

We are working with Global Procurement and our mainstream suppliers to phase in rPET content globally. As a leader in the industry, our goal is by creating this demand developers will further innovate, and it will encourage greater waste collection to grow the supply of rPET.

16. **What role has consumer demand played in encouraging Coca-Cola to be an active participant in marine debris work?**

We are always working to listen to consumer points of view, particularly where our business intersects with an opportunity to do good in the communities that we serve – we are a part of them too.

We are committed to marine debris work because we, like others, have a responsibility to help solve the world's packaging problem. We know it's time for us to help lead the way and do more – and we are, through our World Without Waste initiative.

Our work is not reactionary. We have supported recycling and packaging recovery programs throughout the world for decades. We have partnered with the Ocean Conservancy since 1995 on research and action to cleanup marine litter, including being a lead sponsor of the International Coastal Cleanup. Together with the Ocean Conservancy and others, we launched the Trash Free Seas Alliance® in 2011 to advance the scientific understanding of marine debris globally.

17. **As we work on the next iteration of the Save Our Seas Act, do you have any additional recommendations or comments you would like to share to inform our development of this bill?**

We look forward to working with the Senate in the creation of the next iteration of Save Our Seas Act.

Senator BARRASSO. Thank you very much, Mr. Karas.
Dr. LAW.

STATEMENT OF KARA LAVENDER LAW, RESEARCH PROFESSOR OF OCEANOGRAPHY, SEA EDUCATION ASSOCIATION

Ms. LAW. Good morning. Thank you, Chairman Barrasso, Ranking Member Carper, and members of the Committee for the invitation to testify at this important hearing on man-made debris in the marine environment. My name is Dr. Kara Lavender Law, and I am a Research Professor of Oceanography at Sea Education Association, or SEA.

Since 1971, SEA has taken undergraduate students to sea on tall sailing ships to study the open ocean firsthand as navigators, sailors, shipmates, and scientists. More than 8,000 SEA semester students, some of whom are in the room today, have contributed to our 30-plus year data set on floating plastics in the ocean, assembled by towing plankton nets from our sailing research ships twice a day, every day, and hand-counting their contents.

Trained in ocean physics, I first learned about ocean plastics in 2003, when I joined SEA, where the distribution of floating plastic debris was common knowledge based upon decades of student research. In contracts to misconceptions about immense floating islands of recognizable items of plastic trash, often referred to as garbage patches, SEA scientists knew that the most numerous type of plastic debris are microplastics, particles smaller than your pinky fingernail that are not readily visible even from the deck of a ship. I have a sample here.

Since 2010, I have carried out scientific research on ocean plastics to better understand their sources, abundance, distribution, and transformation in the marine environment not only to advance scientific understanding, but also to inform solutions to this global problem.

Of all the man-made debris in the marine environment, we focus on plastics because of their ubiquity, persistence, and the risks they pose to wildlife and, potentially, human health. To date, widespread encounters of more than 800 species of marine wildlife with plastic debris have been well documented, and scientific evidence clearly demonstrates physical harm that can lead to death of individuals from entanglement or ingestion of large debris.

Laboratory studies have also provided evidence of harm from animal uptake of microplastics and their associated chemicals. However, because experiments are carefully controlled to test single outcomes, it is impossible to generalize results across species of debris types, or from the laboratory to populations in nature. Further research into the ecological impacts of contamination by microplastics is sorely needed.

However, we must not wait for all scientific questions to be comprehensively and definitively answered before taking action to eliminate plastic debris from our oceans. In the short-term, the most important action is to stop uncontained plastic waste from entering the ocean from land.

It is estimated that of the 5 to 13 million metric tons of plastic trash entering the ocean annually, nearly half originates from four

countries in Southeast Asia, where inadequate infrastructure cannot keep pace with the rapidly increasing waste generation.

However, here in the United States, the amount of plastic waste generated per capita outranks that in each of those four Southeast Asian countries, and the amount of plastic waste generated each day in the coastal United States is the highest of any country in the world.

In the U.S. we are fortunate to also have a robust waste management system. But even the relatively small amount of waste that is accidentally lost or intentionally littered adds up to a large amount available to enter the ocean. Global investment in waste management, especially where no formal system currently exists, but even where it does, is the first line of defense in keeping trash out of the ocean.

Cleaning up litter on land, especially in rivers and on coastlines, will continue to be an important "last chance" strategy to capture waste before it enters the ocean. Cleaning up debris in the sea itself is more challenging and resource-intensive, but can be effective when targeting large items in nearshore areas or collecting floating trash before it can move offshore and break apart into millions of microplastics.

Waste collection and cleanups are imperative in the short-term, but long-term sustainable solutions to ocean plastics pollution must address the increasing amounts of plastics in use. We must act to eliminate unnecessary usage and waste; increase demand for recovering and recycling, perhaps through product design that ensures material value at the end of product life; and identify suitable material alternatives where possible.

In summary, to reduce the impact of man-made trash on the oceans, wildlife, and human health, it is imperative that we prevent debris, especially that made of plastics, from entering the ocean. There is an immediate and critical need to assist countries that have inadequate waste management systems and there is much more to do in our own communities here in the U.S. as well.

No matter where in the world we choose to work, a necessary first step is to clearly identify and measure the local sources of ocean debris, as well as the drivers behind each source, which could be a lack of infrastructure, a consequence of product design or use, or factors influencing human behavior. With this information in hand, we can best focus our time, attention, and resources to design appropriate interventions that will reduce input from each source. These actions should always be appropriate to place. There is no silver bullet or one-size-fits-all solution.

Ocean plastics pollution is an environmental problem that is global in scope, in impact, and in responsibility. We all have a stake in a clean and healthy ocean. Whether in towns, cities, or States in the United States, or through international partnerships, we must work together toward short-term and long-term solutions.

Thank you for the opportunity to testify. I look forward to the day when our oceans are clean because of the work we have accomplished together.

[The prepared statement of Ms. Law follows:]

Environmental Studies in Woods Hole & at Sea
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WRITTEN TESTIMONY OF:

Kara Lavender Law, Ph.D.
Research Professor of Oceanography
Sea Education Association
Woods Hole, Massachusetts

BEFORE

THE U.S. SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

Hearing: "Cleaning Up the Oceans: How to Reduce the Impact of Man-Made Trash on the Environment, Wildlife, and Human Health?"

September 26, 2018

Introduction

Good morning. Thank you Chairman Barrasso, Ranking Member Carper, and members of the Committee, for the invitation to testify at this important hearing on man-made debris in the marine environment. My name is Dr. Kara Lavender Law, and I am a Research Professor of Oceanography at Sea Education Association (SEA), a non-profit educational organization based in Woods Hole, MA. Since 1971, SEA has taken undergraduate students to sea on tall sailing ships to study the open ocean, first-hand, as navigators, sailors, shipmates and scientists. More than 8,000 SEA Semester students have contributed to our 30+-year data set on floating plastics in the ocean, assembled by towing plankton nets from our sailing research ships twice a day, every day, and hand-counting their contents. In 2016, for our work in, "fostering scientific discovery and stewardship of the world's oceans", the National Science Board awarded SEA its Public Service Award.

As an oceanographer trained in ocean physics, I knew little about marine debris before joining the faculty at SEA 15 years ago. More seasoned faculty quickly taught me that the "plastics project" was a popular independent research topic for our students who were concerned about ocean pollution, and also one of the most reliable because, unlike projects focused on particular marine organisms, one could guarantee that along certain cruise tracks small bits of plastic debris would be found floating at the sea surface. It wasn't until 2007 when I first heard the term "garbage patch", a term rife with misconceptions about immense floating islands of recognizable plastic trash. In fact, the most numerous type of plastic debris in the ocean, and what we typically collect in our plankton nets, are "microplastics", particles smaller than your pinky fingernail that are composed of a variety of synthetic polymers (Figure 1). These microplastics are not readily visible from the deck of a ship, let alone from an aircraft or satellite. At SEA, we recognized the need to shift the focus away from mythical floating islands of trash and towards a scientifically informed description of ocean plastics pollution. To this end, in 2010 we published an analysis of our unprecedented data set, which now consists of more than 10,000 measurements of the concentration of floating plastic particles in the Atlantic and Pacific Oceans. For the past 10 years, I have carried out scientific research on ocean plastics to better understand their sources, abundance, distribution and transformation in the marine environment, not only to advance scientific understanding, but also to inform solutions to this global problem.

It is important to remember than not all marine debris is plastic, and not all is found floating at the sea surface. Trash on beaches and shorelines is marine debris (Figure 2). Litter on the seabed is marine debris, whether close to land (Figure 3) or in deep and remote places (Figure 4). Debris can be tens of meters long, such as lost fishing nets (Figure 5) or derelict vessels, or it can be microscopic in size. Man-made debris is composed of paper, glass, aluminum or other metals, as well as plastics. Yet the debris of greatest concern and focus, both by scientists and citizens, is that made of plastics.

Plastics: Ubiquitous, long-lived and harmful to wildlife

We focus on plastics in the marine environment because of their ubiquity, and the risks they pose to wildlife and potentially human health. In a 2017 study[1] led by Roland Geyer of University of California, Santa Barbara, we estimated that since the start of mass production, 8.3 billion metric tons of plastics have been produced, more than most other man-made materials, with the exceptions of steel and cement. Further, we estimated that 90% of these plastics still exist on the planet, with only a small fraction of plastic waste having been incinerated, and the majority of waste either residing in landfills or in the environment. Plastics are designed for strength and durability and do not biodegrade; thus, once in the environment, plastics persist for years to decades or longer. Other man-made materials such as glass and metals are also persistent in the environment; however, unlike glass and metals, the light weight of plastics makes them easily transportable. As plastics are carried by wind or water in the environment, they are weakened by sunlight and fragment to smaller and smaller pieces. Their chemical composition changes as well, as additives leach out and contaminants already present in seawater transfer to plastics. Thus, as plastic debris moves around in the oceans, its size, shape, and chemical makeup change. As these debris characteristics evolve, so too do the potential impacts on wildlife that encounter these plastics.

More than 800 marine species have been affected by man-made debris[2] through interactions such as ingestion, entanglement (including ghost fishing), and displacement of species that drift with, or upon, floating debris. Further, plastic debris accounts for 92% of reported encounters with individual organisms[3]. Large whales have ingested items as large as flower pots and meters-long lengths of rope and plastic sheeting[4]; bottle caps and cigarette lighters have been found in the guts of dead albatross chicks[5]; and small microplastics particles contaminate a multitude of species, including fish and shellfish we consume as seafood[6]. Plastics ingestion has now been documented for more than 200 marine species, including all species of sea turtles, 59% of whale species, and 59% of seabird species[7,8]. Further, for particular populations, such as the northern fulmar seabird population in the North Sea, as many as 95% of individuals studied have ingested plastics[9]. The direct consequences to wildlife of ingesting relatively large plastic debris can include physical injury and gut obstruction, ultimately leading to death, whereas the

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[1] Geyer, R., J. R. Jambeck and K. L. Law, 2017. Production, use, and fate of all plastics ever made. *Sci. Adv.* 3, e1700782.

[2] *Marine Debris: Understanding, Preventing and Mitigating the Significant Adverse Impacts on Marine and Coastal Biodiversity.* Technical Series No. 83. Secretariat of the Convention on Biological Diversity, Montreal, 78 pp.

[3] Gall, S. C. and R. C. Thompson, 2015. The impact of debris on marine life. *Mar. Poll. Bull.* 92, 170-179.

[4] de Stephanis, R. *et al.*, 2013. As main meal for sperm whales: Plastics debris. *Mar. Poll. Bull.* 69, 206-214.

[5] http://www.chrisjordan.com

[6] Rochman, C. M. *et al.*, 2015. Anthropogenic debris in seafood: Plastic debris and fibers from textiles in fish and bivalves sold for human consumption. *Sci. Rep.* 5:14340.

[7] Kühn, S., E. L. Bravo Rebolledo and J. A. van Franeker, 2015. Deleterious effects of litter on marine life. In: *Marine Anthropogenic Litter*, Bergmann, M., L. Gutow and M. Klages, Eds. Springer: Heidelberg, Germany, 447 pp.

[8] Wilcox, C., E. van Sebille and B. D. Hardesty, 2015. Threat of plastic pollution to seabirds is global, pervasive, and increasing. *PNAS* 112, 11899-11904.

[9] van Franeker, J. A. *et al.*, 2011. Monitoring plastic ingestion by the northern fulmar *Fulmarus glacialis* in the North Sea. *Environ. Pollut.* 159, 2609-2615.

consequences of ingesting microplastics remain less well understood. An area of intense scientific inquiry asks whether or not chemicals associated with ingested microplastics transfer into animal tissue and cause physiological damage. Some laboratory studies have demonstrated that for particular animal-plastic-chemical combinations, physiological harm does occur[10,11], yet more work remains to determine whether or not these impacts are occurring in nature and, if so, at what scale.

Although recent scientific research has largely focused on impacts of microplastics ingestion, evidence clearly demonstrates impacts of debris on marine wildlife through entanglement and species transport. Entanglements, now reported for 344 marine species, most commonly involve components of derelict fishing gear, such as plastic rope and netting, as well as looped packing or strapping bands, which may cause severe injury and death[3,7]. In 29 years of surveying the critically endangered North Atlantic right whale, 83% of individuals showed evidence of entanglement[12]. The most recent demonstration of species transport on floating debris was the delivery of 289 living marine species from the coast of Japan across the Pacific Ocean to North America for six years following the 2011 Tohoku earthquake and tsunami[13]. Although we don't yet know whether these species will become established and threaten native species, the six-year duration of the invasion is unprecedented, and is likely due to the persistence of plastics in the ocean.

To date, widespread encounters of marine wildlife with plastic debris have been well documented, and scientific evidence clearly demonstrates harm from interactions with large debris. Laboratory studies have also provided evidence of harm from animal uptake of microplastics. However, because experiments are carefully controlled to test single outcomes, it is impossible to generalize results across species or debris types, or from the laboratory to populations in nature. Further research into the ecological impacts of contamination by microplastics is sorely needed.

Identifying the sources

The most effective way to reduce the impacts of plastic debris on wildlife and the marine environment is to prevent plastics from becoming ocean debris in the first place. This can only be accomplished by first understanding the origins of the debris, and the pathways by which it enters the ocean. Plastics can enter the environment at any point in their life cycle, starting from losses of industrial resin pellets (the material feedstock for plastic products), to accidental loss during product use, such as with fishing and aquaculture gear, to accidental or deliberate

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[10] Rochman, C. M. *et al.*, 2013. Ingested plastic transfers hazardous chemicals to fish and induces hepatic stress. *Sci. Rep.* 3, 3263.

[11] Oliveira, M. *et al.*, 2013. Single and combined effects of microplastics and pyrene on juvenils (0+ group) of the common goby *Pomatoschistus microps* (Teleostei, Gobiidae). *Ecol. Indic.* 34, 641-647.

[12] Knowlton, A. R. *et al.*, 2012. Monitoring North Atlantic right whale *Eubalaena glacialis* entanglement rates: a 30 yr retrospective. *Mar. Ecol. Prog. Ser.* 466, 293-302.

[13] Carlton, J. T. *et al.*, 2017. Tsunami-driven rafting: Transoceanic species dispersal and implications for marine biogeography. *Science* 357, 1402-1406.

discard of plastic waste into the environment. A 2015 study[14] led by Jenna Jambeck of University of Georgia estimated that between 5 and 13 million metric tons of plastic trash generated in coastal regions worldwide enters the ocean in a single year because the waste is not properly captured and contained. We estimated that nearly half of this mismanaged plastic waste originates from four countries in southeast Asia (China, Indonesia, Philippines and Vietnam), countries that have experienced rapid economic growth accompanied by an increase in the amount of plastic waste produced by large coastal populations. When waste generation rates outpace the capacity of existing waste management systems, uncaptured plastic waste can flow into the oceans from rivers and waterways, or wash out to sea during storms or with the tides.

The United States also has a large coastal population, and the amount of plastic waste generated per capita outranks that in each of the four southeast Asian countries. According to our analysis, the amount of plastic waste generated each day in the coastal United States is the highest of any country in the world. We are fortunate to also have a robust waste management system – garbage and recycling collection, material sorting, and treatment either in sanitary landfills or by incineration. However, because of the sheer amount of plastic waste we create, even the small amount that is accidentally lost, or intentionally littered, adds up to a large amount available to enter the ocean.

Not all plastic debris in the marine environment originates from improperly managed waste on land. Abandoned, lost or otherwise discarded fishing gear is also a very large source of plastic debris, although no estimate of the global input yet exists. Natural disasters, such as hurricanes, floods and tsunamis, can inject a tremendous amount of debris of all materials into the ocean in a single, short-term event. And microplastics from a variety of sources – including microbeads in cosmetics, dust from tire wear, fragments of agricultural films, and fibers from synthetic clothing – can enter the ocean by pathways such as runoff into waterways, and stormwater and wastewater outflows.

From sources to solutions

Ocean plastics pollution is a global problem that has grown in size and scale since the 1950s as an unintended consequence of rapidly increasing production and use of these innovative and, in many cases, indispensible materials. Plastics were never intended to contaminate our oceans, rivers, lakes and soils, posing risks to wildlife and potentially even human health. Yet we are faced with ever increasing applications and use of these materials, without a clear strategy for management at the end of their useful life. Preventing plastics from becoming marine debris requires a suite of actions from local to global scales, carried out by individual consumers as well as material and product manufacturers; by municipal, state and national governments as well as international bodies. These actions should always be appropriate to place – there is no silver bullet, or one-size-fits-all solution.

[14] Jambeck, J. *et al.*, 2015. Plastic waste inputs from land into the ocean. *Science* 347, 768-771.

Contain the waste

The most pressing short-term need to prevent marine debris is to ensure that no waste is left uncontained in the natural environment, whether terrestrial, freshwater or marine. This requires global investment in waste management systems, especially where no formal waste management currently exists. In the 2015 Jambeck study, we estimated that if plastic waste generation were capped and total waste management achieved in the top ten emitting countries by 2025, then the annual input into the oceans would be reduced by 77%.

Even in countries like the United States, where we have established collection and processing of waste, we must ensure that trash cans are lidded and emptied before they overflow, and that the stray candy wrapper is caught before it blows away in the wind. We must invest in infrastructure that streamlines collection and processing of recyclable materials. The design of waste management systems anywhere in the world must be tailored for the needs of a particular community, understanding how, where and what kind of waste is generated, as well as existing social and cultural practices, to ensure community buy-in and long-term success in managing waste.

Clean up uncontained waste

Cleaning up litter on land, especially in rivers and on coastlines, will continue to be an important strategy to prevent waste from entering the ocean. Seemingly simple interventions can be extremely effective, such as Baltimore's Mr. Trash Wheel, a solar- and hydro-powered river trash collection device with a personality, which has prevented 1.7 million pounds of debris from flowing into the Chesapeake Bay. Cleanups are also effective ways to engage and educate citizens as volunteers, as demonstrated by the nearly 250 million pounds of trash collected by nearly 13 million volunteers around the world since 1985 in Ocean Conservancy's International Coastal Cleanup.

Cleaning up debris in the sea itself is more challenging and resource intensive, but can be effective when targeting large items in nearshore areas, or collecting floating trash before it can move offshore and break apart into millions of microplastics. Fishing for Litter programs engage those in the fishing industry to remove litter from the sea in the course of normal fishing activity, at the same time raising awareness of the importance of keeping trash and derelict fishing gear out of the ocean in the first place. Project AWARE's Dive Against Debris program engages scuba diving enthusiasts to participate in underwater debris cleanups to not only report and remove trash on the seafloor, but also to serve as citizen scientists, collecting data on types and amounts of debris in order to inform prevention efforts.

Sustainable solutions

Improved waste collection and cleanup of uncaptured waste are imperative in the short term, but long-term, sustainable solutions to ocean plastics pollution must address the increasing amounts of plastics in use by employing a variety of strategies to: eliminate unnecessary waste; increase demand for recovery and recycling; and identify suitable alternatives where possible. In some instances, where plastics are unnecessary for function (or are known to be particularly harmful), a mandated ban may be appropriate. The Microbead-Free Waters Act passed by the

U.S. Congress in 2015, banning plastic microbeads in rinse-off cosmetics, is an example of this type of action. In other cases, a reduction in use can be incentivized by government policies (municipal, state, or national), such as mandated fees for single-use retail bags. A complimentary positive incentive to reduce single-use bags is provided by individual businesses that give a discount to customers who bring their own bags. Municipalities and institutions can promote waste reduction not only by offering separate recycling and food waste collection, but also by making improvements to infrastructure, such as installing water bottle refill stations to facilitate use of reusable, rather than single-serve, water bottles, thereby reducing plastic waste. Finally, campaigns by individuals or organizations can influence changes in behavior that will reduce waste. For example, the plastic drinking straw movement has recently grown from a simple "Skip the Straw" pledge to refuse an unneeded drinking straw, to an all-out social media blitz promoted by conservation organizations and celebrities alike, driving strong responses from major consumer goods companies down to stand-alone restaurants and individuals. As consumers, we all make innumerable decisions every day about products that we buy, use and throw away. Although we bear ultimate responsibility for our own decisions, good choices can be made easier by employing a variety of strategies to encourage waste reduction.

Perhaps with an ultimate long-term goal of zero waste, steps should be taken to bring value to products and materials at the end of their useful life. This will ultimately increase demand for reuse, recovery and recycling over disposal. Manufacturers engaged in product stewardship agree to share responsibility for their end-of-life product, such as through take-back and recycling programs, for example. A successful example of cross-brand product recovery and recycling is demonstrated in communities with container deposit schemes for beverage containers including plastic bottles, glass bottles and aluminum cans. Because of the uniformity in materials used across brands, and efficient recovery incentivized by the deposit, recycling of these materials is more cost effective and the waste material more valuable. With attention at the product design stage to ensure material value at the end of life, market incentives can reduce the number of one-way trips most items eventually take to the landfill or incinerator, or the environment.

Finally, continued scientific research to inform evidence-based decision-making is essential to addressing the problem of ocean plastics pollution, so that limited resources can be efficiently and effectively deployed to the greatest benefit. This does not mean that we must wait for all scientific questions to be definitively answered before taking action. Rather, prevention efforts will be most successful when research is first undertaken to understand the local sources and driving factors behind them. For example, Virginia Coastal Zone Management Program and Clean Virginia Waterways used data to identify balloon litter as items of concern, with nearly 9,000 balloons collected on Virginia beaches during 9 years of International Coastal Cleanups[15]. In response, they conducted public surveying and interviews to understand the who, where, when and why behind mass balloon releases in Virginia and, with this knowledge, designed a

[15] Witmer, V., K. Register and L. McKay, 2017. *Balloon Release Research in Virginia and Reducing Balloon Debris through Community-Based Social Marketing.* Virginia Coastal Zone Management Program (Virginia Department of Environmental Quality), 117 pp.

community-based social marketing campaign to discourage balloon releases and provide context-specific alternatives, a more targeted and informed strategy than a simple information-sharing education campaign alone.

Concluding remarks

In summary, to reduce the impact of man-made trash on the oceans, wildlife and human health, **it is imperative that we prevent debris, especially that made of plastics, from entering the ocean**. There is an immediate and critical need to assist countries that have inadequate waste management systems, and there is much more we need to do in our own communities as well.

No matter where in the world we choose to work, a **necessary first step is to clearly identify and measure the local sources of ocean debris**, including item types and locations, as well as the pathways the debris follows from the source to the sea. **Second, we must determine the drivers behind each source**, which could be a lack of infrastructure, a consequence of product design or use, or factors influencing human behavior. With this information in hand, we can best focus our time, attention and resources to **design appropriate interventions that will reduce input from the source**. Interventions may be relatively simple and inexpensive, such as installing and servicing lidded trash cans. Interventions may be engineered, such as debris traps in waterways or storm drains. Interventions may involve technological design innovations to ensure effective recovery and recyclability, and they may aim to influence human behavior away from a "disposable" mentality to reduce unnecessary usage and waste. Interventions may be legislated to mandate or incentivize actions by plastics producers, product manufacturers and consumers that will ultimately reduce the input of plastics to the ocean. Finally, we must continue to increase waste literacy and raise public awareness of this problem in order to drive action by consumers, producers, and governments alike, to both reduce unnecessary consumption and revolutionize our management of waste.

Ocean plastics pollution is an environmental problem that is global in scope, in impact, and in responsibility. We all have a stake in a clean and healthy ocean. Whether in towns, cities or states in the United States, or through international partnerships, we must work together towards short-term and long-term solutions as citizens, scientists, businesses, governments and people. Thank you for the opportunity to testify. I look forward to the day when our oceans are clean because of the work we have accomplished together.

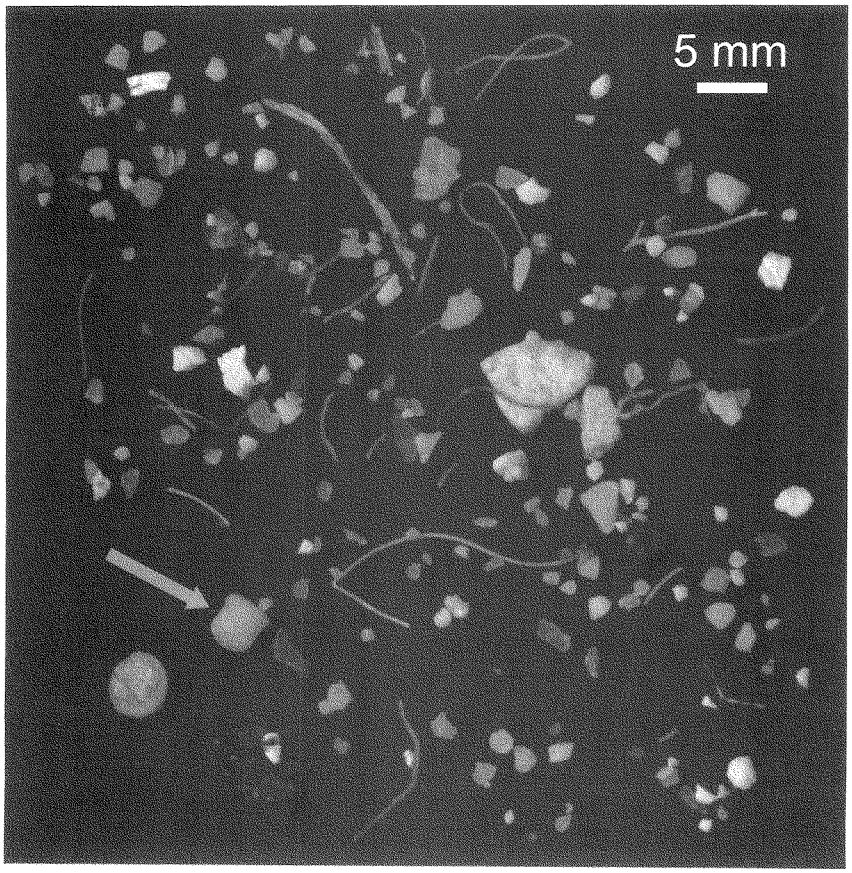


Figure 1: Microplastics collected from surface seawater in the North Pacific Ocean by towing a plankton net. Microplastics are typically defined as particles smaller than 5 mm in size, and are composed of a variety of plastics. Microplastics may be manufactured at this size, such as the industrial resin pellet indicated by the orange arrow, but most are generated when larger plastic items break apart upon exposure to sunlight.
Photo credit: Jessica Donohue/Sea Education Association.

Figure 2: Litter piled high and wide on Marquez Beach, Peru.
Photo credit: Nicholas Mallos/Ocean Conservancy

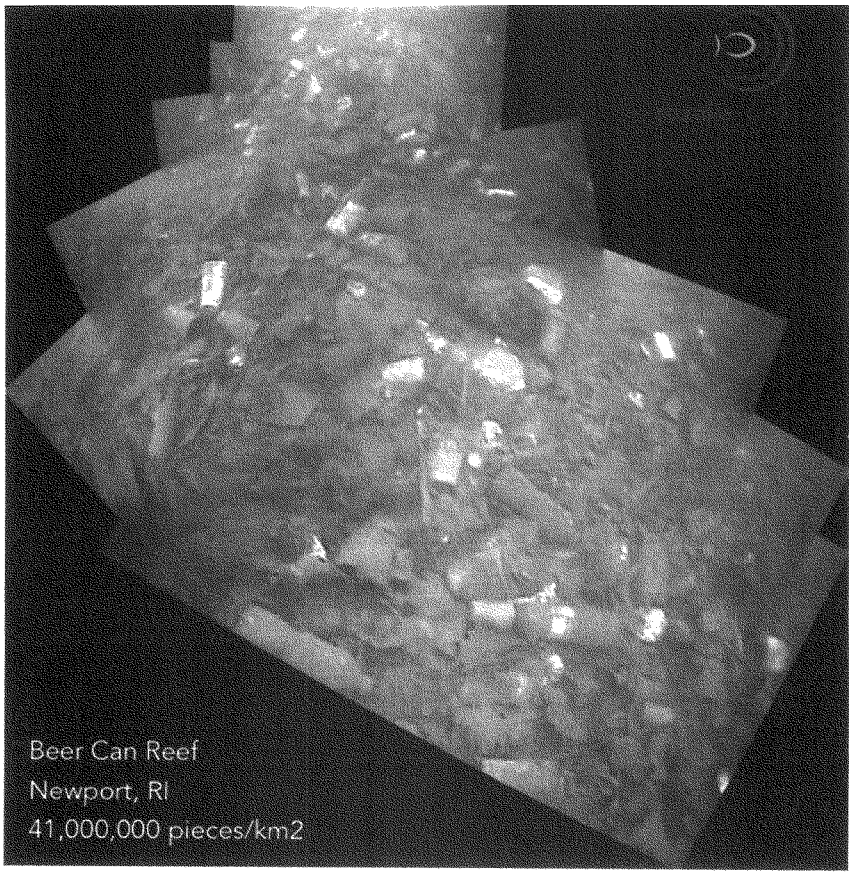


Figure 3: Beverage cans, bottles, food wrappers and other trash in a composite of underwater photos of the seafloor in the harbor in Newport, RI.
Photo credit: Rachael Miller/Rozalia Project

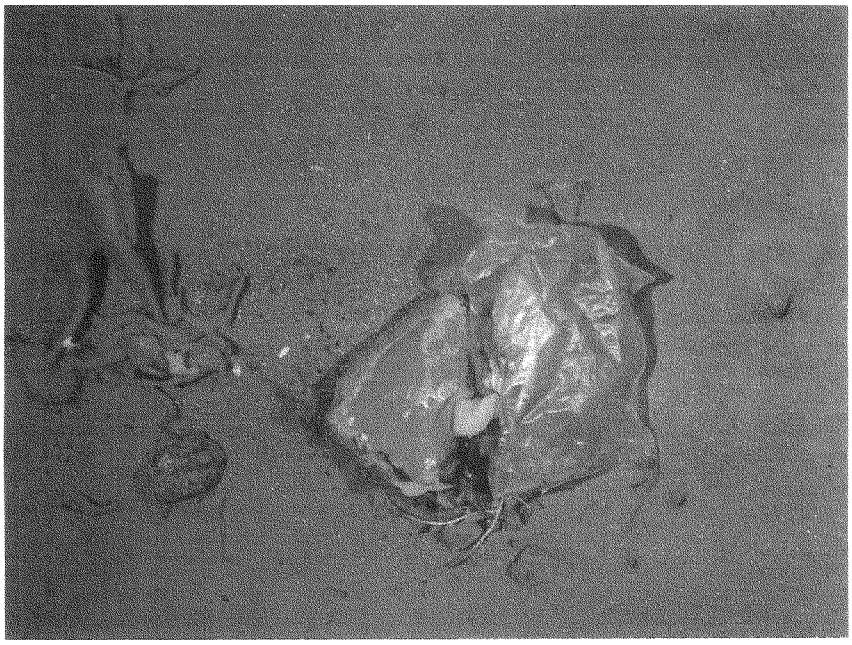


Figure 4: Plastic bag at a depth of 2500 m (8202 ft) at HAUSGARTEN, the deepsea observatory of the Alfred Wegener Institute in Fram Strait in the Arctic.
Photo credit: Melanie Bergmann/OFOS, Alfred Wegener Institute

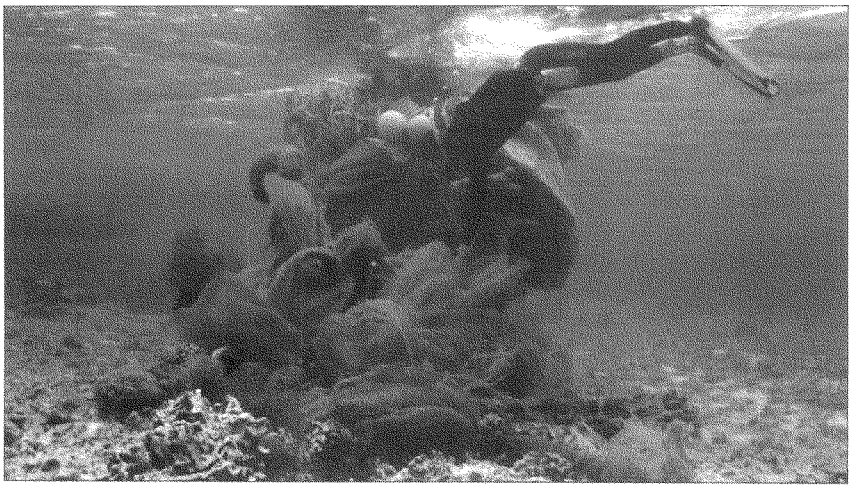


Figure 5: A NOAA diver removes derelict fishing gear from a reef habitat at Midway Atoll.
Photo credit: NOAA Marine Debris Program

Senate Committee on Environment and Public Works
Hearing entitled, *"Cleaning Up the Oceans: How to Reduce the Impact of Man-Made Trash on the Environment, Wildlife, and Human Health?"*
September 26, 2018
Questions for the Record for Dr. Kara Lavender Law

Chairman Barrasso:

1. Experts seem to agree that stopping the flow of debris into the ocean is a bigger priority than cleaning up the debris already in the ocean. Is this an assessment that you agree with? If not, why not?

   Yes, I agree. Cleaning up debris already in the ocean treats the symptom of the problem and not the cause. Even if it were possible to clean up all the debris in the ocean at one moment in time, more and more continues to flow in every day – the task would never be complete. Further, scientists still do not know where the vast majority of trash entering the oceans from land is located in the ocean, making efficient and effective removal a virtually impossible task. Targeted, local cleanups are worthwhile, especially if they take place on coastlines, beaches or in nearshore waters, but cleanups alone cannot solve this pollution problem. Stopping debris from entering the oceans is the top priority.

2. We know that five countries in Asia bear much of the responsibility for the increase in ocean plastic. That does not mean that we in the United States do not have a critical role to play. What additional steps can local and state governments as well as the federal government take to address this problem?

   Yes, the United States population also contributes large amounts of debris to the ocean through leakage of waste from land, as well as through other sources (such as lost recreational and commercial fishing gear; losses due to natural disasters; losses of microplastics in wastewater and stormwater/runoff). Governments at all levels can take steps to help mitigate the problem. At the federal level, incentives (or disincentives) to reduce unnecessary plastics usage could serve to reduce the amount of plastic waste generated that needs to be managed. The Microbead Free Waters Act of 2016 is a good example of this kind of action. Further, the federal government could stimulate growth in the industries that collect and process materials for recycling. State governments could evaluate and improve waste management services, especially by streamlining recycling collection and processing for efficiency and consistency across municipalities. In particular, container deposit policies have demonstrated success in improving capture and recycling rates. Municipal governments can take steps to identify specific "leakage" points of waste to the environment, and act to directly mitigate those potential sources of waste to the ocean. For example, they could ensure the presence of public waste and recycling receptacles that are regularly serviced and designed to prevent losses in heavy weather (e.g., wind). At all levels, funding will be necessary for research and implementation of mitigation actions.

3. On January 24, 2018, the *Financial Times* published an article, by Clive Cookson, entitled, "The problem with plastic." It explained that:

> "While the personal-care industry is phasing out microbeads, concern is growing about another ubiquitous micropollutant: plastic fibres. Analysis shows these to be present in streams, rivers, lakes and seas worldwide, as well as household drinking water. Their main source seems to be clothing and textiles made from synthetic fibres, which become detached in washing machines and are not filtered out by water-treatments plants."

Do you agree with this assessment? If so, how do we begin to address this issue?

Synthetic fibers have been detected in a variety of water bodies, as well as in marine organisms, food and drinking water, and as airborne particles. They appear to be the most ubiquitous of the "microplastics". It is reasonable to assume that many of these fibers originate from clothing and textiles, but there may be other sources, such as synthetic ropes used in marine applications. Fibers shed from synthetic clothing during laundering have been identified as a source of pollution in wastewater that, if not captured, could enter the environment in effluent from wastewater treatment plants.

There is no easy solution to the shedding of microfibers – they cannot simply be phased out like cosmetic microbeads because of a much greater reliance on synthetic textiles. Individuals can reduce the frequency of clothes laundering and install filters on washing machines to trap these particles before they enter wastewater, and perhaps wastewater treatment plans could develop additional methods to filter out synthetic fibers. Further up the chain, textile manufacturers could work to engineer fabrics that are less susceptible to shedding. Most importantly, we must better understand the impacts of exposure to these microfibers to both wildlife and humans, especially through ingestion and inhalation, to evaluate the risks posed by microfibers. Only then can we properly evaluate the overall benefits and risks of synthetic textiles.

4. What regions of the world are the least studied when it comes to plastic pollution?

On a global scale, we have barely scratched the surface in our scientific understanding of plastics pollution. There are perhaps a handful of regions of the ocean in which plastic debris has been measured extensively and over long periods of time, but this is only the case for plastics in a specific size range floating at the sea surface. In other regions, a single study to document the presence of plastic debris may have been carried out, and, in most of the world's oceans, plastic debris has not been studied at all. We have only a relatively coarse assessment of the size and distribution of one major source of plastic debris to the oceans (waste generated on land), whereas there exist very few direct measurements of the movement of trash or debris from land into the sea to inform targeted mitigation efforts.

Ranking Member Carper:

5. Stopping the flow of marine debris into the ocean – and mitigating its impacts – are not problems that can be solved overnight. Long-term, thoughtful, and collaborative solutions are necessary in order to address the full scope of the issue. Solutions that have been discussed included: improving recycling, incentivizing the use of recycled materials in the global supply chain, developing more biodegradable alternatives, and changing manufacturing protocols are potential solutions to help address this issue. What steps can this Committee and the Congress take now to advance these potential solutions here in the United States?

   The most pressing short-term need to solve the problem of plastics pollution is to stop the flow of debris into the environment. The science to date suggests that the biggest source of debris to the ocean is likely waste entering from land, including from the coastal United States, where more plastic waste is produced per day than in any other country in the world. The Committee and Congress could commission a study into the state of waste generation, collection and processing (including recycling) in the United States, as well as research to determine the dominant pathways by which lost waste enters the oceans (e.g., via rivers and waterways, from beaches, transported by wind, stormwater/runoff) to gain a baseline understanding of both waste generation and waste leakage to the environment. Using this informed baseline, which will reveal "hotspots" of extremely high waste production, waste leakage, and flows of leaked waste into the ocean, direct intervention strategies can then be designed and implemented at multiple levels (federal, state, local).

6. Now that China has implemented its "Green Fence Policy," a ban on importing plastic waste, our market for these materials in the United States is flooded. China previously accepted 30% of our plastic waste. Local municipalities are now having even more trouble breaking even when collecting and recycling this waste. In your opinion, what are the best ways for the United States to address this new challenge?

   I am an ocean scientist by training, and as such cannot comment with any expertise on how to reinvent or reimagine the domestic recycling industry. However, as a citizen and producer of waste (including recyclables), I can attest to the many challenges at the household and municipal level in managing individual items. The "Do/Do Not Recycle" list often varies from municipality to municipality, making it extremely challenging for a consumer to know whether any particular item (especially those made of plastics) belongs in the trash or recycling collection. It is my understanding that contamination of recycling collection by items that do not belong (e.g., plastic bags) causes major problems for materials recovery facilities (MRFs), which do not have the technical or human power (as China did for so long) to remove every such item. We must revolutionize current systems, starting from the redesign of products and packaging to facilitate recovery of disposed items. Container deposit schemes (e.g., for glass, plastic and aluminum beverage containers) are one example of a successful design and recovery

strategy, in which uniform material use across brands, together with recovery incentivized by the deposit, allow recycling of these materials to be more cost effective, and the collected waste material more valuable.

7. Dr. Law, in your testimony, you mentioned that the United States produces more waste – per person, per year – than the Asian countries responsible for most of our world's marine debris. So while the United States may not be contributing as much to the problem as other countries, we can clearly do better. If we are going to do better, we need to fully understand how this waste from the U.S. makes its way into our oceans. What do we already know about this? If we have successfully identified sources, what can we do at each source to better prevent more waste from entering the ocean?

Yes, according to our research, the coastal population of the United States produces more plastic waste per year than any country in the world. In no country has the actual amount of waste entering the oceans from land, or the pathways it takes (e.g., rivers and waterways; stormwater/runoff; wind transport; dumping) been directly measured. Before we can design effective interventions, we must better identify the "hotspots" of waste generation, waste leakage (i.e., that escaping the waste management system), and flows of waste from land into the ocean. Ultimately, we need direct measurements of leakage – resulting from litter, improper handling, or accidental loss – on a local scale.

Senator Markey:

8. There is clear consensus that the number one way to reduce the impact of marine debris—from tiny microplastics to piles of plastic water bottles—is to prevent plastic from getting into the ocean in the first place.

    a. Can you speak to the importance of grassroots movements that begin at the local or small-business scale when it comes to bringing attention to the marine debris issue and cutting off marine debris at the source? Can you provide some examples?

As a scientist studying ocean plastics pollution, I think that grassroots movements and the concerns of individual citizens have propelled this issue into the spotlight not only for the public and policymakers, but also for scientists themselves. The level of public concern and willingness of individuals and small businesses to take action to solve this pollution problem are absolutely critical. An excellent example is the recent attention to reducing the use of single-use plastic straws. In 2011, a 9-year old in Vermont (Milo Cress) started a local campaign to "Be Straw-Free", encouraging restaurants to provide straws only upon request, and to educate the public about the impacts of plastic waste on the environment. Since then, momentum on the straw/single-use plastics reduction movement has steadily grown through other grassroots campaigns (e.g., StrawFree.org, The Last Plastic Straw, One Less Straw, ReThink Disposable), eventually drawing the attention of celebrities (e.g., Lonely Whale – For a Strawless Ocean), and most recently reaching policymakers who have proposed and/or implemented bans and/or reduction policies at municipal levels (e.g., Seattle, WA; Davis, San Luis Obispo and Malibu, CA), national

levels (e.g., France, Scotland, Taiwan, UK) and international levels (e.g., European Commission, G7 Ocean Plastics Charter (without the U.S. and Japan)). Ocean plastics pollution is a problem that the public cares about, and grassroots movements have propelled not only the science forward, but also the demand for and action on solutions.

Senator Merkley:

9. In 2010, a total of 270 million metric tons of plastic was produced globally, an estimated 4.8 to 12.7 million metric tons of which escaped into the oceans. How can we scale recycling systems to keep up with the expanding production of plastics?

   Plastics are innovative and, in many cases, indispensible materials that were never intended to contaminate our environment or to pose risks to wildlife and potentially even human health. Yet, our development, production and use of these materials continue to grow without a clear strategy for management at the end of their useful life. While scaling and revolutionizing recycling systems must be part of the actions to address accelerating plastics use and waste production, recycling merely delays (through a limited number of additional uses) the ultimate need for disposal. Manufacturers must play a role, starting at the design phase, in planning for recovery, recycling, and eventual disposal of the materials and products they produce. Ultimately, all plastics must be prevented from entering the ocean – it doesn't matter to marine wildlife whether the plastic debris they encounter is made from recycled or virgin feedstock.

10. What tools and/or technologies are available to help remove the marine debris that is already in the ocean? What can the federal government do to support the development of these technologies or scale up technologies that already exist?

    Although the top priority is the prevention of debris from entering the oceans, removal of debris from coastlines and nearshore areas is important to not only clean up those areas, but to prevent debris from moving offshore where efficient cleanup is essentially impossible, not least because scientists do not yet know where most of the plastic waste is located in the open oceans.

    Current innovations for coastal cleanups include Baltimore's "Mr. Trash Wheel", a river trash collection device that prevents debris from flowing into the Chesapeake Bay. Other trash collectors in development include "Seabin" and "Trash Shark", which gather floating debris in harbors. In my opinion, before investing in cleanup technology, the federal government should first invest in research to clearly identify and measure the largest sources of debris, including the item types and locations and the pathways the debris follows from land to the sea. Armed with this information, the government can then invest in the infrastructure, incentives and/or policies that directly address these sources.

11. As Oregon's experience with the aftermath of the tragic 2011 tsunami in Japan shows, natural disasters can introduce a tremendous amount of debris of all materials into the

ocean in a single, short-term event. What can we be doing to minimize the introduction of debris into the ocean from such events?

Indeed, natural disasters such as tsunamis, floods and hurricanes can deposit a tremendous amount of debris of all material types into the ocean in a single event. Aside from disincentivizing or banning coastal development, the best approach to minimize losses (human, material and debris alike) due to such catastrophic events may be to build structures designed to withstand extreme winds and flooding events. A very recent example is the "Sand Palace" home in Mexico Beach, FL (https://www.nytimes.com/2018/10/14/us/hurricane-michael-florida-mexico-beach-house.html), which was constructed to withstand 250 mph winds, far exceeding local building code requirements, and which was one of very few homes left standing after Hurricane Michael. Not only was the home still standing, but because the roof, doors, and essentially all windows remained intact, it appears nothing from inside the house was lost to the sea as debris.

Senator Whitehouse:

12. What are some of the risks plastics in the ocean pose to wildlife? To humans?

Scientific evidence clearly demonstrates physical harm to marine wildlife, including severe injury and death, due to entanglement in looping materials such as plastic rope or netting, and plastic strapping bands. There is also clear evidence of internal injury and death due to ingestion of plastic debris, especially large debris. The consequences and harm due to ingestion of microplastics (particles smaller than 5 mm in size) by marine wildlife remain less well understood, although there is laboratory evidence of risks associated with physical impacts of ingested debris, as well as with potential transfer of chemicals associated with plastics into animal tissues. We do not yet know if these impacts are occurring in nature, or if there are measurable risks to humans from eating seafood that may be contaminated with plastics and the chemicals associated with them.

13. What are the current gaps in understanding, or emerging areas of research, we must invest in to better understand and combat the marine debris crisis?

Some of the most basic questions about marine debris remain the largest gaps in our scientific understanding. We have a coarse estimate of only one source of debris to the oceans (plastic waste leakage from land), with very limited direct measurements of the flow of debris from land to the sea (e.g., in rivers, stormwater/runoff, carried by wind or waves/tides, etc.). In order to design effective interventions, we must first identify and measure inputs at a local scale.

Second, we do not know where in the ocean most of the debris is located. We can only account for ~1-3% of the plastic waste estimated to enter the ocean in a single year from our (fairly rudimentary) measurements of floating microplastics. We do not yet know whether most of the debris is residing on coastlines, on the seafloor or in marine wildlife.

We must invest in robust new technologies to efficiently detect and quantify debris of all sizes (nanoscale to large debris) in all marine reservoirs.

Third, we do not know how plastics are transformed and transported within the marine environment, including pathways between the major reservoirs. We have a very limited understanding of the chemical degradation and physical fragmentation of plastics from large items to microplastics and nanoplastics, including the time scales of these processes, and we do not yet know the ultimate fate of plastics (and their chemical additives) in the oceans.

Finally, we cannot fully evaluate the risk of marine debris to wildlife because of the gaps described above. For any particular species or cohort, we cannot yet quantify the exposure to marine debris because we have little understanding of where the debris is located and the form (size, shape, chemical composition) it takes. For microplastics (and potentially nanoplastics) in particular, there is some laboratory evidence of harm due to ingestion or uptake into marine animals, but further research into the ecological impacts of contamination by plastics occurring in nature is sorely needed.

14. What marine species are particularly vulnerable to harmful marine debris interactions, either from ingestion or entanglement?

Scientific evidence of encounters and/or contamination by marine debris is steadily increasing, with documentation of debris interaction existing for more than 800 species. However, contamination may not always result in harm to an individual, and harm to an individual can only be determined if the animal was encountered, recovered and examined. Thus far, there is clear evidence of harm due to entanglement for animals including marine mammals, sea turtles, seals and sea lions, seabirds, fish and some invertebrates. Many entanglement reports are cases of "ghost fishing" by derelict fishing nets. For ingestion of plastics, clear evidence of harm has been documented for marine mammals, sea turtles, seabirds, fish, shellfish, some invertebrates and even zooplankton, although it should be noted that some of this evidence of harm due to microplastics ingestion comes from controlled laboratory studies. The current scientific understanding of risk due to marine debris is limited to those marine species that have either been encountered or targeted for study, and current understanding of harm occurring in nature due to encounters with microplastics is severely limited.

15. How widespread are micro plastics in the environment?

The abundance of microplastics in the environment (marine, freshwater, soils, air) appears to inversely scale with particle size. That is, the smaller the particle, the more widespread the occurrence seems to be. For example, microfibers (such as those shed from synthetic textiles) seem to be ubiquitous in the environment, including in our homes, workplaces and in scientific laboratories. This makes careful control against procedural contamination by airborne particles in the field and/or laboratory absolutely essential for scientific study of these particles. More generally, because research into environmental contamination by microplastics is still in very early stages, and is severely limited by a

lack of robust, efficient and consistent identification and measurement techniques, we cannot yet make broad generalizations about their abundance and distribution in the environment.

16. As we work on the next iteration of the Save Our Seas Act, do you have any additional recommendations or comments you would like to share to inform our development of this bill?

Thank you for your dedication to and hard work on this legislation, and congratulations on the successful passage of the Save Our Seas Act of 2018 into law. The reauthorization of the Marine Debris Program (MDP) within the National Oceanic and Atmospheric Administration is instrumental to continuing critical scientific research that informs the design of solutions including, most importantly, the prevention of marine debris. An increase in the MDP budget has been sorely needed, especially as this is the only federal agency substantially investing in scientific research in this field. I think the program will continue to experience strong and growing competition even for these expanded resources, given the increase in scientific inquiry in this field.

I strongly support the Act's promotion of international engagement and action, especially related to expansion of waste management systems, as this is a critical need to stop the flow of debris to the oceans. I would also like to see attention to waste generation and management in the United States, to better quantify challenges and weaknesses in the current waste and recycling systems that result in leakage to the environment. The coastal United States is the largest producer of plastic waste of any country in the world, thus even proportionally small losses can add up to large inputs of waste into the oceans. In particular, we need to invest in research to identify and measure local sources of ocean debris so that we can design appropriate local interventions. Finally, we need to focus further upstream to avoid unnecessary use of plastics through reduction and/or redesign, and to ensure a safe and sustainable end-of-life plan for these manufactured materials.

Senator BARRASSO. Well, thank you all for your testimony. Very thoughtful, very insightful.

We are going to start with some questioning. I am going to ask each of you, and maybe we want to start with Dr. Law and then work down the panel. You talked about training in ocean physics, undergraduate degree in math. Obviously, very thoughtful on these topics.

There are a couple of articles that were in The Economist that ran 2 weeks ago on this specific topic, in the science and technology section. One was entitled "On the Plastic Highway." Road makers are using waste to create harder wearing surfaces, the idea of using some of the recyclables not just for some of the things that you mentioned, Dr. Baillie, but actually for hardened surfaces on the roads.

The second title, which made me think to start with you, was a teenager in California. This article is called "Sweeping the Ocean: A Teenager's Plan to Troll for Plastic in the North Pacific Becomes Reality," and you are familiar with what he is doing out there.

I would like each of you to describe what you think are some of the most promising areas of innovation that are taking place right now. And if it is OK, we can start with you, Dr. Law.

Ms. LAW. Sure. Thank you for the question. I actually think that some of the most promising innovations and interventions are actually quite simple. So, thinking about communities in the United States, in Portland, Maine, where I live, there has been an initiative to replace open garbage cans with lidded garbage cans. So, this is a way that we simply prevent waste from blowing out on a windy day.

In Baltimore there is a river trash catching device called Mr. Trash Wheel that captures litter that is floating down the river before it can enter the ocean.

These are relatively simple interventions. Mr. Trash Wheel runs on solar and hydropower, and actually has a great personality if you follow his Twitter feed. So, raising awareness, as well.

Senator BARRASSO. You are paying close attention to the personality.

Senator WHITEHOUSE. Mr. Trash Wheel. OK.

Senator BARRASSO. Let the record reflect.

Ms. LAW. So, I think these innovations are critical because those are acting to trap the trash before it enters the environment and ultimately the ocean.

I think it is laudable that we are thinking big about trying to clean up the open ocean, but I have some concerns about trying to go out in the middle of the ocean to collect particles, most of which are as small as those found in this little vial. So, I do applaud all kinds of innovation and hope people will continue thinking big about how to solve this problem.

Senator BARRASSO. Mr. Karas?

Mr. KARAS. It is a great question. I think in the area of innovation, one of the things to consider is really thinking about innovation in process, how we do things. At least where we sit, as a company that makes beverages, it is very challenging for us to even get PET plastic back into our packages. So, we have partnered with groups like the Closed Loop Fund, which is focused on innovative

solutions and they have done some great things in different geographies, basically applying technology to enhance the collection and recycling of materials.

I think we have looked at things like the water wheel. We have looked at partnering with aquariums on different innovations like that. The key is how can you get close to the source of generation, and the innovation would be how do you recycle better.

We can do carts in the street, and we work with the Recycling Partnership. We have a coastal communities grant that we had with the Recycling Partnership, exactly as you talked about in Portland. So, we are learning, as a company, what are some of those next steps that we can take that would be innovations that would improve collection, recycling.

But I would say what we see where we sit today is the recycling infrastructure is very challenging for us to negotiate even in the U.S. It is a combination of privately owned companies, small municipalities, and each one is a little bit separated. What we would like to see longer term is really thinking through what is the waste infrastructure 2.0. What does it need to be to properly collect materials? And then you enable end markets to really function properly.

Senator BARRASSO. Mr. Dooley?

Mr. DOOLEY. Thank you, Mr. Chairman. What I guess I would start off is that there is not one silver bullet that will solve this issue. But one of the things I think is very, very important is how do you establish policies that will result in adding value to the waste stream. And by that I mean how can you see an incentive for the investment in technologies that can ensure that waste plastic is more easily recyclable or the captured energy is more recoverable.

How do you ensure, too, that there could be added value by finding new uses and applications of that plastic waste stream, as you mentioned, in terms of enhancing the infrastructure, the asphalt, and adding, even actually enhancing performance attributes there.

That is where I think there are some simple things that Congress could do that would not treat the plastic waste and the recovery of it as a hazardous waste, because that is stemming the flow of investment dollars and the development of new technologies that could advance the value of that waste stream and recapture some of the value.

A lot of our companies are making investments in pyrolysis. Actually, one company is about ready to launch, where they can take a mixed plastic waste stream that they can break down, run it through pyrolysis, basically, and break it down into a new feedstock that can be recycled into the plastic manufacturing and conversion stream.

Senator BARRASSO. I will get to you in a second, Mr. Baillie, to answer that same question.

I think, Mr. Dooley, in your comments you earlier talked about a public-private partnership. There has to be a profit motive for this, and some of these new advances may lead right to that, it sounds like.

Mr. DOOLEY. Absolutely. If you increase the value of it, you are going to have individuals be more willing to play a role in recovering, picking it up. You could have more incentives for the invest-

ment in water wheels in the developing world if there was a greater value to it. National Geographic is doing a lot of work looking at these scalable technologies as well, which we are very supportive of the work they are doing there.

Senator BARRASSO. Well, then, to National Geographic. Mr. Baillie.

Mr. BAILLIE. Thank you. We have been thinking a lot about innovation and we have actually developed an impact investing fund with Sky. We have also developed a number of global challenges which we will be launching to promote innovation.

In our community, we have some interesting projects which are being developed. The one I highlighted there with Heather Koldewey is very interesting, where you take nets from the ocean, which are basically floating around and capturing and killing a broad range of species. The local community benefits, but then we also get a recycled product in the end, so it is an interesting win-win-win scenario.

We also have other explorers that are working on technology to take plastics locally and then convert that into building materials that people can actually use.

In addition to that, we have another woman we are working with who is taking plastics that can't be recycled and looking at how that can be converted into fuel.

So, there are lots of exciting things on the horizon, but I would agree with my colleagues that the greatest innovation is more about process and it is more about incentives. Here in Washington, DC, the five-cent charge on bags made a world of difference, so why don't we have that across the entire United States? Norway has 90 percent of its bottles being recycled with a simple incentive program around that.

We are behind, actually, China and Europe in recycling, so let's look to the others. We are about 9 percent of our plastics being recycled. Let's look to the others and see these basic measures that we can put in place first, and then make sure that that innovation catches up with us as we move forward.

Senator BARRASSO. Thank you.

Senator Van Hollen.

Senator Van Hollen. Thank you, Mr. Chairman, for holding this hearing.

It is great to see all of you.

I want to commend my colleagues, Senators Sullivan and Whitehouse, for the SOS Act. I heard you, Mr. Chairman, say we might pass that by unanimous consent today. I am proud to be a co-sponsor.

Great to see Cal Dooley. We served together in the House.

So, as I see it and listening to the testimony, we have to do a couple things. No. 1, we try and reduce upfront the amount of plastic packaging; No. 2, we need to significantly increase our recycling and improve our waste management, and not just here at home, but as has been discussed, you have major sources overseas.

Dr. Law, thank you for giving a shout out to Mr. Trash Wheel. Baltimore is home to the National Aquarium, and the Aquarium works hard to try to educate people throughout the Country and

around the world about the importance of protecting our environment and ocean environment.

I should say that since we gave a shout out to Mr. Trash Wheel in the Baltimore Harbor, Canton, Maryland has Professor Trash Wheel. These are actually really important innovations to try and prevent trash that does get into our waterways and rivers from going out into the Chesapeake Bay and, of course, ultimately into the ocean. So, we want to prevent it from getting into rivers in the first place, but, when they get there, it is easier to catch it there than when it disburses.

My question really relates to some of the testimony we have heard this morning on how plastics, as it breaks down, can get into the food chain.

There was a story in Science Alert that just came out a few days ago, September 22d, saying that plastic pollution is now spreading from ocean food chains to land mammals via mosquitos. I don't know if you saw that article.

Dr. Baillie, you say in your written testimony here, "Research has demonstrated that many of the fish and shellfish humans eat are consuming microplastics. It has also tied plastics to issues ranging from weight gain to brain development impairment."

So, if our two doctors here today could comment on the issue of plastics breaking down into microplastics and getting into the food chain, the animal food chain, and then what risk is there currently to the human food chain?

Ms. LAW. Thank you for the question. So, scientific studies have indeed found contamination by microplastics in a wide variety of species who have ingested them, and when you look at the size of these particles, you can see how we can be entering the bottom of the food chain.

When we look at the percentage of individual animals that have microplastics when they are captured, the percentage may be around 20 or 30 percent, but this can add up if we eat a lot of seafood. Of course, it depends on the animal. We eat invertebrates whole, so if there is plastic in the invertebrate, we will be eating that. If it is a fish, likely, the plastics are in the gut, and we don't typically eat the guts of those animals.

I think there is reason to be concerned, of course, because the amount of plastics that we are producing that are leaking into the ocean are going up over time, so the amounts we may ingest can go up over time as well. But there is so much remaining to be learned about what actually happens when an animal eats plastic or when a human eats plastic, including how long is it spending in the body. Are chemicals transferring from those particles to the organism? Do those chemicals bioaccumulate? And we simply don't have those answers yet.

One thing to consider, there was one study looking at plastics ingestion in invertebrates, I believe, mussels or shellfish, and, as a side part of the study, they put out a Petri dish at a typical dinner table, and the number of plastic particles that landed in that Petri dish, sort of equivalent to on your dinner place, was much higher than what was in the seafood itself.

So, I think we need to think beyond just seafood. Think about our drinking water, our bottled water, sea salt, all these other

studies that are finding microplastics far beyond just the fish and shellfish.

Mr. BAILLIE. I would agree with all of that. With the number of plastics increasing in the oceans, we are going to see more and more of this. There is plastics breaking down into their tiny fragments, but then there are nanoplastics as well; and the science is at a very early stage in terms of understanding the implications, but we do know with these plastics that the organic pollutants do bind with them in the ocean, which will probably make things even worse.

But even if it turned out that there wasn't major implications for our health, which I don't think will be the case, I don't think future generations will be grateful for having plastics as a large part of their diet.

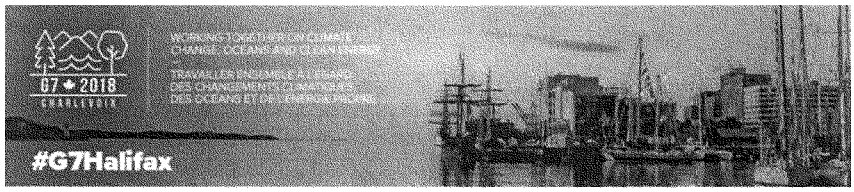
Senator Van Hollen. I agree. I just wanted to get the most recent State of the science on this, as I said.

Mr. Chairman, if I could ask unanimous consent to put in the record the article that appeared recently, because my understanding is, as you said, in fish, plastics seem to concentrate in the gut. But if you have mosquitos, then passing this on to land mammals, then there are questions about the food chain there. But there are all sorts of reasons to try and want to reduce this huge volume of trash. Obviously, this is one of them.

Thank you.

Senator BARRASSO. Without objection, it is entered into the record.

[The referenced information follows:]



G7 INNOVATION CHALLENGE TO ADDRESS MARINE PLASTIC LITTER

Plastics are one of the most revolutionary inventions of the past century and play an important role in our economy and daily lives. They are used in almost everything from cars, appliances and construction to packaging and food services, because they are low cost, durable and versatile. This Challenge provides an opportunity to spur innovation while promoting both environmental well-being and economic prosperity. The Challenge will also help retain the significant value, resources and energy lost in plastic waste, as well as minimize threats to the environment.

All countries face difficulties in addressing marine plastic pollution. G7 members are well positioned to share their expertise and promote innovations that can be used elsewhere, including among countries that are large sources of marine plastic litter. This G7 challenge is designed to stimulate innovations, raise awareness of how to address marine plastic litter or facilitate much needed improvements to the management of plastic, especially plastic waste, in developing countries. Scalable solutions are needed to foster a more sustainable use of plastic products and reduce plastic waste and marine plastic pollution including technological and social innovations in plastics design and production, use, reuse, as well as management of plastic waste.

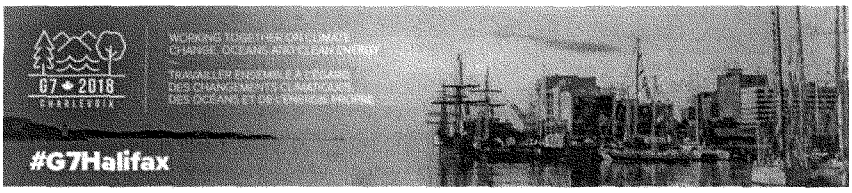
G7 members are part of a larger global community committed to addressing marine plastic pollution. We acknowledge the essential role that the private sector, innovators and entrepreneurs play in developing innovative alternatives and solutions for increasing resource efficiency and circular economy in the use of plastics and plastic products by using their expertise, knowledge, and relationships.

'Innovation challenges' are a recognized and effective mechanism by which solutions can be developed and implemented in an economically viable way, as well be responsive to countries' needs and target recipients.

While respecting each participating member's expertise and reflecting national priorities, G7 members commit to undertake international and/or domestic initiatives, individually or jointly, in support of a common objective to promote innovation in addressing marine plastic pollution by managing plastics more sustainably throughout the whole life-cycle. G7 plastic initiatives will respond to varied individual country needs accordingly. For example, domestic initiatives could focus on plastic design or recycling questions in accordance with national needs, while international efforts could respond to the need for support in improving waste management systems or creation of secondary markets. G7 members commit to sharing information their activities in support of this Challenge through the G7 Alliance on Resource Efficiency.

In implementing the Challenge, G7 initiatives will aim to:

- Leverage, build on, and complement existing initiatives throughout the plastics lifecycle.
- Leverage the strength of a diversity of expertise, including entrepreneurs, innovators, small to medium enterprises, researchers, not for profit organizations, and/or large multi-national companies.
- Support gender equality, women's empowerment and women's leadership.



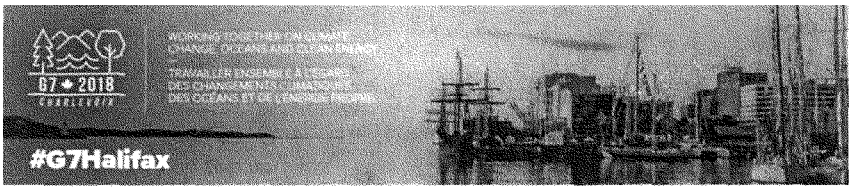
- Encourage innovative solutions that are sustainable, feasible, lasting, economically viable, and scalable (scaling up of an existing initiative; or developing new initiatives that can be scaled up through mechanisms such as blended finance) as well as reflect local and regional circumstances and gender dimensions.

- Develop and maximize effective relationships by leveraging implementation mechanisms including international financial institutions such as the World Bank, Inter-American Development Bank, and Asian Development Bank, as well as pursuing alternative approaches including philanthropic foundations.

The overall objective of the Challenge is to incentivize the development of innovative social or technological solutions for a more sustainable management of plastics throughout their lifecycle in order to increase resource efficiency and to reduce marine plastic pollution including by finding innovative ways to enhance waste management of plastics that may become marine litter. More specific objectives to encourage innovation could include:

- Product Design and Waste Prevention:
  - Developing new product designs and management processes to increase resource efficiency and the durability, reusability and recyclability of plastic products, in particular those that are not currently recycled.
  - Supporting technologies for repair, refurbishment and remanufacturing of plastic products.
  - Developing processes to incorporate recycled content in local manufacturing processes and products to create markets for collected and recycled materials.
  - Developing and using more sustainable plastics and environmentally sound alternatives within a context of science-based and lifecycle decision-making and in consideration of environment, social and economic factors. For those G7 Members that choose to do so, single-use plastics may be an area of focus.
  - Developing solutions that reduce microplastics in products and reduce by design, to the extent possible, unintentional release of microplastics by wear and tear of products during their use.
  - Improving production processes to minimize loss of plastic materials, including pellets and maximize resource efficiency in the use of the materials.

- Waste and Wastewater Management and Clean-up:
  - Supporting major source countries to manage waste (e.g. collection, sorting, treatment, recovery, refurbishment and recycling, disposal, infrastructure, legal frameworks) in a manner that is cost-effective and transferable in order to prevent plastics from entering the environment.
  - Developing new cost-effective technologies and infrastructure to collect, recycle and treat plastic waste, including mobile and small scale technologies.
  - Promoting technologies to improve collection and facilitate recycling or recovery of single-use plastics.
  - Using technology to make it easier for remote and small island developing states to prevent and manage plastic waste.
  - Developing new and utilizing existing technologies and processes to prevent plastic litter and microplastics entering water bodies through improved storm water and waste water management, effectively cleaning-up marine plastic litter from waterways and shorelines in an environmentally sound manner.



- Strengthening measures to prevent plastics entering the sea from fishing (including ghost gear) and shipping, and to ensure adequate reception facilities in ports to collect and manage the waste from ships and facility users (including passively fished waste and old/derelict fishing gear).
- Creating new technologies and processes or improving existing technology to recycle mixed plastic wastes.
- Developing cost-effective processes to reduce contamination during the collection and recycling process.

- Markets, education and awareness:
  - Developing business models and approaches to establishing new markets and value for used and recycled plastics to achieve environmental, social and economic benefits, including supporting local entrepreneurs in major marine plastics source countries.
  - Supporting the development of markets for recycled plastics through greater use of secondary plastics into finished products.
  - Creating innovative partnerships along the plastic value-chain to reduce plastic waste and plastic pellets losses.
  - Supporting community-based approaches to changing behaviours towards reducing, reusing plastics, or recycling plastic wastes.
  - Supporting plastic waste mitigation approaches through socially innovative solutions (e.g. education, innovative alliances, relationships, connectors, enabling conditions, etc.).
  - Supporting local and indigenous solutions and initiatives of women and youth, that can be leveraged to support plastic waste mitigation approaches.
  - Forging public-private partnerships to improve plastic waste management in major marine plastics source countries.
  - Developing, harmonizing, and sharing methodologies for monitoring and assessing marine litter and microplastics, including their amount and distribution, as well as related environmental and human health impacts.

Examples of Implementation Mechanisms

- Public-private partnerships (domestic and international).
- Domestic mechanisms within each G7 member.
- Multilateral organizations efforts such as World Bank Problue – new umbrella multi-donor trust fund in support of the Bank's Global Blue Economy Strategy through consultations with their governing bodies.
- Third party organizations –external private organizations who leads leveraged, incentivized prize competitions with ambitious goals, that target market failures, that can be won by small groups and ultimately that is achievable.

Senator BARRASSO. Senator Ernst.

Senator ERNST. Thank you, Mr. Chair. I appreciate the discussion today. I think a number of us are in and out, but it does tend to be a very bipartisan issue, so I want to thank you all very much for being here.

Mr. Dooley, a lot of the testimony that we have heard today has been about how to better manage the plastic waste that ends up in our oceans. However, I also think it is important to touch on the work being done to make plastic more eco-friendly. I think a number of us have discussed this before.

The Iowa Corn Promotion Board was one of the first groups to fund research on polylactic acid, PLA, which is compostable and made from corn; and PLA is the most widely used bioplastic and is used to make straws, cups, plates, cutlery, and other items. After composting, PLA doesn't contain any hazardous byproducts that we see from other plastics and doesn't release toxic chemicals into the environment.

Though advancements will need to be made for PLA to become more widely used, do you see that PLA or other bio-based plastics could be part of the solution to the problem that we are facing right now?

Mr. DOOLEY. Yes. Thank you. Like I said before, there is not going to be one silver bullet, and what you have identified is where there is going to be an opportunity, and our companies are investing a lot of money in research and development of some of the biodegradable plastic alternatives that are out there.

We have to, though, be also concerned in terms of making sure that we do a comprehensive evaluation in terms of how that can be managed through the waste stream as well, because some of these compostable plastics can also contaminate the recycling, the more traditional and other plastic waste streams as well. So it has a role in the marketplace and it is where we see a lot of investment going into.

There is also an increasing demand, as Bruce said in terms of Coca-Cola, with an increased demand that they are making a commitment to 50 percent recycled content. That, again, is going to add value to that plastic waste stream. The industry, the resin producers and the plastic producers, have to do a better job in investing the technology that facilitates the recovery of this material so that it can go more easily into that recycled content. So that is also going to be a component.

But we have to be careful that we don't go down a path that goes all to biodegradable that then when a consumer or a homeowner mixes it into the recycling bin and then it creates another sorting opportunity and, if not sorted appropriately, then it contaminates the recycled material that some of the consumer product companies need.

Senator ERNST. And we obviously know that there is a multipronged approach to really wrangling with this issue, so certainly I think that composting type products should be part of that discussion.

But then would you all agree maybe then that we need to be looking at additional research and development opportunities for all of these? I think opportunities really is there. With Iowa and

the resources that we have, many of our other States as well, through the various commodities that we have, we can produce a number of those types of materials, and that might be one part of the solution, and I do hope that we will take an opportunity to look at that.

Any other comments on those biodegradables?

Mr. BAILLIE. I would just add, and maybe to build on what Cal had mentioned, is I think as we design things for use and they are plastic, you have to design with the end in mind. I think one of the reasons why we are where we are today is many plastics are designed to—a bag is designed to carry materials, but the thought isn't given to the end market, and I think that is a key piece of development in the process, is understanding what we are building and does it actually have value later.

If it has value, it is going to come back and create that circular economy that we want. But if it is very difficult to recycle, we don't have technologies, as Cal mentioned, to actually solve for, then that is when we run into problems. So really focusing on making sure we design with the end use in mind when we make things.

Senator ERNEST. Absolutely. I think that is very smart. So looking at, perhaps, straws, there is the big debate about plastic straws right now, how many plastic straws are actually recycled. I don't know that many of those are, so that could be a potential stream or opportunity for something that is biodegradable and something that would be composted in a landfill, perhaps. So I think that is a very smart approach, is understanding what is recoverable later on and what is actually put into our landfill system.

Did you have a comment as well, Dr. Lavender Law?

Ms. LAW. Yes. Thank you for bringing up straws, because I think that is a really good example of if we don't need a straw, not creating the waste in the first place is actually a higher level strategy so that we don't even have to worry about managing it.

But from the perspective of the oceans, I just wanted to comment on the biodegradable plastics as well. Specifically, the PLA is designed to biodegrade in an industrial composting facility.

Senator ERNST. Composting, correct.

Ms. LAW. So, if you are in a municipality that doesn't have access to one of those facilities, your PLA is trash, and the ocean doesn't really care if it is PLA or polyethylene or polypropylene. So that is something just to keep in mind when we talk. We talk broadly about these materials, but really we need to think carefully about which specific material we are talking about.

Senator ERNST. Right. Exactly. I will make another plug for it, though. With the PLAs, we still do have to look at other research and development, and understanding where perhaps this particular stream of PLA may not be appropriate for oceans, but certainly if there is additional research that can be done that does support another biodegradable product that is ocean-friendly, we certainly should be looking at all those opportunities.

So, thank you. Oh, excuse me, yes, Dr. Baillie.

Mr. BAILLIE. Just on the straws, Americans are using 500 million straws every day, and there are alternatives. You can use a straw like this and keep it with you at all times. But with a lot of these plastic items that we simply don't need, there is an opportunity to

take leadership and just say we are going to ban certain items. You have the French, which have made a commitment to banning plastic cups and plates by 2020. You have many countries that have banned the use of plastic bags. We have about a trillion plastic bags per year being produced. While I gave my testimony, I think about 10 million plastic bags were used, with an average lifespan of about 15 minutes.

So, there are many kinds of interventions that we can make immediately if we are truly serious about addressing the small waste issues like straws.

Senator ERNST. Well, I appreciate it.

Thank you very much, Mr. Chair.

Senator BARRASSO. Thank you, Senator Ernst.

Senator WHITEHOUSE.

Senator WHITEHOUSE. Thank you, Chairman, and thank you again to you for this hearing and to the witnesses for appearing here.

In my opening comments I mentioned a couple of topic areas. One is cleaning up in the oceans, and particularly cleaning up in the rivers that feed the oceans, where much of this plastic comes downriver; trying to find ways to pick the plastic out of the flow points before it hits the ocean. Once it is out there floating around in the great Pacific Garbage Patch, it is really hard, really inefficient, really expensive to deal with it. To try to get it upstream is more significant.

I think to prevent that we need to have a strong focus on requiring countries with whom we have trade relationships to meet elementary standards of upland waste disposal responsibility. We have never been very good at enforcing pollution control standards overseas as a part of trying to balance our trade, so there has been a lot of cheating, where an American company has to keep its junk out of the river and the competitor doesn't, so the price of the competitor's product can go down, but we all pay the price when it ends up in the ocean.

And I think there are technical ways to go about doing that. Even in Newport Harbor we have a little basically a sunk dumpster with a solar pump that keeps pumping the water out so that there is constant inflow and there is enough inflow the plastic flows in, it gets trapped in the dumpster and you can clear it out.

Rivers have similar catchment technologies. But until there is a revenue basis for doing that, it is hard to get it done, so that is something I think that we can work on.

Biodegradability we have talked about, so I don't need to add to that.

Again, on entanglement, if a fisherman loses a long-line rig, for instance, first of all, it may be hard to find, but it is not really hard to put pingers on things these days. Supporting people in trying to make fishing gear more traceable once it is lost could be a good strategy. Having a bounty so that if you are out fishing and you come across somebody's gear, you take the trouble to bring it in and bring it home and take it out of the ocean.

Fisherman work incredibly hard and it is a very uncertain world out there. It is even more uncertain with oceans warming and populations of fish moving around, so to expect fishermen to stop what

they are doing and become the people who are responsible for cleaning the oceans themselves I don't think is really fair unless all of us have found a way to help make that a productive use of their time.

And then I think the human health research is the other point. We really, I think, need to know pretty quickly what risks this poses so we can know with what degree of urgency and alacrity we need to take on the problem.

So, I would just like to ask each of you to comment on those four topic areas for our 2.0, and if there is anything further you think I have completely missed, please throw it in.

We will start with Dr. Baillie. This will be my only question, so if we could just run it out, that would be fine.

Mr. BAILLIE. Sure. So, on the initial map that I showed, it showed the major river systems where plastic pollutants are getting into the oceans and, of course, you commented on the top 20 being in Asia and being a significant problem.

At National Geographic we are committed to doing an exploration looking at some of the major rivers around the world and understanding where the plastics are actually coming from and looking at the social issues and the political issues, but also looking at innovation that we can help promote so that that process can be addressed.

When it comes to fishing gear, you saw the short video in terms of using the nets. It would be wonderful if we could look at creating more of a market for those nets, as many of them are made of nylon, which is actually quite a valuable material that can be reused for things like the carpet tile right here. So, I think it is about exploring some of those innovative approaches, but also putting more pressure on the fishermen to actually keep track of those nets when they are out there.

I very much like your idea of the tracking device. Again, at National Geographic, we are developing a whole bunch of sensor systems, so this is just the type of thing we could explore, sensors to try and keep greater tracking.

Mr. DOOLEY. Thank you. You know, I think that what we are interested in and we are trying again to really establish a private sector initiative that would represent constituents throughout the value chain. Part of our interest is how do we do a better job of identifying those initiatives and those investments that are going to be the most cost-effective in making a meaningful impact on reducing plastic waste in the environment.

We think the public agencies, the U.S. Government, has an opportunity to help and facilitate that as well.

I think when we look at, again, the Asia region, which is the primary source for certainly the Pacific driver, we have the opportunity to focus on cities. Ocean Conservancy has just launched an initiative called Cities, and cities on rivers, because, as you said, the rivers are the source that enters into the ocean. If we focus on developing a comprehensive waste management assistance program for cities on rivers in the Asia region, I think you would be able to see significant private sector resources that would complement public sector investments as well.

You can even get that a little more granular because you also, in order to have a sustainable waste management system, you have to add more value to that waste stream; and that is where I think the U.S. Government also has an opportunity to make investments in pilot programs in that region. We have a number of military bases there that could make an investment in a pilot program that could be able to demonstrate and capture the value in the waste stream not only from their own operations, but perhaps even extend it to the communities.

You can even see it with fishing nets. If you had a pyrolysis unit that could develop syn fuel or diesel fuel from a plastic waste stream, as well as fishing nets, it could be a source of income for the local community that was playing a major role in trying to be a collection center or providing the collection of unused fishing nets.

So we think that there is just a wonderful opportunity for the U.S. to show leadership that would complement and encourage private sector involvement in meaningful initiatives that really focus on making waste management more effective.

Senator WHITEHOUSE. My time has long expired, so I should probably invite the other two witnesses to make their responses for the record, if you would do that.

It is up to the discretion of the Chair, but I think we probably need to be thinking about bounties, as well, because I doubt there is enough of a resource there to make it self-sustaining without some help.

Senator BARRASSO. Senator Inhofe.

Senator INHOFE. Thank you, Mr. Chairman.

Senator Whitehouse, you opened your great comments about the fact that we don't have the control over some of the foreign countries that we would otherwise have. I want to give another side to that because in some of these countries they actually have ideas that we haven't gotten. One of my close friends on the continent of Africa is Paul Kagame, who is head of Rwanda. He made a decision to really cleanup his country. And I have to tell you guys that of all 54 countries, and I have been to all of them, in Africa, you go in there, that is the clean, pristine country, Rwanda.

Don't get me wrong on this, I am not suggesting this, Mr. Karas, but the first thing he did was outlaw plastic bags. Then he went on. Now when you go from the airport to the headquarters, you just see a pristine country. I think we ought to really sit down and look and see some of the things that he has done successfully and emulate those.

I am kind of surprised not many people talked about the meeting that took place just last week. Maybe it is because it is so soon afterwards, but it was in Nova Scotia, where the G7 people, and our participant there, of course, was Andrew Wheeler, who worked for me for 14 years, who was very active on this Committee. He attended that. It was a meeting where they discussed the very thing that we are discussing here.

The objective, and I am going to read this and then I am going to be asking to put the outline in the record, is to "incentive the development of innovative social and technological solutions for a more sustainable management of plastics throughout their life

cycle in order to increase resource efficiency and to reduce marine plastic pollution, including by finding innovative ways to enhance waste management of plastics that may become marine litter."

They have excellent suggestions, and I ask, at this point in the record, you include this. With no objection. Thank you.

[The referenced information follows:]

To: The Senate Committee on Environment and Public Works

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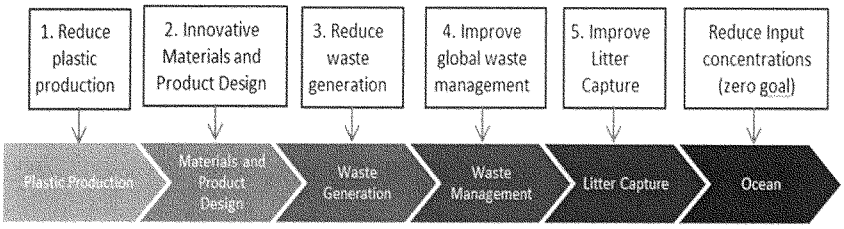
Date: October 9, 2018

Re: Further comments on the hearing titled, "Cleaning Up the Oceans: How to Reduce the Impact of Man-Made Trash on the Environment, Wildlife, and Human Health?"

Thank you for the opportunity to provide comment on the hearing titled, "Cleaning Up the Oceans: How to Reduce the Impact of Man-Made Trash on the Environment, Wildlife, and Human Health?" I am environmental engineering professor at the University of Georgia and have been working in solid waste management for 22 years and on marine debris since 2001. I testified on May 17, 2016 to the subcommittee on this topic. I am also now currently in the International Informational Speakers Program with the US State Department and have been to nine different countries since 2017 working on the issue of marine debris in public environmental diplomacy (Philippines, Indonesia, Japan, South Africa, Vietnam, Jordan, Israel, and India).

As all the witnesses testified to, there is no *one* solution to this issue, but an integrated approach is needed to make headway on reducing plastic entering the ocean. I developed the framework below for my 2016 testimony and would like to submit it again with some ideas, further explanation and answers to some of the questions posed by the senators in this hearing. This framework provides intervention points (1 through 5) and then a list of potential (but not all encompassing) interventions that may occur at the various points. In general, this represents a hierarchy of interventions. However, the most "bang for your buck" interventions will depend on the needs of the specific geography addressing the issue, however, in many cases, all geographies have points along the entire framework that will help reduce debris and plastic going into the ocean. Some interventions can be immediate and some will take more time. The framework starts on the left with the most "upstream" interventions and ends with a last chance to capture the material before it enters the ocean. In many cases the interventions offer the opportunity for economic innovation and growth. The USA could be a leader in several of these categories of interventions.



1. Reduction in demand
    a. Consumers demanding less packaging or no packaging (some markets)
        i. Not everyone has access to clean water, for example, so can't always make the choice of a reusable bottle, but these choices taken collectively where possible do make a difference
    b. Local initiatives (e.g., bans, taxes)
        i. These are often very local-specific, but are also becoming more common
        ii. Mass of items removed may be relatively small, but numbers of items are also important – there is more than one way to measure debris (e.g., mass, count, etc.)
    c. Voluntary industry actions
        i. Industry has become more engaged on this issue – I wonder if they will volunteer some changes to help in the future as well?
    d. The reality is that all signs point to further growth in waste generation, as well as plastic use, especially where economic development is occurring or predicted to occur in the future
2. Innovative materials and product design
    a. Sustainable packaging associations (pre-competitive collaborations)
        i. E.g., Sustainable packaging coalition, Green-Blue: These pre-competitive environments could help to standardize packaging and help packaging retain value so that it is easier to recycle and less leakage will occur if it has value.
    b. Truly biodegradable alternatives (e.g., PHA)
        i. PLA was mentioned in the hearing and while it is bio-based and industrial compostable, it will not biodegrade in the ocean. It will not biodegrade if littered on land. It has to reach a high temperature (reached in industrial composting) to be able to biodegrade.
        ii. One polymer that may biodegrade in the ocean is PHA. This polymer is expanding in the market in the USA and will be creating economic value in the future (new facility opening in Kentucky – one open in Georgia already). While it may biodegrade if littered in the environment, it should still be managed in the solid waste system, and be thoughtful about where used (in currently non-recyclable items, for example). But it has the possibility of being home-

composted as well. The USA is currently a leader in the development of this material and other bio-based and biodegradable materials.

c. Packaging with more value (e.g., single, homogenous materials, design for recycling/end-of-life)
    i. This can be helped by collaborations between industry, brands and waste managers/experts
d. Design out problematic items/materials (e.g., caps/lids)
    i. Similar to how aluminum can opening was changed to a tab that stayed on (so the pull tabs did not get littered), we can innovate design for items that leak into the environment (if data is collected on them – see point 5.c.).

3. Reduce waste generation – *how can we decouple waste generation from economic growth?* I believe we can through creativity and innovation – and I get very excited to see what my students will create in this category one day.
    a. Sharing, Collaborative Economy concepts
        i. Bike shares, car shares, tool shares, clothing rental, etc. these all reduce the need to purchase and create waste (facilitated by technology), but still meet people's needs and can still create revenue for the companies providing the services.
        ii. How can these concepts be related to packaging? (see b.ii.)
    b. Decouple waste generation with economic growth (facilitated by technology)
        i. Reuse programs (using mobile phones, which many people have globally, especially where rapid economic growth is occurring)
        ii. RFID, mobile phones, smart-labels, etc. (e.g., RFID water refill stations exist for both Coca-Cola and PepsiCo products, but are not yet widely distributed yet)
4. Improve global solid waste management
   This has some basic similar concepts, but solid waste collection can be a hyper-local activity and can look different in each country, city and even neighborhood. Global resources are needed to further develop the infrastructure needed. Waste needs to be managed globally no matter what the materials it is composed of. Plastic has made it a more complicated and created a rapid change in the waste stream that we were ill prepared for. It creates a waste stream that is more varied and dynamic than we have ever experienced before. It has proved to be quite a challenge for waste operators and municipalities to manage. Improving infrastructure is especially needed in rapidly developing economies with high population growth.
    a. Collect: May be traditional, on-demand, or decentralized waste collection
        i. Collection innovation is needed – revers logistics may play a role
    b. Capture: Material Recovery Facilities, waste depots, waste banks, community centers (e.g., "punto limpio" in Chile)
    c. Contain: Recycling or engineered disposal
    d. Important to keep in mind: ***Context and Culture*** – *these can "make or break" the success of a potential intervention. The local community and stakeholders need to be engaged and involved from the start through the end of any project.*
5. Last-chance cleanup

a. Engineered, mechanical systems
    i. Mr. Trash Wheel or other engineered devices
b. Manual (by hand)
    i. Cleanups (e.g., ICC by Ocean Conservancy)
    ii. Use of ocean-bound plastic can catalyze the development of infrastructure since the material now has value – often a much higher value than it did previously (e.g., Parley, Dell, NextWave plastics)
c. Data to feed back to Interventions 1 through 4
    i. E.g., Marine Debris Tracker developed by NOAA and UGA (or other apps) to collect data
    ii. Could make upstream choices/changes based upon what is leaking into the environment

Specific questions asked:

1. What are some of the most promising innovations?

In my opinion some of the most interesting and promising innovations are the ones that decouple waste generation from economic growth. How can we meet people's needs and increase livelihood without creating more waste to manage? Sharing and collaborative economy concepts, RFID cups, using technology to connect people and facilitate sharing and reuse programs all lead to potential interventions. Reduce waste generation in the first place.

2. What is role of PLA and other bio-based plastics?

I think there is a role for material and product innovation and bio-based and biodegradable (truly) polymers will be a part of the solution. However, these materials are being produced at relatively low quantities right now, so they are not going to be a big market for some time – if ever (also see 2.b., above).

3. Fisherman incentives

I think incentives for fisherman to collect or bring back gear would be a way to get some of the most deadly gear out of the ocean and marine environment. I think also supplying a place for fisherman to put used gear is important (e.g., dumpster or recycle bin at the port). Tracking and transparency of nets – and really all plastic (as much as feasible) could help keep the material out of the ocean because we would have a better inventory of it.

4. Root causes

Responsibility – while not particularly popular in the USA, product stewardship is an important concept to discuss here. From an engineering standpoint, when a company wants to build a development/civil engineering project, there often is a partnership with the community. One example, I live near an above ground storage tank farm, and trucks come and go from it regularly. There were likely road improvements needed to be able to build the tank farm and the company who constructed it may have contributed to that infrastructure since they were building at this site. In some ways, this can be analogous to selling products in a country or location that does not have infrastructure to manage the

waste created from those products. I don't think companies knew the issues this would bring. And I think they want to help based upon new awareness, but we are certainly playing "catchup" with the issue now. I have seen some good examples of shared responsibility in South Africa and Norway. And some companies are doing this individually, but many still don't know how to help with infrastructure. I think that facilitating this in some way could be significant – maybe it will all be individual public-private partnerships, but some thought could go into how to facilitate companies engaging in shared responsibility. Ultimately it will take shared actions by industry, municipalities, and citizens to make significant positive change on this issue.

Thank you again for your attention to this issue and for the opportunity to offer my thoughts.

Senator INHOFE. I would ask you, Mr. Dooley, I think you are familiar with this. Nothing much has been said about this, but I would like to know what thoughts you have about the recommendations that have come from the G7 talks that took place. Actually, that meeting took place in Nova Scotia right up until last Saturday, I think they concluded it, so your thoughts about what has happened there and how that coordinates with the recommendations that we are making with this excellent panel that we have.

Mr. DOOLEY. Well, ACC was very pleased that Administrator Wheeler attended that meeting and also committed, along with the balance of the environmental ministers there, to really support moving forward on how could they collectively create greater incentives for the development of innovations that would contribute to the elimination of plastic waste.

It really was building upon one of the commitments that Trudeau made at the G7 principals meeting, where he committed to doing $100 million innovation grant that was really trying to provide public sector investment that would be matched oftentimes by private sector commitments that was focused on trying to eliminate plastic waste in the environment. That was further developed under the challenge program that was talked about at the Halifax meeting of the G7.

We think those are opportunities to really leverage the private sector funding and to ensure, again, that we have a collaborative effort to identify what are going to be the most cost-effective investments of both taxpayers' dollars, as well as private sector funds. We are very supportive.

Senator INHOFE. That is good. I think we need to become more familiar with that. A lot of heavyweights were involved in those decisions and that discussion in Nova Scotia.

Mr. Karas, I think we may share one philosophy that I kind of picked out of your opening statement, and that is it has been my experience over the years—and I have been on this Committee since, I don't know, a lot of years—that some of the solutions to problems are best handled by the private sector.

I can remember when we had a lot of the Superfund problems. I was actually chairing this Committee at that time. What happened, and I won't mention the oil company, it was an oil company, though, that was working at that time in Louisiana, and they did have a spill, and it was a pretty serious one. So they went in and evaluated what it would take to clean that up and what it would cost to clean that up.

I am going from memory now, but I think it was something like it would take 13 months if this oil company were allowed to do it at the cost of $7 million. EPA rejected it at that time. We were kicking and screaming about that, but they did. They took this on and it ended up taking not 13 months, but 4 years; and not $7 million, but $15 million.

I guess what I would ask you, your thoughts on the things that can be done through private sectors that cannot be done through the public and what your experience has been.

Mr. KARAS. Thank you, Senator. I think the way I would answer that question would be in really looking at this space. We are good

at making beverages and marketing beverages and selling; that is our core business, we make beverages. And what we find when we get into a space like waste is we have to rely, in my comments I talked about the critical importance of partnerships, we have to rely on others.

What we have learned in the course of we had a water stewardship goal to replenish the volume of water that we put in our products by 2020. We met that early. We met that because one of the reasons was public-private partnerships. We have a public-private partnership with USDA, U.S. Forest Service. For us, it gives us resources that we thought we would never have, knowledge and information that we wouldn't have access to, and, really, we learned a lot and advanced quickly.

So I think our learning in these spaces has been it is absolutely mandatory for us to really reach out and engage with trade groups like ACC, with technical people that are knowledgeable, to really come to a great solution collectively. I think that is what ultimately wins the day.

Even when we do partnerships through our foundation, we have something called a Golden Triangle partnership, and what we learned when we link business, civil society, and the government together to look at a problem, we usually get to a really good place, a place that we wouldn't have gotten to by ourselves.

Senator INHOFE. Thank you very much.

Thank you, Mr. Chairman.

Senator BARRASSO. Senator Carper.

Senator CARPER. I am told by my colleagues and our staff that you all are doing a good job. As you know, we serve on a bunch of different committees and, unfortunately, all my committees are meeting right now, so I am trying to be three or four places at once. I am not doing really well at it, but now I am with you and look forward to asking a couple questions.

First, I want to ask unanimous consent, Mr. Chairman, to enter a letter from MERR and supplemental materials be entered into the record from the Marine Education, Research & Rehabilitation Institute in Delaware, as well as some other supplemental materials.

Senator BARRASSO. Without objection.

[The referenced information follows:]

Marine Education, Research & Rehabilitation Institute, Inc.
801 Pilottown Rd. Lewes, DE 19958
(302) 228-5029 *merrinstitute@gmail.com*
www.merrinstitute.org

...dedicated to the conservation of marine mammals and sea turtles and their ocean habitat

October 9th, 2018

The Honorable Thomas R. Carper
Ranking Member
Committee on Environmental and Public Works
United States Senate
Washington, D.C.

Dear Senator Carper,

The Marine Education, Research & Rehabilitation Institute, Inc. (MERR) has been providing stranding response for marine mammals and sea turtles in the state of Delaware for over 18 years. As Delaware's leading authority on marine animal health and welfare, we have observed first hand the negative impacts of marine debris on the marine environment, and on the creatures that reside there.

MERR responds to approximately 300 stranded animals per year, the majority of which have stranded due to some type of human impact. These impacts include fisheries, dredging, underwater noise pollution, oil spills, marine debris, and more. Marine debris with all of its various components causes constricting entanglements, and is ingested when it is mistaken for prey. Marine animals become entangled in the copious amount of material that we have introduced into their habitat, such as ribbons from balloons, discarded six pack rings, fishing line, fisheries gear, packing straps, etc. The effect of this type of debris on marine animals is slow and painful debilitation as the constricting debris cuts into the animals tissues, leading to infection, strangulation, osteomyelitis, and ultimately death.

The components of marine debris are far too many to list, but plastics pose an especial threat to the quality of ocean habitat. In their intact form, they can appear to be food sources, as in the case of plastic bags, which are accidentally ingested by marine animals, leading ultimately to starvation. Plastic bags and balloons resemble jellyfish in the water, a favored food source by the endangered leatherback sea turtle, and the loggerhead sea turtle. Pieces of plastic large and small have the capacity to photo-degrade, causing smaller and smaller particles to emit into the ocean, ultimately to be consumed by fish. Micro-plastics are consumed by the smaller organisms, which leach into their tissues. The smaller organisms are ultimately consumed by the macro-organisms, such as dolphins, whales, seals, and humans. The prey source for these endangered species is contaminated, as is the water in which they live, due to the inundation of micro-plastics in the ocean and the inland waterways that ultimately lead to the ocean.

Our stranding response team has witnessed the excruciatingly painful suffering of beautiful and majestic whales, dolphins, seals and sea turtles as a result of human based trash and debris in their habitat. A loggerhead sea turtle on the Delaware Bay that had over 65 different types of plastic in its stomach, whales and dolphins maimed and ultimately drowned by fishing gear, a young pilot whale that had mistaken shredded packaging from beef ramen noodle soup as squid, a helpless

one month old seal pup barely able to breath because of constricting fishing net, ribbons and plastic bags, and a bungee cord wrapped around its throat-these are just some of the heart breaking examples of how these animals suffer due to the impacts of marine debris. Our organization invests thousands of hours in an attempt to inform and educate students and the public about the harm caused by marine debris, in hopes that this information will lead to consumer choices that minimize the amount of trash in the ocean.

We know of the astounding statistics surrounding the Pacific Garbage Patch, now believed to be twice as large as the state of Texas on the surface, with depths surpassing that size. The Marianna trench, the deepest known area of the ocean, has been identified as 50 times more toxic than the most polluted rivers of China, due to the cumulative and concentrating effects of plastic in the marine environment. Phytoplankton, which makes up the basis of the food web for all other organisms, is being impacted as algae accumulates on both large and micro sized particles of plastic, interfering with sunlight penetration to stimulate photosynthesis. Plankton is the foundation species for all life forms in the ocean, without which the entire ecosystem is destined to collapse.

Reducing the quantities of marine debris and its toxicity in the oceans is imperative to the health of the marine ecosystem. Our organization strongly supports any initiatives to reduce the presence of marine debris in the ocean environment. We greatly appreciate any efforts that are put forth to accomplish this important goal.

Sincerely,

Suzanne Thurman
Executive Director

Senator CARPER. Thanks very much.

Dr. Law, if I could just aim my first question at you. I am told by my staff that you spent a lot of time at sea. They said more than probably anybody in the room. I was in the Navy for 23 years, mostly in airplanes; some time on seas, but I would be happy to give that honor to you today.

They tell me you spend a lot of time at sea observing firsthand the impact of marine debris on the environment, but also especially on wildlife. Do you want to share with us some specific examples of some things you have seen with respect to marine debris' harm to wildlife, including marine mammals, sea turtles and birds?

In addition to minimizing the amount of debris that ends up in our oceans, what else should we be doing to mitigate these impacts?

First some examples.

Ms. LAW. Sorry.

Senator CARPER. First some examples.

Ms. LAW. Some examples, yes.

Senator CARPER. And then some ideas on what we ought to be doing to mitigate these impacts.

Ms. LAW. Sure. So, most of my sailing experience has been in the open ocean, much of it in what are called the subtropical gyres, which are areas of the "garbage patches." These are areas of the ocean that are actually quite nutrient poor and not——

Senator CARPER. Most people probably try to avoid those.

Ms. LAW. Sorry?

Senator CARPER. Most people try to avoid those.

Ms. LAW. Most people try to avoid those, that is right; there are not a lot of wind. They are not places many people spend a lot of time, but we do spend time doing our science there.

I think the most important observation I have had is that many of the descriptions we hear about this problem are not what you observe out at sea on the boat. I don't see very large objects going by, but when you do it is very surprising to see a shoe or a bucket or a teapot or a toothbrush drifting by thousands of miles from land.

When you look over the side, you see these little bits of plastic. And in terms of interaction with wildlife, what I have observe personally is sea birds who are feeding at the sea surface where these little bits of plastic are floating. So while you can't actually see it hanging out of their mouths, you know that the birds are eating these plastics.

Similarly, we have captured in our nets, at one point we captured a five-gallon bucket that did have a fish swimming under it. That fish, we brought aboard and it had 42 pieces of microplastic in its gut. We also tow a fishing line. We brought a mahi-mahi onboard and it had a piece of plastic——

Senator CARPER. Was the fish dead or alive?

Ms. LAW. Just a line with a hook.

Senator CARPER. OK.

Ms. LAW. We brought a mahi-mahi on board for dinner and it had a piece of plastic this big in its stomach. So we were faced right then, do we want to eat this fish or not? We did. It was delicious.

Senator CARPER. Did you? OK.

Ms. LAW. But I have not seen marine mammals entangled myself, so I don't have that personal experience.

I really think I come back to we have to keep this out of the ocean to solve it. The rescue efforts, when people spend lots of time and resources to help these animals when they are entangled are critical, and when we have access that is very important, but we just have to stop it from entering.

Senator CARPER. All right.

I like to focus on root causes. I just came from a Homeland Security business meeting; we are marking up about 20 different bills. One of the things we focus on in Homeland Security is border security, including border security with the border with Mexico. We spend a lot of time, effort, and energy trying to keep people from getting into our country from places like Honduras, Guatemala, El Salvador. The root cause of all that, though, is the lives that they live in those three countries are miserable; and we are complicit in their misery given our dependency and addition to all kinds of drugs, narcotics.

But part of the root cause in solving that problem, all these people trying to get into our Country from our southern borders, is to help make sure that their lives are less miserable in those three countries; they have some hope of opportunity. That is the root cause.

Is there a root cause in this case? Is there a similar root cause we ought to be focused on, rather than just focusing on the symptoms of the problem? I have a great photograph of Coast Day in Delaware this last weekend, but we are addressing the symptoms of problems. There is always trash that washes up on the east coast, including in Delaware, so we focus on the symptom of the problem.

If we looked for the root cause, where should we be looking? Because we are really good at spending a lot of time and energy and resources on symptoms of problems, not always on the root cause.

Mr. DOOLEY. Senator, the way that I would respond to that, if you look at where the major source of the problem, it is in the developing economies; and in those developing economies they have a host of public needs. Some of it is nutrition, some of it is education, some of it is healthcare, and some of it also is waste management systems. When they prioritize them, oftentimes the waste management investments come down very low on the list, and that is why, oftentimes, they lag behind in developing the waste management systems. As their economy develops, it becomes the source of a lot of the waste plastic and other waste that is getting into the environment.

That is where I think we have an opportunity in the industrialized world in the private sector to allocate resources to help prioritize waste management, and part of that help in prioritizing investments in waste management is providing public and private sector support. We think if you do that in the developing world, we can make a tangible difference in reducing the amount of plastic waste in the environment.

Senator CARPER. Good. Thank you.

Mr. Karas, please.

Mr. KARAS. Just an add-in. I think we maybe touched on it around the fringes in the conversation here, but infrastructure is absolutely important. But the layer over that, and we have learned this as we have done projects, it is the level of I guess you would call public education and awareness. How do people value that material? Obviously, if it is all in the ocean, it is a throwaway, and we are not thinking about it. Even in the developed world it takes time to change sort of the hearts and minds, and that has to accompany all the work that we are doing. So, it maybe starts with PSAs, but maybe ingraining into younger generations what should you do with materials when they are in your hand.

I would suspect that if you asked most of the public about recycling, recycling is the act of putting something in a specific container, and not thinking about the circular economy and where it needs to go in the long-run. So, I think some of that cultural piece is important to mix in with that.

Senator CARPER. All right, thanks.

Senator BARRASSO. Senator Whitehouse, now that Senator Inhofe has completed, did you want to get a continuation of the line of questioning?

Senator WHITEHOUSE. Sure, if Mr. Karas and Dr. Law. I don't know if you recall the question; it had to do with the various recommendations about trying to stem the flow into the seas, particularly in the big rivers; about trying to invest in biodegradability; about trying to make it a better revenue proposition for fishermen to keep and recover lost fishing gear; and the last one was research on the human health effects of ingesting microplastics. Are those areas we should be working on and are there other areas you would recommend? That was the question.

Mr. KARAS. Senator, I think those are all good areas that you highlighted there. I think what we have learned in the Asia Pacific region as our business units work is we are having to form some of these cooperative partnerships. We are doing it in Indonesia and the Philippines, starting some of that in Vietnam to really start to look at where do you start. I think that is sometimes the challenge. Here we can look at our infrastructure that exists. Maybe it is not well connected, but it is like where do you start, what is ground zero, and we have to do that collaboratively.

So, what we are seeing is brands are engaging with different NGO's and governments to say, OK, how do we move the needle in that. I think those will help in the long-run, but it takes time to build those out.

Senator WHITEHOUSE. And in this case it takes incentives.

Mr. KARAS. Correct. Correct. But I would add that in terms of incentives, and maybe it is something that Cal has already touched upon, I think we have to really think closely about the end markets and the value of the materials.

What often is lacking, you could sort out polypropylene, but there may not be a market there; and if that doesn't happen, if the economics aren't there, it just isn't going to work. But if we can work to build the proper end markets, it really starts to close the loop. To me, when a business has an incentive to get that material and put it into something else, that is going to be a powerful driver in that space.

Senator WHITEHOUSE. You will agree that there is a discrepancy between the recovered value of waste plastic and the value to humanity of not having an ocean in which there is more plastic than fish.

Mr. KARAS. I would agree. I would agree.

I guess in terms of waterways, one of the interesting experiences we have had here, I talked about partnerships earlier, a group called Living Lands and Waters works our own Mississippi River system. Actually, six barges collecting materials, anything from cars, tires, drums, and plastic.

We have had the opportunity to be able to really create a circular economy with those kinds of activities, actually bring material out of the Mississippi. We had an example, last year sorted 9,000 pounds of PET hand-sorted by our own bottler there, and it was turned into bottles for a product 30 days later. That is a circular economy, but we had to force it.

So, ultimately, I think it is how do we really have a vertically integrated waste management system that really allows it to pull through where there is economic viability to that activity. If you have to prop it up because it doesn't have economic viability, it is going to collapse sooner or later, or you are always going to be feeding it funding. So, to get the 2.0 system it really requires some thinking and thoughtful examination of where we want to go.

Senator WHITEHOUSE. Dr. Law.

Ms. LAW. Thank you. I do agree with all of your priorities, especially the impacts on human health, and I think we need to expand that conversation more broadly into impacts of plastics and freshwater and soils and agriculture, and things like that.

Other opportunities, though, that I would like to raise are the idea that we can try to make less waste; and this is falling on the previous question as well, starting to think about a cultural shift away from disposable, away from I use it, I put it in the garbage can, and it goes somewhere that is no longer my problem. So, encouraging reuse programs.

One really simple intervention we can all do is put in refillable water stations into our public spaces to encourage people to carry a reusable bottle, as opposed to using something a single time. So I would just like to point out not just information campaigns, sort of your traditional education campaigns, but thinking about targeted interventions in spaces that are locally defined about quite simple interventions that will cause us to just simply make less trash that we then have to deal with.

Senator WHITEHOUSE. Mr. Chairman, shall I tell a brief sailor story that Dr. Law's testimony called to my recollection?

Senator BARRASSO. Please.

Senator WHITEHOUSE. Newport, Rhode Island is probably the sailing capital of the world; we claim that, anyway. Delaware may have a disagreement, but I am sure we have Wyoming beat.

[Laughter.]

Senator WHITEHOUSE. A lot of sailboat racing goes through Newport, including what is now called the Volvo Ocean Race, which is perhaps the most dangerous and demanding sporting event on the planet; and it is around the world, very fast race, very high-tech

boats going very fast. Racing boats have, for generations, had to learn a man overboard drill.

You don't go offshore racing without having drilled and drilled on the man overboard situation; who is the spotter, how quickly do you turn the boat. You know, the whole routine is just drilled until you can, as soon as somebody yells overboard, everybody knows exactly what they are supposed to do.

For the first time these racing boats have to have a new and different drill, and that is a keel clearing drill. They sail through the South Atlantic on their course and they sail near the place that is farthest from land anywhere on the surface of the earth; and even out there they are still doing these keel clearing drills. When the boats came into Newport from Brazil on their leg that ended with us, you could see the boats in Newport Harbor as they came in within sight of each other.

They had sailed all the way from Brazil and these races are still so close that they end up within minutes of each other, within sight of each other as they finish, so you really, really need to make sure that your vessel is operating at peak performance. And they have enough computers to know when it is off performance, so they then have to deploy—they know what is wrong, the keep clearing drill; and somebody has to go over the side real quick, with goggles and a knife and whatever else they need, to get the junk, the plastic junk, usually, that the keel has swept like a single comb tooth out of the ocean and get their boat operating back at speed again.

So, it is an interesting physical comparison to the longstanding, ancient, well established man overboard drill. It is only now, only in the last few years that ocean racers now have to come up with a whole new drill that they have to practice, keel clearing, even in the farthest corners of the South Atlantic.

Senator BARRASSO. Thank you, Senator Whitehouse.

Senator CARPER.

Senator CARPER. Mr. Karas, I don't know a whole lot about Coca-Cola's World Without Waste campaign, but I am told that the goals are ambitious. I am told that it will really make a difference to improving international recycling practices and reduce waste in our oceans, and that is encouraging. What are the biggest challenges that your company faces in implementing these goals domestically and what can Congress do to support your efforts in this Country?

Mr. KARAS. I think domestically the biggest challenge that we are trying to work through now, and I mentioned this in some of my earlier comments, at times I am dealing with sort of the waste infrastructure 1.0. I may have five different entities, public and/or private. One might be hauling, one might be operating the material recovery facility or the MRF. My end market might be somewhere off in the distance, and it is very disconnected.

So, for us to be able to deliver 50 percent recycled content, I have to do it in a way that I have an adequate supply, adequate a good quality material, so I think the challenge is I am looking to see what the next 2.0 waste management system will be in the long-term.

We have a combination of different efforts that we are doing to really work on vertically integrating that system, so, from a business perspective, if you are one and the same entity, I just toured

a MRF, material recovery facility, earlier this week. They are integrated with making cardboard boxes, so they pull the cardboard out of the materials coming into this site, drive across the parking lot and they are making brand new cardboard boxes. When they do it that way, it works; it has value. I think that is sort of the area that we are seeing as the biggest challenge, is how do we really get that system to work.

I think the second piece is we have probably, it is something I mentioned earlier, about the culture right here in this Country. I really believe that people don't understand the concept of the circular economy and we have very much a culture that is throwaway, so we are working on that space as well.

Senator CARPER. Any question you have not been asked that you would like to be asked?

Mr. BAILLIE. I just wanted an opportunity to respond to the systemic question that you asked.

Senator CARPER. Oh, good.

Mr. BAILLIE. I think there is nothing inherently bad about plastics, but in 1950 we were producing 2.3 million tons.

Senator CARPER. How much?

Mr. BAILLIE. Two point three.

Senator CARPER. In what year?

Mr. BAILLIE. In 1950. And now it is 500 million tons. So that is a massive increase. And we haven't moved to that closed loop economy, so we are producing these plastics without a full cycle of what will happen to them going forward, and there is just too much of it.

But when you talk about the source, it is really working with the industries and saying how can we produce plastics that can definitely be recycled. When you have multiple plastics, say, in a toothbrush—there are three types of plastics, often—it makes it much more difficult to recycle. So how can we create conditions where it is easy to recycle things? And things like coffee cups, we have plastics being mixed and layered with wood and with aluminum. Again, it makes it extremely difficult to recycle that. How do we simplify that process?

If we can do that and then we develop more standardized approach across the United States in terms of recycling, we can bring recycling to scale. The things you do in D.C. are different than you might do in States across America. We have to standardize this process so we can work at scale and we can innovate at scale.

Then we talked about innovation. I mentioned the Impact Investment Fund we are promoting, but there are much larger funds out there, and I think there is a real opportunity for Government to work with the private sector to develop these large funds to actually drive innovation.

Then, finally, incentives. We talked about the five cents on a plastic bag, which makes a world of difference, or the five cents to collect a bottle, which makes a world of difference. We have to explore and deliver on these standards.

Then, I think that the United States can then play a much stronger global role. We are now only recycling 9 percent of our plastics. Some of these other countries that we are talking about that are putting more waste into the world are actually recycling

more than we are. So, we should set a target of going from at least our 9 percent to what Europe is doing, which is around 30 percent, to ensure that we can then move into a leadership position in this space and lead with our innovation as well.

Senator CARPER. Congressman Dooley.

Mr. DOOLEY. If I may respond. I would say that the fact that we have seen an increased use of plastics, that has been a significant contributor to enhancing global sustainability. A few years ago, UNEP, the United States Environmental Program, at the request of one of their members, did a study in terms of trying to identify the environmental costs of plastics. They hired a firm called True Cost that went out and did this study, and they came back and they said, OK, it is about $90 billion a year.

From a policymaker's perspective, I said, what would you respond to a study that said that? You could be led down to say, well, then we ought to eliminate the use of plastics. What we did at ACC, we said, you know, you need to do a more comprehensive assessment.

We went back to True Cost, we said, not only should you do an assessment of the environmental cost of plastics, but what would be the environmental costs of the alternatives. They did that and they came back to us and they said, it is a good news, bad news story. It is not 90 billion, it is 139 billion for the environmental cost of plastics. But the good news is, from a plastic manufacturer, is that the environmental cost of using alternatives to plastics was four times as large.

So I think we have to be careful here when we are trying to develop policies that are going to ultimately enhance global sustainability, that we should do so in a manner that is really based on doing comprehensive assessments of the life cycle impact of the various materials. When you take that approach based on the more comprehensive study, it sends a signal to us as manufacturers that we have to do a better job of ensuring that the plastics that are increasingly being used are more easily recycled, that their energy and their chemicals can be more easily recoverable so that we can minimize their impact in terms of the environment, but still capitalizing on the positive environmental benefits from their use.

Senator CARPER. Fair enough. Thank you. Thank you, Cal.

Could I have one more question, Mr. Chairman?

I am trying to remember the name of the new program they have over in China. I think it is called the Green Fence policy. It is a ban on importing plastic waste. As you know, China was our market for these materials and for a long time they previously accepted about 30 percent maybe a third of our plastic waste. In our Country, local municipalities are having more trouble now breaking even when collecting and recycling this waste.

Anybody have an idea what are some of the best ways for the U.S. to address this new challenge? Any thoughts?

Mr. DOOLEY. Again, I think that there are some real opportunities to use this as an inflection point where we could see opportunities to increase the value of this accumulating plastic waste. In my opening remarks, we identified some policies that we currently have in place in the United States that are impeding the flow of investment capital in developing the innovations that can trans-

form that mixed waste or plastic waste stream accumulated into energy as well as into going through a pyrolysis where you can turn it into feedstocks.

Now, if you want to try to get a permit for a pyrolysis unit to do waste plastic, sometimes it is subject to being permitted as a hazardous waste facility versus what could be a recycling center. If you make that small change, you could, again, create a greater incentive for the flow of that investment capital to develop those new innovations.

The same thing, if you could develop diesel or a syn fuel from a plastic waste stream, it doesn't qualify for the alternative fuels treatment or renewable fuels. Making simple changes like that are going to encourage a lot of investment from a lot of startup companies, as well as a lot of large companies, to make investments that can add value and capture the energy and the value in that plastic waste stream.

Senator CARPER. Were you this smart when you were a Congressman?

[Laughter.]

Mr. DOOLEY. I was smart enough to leave.

[Laughter.]

Senator CARPER. I will say in closing, for myself, this is a really important issue and I again want to thank Senator Whitehouse and Senator Sullivan for their great leadership on this, and our Chairman for holding this hearing and for Senator Inhofe's strong interest in this issue as well. This is one I care about enormously. I am sorry there is so much other stuff going on that hasn't allowed me to be here.

One of my favorite witnesses, the guy who is the controller general of the Country, the head of GAO, General Accountability Office. His name is Gene Dodaro. I don't know if you have ever met him, but he comes and testified fairly regularly on different committees. Sometimes he will be sitting right where you are, Mr. Karas, and he speaks opening statement, no notes. Answers every question, no notes. Finally, I noticed 1 day that when he would speak there was a woman sitting right behind him and her lips were moving when he spoke.

I have been watching you and your responses, and there is a lady in a red dress right behind you, and I noticed that her lips were moving when you speak. She looks very familiar and I just want to say to Missy, welcome to our hearing; it is great to see you. You have another career ahead of you if you can take this show on the road.

Thank you very much.

Senator BARRASSO. Thank you, Senator Carper.

Thank you all. This was very productive.

Senator Whitehouse, thank you for your leadership. Thank Senator Sullivan as well.

If there are no more questions today from the panel, members might submit written questions for up to 2 weeks, so the record will stay open for that period of time.

But I really do want to thank all of you for being here, as well as what you are doing on this vital, vital issue. Thank you to National Geographic for your leadership and for putting visually

something that I think really caught the attention of the Country and the world.

With that, this hearing is adjourned.

[Whereupon, at 11:52 a.m. the committee was adjourned.]

[Additional material submitted for the record follows.]

Plastic Pollution Is Now Spreading From Ocean Food Chains Into Land Animals, Thanks to This Insect

Just when you thought it couldn't get worse.

DAVID NIELD
22 SEP 2018

We know that plastic pollution is a major problem for the world's oceans, but scientists just discovered a new way that discarded microplastics are making their way out of the water and into other food chains – through mosquitoes.

What's happening is mosquito larvae are ingesting microplastics as water-dwelling larvae, and those plastic particles are sticking around as they transition into flying mosquitoes.

Those adult insects provide tasty snacks for birds and bats in the air above, which means microplastics are now ending up in the stomachs of land animals, not just marine creatures.

This process is technically known as ontogenic transference, meaning it happens as the organism matures and moves habitats.

Once the plastic-carrying mosquitoes have been eaten by birds and bats, the pollution can then make it further into other food chains and ecosystems, according to the researchers from the University of Reading in the UK.

"This is eye-opening research, which has shown us for the first time that microplastics are able to navigate several life stages in flying insects, allowing them to contaminate all kinds of living creatures who would not normally be exposed to them," says one of the researchers, biological scientist Amanda Callaghan.

"It is a shocking reality that plastic is contaminating almost every corner of the environment and its ecosystems."

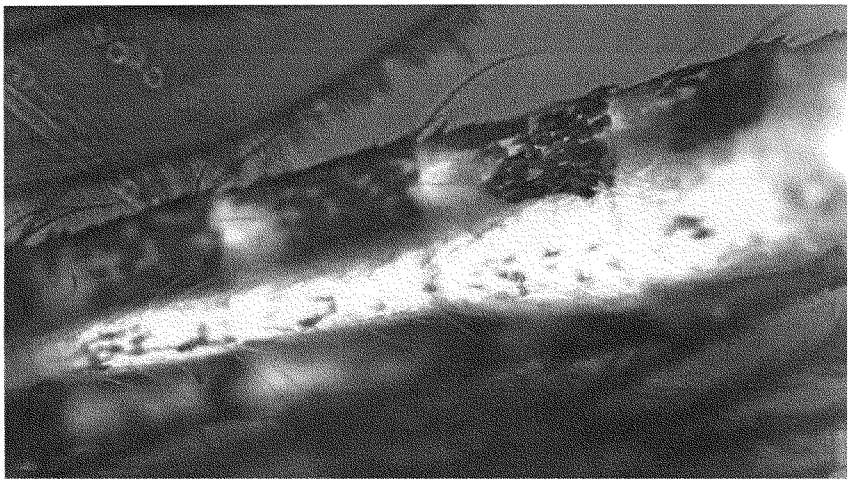
Callaghan and her colleagues fed fluorescent plastic microbeads to mosquito larvae in lab conditions then monitored their growth through a microscope.

The plastic remained in place through the non-feeding pupal stage and into the adult insect, via the Malpighian tubules (structures equivalent to the human kidneys).

Microplastics like these can take hundreds of years to be broken down in the environment, and the study showed that the smaller the plastic beads were, the more likely they were to stick around in the bodies of the mosquitoes.

We already know that plastics polluting our oceans and waterways can have a damaging effect on wildlife and make progress through the food chain.

Now we know these harmful, microscopic fragments stick around as mosquitoes change form and make their way out of the water too.



Fluorescent microplastic in a mosquito abdomen. (University of Reading)

Friends of the Earth plastics campaigner Emma Priestland, who wasn't involved in the research, said the findings were "disturbing".

"Knowing that plastic can be transferred from the larval stage to the adult mosquito, which then serves as food to a multitude of larger animals, highlights the urgency with which we need to drastically reduce our use of plastic," Priestland told the BBC.

As well as mosquitoes, insects like mayflies, dragonflies and midges start life in ponds and puddles before making their way into the outside world, where they're often eaten by bigger creatures – so the problem could go way beyond the boundaries of this study.

We know that as plastic seeps into the natural world it can get passed further and further between animals and ultimately have serious consequences for natural ecosystems.

Let's hope this new study helps underline the potential scale of the problem and spurs efforts to cut back on plastic use.

"Much recent attention has been given to the plastics polluting our oceans, but this research reveals it is also in our skies," says Callaghan.

The research has been published in *Biology Letters*.

September 26, 2018

STATEMENT FOR THE RECORD
of the September 26, 2018
Senate Committee on Environment and Public Works Public
Public Hearing, on the subject:
"Cleaning Up the Oceans: How to Reduce the Impact of Man-Made Trash on the Environment, Wildlife, and Human Health"
http://www.epw.senate.gov/public/index.cfm/2018/9/cleaning-up-the-oceans-how-to-reduce-the-impact-of-man-made-trash-on-the-environment-wildlife-and-human-health

"*Food waste is a multi-billion dollar problem*" or "*opportunity*" according to Rethink Food Waste through Economics and Data (ReFED) www.refed.com/ - ReFED and others are working diligently and successfully to reduce food waste.

However, when a consumer discards food, the packaging that accompanies the food is also discarded.

The Animal Digestible Food Packaging Initiative (ADFPI www.adfpi.org) is an effort to *encourage/convince/inspire representatives of grocery stores, quick service restaurants, food manufacturers and food packaging manufacturers to establish a public-private partnership (PPP) with the objective of* ***funding research*** *necessary to identify* ***new*** *food packaging materials that not only meet food safety, integrity and quality requirements but that are also digestible by animals so that grocery and quick service restaurant waste may be sent to a renderer for manufacture into animal feed instead of being sent to a landfill.*

Because food packaging that meets food safety, integrity and quality requirements and that is digestible by animals either does not exist or is not readily available, and because the United States does not have an economically robust recycling industry, food waste along with its accompanying packaging generated by quick service restaurants and grocers, that is not beneficially used, is sent to a landfill for disposal.

But if grocery stores and quick service restaurants were to utilize food packaging that meets food safety, integrity and quality requirements and that is also digestible by animals, food waste along with its accompanying packaging could be sent to a renderer for manufacture into animal feed http://www.nationalrenderers.org/publications/press-kit/nra-releases-industry-videorendering-the-sustainable-solution/ - Recovered would be all the energy and natural resources that went into producing and manufacturing the wasted food and its inherent packaging, including its inherent animal nutrition value and its economic value as a feed source.

No one industry, be it food or package manufacturers, quick service restaurants or grocers, is willing or financially able to assume the responsibility to fund millions of dollars of research necessary for the identification of new food packaging materials that would meet food safety, integrity and quality requirements and also be digestible by animals.

If such food packaging is to be found, a food industry cooperative research effort will be required through creation of a public-private partnership (PPP) comprised of key stakeholders (including food and package manufactures, grocers and foodservice companies, renderers, pet food manufacturers, their trade associations, government agencies, foundations, think tanks and universities).

Funding for such a PPP can be found through the Foundation for Food and Agriculture Research (FFAR) https://foundationfar.org/ and the National Science Foundation (NSF) "*Innovations at the Nexus of Food, Energy and Water Systems*" program https://www.grants.gov/web/grants/view-opportunity.html?oppId=301132
~ FFAR and/or NSF funding would **unleash the genius of students and professors at the Nation's land grant universities and other research organizations** – Let us put them to work on the challenge to discover animal digestible food packaging that meets necessary safety, integrity and quality requirements!
~ FFAR " *... builds unique partnerships to support innovative and actionable science addressing today's food and agriculture challenges. The Foundation was established by the Farm Bill passed in 2014 and charged with complementing and furthering the important work of the U.S. Department of Agriculture. Leveraging public and private resources, FFAR will increase the scientific and technological research, innovation, and partnerships critical to enhancing sustainable production of nutritious food for a growing global population.*"
~ The NSF grant program " *... seeks to support research that conceptualizes FEW systems broadly and inclusively, incorporating social and behavioral processes (such as decision making and governance), physical processes (such as built infrastructure and new technologies for more efficient resource utilization), natural processes (such as biogeochemical and hydrologic cycles), biological processes (such as agroecosystem structure and productivity), and cyber-components (such as sensing, networking, computation and visualization for decision-making and assessment) ...*"

This public hearing is one example of the public's demand that manufacturers take responsibility for the after-life environmental effects of single use packaging as exemplified by the Earth Day site, titled "*Initiatives to Ban or Reduce Consumption of Single-Use Plastics*" at https://www.earthday.org/plasticban/ and the Linkedin posts of Jack Cooper, ADFPI Executive Director, at https://www.linkedin.com/in/jack-cooper-21474b14/detail/recent-activity/shares/
~ Further, "*... increased consumer and regulatory concern toward single-use plastic and other packaging materials is a critical investment theme, especially for asset managers with an Environmental, Social and Governance (ESG) mandate ...*" according to an extensive August 2018 Citi Global Perspectives and Solutions (GPS) Report, titled "*Rethinking Single-Use Plastics: Responding to a Sea Change in Consumer Behavior*" at https://ir.citi.com/1/A9tF7xva3SU5qL6ghGCVgXf4Wi3eDYs3Nd/tXPY7srxTM21ihP4orVMVpyfyOW

Another reason to support such a PPP is presented in a September 2018 University of Cambridge Institute for Sustainability Leadership report: "*... The significant challenges presented by plastic packaging waste can only be solved through collaborative actions from business, government and society ... We do not know if it will even ever be achievable to totally eliminate plastic packaging waste. However, there is a need to act now, before all of these unknowns can be addressed, and to set a high level of ambition, even if it seems hard to achieve in the current context ...*" - The report is available here: https://www.cisl.cam.ac.uk/resources/circular-economy/towards-sustainable-packaging-a-plan-to-eliminate-plastic-packaging-waste-from-uk-bottled-water-and-soft-drinks
~ As well, according to a June 28, 2018 Sustainable Brands http://www.sustainablebrands.com/ report, when individual food companies and their trade associations take a stand on issues the public cares about, like the after-life environmental effects of single use plastic packaging, consumers are "*... ready to reward brands that take stands ... Consumers want brands to stand up for issues in their areas of expertise ... [Consumers] believe companies should provide ongoing support for issues that align with the types of products or services they offer*

... companies [should] look to their primary business first to refine their purpose and prioritize relevant social issues ... It is clear that brands have much to gain from taking stances that fit with their organization's purpose and product ... The key is effectively communicating those stances ..." - The SB report is here: http://www.sustainablebrands.com/news_and_views/marketing_comms/sustainable_brands/consumers_ready_reward_brands_take_stands?utm_source=newsletter&utm_medium=brandsweekly&utm_campaign=jun28

~ Also, according to an August 20, 2018 Boston Consulting Group report, titled "*Tackling the 1.6-Billion-Ton Food Loss and Waste Crisis*" "*... no one group, government, or company can ... [solve the food waste crisis on its own but] ... Companies that play a role in the food value chain stand to reap tangible business benefits ... [and] can burnish their brand ...*" by addressing the issue: https://www.bcg.com/en-us/publications/2018/tackling-1.6-billion-ton-food-loss-and-waste-crisis.aspx

Finally, plastic waste recycling is not projected to be effective and efficient in the United States and the EU for a decade or two:

~ The U.S. Plastics Resin Producers have set the following goals: 100% of plastics packaging to be re-used, recycled or recovered by 2040 with 100% of plastics packaging to be recyclable or recoverable by 2030, according to a May 9, 2018 The American Chemistry Council's (ACC) news release at https://www.americanchemistry.com/Media/PressReleasesTranscripts/ACC-news-releases/US-Plastics-Producers-Set-Circular-Economy-Goals-to-Recycle-or-Recover-100-Percent-of-Plastic-Packaging-by-2040.html

~ The European Union proposed EU plastics strategy calls for "*... all plastic packaging ... [to be] recyclable by 2030 ...*" according to a January 16, 2018 European Commission News Release at http://europa.eu/rapid/press-release_IP-18-5_en.htm

~ Many cities are abandoning recycling programs because of soaring costs in the wake of new waste acceptance policies adopted by China, according a September 14, 2018 Bloomberg Environment story at https://www.bna.com/curbside-recycling-threat-n73014482530/

~ "*More Recycling Won't Solve Plastic Pollution*" is the title of an August 6, 2018 Scientific American "Observations" which argues that "*... It's a lie that wasteful consumers cause the problem and that changing our individual habits can fix it ... The real problem is that single-use plastic ... is an incredibly reckless abuse of technology ... At face value ... [Keep America Beautiful and other] efforts seem benevolent, but they ... shift the onus of environmental responsibility onto the public ... A better alternative is the circular economy model, where waste is minimized by planning in advance how materials can be reused and recycled at a product's end of life rather than trying to figure that out after the fact ...*"
https://blogs.scientificamerican.com/observations/more-recycling-wont-solve-plastic-pollution/

~ Whether or not food and other packages become "recyclable," are actually recovered and "recycled" (that is, actually manufactured into new products), the plastics industry will continue to be robust according to this story: "*Plastics Industry Flourishes in Response to Market Demand*" is the title of an article in the Third Quarter 2018 issue of the Area Development Magazine which notes that "*... It's a good time to be in the plastics manufacturing business. Plastics manufacturers in the U.S. are continuing to enjoy increased demand for their products ... along with decreasing production costs ... Packaging ... is showing especially strong growth ...*" - The article is here: http://www.areadevelopment.com/Plastics/Q3-2018/plastics-industry-flourishes-in-response-to-market-demand.shtml

END

Submitted on behalf of the Animal Food Packaging Initiative www.adfpi.org by Jack Cooper, Executive Director, 33 Falling Creek Court, Silver Spring, Maryland 20904 – JLC@adfpi.org – Text to: 301 384 8287

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October 7, 2018

RE: Hearing: Cleaning Up the Oceans: How to reduce the impacts of man-made trash to the environment, wildlife, and human health?"

Dear Chariman Barrasso and Ranking Member Senator Carper,

Thank you for providing me with the opportunity to submit testimony. I also want to thank you for giving time to this important issue.

I am Dr. Chelsea Rochman, a professor in Marine and Freshwater Ecology at the University of Toronto. I have been researching the issue of plastic pollution for more than a decade. During this time, I have watched the state of the evidence grow tremendously. **Today, there is no doubt that anthropogenic debris of all shapes and sizes litters our oceans and freshwater ecosystems. This debris is found in hundreds of species of wildlife, including in the species we consider seafood. We know that plastic pollution harms individual organisms, wildlife populations and communities. These impacts, combined with evidence for accelerating plastic production and emissions into the environment, suggest the international community should come together to limit future environmental emissions of anthropogenic litter now, before they transform ecosystems irreparably.** Below, I will speak specifically to microplastics followed by marine debris in general.

Microplastics
My research mainly focuses on microplastics (plastics 5mm in size) and **demonstrates that microplastics are ubiquitous in the environment, including in seafood.** My research has also shown that microplastics are associated with a cocktail of toxicants, including 78% of those we currently consider priority pollutants under the US EPA. It also demonstrates that microplastics can be toxic to fish and invertebrates.

By weight, large plastic debris such as fishing nets, make up the largest percentage of plastic floating in our oceans. However, by count, microplastics by far exceed the number of plastic in our environment. **Thus, as we design policies aimed at plastic pollution, we must be mindful to include policies specific to microplastics.** Because some sources of microplastics are unique (e.g., microfibers, tire dust, pre-production pellets), policies will also be unique to larger items of plastic waste. As such, it is important that we invest time thinking about creative and effective solutions for mitigating microplastics.

Although we often think of microbeads when we think of microplastics, the term microplastic incorporates a large diversity of plastic types, including those that were produced as microplastics (e.g., microbeads, pre-production pellets often referred to as "nurdles") and those that are literally degraded bits of larger plastic products (e.g., tire dust, microfibers and fragments of bottles, bags and film). The former is called primary microplastics and the latter is referred to as secondary microplastics. Secondary microplastics are the most common type of microplastic waste found at sea. Still, we must not forget the primary sources of microplastics as well as the sources that emit secondary microplastics into the oceans (e.g., microfibers). These particles, specifically microfibers, are some of the most common microplastic types found in global ecosystems.

Researchers estimate that there are between 15 and 51 trillion microplastic particles floating around in our oceans, reaching from the poles to the equator. Microplastic particles are found in large concentrations in Arctic sea ice and are also present in sediments and wildlife from the deepest parts of the ocean. Consequently, this widespread contamination has led to the contamination of 100s of species of wildlife across all trophic levels. Laboratory studies demonstrate that microplastics can lead to mortality, reduced growth, and decreased reproductive output in marine animals. Although we do not yet understand how they may affect human health, they are also found in sea salt, seafood and drinking water.

Although policies that mitigate large plastic debris also reduce microplastic debris, we need to make sure we consider microplastics when we consider all of the policy options for plastic pollution. **Policies specific to microplastics may include, but are not limited to, emissions standards for microplastics (e.g., from washing machine effluent, wastewater, stormwater, etc…), filters on washing machines to trap microfibers, increasing participation for operation clean sweep and extend this model to textiles, material innovation, and banning microbeads.**

The above mitigation strategies are simple solutions to combat some sources of microplastics. Still, when it comes to plastic pollution, we know the least about sources, fate and effects of microplastics. As such, while we begin implementing policies now related to known sources of microplastics, **we must continue to put resources into research that helps us better understand what some other sources of microplastics are and which may be prioritized for policy based on quantities and risk.**

Marine Debris in General

Today's estimates suggest that about eight million metric tons of plastic enters the oceans annually from land. If we continue business as usual, this number is expected to increase by an order of magnitude by 2050. In the US, I think we have an opportunity to lead in this space. The US can and should be a large part of the solution, and show other countries that reducing emissions of plastic is possible.

Last year, I co-led a paper in the journal *Proceedings of the National Academy of Sciences* titled, "Why we need an international agreement on marine plastic pollution". Like many other contaminants, plastic is not constrained by borders. It migrates via air and water currents in and out of parts of the oceans that are beyond national jurisdiction. Because plastic pollution does not observe borders, neither should policy. At this time, there are no international agreements for plastic pollution. I recognize that the Clean Seas Initiative is a great first step, but I think it is time to move to something similar to the Paris Agreement and at a faster pace than in took to get to the Paris Agreement. To measurably reduce emissions of plastic pollution, we need defined reduction targets, signatories, methods of reporting progress and a global fund.

I envision an agreement where countries sign on as signatories with a defined reduction target. For example, in the US we might agree to reduce 25% of our emissions by 2025. To meet reduction targets, each country needs to come up with strategies to do it. Because there is no one-size-fits-all solution, each country may take on its own set of unique solutions to reach its target. For example, countries may adopt container deposit schemes to improve recycling rates, eliminate the use of some single-use plastic items that are unnecessary (e.g., microbeads, straws), improve waste collection and management infrastructure, and agree to market only plastics that are recyclable and/or reusable in their region. For some countries, particularly in the developing world, aid is necessary to build new infrastructure for waste. These countries need access to a global fund, similar to the UNFCCC's climate fund. To build this fund, an extended producer responsibility program can be implemented. If the fund pulled in one penny for every pound of plastic produced, the fund would build by over $6.8 billion per year. Finally, each year countries would report on their success measuring the reduction of plastic emissions globally over time and ensuring signatories reached their goal.

With more than a decade of experience researching plastic pollution, I have a vast knowledge base on this issue. I have published many papers about the topic and have advised managers and policy-makers in several countries. For example, I presented at the Our Ocean Conference at the US State Department and in front of the UN General Assembly in New York City. I have also had one-on-one discussion with the offices of several congress- men and women in the United States. I would be more than happy to sit down with you and discuss the state of the science and how it might inform policy around this important issue both nationally and internationally. Please feel free to connect with me anytime.

Many thanks for your time.

Sincerely,

Chelsea M. Rochman
Assistant Professor

GOVERNMENT OF THE DISTRICT OF COLUMBIA
Department of Energy and Environment

October 10, 2018

Senator John Barrosso
Chairman
Committee on Environment and Public Works
410 Dirksen Senate Office Building
Washington, DC 20510

Senator Tom Carper
Ranking Member
Committee on Environment and Public Works
456 Dirksen Senate Office Building
Washington, DC 20510

Subject: Written Testimony for recent U.S. Senate hearing entitled *Cleaning Up the Oceans: How to reduce the impact of man-made trash on the environment, wildlife, and human health*

Dear Sen. Barrosso and Sen. Carper:

Thank you for your leadership to reduce the impacts of trash on our nation's waterways. Trash is one of the great environmental challenges of our time and will not be solved without robust participation from federal, state, and local governments. We welcome this opportunity to provide written testimony and stand ready to work with you on further efforts to address this issue.

The District has been a leader in the nation for over a decade on addressing trash in our local waterways. According to a 2015 article published in the journal, *Science*, researchers estimate over 8 million metric tons of trash enter the oceans annually from land-based sources.[1] In a heavily urbanized area like the District, a large portion of that trash comes from litter being conveyed via storm sewer and combined sewer systems to waterways like the Potomac and Anacostia Rivers. In response to this problem, the District, in collaboration with U.S. Environmental Protection Agency (EPA) and upstream jurisdictions, established a total maximum daily load (TMDL) for trash in the Anacostia River. As a result, the District is compelled by EPA and our own priorities to reduce trash in the Anacostia River as part of our efforts to make the Anacostia fishable and swimmable once more. Given that the District has declared 2018 the Year of the Anacostia River, it is very timely for us to provide the Senate with a summary of our experiences. We are proud of all of our accomplishments and would like to share details of some of our efforts in hopes that this work can, and will be, emulated elsewhere throughout the nation.

[1] - Jambeck, J.R., R. Geyer, C. Wilcox, T.R. Siegler, M. Perryman, A. Andrady, R. Narayan, & K.L. Law. 2015. Plastic waste inputs from land into the ocean. Science 347: 768-771.

Three important components have helped us to effectively manage trash in our waterways: regional partnerships, using sound science to inform policy, and taking multi-pronged, innovative approaches.

Regional Partnerships

The issue of trash impacting the Potomac River watershed began over a decade ago thanks to a regional collaboration facilitated primarily by the Alice Ferguson Foundation of Accoceek, MD. Since 2005, the Alice Ferguson Foundation has held an annual Potomac Watershed Trash Summit in the DC metropolitan area. This summit brings federal, state, and local government agencies, elected officials, and non-governmental organizations together to discuss efforts to reduce trash in the watershed. This would not be possible without grant funding from the NOAA Marine Debris Program, which has been an invaluable partner in regional efforts to address this issue.

Example of trash conditions in Watts Branch, a tributary to the upper Anacostia River in Washington, DC

Over the years, participants have implemented key efforts discussed at this summit including a regional anti-littering campaign, innovative local policies for reducing trash, and regional collaborations to establish the TMDL for trash for the Anacostia, one of the most urbanized tributaries to the Potomac River. The summit brought together leaders from the District, the state of Maryland, local Maryland counties, EPA, and local advocates to reach common ground on establishing the TMDL. Without this regional partnership it is very unlikely this effort would have been successful. As we will highlight more specifically, several new innovative approaches for trash reduction have been implemented since that time.

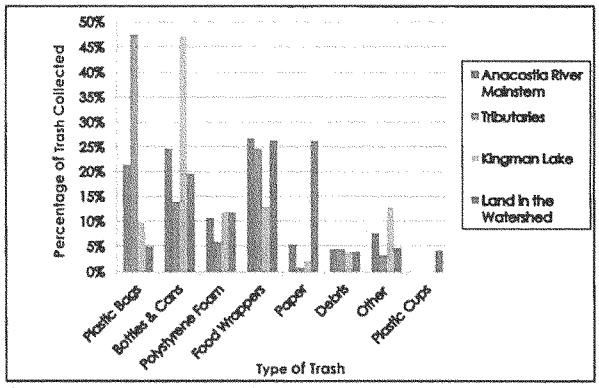
In 2016, the District, Montgomery County, and Prince George's County reaffirmed their commitment to making the Potomac and Anacostia River free of trash by signing the Anacostia River Accord. The accord was signed by the District's Mayor Muriel Bowser, as well as Montgomery County Executive Isiah Leggett, and Prince George's County Executive Rushern

Baker. In addition, the Anacostia Watershed Restoration Partnership, housed at the Metropolitan Washington Council of Governments, has convened a trash working group to develop consistent methods for tracking and reporting trash reductions across all three jurisdictions. This is further evidence of the importance of regional partnerships at combatting the issue of trash in our waterways.

The next Potomac Watershed Trash Summit to discuss what the District, other jurisdictions businesses, and non-governmental organizations are doing to address trash in the Potomac River will be held on October 16th, 2018 at George Mason University in Arlington, VA.

Using Sound Science to Inform Policy

One of the first things the District did to address the problem of trash in the Anacostia River was conduct a two-year comprehensive study of trash conditions. The District Department of Energy and Environment (DOEE) funded the Anacostia Watershed Society of Bladensburg, MD to conduct surveys of litter along the river and its many tributaries and monitor trash loads from storm sewer outfalls. The study provided two important pieces of information: (1) data on the most common types of trash in the Anacostia River and its watershed and (2) data on total weight of trash entering the Anacostia River on an annual basis. The first dataset informed District policies targeted to address specific types of trash most common in our waterways such as single-use plastic bags and expanded polystyrene foam products. The graph below shows the most common types of trash found out of 44 different categories sampled along DC shorelines in the Anacostia River, its tributaries, Kingman Lake (a semi-enclosed lake in the Anacostia River), and land in the Anacostia River watershed. The District utilized the second dataset to develop the trash TMDL and identify and strategically address hotspots in the watershed which are conveying above average amounts of trash to the river.



Graph displaying most common types of trash found by count in 2008 in the Anacostia River, its tributaries, Kingman Lake, and land in the Anacostia watershed.

Since 2016, DOEE has been working with the Metropolitan Washington Council of Governments to sample trash along rivers and streams throughout the District. We provide this data annually to U.S. EPA Region III. This work builds upon a larger monitoring dataset the Council of Governments has been collecting in the Maryland portion of the Anacostia River watershed since the early part of this decade, making it one of the most robust datasets for trash for a waterbody anywhere in the nation. Having this data is imperative to making future strategic decisions for implementation and informing development of new policies.

Multi-Pronged, Innovative Approaches

As with most environmental challenges, there is no "silver bullet" for eliminating the harm trash poses to our waterways and wildlife. The District has devised a plan that utilizes innovative policies, trash capture technologies, education and outreach.

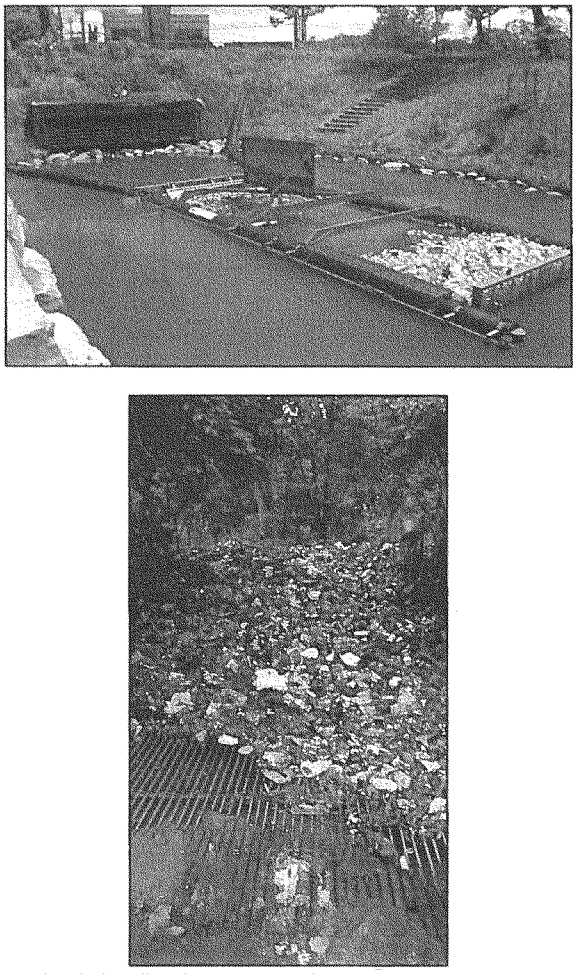
As mentioned previously, our monitoring efforts helped us to determine the most common types of trash found in our waterbodies. The District utilized monitoring data described previously to justify the need to reduce three of the most common types of trash found during sampling: single-use plastic bags, expanded polystyrene foam products (commonly referred to as Styrofoam™), and other food service ware.

In 2009, the District enacted the Anacostia River Clean Up and Protection Act (also known as the Bag Law) to create a five-cent fee on single-use plastic bags. Starting January 1, 2010, consumers in the District pay the fee at the time of purchase in a restaurant, grocery, liquor, or convenience store. DOEE employs an inspection team to ensure businesses are in compliance with the law. Revenue, fines and other contributions generated by the law goes into the Anacostia River Clean Up and Protection Fund to pay for projects like trash capture devices, stream restoration, stormwater management projects, education, outreach, and administrative costs. In Fiscal Year 2017, the Department found that 76% of businesses inspected were in compliance with the law. More information on the District's Bag Law, including annual revenue and expenditure reports, are available at https://doee.dc.gov/bags.

In 2014, the District enacted the Sustainable DC Omnibus Amendment Act, which includes restrictions on food service ware packaged and intended for consumption without further preparation. Specifically, a ban on food service ware made of Styrofoam™ (foam) took effect January 1, 2016, and the law requires food service ware to be made of recyclable or compostable materials starting January 1, 2017. As with the Bag Law, DOEE inspects businesses to make sure they are in full compliance with the law. In fiscal year 2017, DOEE found that 88% of District businesses inspected were in compliance. Further information on the District's food service ware requirements is available at https://doee.dc.gov/foodserviceware.

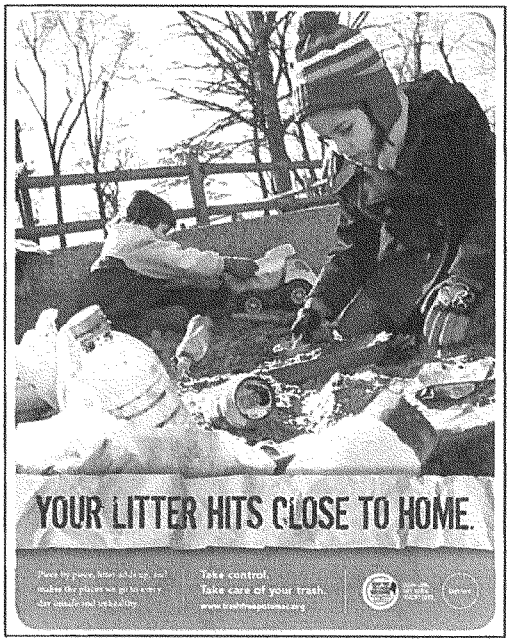
The District has also implemented innovative structural controls for capturing trash. Since 2009, the District has installed nine trash traps in the Anacostia River watershed. These traps have varied from proprietary products to custom devices designed by local non-profits. The pictures below display examples of the devices. These devices have primarily been funded by the Anacostia River Clean Up and Protection Fund and other local funding sources through grants to

local nonprofits to design, install, and maintain these devices. The nonprofits also collect data on trash collected in the traps to further inform policies. Since installation of the first device in 2009, these devices together have helped capture and remove over 60,000 lbs of trash and debris from the Anacostia River and its tributaries.



Examples of trash traps installed in tributaries to the Anacostia River in the District. Top: Proprietary device known as a Bandalong Litter Trap™ installed and maintained by Anacostia Riverkeeper. Bottom: custom trash weir designed, installed, and maintained by the Anacostia Watershed Society.

Lastly, the District has led many education and outreach activities over the years to change behavior. In 2010, DOEE funded the Alice Ferguson Foundation (AFF) to conduct a study of littering behavior that guided the development of an anti-littering campaign throughout the District. The campaign's central message, *"Your Litter Hits Close to Home,"* was based on AFF's research that found people were most impacted by the effects litter has on their personal space, health, and well-being. Below is an example graphic from the anti-littering campaign. Other local governments in the Potomac River watershed have adopted these campaign materials.



In closing, I want to again thank you and the Senate EPW committee for your interest in this important subject. As the nation's capital, the District has an important role to play in restoring urban waterways. We have set the stage for reducing trash in our rivers and streams using multi-faceted, innovative approaches, but we are not done. We are truly alarmed by the potential impacts microplastics could have on our aquatic resources such as some of our valuable fisheries. A 2014 study published in the journal, *Environmental Science and Technology*, found microplastics to be present in four tidal tributaries to the Chesapeake Bay[2]. 59 of the 60 samples collected during the study contained microplastics. We are actively engaged with the EPA

[2] - Yonkos, L.T., E.A. Friedel, A.C. Perez-Reyes, S. Ghosal, & C.D. Arthur. 2014. Microplastics in four estuarine rivers in the Chesapeake Bay, U.S.A. Environ. Sci. Technol. 48: 14195-14202.

Chesapeake Bay Program, the NOAA Marine Debris Program, and neighboring jurisdictions on research and management to address the issue. We hope Congress will also take a leadership role in finding solutions to this challenging pollution issue.

I would encourage the Senate Environment and Public Works Committee to peruse reports on our monitoring efforts. If you are interested in receiving copies, or have any other questions regarding our efforts to reduce trash in our waterways, please contact Matt Robinson of the DOEE Watershed Protection Division at matthew.robinson@dc.gov or (202)442-3204.

Sincerely,

Tommy Wells
Director

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