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EXAMINING THE IMPACT OF PLASTIC USE AND IDENTIFYING SOLUTIONS FOR REDUCING PLASTIC WASTE

HEARING

BEFORE THE

SUBCOMMITTEE ON CHEMICAL SAFETY, WASTE MANAGEMENT, ENVIRONMENTAL JUSTICE, AND REGULATORY OVERSIGHT

OF THE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

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SECOND SESSION

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C O N T E N T S

EXAMINING THE IMPACT OF PLASTIC USE AND IDENTIFYING SOLUTIONS FOR REDUCING PLASTIC WASTE

THURSDAY, DECEMBER 15, 2022

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
SUBCOMMITTEE ON CHEMICAL SAFETY, WASTE MANAGEMENT,
ENVIRONMENTAL JUSTICE, AND REGULATORY OVERSIGHT,
Washington, DC.

The Subcommittee met, pursuant to notice, at 10:04 a.m. in room 406, Dirksen Senate Office Building, Hon. Jeff Merkley (Chairman of the Subcommittee) presiding.

Present: Senators Merkley, Wicker, Carper, Whitehouse, Capito, Sullivan, and Ernst.

OPENING STATEMENT OF HON. JEFF MERKLEY, U.S. SENATOR FROM THE STATE OF OREGON

Senator MERKLEY. Good morning. Welcome to the final hearing of the Subcommittee on Chemical Safety, Waste Management, Environmental Justice, and Regulatory Oversight in the 117th Congress.

To Ranking Member Wicker and the rest of the Committee members, I appreciate your work and partnership over these last 2 years as we have examined a number of issues important to people here in the United States. Now, we are looking at another issue, the issue of plastics.

I am going to ask my team to hold up, I will have them hold up first, this photo, which I took when I was out jogging along the Anacostia River. The river is just choked with plastic. I took some other pictures when I was running on the Potomac after a high tide event, and the entire running trail is covered with millions of pieces of little tiny pieces of plastic. It is what we would never see, except the river overflowed onto the running trail, and when the water receded, it left this deposit.

On the day I was undertaking this marathon along the Potomac, there were people out there on teams, and they were picking up each little tiny bit of plastic because they were trying to separate them from all the leaves and all the grass and everything else. In the time that I was running the marathon and went down the Potomac and came back, each volunteer, in a couple hours, had cleared a 2 square foot section trying to pick all these little tiny bits out, all these millions of bits that would have been washed into the ocean, or are washed in, on every other hour of every other day.

Another reason for us holding this hearing, I will have them hold up the other poster here, is that we have an emerging problem of microplastics. Plastics don't really degrade. They break down into tinier and tinier pieces. We are now seeing that these plastics are everywhere. As the headline says, baby poop is loaded with microplastics. The Antarctic, far away, has microplastics. Human breast milk has plastics. We find them deep in the lungs of living people.

What we know is that plastics are loaded with thousands of chemicals with different effects, and that those chemicals are not even disclosed to the public. Here, we have thousands of chemicals deep in our lungs, in our breast milk, in our consumption, and we don't really understand all of the effects of those chemicals, but it is certainly a cause for concern. That is why we are holding this hearing.

It is my sense that plastics may well pose a very significant risk to human health. I am struck by the fact that it is estimated that each of us consumes, in our food and in the air we breathe, the water we drink, the equivalent of a credit card worth of plastic every single week. Think about that of your children, consuming those, if you will, 52 credit cards a year, and all the chemicals that are embedded in that plastic, and ask yourself, do we need to thoroughly understand this issue as it affects human health? Certainly, I think we have a responsibility to our children, to the generations to come, to thoroughly understand this and address this challenge.

Twenty-five percent of the more than 10,000 chemicals associated with plastics pose potential health or environmental damages, including chemicals that mimic, block, or alter the actions of hormones, that reduce fertility, and that damage the nervous system. Through every stage of its life cycle, plastic can release these toxins. From the petrochemicals used in their production that workers and frontline communities are exposed to, to the ones that are released through regular plastic use, and finally, to the toxins that make their way into the air, the soil, the water, when the plastics are thrown away.

Most of us have heard of the three Rs: Reduce, reuse, recycle. It sounds like a magical way to address this challenge, but here is the story with plastics: It is not three Rs; it is three Bs. They are buried, they are burned, or they are borne out to sea. That is quite a different picture.

Then, we have the notion that we have recycling bins, and we put plastic items into them, and yet very few people know that often, those recycling bins are simply combined with the trash. In many, many institutions, they are simply greenwashing, and if they are being brought to recycling operations, only about 9 percent gets recycled.

That means just a fraction of the plastics recycled. Mostly what you do when you put something into a recycling bin with plastic, you are not recycling. You are wish-cycling. You are making a wish and a hope that somehow this plastic will be recycled when it is not going to be recycled.

The risks and dangers associated with plastic production and pollution are not going away. In fact, they are going to get worse. Plastic doesn't break down; it just breaks up. In the last 60 years, the world has produced more than 8 billion tons of plastic, where

6 billion tons of that has become plastic pollution, meaning the plastic that has been produced has ended up in the environment, and it is still there, forevermore. The United States' rate of production is expected to triple over the next three decades, another reason this Committee should be taking a thorough examination of it.

We have something that has caused a lot of concern, and yet we are blindly en route to tripling its presence. I think that that is not an acceptable formulation for the accountability that we bear as legislators to the people of the United States.

Without serious changes to our recycling systems, such as proper labeling or requirements for companies to use recycled materials in their products, our Nation will continue, simply, to be wish-cycling.

That is why we are here this morning, to see what options there are, to hear from our various folks testifying about approaches. I have introduced the Break Free from Plastic Pollution Act. It says, basically, yes, let us improve our recycling, to the degree that that will make a difference. Let us eliminate single use plastic that is absolutely unnecessary in the first place.

Let us use more producer responsibility, such as we do with ink cartridges for printers, to have a system in place that ensures far more of the stream of waste actually gets recycled. Let us have a national bottle bill. The bottle bill in States like my State, Oregon, the first in the Nation to have a bottle bill, its recycling rate on plastic bottles is up around 90 percent. Many States are closer to 15 or 20 percent without such a bottle bill.

We are delighted to have this panel of experts, and now, I would like to turn things over to my colleague and Ranking Member, Senator Wicker.

OPENING STATEMENT OF HON. ROGER WICKER, U.S. SENATOR FROM THE STATE OF MISSISSIPPI

Senator WICKER. Thank you, Mr. Chairman, for calling today's Subcommittee hearing.

Today, we are here to consider the impact of plastic use as well as solutions for reducing plastic waste. I appreciate our witnesses for joining us this morning to discuss this important topic.

I want to particularly thank Matt Seaholm, the CEO of the Plastics Industry Association, for being with us today. He will be able to share with the Subcommittee the importance of plastics in our modern economy. They are essential to our economy, and I think both sides of the dais will acknowledge that. He will also discuss steps that industry is taking to respond to concerns, such as the ones the Chairman mentioned.

Eric Hartz, President and Co-Founder of Nexus Circular, will be able to share with the Committee some of the solutions being developed in the private sector to respond to plastic waste.

The production of plastics has been pivotal for a number of advancements in our modern world, particularly for public health and hygiene. This was especially apparent during the COVID-19 pandemic. Front line workers and many others deemed essential relied on personal protective equipment, or PPE, that often contain plastics. Items such as gloves, gowns, and face shields are for protection for our most vulnerable and hardworking individuals.

Single use plastics were also essential for creating COVID-19 vaccines and tests, two developments that allowed us to return to normal sooner. When considering the use of plastics, we should keep in mind the vast range of benefits that have been provided for public health because of plastics.

As with aluminum and other products, the use of more plastics has led to discussions about their production and disposal. Some States and localities, as the Chairman has said, have taken steps to encourage shoppers to use reusable bags instead of single use plastic bags.

Several States have established bottle buy back programs, encouraging customers to return their plastic bottles after being used. In addition, recycling and advanced recycling offer promising solutions for dealing with plastic waste.

However, lack of demand and contamination issues have kept recycling from realizing its full potential. Access to recycling is a problem. It is limited, if not completely unavailable, in many parts of the country, including rural areas, such as many places in my home State of Mississippi.

Congress has taken steps to tackle these issues. We addressed contamination concerns when we included Senator Portman's RECYCLE Act in the Bipartisan Infrastructure Law. This legislation, which is now in statute, creates a new grant program to fund recycling education, with a goal of reducing contamination.

We also addressed recycling access issues when this Committee and the Senate passed Ranking Member Capito's Recycling Infrastructure and Accessibility Act. This legislation seeks to make recycling easier and more accessible throughout the United States, particularly in underserved areas.

Congress also passed Senator Sullivan's Save Our Seas 2.0 Act in 2020, establishing a new grant to support improvements to municipal recycling programs.

Advanced recycling is another potential solution for plastic waste. This method of recycling dismantles plastics into their constituent parts, allowing for more materials to be repurposed. Advanced recycling technology can also extend the life of existing materials so that fewer virgin materials have to be used.

Notably, this method, advanced recycling, allows many previously unrecyclable plastics to be processed while also dealing with contamination issues. These advancements are important to keep in mind as we look to the future of plastics and continue to work to reduce plastic waste.

Thank you, Mr. Chairman.

Senator MERKLEY. Thank you very much.

We are going to turn now to our witnesses.

I will first introduce Dr. Pete Myers, the founder, CEO, and Chief Scientist of the Environmental Health Services.

We look forward to hearing your testimony. Mr. Myers, the floor is yours.

STATEMENT OF JOHN PETERSON "PETE" MYERS, PH.D., FOUNDER, CEO, AND CHIEF SCIENTIST, ENVIRONMENTAL HEALTH SCIENCES

Mr. MYERS. Thank you very much, Chairman Merkley, Ranking Member Wicker, Senator Whitehouse. It is an honor to be in front of you today to provide testimony.

As you said, my name is Pete Myers. I am founder, board chair, and chief scientist of Environmental Health Sciences, a C3 that promotes public understanding of the intersection between health and the environment.

I am also an adjunct professor of chemistry at Carnegie Mellon University and a founder and a board member of Sudoc.com, a chemical company building out sustainable chemistry.

You have invited me here today to talk about plastics and human health, right in my sweet spot. I have been doing it for a long time. I will summarize some of the key concepts in the science and then provide specific examples of where chemicals leeching out of plastics have harmed human health. I can't cover it all in 5 minutes because there is so much more, so please look at my written testimony.

Endocrine disrupting compounds, which Senator Merkley mentioned, are a key part of the story. They are not the only chemical hazard in plastics, but because they cause harm at such extraordinarily low doses, I will focus on them this morning.

What are endocrine disrupting compounds, EDCs? They hack hormone signaling. Hormones are the messaging system that tells genes when to turn on and off. They affect literally all physiological processes throughout our bodies. They make sure the fetus grows up to a healthy adult. They also work to ensure that healthy adults age well.

When hormone signals are hacked, bad stuff happens. That is what endocrine disruption is about. We are exposed to hundreds of endocrine disrupting compounds throughout our lives, including from plastics. Many chemicals leeching out of plastics are EDCs. That links them to a wide array of today's epidemics of non-communicable diseases, like breast cancer, prostate cancer, testicular cancer, infertility, immune disorders, and brain impediments, including ADHD and autism.

Toxicity in plastics, you have to understand, comes from three different sources. One is the basic building block of plastics, what is known as the polymer, what becomes the chain that makes a plastic. Then you have the additives that are infused into the plastic that is composed of monomer. These molecules, like phthalates, alter the material characteristics of the plastic.

Finally, you have chemicals that were not intentionally added, and these are really important, but most people are unaware of them. They are the result of impurities in the reagents that are used to make the plastics originally. Those impurities come from many different sources. They often can't be controlled, and it is really expensive to remove them. If you were to spend the money to remove them, plastic would be much more costly.

Most chemicals in plastics have not been tested for safety. None have been tested thoroughly, but if you don't test, you don't know if they are safe. If you don't test, you don't know. That is one of

my core messages: You must test. If you take a random sample of plastics from consumer shelves, about 75 percent of them will show at least one toxic feature, 75 percent, off the shelf.

Also, you can't assume that bioplastics are safe. Some are definitely not. You have to test to determine what is safe and what is not.

I studied endocrine disruption for 30 years. In 1991, I even gave it that name, endocrine disruption. In 1996, I coauthored the first book for the general public about endocrine disruption called Our Stolen Future. Since then, over a billion dollars and euros and yen and whatever need be, have been invested in EDC research around the world. Tens of thousands of scientific papers have been published in the peer reviewed literature. We know so much more now than we did in the early 1990s.

Senator MERKLEY. Please feel free to hold on for a moment while we figure out what happened to the lights.

Mr. MYERS. I must have said something shocking.

[Laughter.]

Senator MERKLEY. Somebody doesn't like your testimony, apparently.

There we go. Now we are all now collectively enlightened.

Thank you, please continue.

Mr. MYERS. What we know now, after all that research, tells us that it is much worse than we thought when this discipline began, much worse. The ubiquity of EDCs in plastic and the abundance of plastic everywhere is a major factor in why it is worse.

Let me give you four quick examples, or at least start on four quick examples before my time runs out. One: Data showed that, over the last five decades, there has been a 50 percent decline in sperm count in adult men. The original studies have only focused on men in the developed world, but just this past month, a new study came out that expanded it to the developing world also, and what it showed is the rate of decline is speeding up. It is not slowing down. It is global.

It is not just sperm count. Other features of male and female infertility are worsening also. If the current rate of sperm count decline continues, the average sperm count will decline asymptotically toward zero by the 2040s. That is not very far off. Reproducing the old fashioned way will become much less common. It just won't work.

To add injury to injury, some plastic chemicals interfere with artificial reproduction technologies, which, to begin with, are quite expensive. That is one.

Two: Brains are being rewired by certain plastic chemicals. This has been proven definitively in animal experiments where you can take the brain apart. Epidemiological studies of kids whose mothers were monitored for chemicals during pregnancy shows patterns predicted by these experiments. Not always, but most of the evidence is consistent. ADHD and autism are part of the picture.

I will end with this. One expert in how thyroid hormone is key to proper brain wiring and how EDCs hack thyroid hormone has written that "Unless the long term exponential increase in autism is stopped by 2045, one in two children born in the U.S. will be on the autism spectrum." Think about what that means for society.

I have several other examples I could go on about why do so many men have trouble peeing in the bathroom as they grow old, or some really interesting work on how chemicals interfere with breast cancer treatment, but I will stop here.

I look forward to your questions.

[The prepared statement of Mr. Myers follows:]

Environmental Health Sciences
614 W. Lamme St., Bozeman, MT 59715
EHN.org | DailyClimate.org

Testimony of John Peterson Myers, Ph.D., Board Chair and Chief Scientist of Environmental Health Sciences (EHSciences.org), to the U.S. Senate and Public Works Committee on Chemical Safety, Waste Management, Environmental Justice and Regulatory Oversight's Hearing: Examining the Impact of Plastic Use and Identifying Solutions for Reducing Plastic Waste.

15 December 2022

Thank you for the opportunity to provide testimony today on this critical topic. My name is Pete Myers and I am the founder, Board Chair and Chief Scientist of Environmental Health Sciences, a 501(c3) that promotes public understanding of key issues in how environmental factors affect human and wildlife health. I am also Adjunct Professor of Chemistry at Carnegie Mellon University and a Founder and Board Member of Sudoc.com.

You have invited me to address the issue of plastic additives and human health. Over the last 30 years a huge scientific literature has arisen that explores this wide and deep issue. There are many dimensions to it. I will cover highlights and point to sources that go deeper. But let me begin by reporting that I have read Judith Enck's testimony and strongly endorse each point she makes. Fixing the plastics issue is a wicked problem that requires federal and international leadership. Too many decisions about plastic safety were made in ignorance. And now we live and suffer with the consequences.

Here are two overarching realities of plastic:

- There is no single "plastic"... there are virtually an unlimited number of plastics that vary in composition because of:
    - choice of monomer (the basic building block of the polymer chain),
    - choice of additives (thousands of ingredients that can be added to change the material characteristics of the plastic into something a chemical engineer can use to make a product, and
    - "non-intentionally added substances" or NIAS, which are there because of impurities in ingredients that are intentionally added, because of reactions between the chemicals, because of air pollution in the facilities where the plastic is being made, etc.
- Each of these three choices can introduce toxicities into plastics. Therefore, I am going to broaden your request to me to consider all three, not just additives.

Plastic is not inert. Biologically it can be very active. How active depends upon the choice of monomer, the additives and the NIAS. It also depends upon the wear and tear of the plastic, for example, because worn plastic can leach ingredients more rapidly.

The combined effect of these two realities is that plastic cannot be considered "safe" until it is thoroughly tested. And no plastic has ever been thoroughly tested using the tools of modern, 21st century medical science. The closest to a thorough test has been Bisphenol A (BPA) in the US NIEHS/FDA/NTP $30M

experiment called CLARITY-BPA. This research revealed many toxic attributes, which the FDA chose to ignore by invoking a thoroughly falsified 16th Century assumption.[1] [See attachment 1.]

Endocrine disruption is an essential piece of the story of plastic toxicity (See Infographics 1 and 2). Many of the ingredients of plastics disrupt hormone action. They are called endocrine disrupting compounds (EDCs).

Hormones are chemical signals that govern vital physiological and genetic processes in our bodies. They guide development of the fetus to adulthood, controlling how our nervous system is wired, how our reproductive tract grows, how our organs form and mature, whether our immune system works. When those chemical signals get hacked by chemical agents, the effects can be ruinous.

- I began working on endocrine disruption in 1989, when it didn't have a name.
- In 1991 I coined the term 'endocrine disruption' at a scientific meeting in Wisconsin.
- In 1996 I co-authored a book, *Our Stolen Future*, the first book for the general public on endocrine disruption. It included passages about the effect of plastic ingredients on human health.
- That year, Congressman John Porter, Republican of Illinois and then Chairman of the House Subcommittee on Health Appropriations invited me to attend hearings on the NIH Budget. Dr. Harold Varmus, Director of the NIH, was testifying. In the middle of the hearing Porter held up *Our Stolen Future*, pointed at it, and said "Dr. Varmus, you need to read this book."

Now, almost 25 years later,

- Over a billion dollars have been invested around the world in scientific research on endocrine disruption.
- 10s of thousands of papers have been published about it in the peer-reviewed literature.
- Our understanding of how EDCs work has been vastly deepened.
- A lot of this research has been on plastics and what is in them

The bottom line is that it is much worse than we realized 25 years ago. It's on a scale of bad somewhere near, if not equal to, climate change. And some of its worst impacts may strike well before climate change's worst consequences unfold.

The Endocrine Society, the world's largest professional association of doctors and scientists specializing in hormone related diseases, has identified endocrine disruption as its top public policy issue, because its membership is on the front lines of witnessing, and treating, a wave of non-communicable endocrine-related epidemics that research has revealed are at least in part caused by endocrine disruption.[2]

All that research has made it very clear that common chemical exposure levels… levels that people encounter every day… can have severe effects (Infographic 3).

Hundreds of epidemiological studies published in the last 20 years support that assessment, as do thousands of laboratory studies with animals, cells and cellular machinery.

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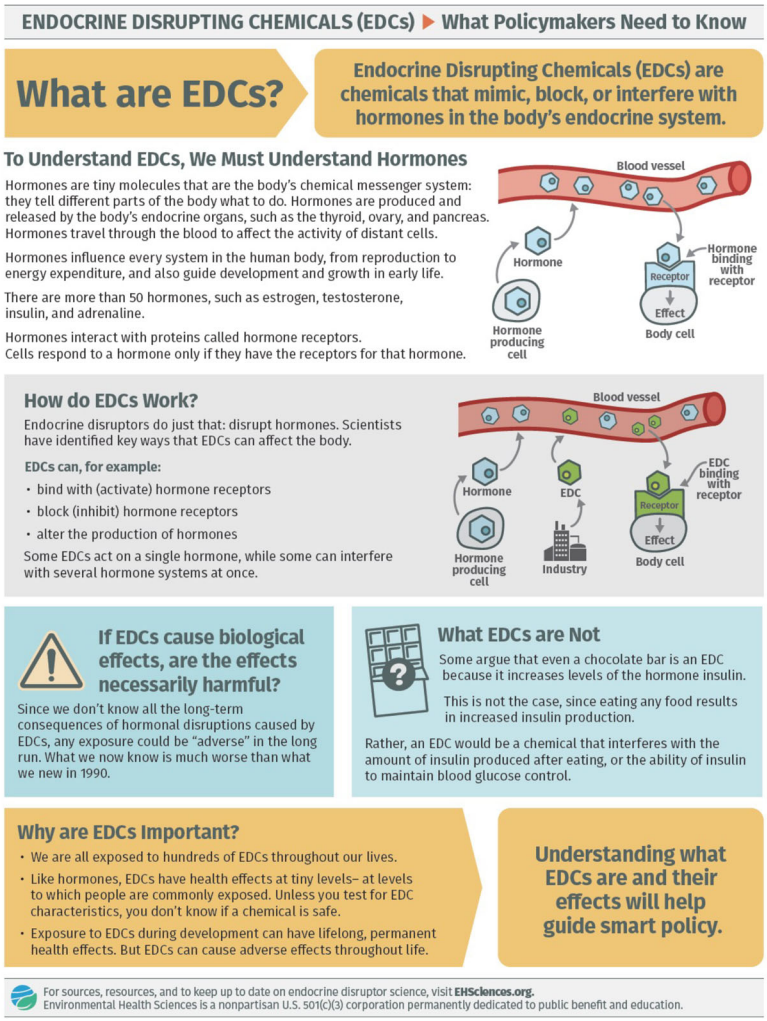
[1] Data integration, analysis and interpretation of eight academic CLARITY-BPA studies. doi: 10.1016/j.reprotox.2020.05.014

[2] Endocrine-disrupting chemicals. An Endocrine Society Position Statement. https://www.endocrine.org/advocacy/position-statements/endocrine-disrupting-chemicals



Infographic 1.

Infographic 2

Infographic 3.

The Endocrine Society periodically assesses the state of EDC science (as well as publishing peer-reviewed journals that carry original EDC research). In the most recent assessment, published in 2015, they state that the evidence is strongest for: "1) obesity and diabetes; 2) female reproduction; 3) male reproduction; 4) hormone-sensitive cancers in females; 5) prostate; 6) thyroid; and 7) neurodevelopment and neuroendocrine systems."[3]

The published evidence since then has only become stronger. For example:

Relevant to human reproduction:

- In November 2022, Levine, Swan et al. published strong evidence showing that sperm counts world-wide continue to decline... by over 50% over the period 1973-2018, and that the decline is speeding up[4].
- This decline is linked by strong evidence from other research to exposure to chemicals common in plastics, including phthalates, bisphenols and perfluorinated compounds. The crucial exposure is when the baby is in the womb. The impacts manifest later in life.[5]
- If current trends continue, average sperm counts around the world will approach zero by 2045. Most of today's infant boys when they mature will be unable to have babies the old-fashioned way. Artificial reproductive technologies will be necessary for most couples.
- Research on PFAS in Italy "found increased levels of PFCs and seminal fluid positively correlate with circulating testosterone and with a reduction of semen quality, testicular volume, penile length and ano-genital distance (a marker of maleness). Experimental evidence supports our observational results and points toward antagonistic action of PFOA on the binding of testosterone to its natural androgen receptor."
- Moreover, exposure to bisphenols can decrease the success of artificial reproductive technologies[6].

Plastic chemicals rewire the developing brain:

- Epidemiological studies link brains exposed during development to plastic chemicals to neurological disorders such as ADHD and autism.[2,7,8,9]
- One expert on how chemicals alter thyroid signaling, which plays a powerful role in guiding brain development, has predicted that if the increases in autism in the US continue to grow

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[3] EDC-2: The Endocrine Society's Second Scientific Statement on Endocrine-Disrupting Chemicals doi: 10.1210/er.2015-1010. Epub 2015 Nov 6.

[4] Temporal trends in sperm count: a systematic review and meta-regression analysis of samples collected globally in the 20th and 21st centuries. doi: 10.1093/humupd/dmac035.

[5] Count Down: How our modern world is threatening sperm counts, altering male and female reproductive development, and imperiling the future of the human race. Swan and Colino. Scribner, NY.

[6] Urinary bisphenol A concentrations and early reproductive health outcomes among women undergoing IVF https://doi.org/10.1093/humrep/des328

[7] Prenatal phthalates, maternal thyroid function, and risk of Attention Deficit Hyperactivity Disorder in the Norwegian Mother and Child Cohort. https://doi.org/10.1289/EHP2358

[8] Gestational exposures to phthalates and folic acid, and autistic traits in Canadian Children. https://doi.org/10.1289/EHP5621

[9] Bisphenol A exposure in children with autism spectrum disorders. DOI: 10.1002/aur.1444

exponentially, as they have since the 1970s, by 2045 one in two US children will be on the autism spectrum.[10]

Plastic chemicals contribute to obesity and type 2 diabetes:

- Animal experiments exposing fetuses in the womb to EDC chemicals common in plastic cause morbid obesity in adulthood.[11]
- Elegant cell and animal experiments show that very low doses of BPA induce insulin resistance and type 2 diabetes.[2,12]
- These studies are consistent with multiple human epidemiological findings.[2]

Plastic chemicals may be driving the increases in obstructed bladder syndrome (OBS), where men have difficulty urinating. Think about your experience in a public restroom. How often do guys have problems urinating? In the developed world, OBS can be managed pharmaceutically and sometimes via surgery. In the developing world without advanced health care, OBS is a death sentence because it leads to kidney failure. For people in the US without sufficient health insurance to cover the intensive treatments required, OBS is also a death sentence.

- The only animal model that manifests obstructed bladder syndrome is caused by BPA exposure in the womb, coupled with natural hormonal changes that occur as men age. It can also be induced by an adult exposure to BPA when fetal exposure had preceded adult exposure. This "second-hit" pattern is common in EDC studies. Fetal exposure sets it up. A second exposure later in life seals the deal.[13]
- A 6-year prospective epidemiological study found that BPA is a predictor of chronic kidney disease and high blood pressure in men.[14]

Plastic-related EDCs are strongly implicated in causation of cardiovascular disease, the leading cause of death for men and women and people in most racial and ethnic groups in the US.[15] A now famous prospective study reported that levels of BPA measured in adult men was a strong predictor of heart disease victims a decade later.[16] Phthalates are also associated with cardiovascular diseases.[17]

Perhaps the biggest surprise in EDC research over the past 30 years has been the discovery and repeated reporting of "transgenerational epigenetic inheritance," including with plastic-related chemicals such as organotins, bisphenols and plastics. Fetal exposure during crucial windows of development cause effects not only after birth, but those same (and related) effects are carried on to subsequent generations, with no changes in DNA sequence. What changes are the control mechanisms (epigenetic) for how hormones

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[10] p97-98 in Demeneix, B. Toxic cocktail: How chemical pollution is poisoning our brains. Oxford University Press 2017.

[11] Obesity II: Establishing causal links between chemical exposures and obesity. doi: 10.1016/j.bcp.2022.115015

[12] Endocrine disruptors in the etiology of type 2 diabetes mellitus. doi:10.1038/nrendo.2011.56

[13] Interactive effects of perinatal BPA or DES and adult testosterone and estradiol exposure on adult urethral obstruction and bladder, kidney and prostate pathology in male mice. doi: 10.3390/ijms21113902

[14] Serum bisphenol A as a predictor of chronic kidney disease progression in primary hypertension: a 6-year prospective study. DOI:10.1097/HJH.0000000000000780

[15] Heart disease facts. US Centers for Disease Control and prevention. https://www.cdc.gov/heartdisease/facts.htm

[16] Urinary bisphenol A concentration and risk of future coronary artery disease in apparently health men and women. DOI: 10.1161/CIRCULATIONAHA.111.069153

[17] Phthalates implications in the cardiovascular system. https://doi.org/10.3390/jcdd7030026

turn genes on and off. The details of the mechanisms are still under study but the phenomenon, however it is caused, is real.[18] This phenomenon is especially troubling for safety testing of chemicals because sometimes adverse effects do not appear until the second generation after fetal exposure to the first generation.

Recent studies demonstrate that plastics in medical equipment can undermine chemotherapy for breast cancer, including increasing the risk of relapse and death.[19]

Recommendations:

As I stated early in this testimony, the plastic problem is wicked. There are no silver bullets. But there are important steps to take beginning now that can reduce the threat that plastics represent for our health and environment.

Re-think: Many applications of single use plastics are not essential. Packaging can be reduced and eliminated. Re-use and re-fill systems can be implemented that dramatically reduce the need for single use packaging. Serious efforts should be made to identify the essential uses of plastics vs. non-essential. Decisions on what is essential should be made by parties with no conflicts of interest.

Reform: The regulatory system needs to be reformed by (1) incorporating 21st century biomedical science in its assessments of safety and (2) eliminating conflicts of interest that currently pervade the system. See Attachment 1 and Infographic 4 (next page).

Redesign: There are essential uses of plastic, especially in medicine. But chemists should be given the challenge of creating safer materials to use when the services of the material are required. We know enough now from all the research that's been conducted on endocrine disruption to help chemists avoid EDC characteristics in the design of new materials.[20]

The US should study the approach upon which the European Union is now embarked: The Chemical Strategy for Sustainability.[21] It embraces modern biomedical science, based upon endocrinological principles to avoid EDC hazards. It is structured around the issue of essential use. And its implementation will involve major commitments to funding sustainable chemistry.

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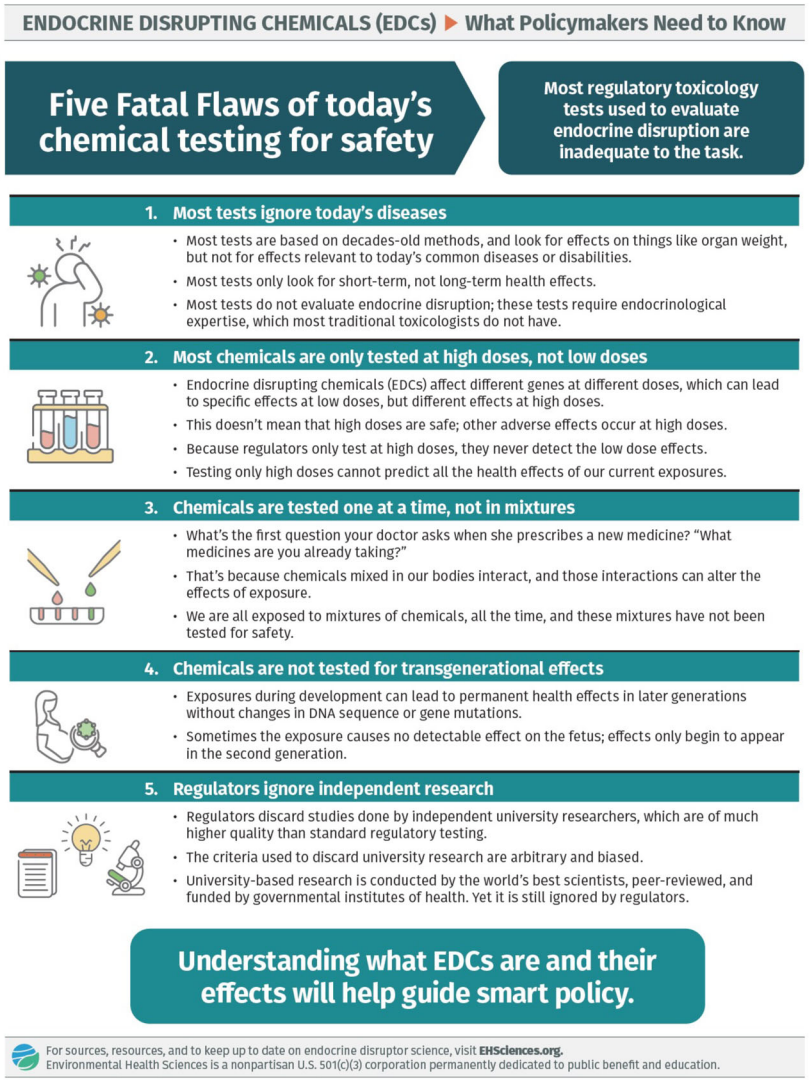
[18] Molecular mechanisms of transgenerational epigenetic inheritance. https://www.nature.com/articles/s41576-021-00438-5

[19] DEHP mediates drug resistance by directly targeting AhR in human breast cancer. https://doi.org/10.1016/j.biopha.2021.112400

[20] Designing endocrine disruption out of the next generation of chemicals. https://pubs.rsc.org/en/content/articlelanding/2013/gc/c2gc35055f#!divAbstract

[21] Green Deal: European Commission adopts new Chemicals Strategy towards a toxic-free environment. https://ec.europa.eu/commission/presscorner/detail/en/ip_20_1839



Infographic 4

Senate Committee on Environment and Public Works
Hearing Entitled, *"Examining the Impact of Plastic Use and Identifying Solutions for Reducing Plastic Waste"*
December 15, 2022
Responses to Questions for the record from John Peterson Myers, Ph.D.
Environmental Health Sciences and Carnegie Mellon University
Responses Submitted January 12, 2023

Ex-Officio Chairman Carper:

1. ***Technology and science have come a long way in recent decades. It is my understanding that chemical recycling facilities have the capability to produce products from plastic waste, including plastic resin and chemicals, as well as fuel for transportation or other purposes. Some have argued that a process that makes fuel that is burned - and emits greenhouse gases into our atmosphere – should not be considered to be, or referred to as, recycling.***

    a. ***Do you agree that converting plastics-to-fuel should not be considered to be recycling?***

    Converting plastics-to-fuel manifestly does not qualify to be recycling. What it qualifies to be is burning waste for fuel using old technologies, pyrolysis and gasification, that have been round for a long time. The plastic problem cannot be solved by giving these old technologies new names like "chemical recycling," especially if that renaming is used to justify release of additional greenhouse gases and toxic gases into the atmosphere.

    Calling it a new name will not reduce the harmful effects of those gases on the planet or on people living near the facilities.

    Hiding old technologies behind new names is simply another attempt at greenwashing that would give false excuses for continued exponential growth in plastic production. Moreover, it is an approach that is costly, will work at scale only with public subsidies, and ultimately will be unsuccessful at reducing the plastic problem because the costs of implementing it at a scale sufficient to have material effects on the plastic problem would be too great.

    The only way to reduce the plastics problem at scale is to reduce the production of plastic, and to do so smartly by identifying and eliminating uses of plastic that are not essential. Start with non-essential single use plastics. Identify them and turn off their production. For those uses that are deemed essential, begin now to rethink how those uses can be replaced. Introduce policies that will stimulate innovation, including in chemistry.

    b. Are there any risks to public health created from the burning of plastics for fuel or resin that should be considered by the federal government when regulating these facilities?

The well-known risks of these related technologies include:

- Air emissions of very toxic chemicals such as acetaldehyde, arsenic, benzene, bisphenols, dioxins, ethylbenzene, formaldehyde, hexane, hydrochloric acid, methanol, mercury, toluene, and xylenes.
- Those chemicals are known risk factors for a wide array of adverse health effects, including cancer, infertility and other types of reproductive harm, neurological disorders, heart disease, liver dysfunction, kidney effects, asthma and more.
- burning plastics for fuel or resin also produces hazardous waste.

If the EPA chooses to ignore these problems it will be a severe dereliction of duty and will lead to serious health effects, especially (but not only) in the communities where such facilities are located, which often are communities of color.

2. We are aware of the extremely high risk of cancer and other illnesses for those living in the vicinity of plastics production and disposal facilities.

a. Please identify five of the top public health manifestations of exposure to chemicals found in (and released from) plastics throughout the plastic lifestyle from manufacture to use and disposal.

The public health manifestations listed below all have multiple causes, including chemicals found in plastics at one or more times in the plastic lifecycle. The Endocrine Society's position statement on this plus authoritative books written by different experts in the field are listed in the footnotes. Additional references are provided in my written testimony.

- Heart disease[1]
- Type 2 diabetes[1, 2]
- Male and female infertility, such as declining sperm quality and quantity[1,3]
- Obesity (via the action of obesogens) [1,2,3,4]
- Neurological disorders such as ADHD and autism[1,5]

[1] Endocrine-disrupting chemicals. An Endocrine Society Position Statement. https://www.endocrine.org/advocacy/position-statements/endocrine-disrupting-chemicals
[2] *Sicker, Fatter, Poorer*. Leonardo Trasande
[3] *Count Down*. Shanna Swan and Stacey Colino
[4] *The Obesogen Effect*. Bruce Blumberg
[5] *Toxic Cocktail*. Barbara Demeneix

b. Does plastic also endanger the health of the rest of us? Please explain.

Chemicals found in plastic such as the bisphenols (including BPA), the phthalates (including DEHP) and the perfluorinated compounds (PFCs) literally find their ways into almost all humans (and wildlife) on the planet. Because they interfere with hormone signaling, a process vital to almost all bodily functions including development of the fetus, they are called endocrine disrupting compounds (EDCs). Strong ties have been repeatedly found between EDCs and almost all of the major non-communicable disease that have become epidemic around the world, including the 5 listed above. And because they also interfere with hormonally-controlled development of the immune system (for example decreasing the effectiveness of vaccines, they are linked to communicable diseases also.

It is no accident that the Endocrine Society, the world's largest professional association of medical and scientific experts in endocrinology, has made EDCs, including in plastics, one of their top policy issues. Why? Because physicians specializing in endocrine-related disease have watched these epidemics grow over the last 5 decades and realized that treatment was not stopping that growth and that preventing exposures to EDCs was a vital public health measure.

Policy makers in the European Union has listened repeatedly to representatives of the Endocrine Society. And as a result, endocrinological principles are at the core of the European Union's "Chemicals strategy for sustainability," launched on 14 October 2020. The EU has invested €50M in was to test chemicals for EDC action, research that is currently underway. The chemicals strategy also commits to funding major research on "sustainable chemistry" so that the European chemical enterprise can replace EDCs with safer materials.

Unfortunately, in the US both the EPA and the FDA (their Center for Food Safety and Applied Nutrition) have lagged far behind. The EPA has yet to fulfill a Congressional mandate in an amendment to the Food Quality Protection Act to screen pesticide chemicals in food for endocrine disruption.[3]

The FDA has rejected incorporation of key endocrinological principles in the way it assesses food safety, including involving chemicals that are in plastic and which migrate into food. The FDA continues to ignore inconvenient data from a $30M collaborative project funded by taxpayers and implemented by the FDA, the US

[3] Failure to launch. The Endocrine Disruptor Screening Program at the U.S. Environmental Protection Agency https://doi.org/10.3389/ftox.2022.908439

National Institute for Environmental Health and the National Toxicology Program (see the 48 page appendix I attached to my written testimony).

This program, named CLARITY-BPA was explicitly designed and executed to determine whether FDA's chemical approaches to assessing chemical safety were as capable of bisphenol A safety as independent university-based NIH-funded researchers. As described in that attachment, the FDA's methods failed and in the end the FDA refused to collaborate in a joint assessment of the research by FDA, NTP and university researchers, despite having committed to doing so when the project was designed.

Another source of exposure to dangerous chemicals in plastic is in some medical equipment. For example, Genco et al. state that "the role of healthcare in exposing individuals to EDCs is grossly underappreciated… healthcare providers are unknowing mediators of exposures to EDCs, chemicals that might not only promote disease but that also may antagonize the efficacy of treatments."[4] Phthalates, well-established as EDCs, are commonly found in plastic IV tubing and bags. According to Genco et al. phthalates account for up to 30% to 40% by weight of medical use plastics. Bisphenol A is widespread in medical appliances made out of polycarbonate plastic, including in kidney dialysis machines. High levels of both chemicals are in the equipment in intensive care units. PFAS chemicals also widely used to coat medical care plastics.

My organization, Environmental Health Sciences, is currently collaborating with a major privately-held medical equipment company to determine which of their products contain EDCs and to help prioritize efforts to remove them. Some of the uses will undoubtedly be found to be essential, some will not. The plan is to eliminate the plastics with EDCs whose uses are non-essential, and to work with the company and independent chemists to identify replacement chemicals, some of which may have to be redesigned at the molecular level to avoid EDC hazards. We know so much more now about EDC toxicity than we did when the current generation of plastics were developed this may be possible.[5]

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[4]Unwitting Accomplices: Endocrine Disruptors Confounding Clinical Care. Journal of Clinical Endocrinology & Metabolism 2020 doi: 10.1210/clinem/dgaa358

[5] Designing endocrine disruption out of the next generation of chemicals. https://pubs.rsc.org/en/content/articlelanding/2013/gc/c2gc35055f/unauth

Please explain how the science of epigenetics relates to the inter-generational harm that may be caused by exposure to toxic chemicals widely used in plastic.

Transgenerational epigenetic inheritance was first reported in animals in 2005[6]. Since then dozens of reports have confirmed the basic observation: exposing a pregnant rodent (called F0) can not only affect the fetus (F1), but also the offspring of the fetus (F2) and the offspring of the offspring of the fetus (F3).

In humans, F3 would be the great grandson or great granddaughter of the mother that was exposed while pregnant with her daughter. In humans and rodents, the fetus (F1) of the exposed mother (FO) is already forming all the eggs she will ever have. So exposing the mother simultaneously exposes F1 and F2. F3, however, is never exposed.

Careful experiments confirmed that the DNA sequence has not been altered. Subsequent work has confirmed that instead of altering the DNA sequence of subsequent generations, genetic factors that control when a gene is turned on or off were changed. Those factors are called the epigenome. Until this study, that had not been observed.

Changes in the epigenome will affect when genes are turned on and/or off. In simplified terms, if a gene's epigenome prevents the gene from turning on, then it is functionally the same as not having the gene in the first place. The adverse effect will depend upon what the gene "was supposed to do." For example, if turning on the gene normally leads to the synthesis of a protein that suppresses tumors, a mouse or a person whose epigenome prevents that gene from turning on will be less equipped to suppress tumors.

Several chemicals commonly used in plastics have been confirmed to cause transgenerational epigenetic inheritance in animal experiments, including bisphenols, phthalates and organotins. A variety of adverse health effects have been observed. For example, organotins can cause obesity in mice[7]. Organotins are commonly added to PVC plastic. This suggests that the practice of installing PVC piping in homes for drinking water might be a bad idea. Much more research needs to be done before PVC piping is used to replace lead water pipes.

No regulatory decisions on chemical safety, including chemicals in plastic, have ever considered the possibility of intergenerational epigenetic inheritance. This is a giant blind spot is chemical regulation, especially because of the transgenerational dimension of the effects.

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[6] Epigenetic Transgenerational Actions of Endocrine Disruptors and Male Fertility. http://www.sciencemag.org/cgi/content/full/308/5727/1466

[7] Epigenetic transgenerational inheritance of the effects of obesogens exposure. https://www.frontiersin.org/articles/10.3389/fendo.2021.787580/full

There is much we do not know about this phenomenon, particularly since there is no direct confirmation that it occurs in people. The evidence from animals, not just multiple species of rodent but also multiple species of fish, is strong and the basic mechanisms controlling gene action are highly conserved. It is highly unlikely that humans have evolved away from such a basic mechanism.

Senator MERKLEY. Thank you very much for your testimony. I do encourage people to read your full written testimony.

We are now going to turn to Ms. Enck.

You serve as President of Beyond Plastics, and former EPA Regional Administrator for Region 2. The microphone is yours.

STATEMENT OF JUDITH ENCK,
PRESIDENT, BEYOND PLASTICS

Ms. ENCK. Good morning, Senators. What an honor to be with you. Thank you for holding this hearing. It is so timely, and so vitally important that we get to solutions.

I am Judith Enck. I use she/her pronouns, former EPA regional administrator, founder of Beyond Plastics, and I am on the faculty at Bennington College in Vermont.

On the off chance that you are not riveted by my 22 page testimony today, I want to direct you to page 8, with a great cartoon by Liza Donnelly. There is a guy or a gal looking out the window with their daughter, saying, "Someday, daughter, all of this will be yours, and you will just have to deal."

I included that cartoon because it is a reminder of what is at stake, that we cannot leave our kids and our grandchildren with this enormous problem of plastic pollution. There are solutions. I can go on forever with solutions we can grab off the shelf today.

There are also false solutions being promoted by the plastics industry, which I hope we can get into, which is chemical recycling, or advanced recycling. You all know, you open a package that you order on Amazon, for instance, it arrives really over packaged, so much stuff you don't need. And in fact today, the prestigious national group, Oceana, put out a report on how much plastic packaging is produced by Amazon.

Amazon, we need you to do much, much better.

Oceana also commissioned a poll. Eighty-two percent of voters want you to adopt laws to reduce plastics. The poll results were bipartisan, Republicans, Democrats, Independents. When I served at the EPA, I met many people who were climate change deniers. I have never met a plastic pollution denier, because the evidence is everywhere. You walk down the street, you see plastic bags in the trees.

I also want to go on the record by saying, there are some uses of plastic. But we don't see medical waste hanging from trees. And medical waste, by the way, is a small percentage of plastic production.

Cars are more efficient if they have some plastic, making them lighter. I don't see car bumpers in my local park. I see a lot of single use plastics.

This is a climate change issue. My organization did a report called The New Coal: Plastics and Climate Change. We looked at production, use, and disposal of plastics, and learned that in the next decade, greenhouse gas emissions from plastics will exceed that of coal.

I support recycling. I started my town's recycling program over 30 years ago. Everyone should keep recycling metal, glass, cardboard, aluminum. However, plastic recycling has been an abysmal failure. It clocks in at under 10 percent.

I quickly want to explain why. If you take a newspaper, and you put it in the recycling bin, it can then be recycled into a new newspaper. There are many, many different plastic resins, as Dr. Myers said, thousands of different plastic chemical additives in plastics, and many different colors.

In your own home, your washing machine probably has on top of it a bright orange detergent, hard plastic. In your refrigerator, you have a clear squeezable plastic. Those two cannot be recycled together. And when the plastics industry says they can use chemical recycling and create new plastics, that is not true. What they are mostly producing is fossil fuel. That is the last thing we need, is more climate warming fossil fuel.

Also, it is just not dealing with a large percentage of plastics that are out there. This is very much an environmental justice issue. Plastics are produced in environmental justice communities, places like Cancer Alley in Louisiana, where there is a concentration of petrochemical facilities.

These communities, typically low income communities of color, are so overburdened on both the production side, and then because so little plastics actually get recycled, when it comes to disposal it is these same communities that are homes to landfills and incinerators.

We need to cut plastic production by 50 percent in the next 10 years. We can do it. Pass the Break Free from Plastic Pollution Act, pass the National Bottle Bill, pass a sensible law called the Plastic Reduction and Recycling Act, also known as EPR, which has been introduced in State legislatures around the country. We don't need a magical breakthrough. We need reduction, refill, and re-use. And if you absolutely cannot reduce or refill and re-use, then rely on paper, metal, glass. Get the toxics out, particularly out of the paper. And make sure that material is made from recycled content and are easily recyclable.

Local governments are drowning in plastics that you can't recycle. If you are a fiscal conservative, you should embrace plastics reduction. We have got to be honest: Plastics recycling isn't working. It is having a devastating impact on health in the communities where it is manufactured. Reduction is the way to go.

The Federal Government could start using real dishes in all of all of its facilities, rather than single use plastics. Schools need funding to install dishwashing equipment, to stop serving children on single use, for instance polystyrene trays. How about public drinking water fountains everywhere you go, so you can fill this up rather than wasting your money on plastic water bottles?

Funding is key. When you look at infrastructure, I urge you to think about putting funding for States and local governments into a re-use, refill infrastructure. Right now, local governments can't control everything that is coming at them. But packaging companies have choices to make. Are they going to provide sustainable packaging, or more and more multi-material packaging, that is either littered, buried, or burned?

You and I don't want to use so much plastic. But we have little choice, which is why extended producer responsibility with teeth goes a long, long way.

[The prepared statement of Ms. Enck follows:]

BEYOND PLASTICS
BENNINGTON COLLEGE

Testimony of Judith Enck, President of Beyond Plastics

U.S. Senate Environment and Public Works, Subcommittee on Chemical Safety, Waste Management, Environmental Justice and Regulatory Oversight Hearing: *Examining the Impact of Plastic Use and Identifying Solutions for Reducing Plastic Waste*

Washington, D.C.

December 15, 2022

Thank you for the opportunity to offer testimony today on this critical topic. My name is Judith Enck, and I am the founder and president of Beyond Plastics, a nonprofit that aims to end plastic pollution everywhere. I am on the faculty of Bennington College in Vermont, and I served as Regional Administrator for Region 2 at the U.S. Environmental Protection Agency, appointed by President Barack Obama.

The production, use, and disposal of plastics is a vitally important issue that threatens human health, our ability to avoid the worst projected impacts of climate change, and the health of our oceans and environment. The U.S. already has sufficient plastic production to meet domestic demand and is a net exporter of plastics. But petrochemical and fossil fuel companies are seeking to add profits from low U.S. gas prices and are building new production facilities intended for plastics export to global markets, including to countries that lack basic waste management systems. These U.S. facilities include ethane crackers in low-income communities of color—making pollution and health problems in the U.S. even worse.

Unfortunately, federal leadership has been sorely lacking on plastics waste. To briefly summarize federal actions to date: in 2015, Congress passed and President Obama signed the Microbead-Free Waters Act, which limited the use of rinse-off cosmetics containing plastic microbeads. In 2020, Congress passed and President Trump signed the Save Our Seas 2.0 Act which created a genius prize, urged international cooperation, and provided

grants for studies of waste management and mitigation programs. One of the products of Save Our Seas 2.0 was a 2022 report by the National Academies of Sciences, Engineering, and Medicine titled "Reckoning with the U.S. Role in Global Ocean Plastic Waste."[1] This bipartisan report called for the United States to create a national strategy by the end of 2022 to reduce our increasing contributions to global ocean plastic waste, including a focus on reducing the amount of plastic waste generated in our country. This report and others show that it is past time to address the plastic pollution crisis we currently face.

We need major new federal legislation to significantly reduce the production, use, and disposal of plastics, and we need it now.

One caveat: I'd like to note that there are valid uses for certain plastics. For example, many life-saving medical devices are made with plastics. But medical uses for plastic account for a tiny percentage of all the plastics made, used, and disposed of—and we're not seeing beaches littered with pacemakers or trees festooned with IV tubing.

I do not dispute that plastics used to make car parts lighter can improve the fuel efficiency of cars. But, again, car bumpers are not commonly found in our rivers and streams, and they are used for decades, not minutes.

Plastics are also used in electronics such as phones and computers. Even though we use these devices for years–not minutes–they still break down, and when they do, they should be repaired, not discarded. Congress needs to pass a "Right to Repair" law so that electronics, car parts, and consumer items are designed to be repaired, rather than being designed for wasteful and expensive "planned obsolescence" as they are now.

My testimony today focuses not on the tiny percentage of plastics used to create medical devices or car bumpers, nor on the plastics used in electronics, but on the *majority* of plastics produced that are designed *for a single use* before being buried in a landfill, littered in our environment, or burned in an incinerator. This growing class of non-essential plastic products includes single-use plastic bags, straws, cups, forks, plates, gift cards, bottles, vapes and e-cigarettes, and plastics in cigarette filters, to name just a few of the most common problem items. I find it particularly ironic that plastic—a

[1] "Reckoning with the U.S. Role in Global Ocean Plastic Waste." National Academies of Sciences, Engineering, and Medicine, 2022.

material that lasts for literally hundreds of years, if not longer—is used to make so many products that are designed to be used just once before they are thrown away.

We need policy solutions that are commensurate with the problem that is described below. Voluntary efforts by the business community are not working and there is no more time to waste on fictional schemes and failed approaches. Some states and local governments have adopted new laws, but the federal government is largely missing in action. This will only change with Congressional leadership—the leadership of this committee and your colleagues in the House.

I've included more details in the section of my testimony that deals with solutions, but **my primary recommendation is for Congress to adopt a law establishing the goal of reducing the production of plastic by 50% over the next ten years, and providing enforcement mechanisms and federal funding to achieve this goal.**

THE PROBLEMS WITH PLASTICS

Plastics Are Polluting Our Ocean

Plastic pollution is turning our ocean into a watery landfill. Scientists estimate that about 8 million metric tonnes of plastics enter the ocean each year. This is the equivalent of emptying a dump truck full of plastic into the ocean every minute.[2] Since plastic doesn't decompose, the amount of plastic pollution in the ocean is growing larger as we meet here today. As one of the world's largest producers of new plastics, and one of the world's largest generators of plastic waste, the U.S. bears a unique responsibility for the global plastic pollution crisis. Similar to the global climate change impacts caused by historical carbon emissions from industrialized nations, decades of massive U.S. plastic production are resulting in legacy impacts to global human health and the environment.

This plastic pollution is taking a heavy toll on marine life and ecosystems. It is everywhere—from wetlands and mangrove forests to the ocean floor, including, remarkably, the deepest point of the ocean—the Marianas Trench,[3] and everywhere in between. As a result, plastics are being eaten by all manner of marine life, starting with the tiny zooplankton who form the foundation of the marine food chain. A 2021 study

[2] "The United States' contribution of plastic waste to land and ocean," *Science Advances,* October 2020.
[3] "Plastic in Mariana Trench." National Oceanic and Atmospheric Administration's Science on a Sphere webpage, accessed Dec. 11, 2022.

found that microplastics limit the growth and abundance of microscopic marine life,[4] with troubling implications for all organisms higher up the food chain.

Fish—including many species humans enjoy eating—are eating micro and nano plastics. There are a number of videos that one cannot unsee showing people cutting open fish's stomachs and discovering plastic litter both large and small.[5] Seabirds routinely mistake bits of plastic for food, ending up with stomachs full of plastic litter that they cannot pass. This fools them into thinking they are full of food, and they die of starvation. A recent study indicates that plastic litter covered with algae emits a gas that is similar to seabird's food.[6] Scientists estimate that almost 100% of seabirds will be ingesting plastic by 2050.[7]

Art courtesy of Dave Coverly: www.SpeedBump.com

Sea turtles tend to mistake floating plastic bags for jellyfish—a favorite food—an error that often proves fatal. Researchers found that ingesting just one piece of plastic came

[4] "Microplastics hinder the growth of microscopic marine animals." *Frontier Science News,* Aug. 17, 2021.
[5] "Gut-wrenching video of man finding plastic in fish's stomach in Spain goes viral." YouTube video, accessed Dec. 11, 2022.
[6] "Marine plastic debris emits a keystone infochemical for olfactory foraging seabirds." *Science Advances,* Nov. 9, 2016.
[7] "Threat of plastic pollution to seabirds is global, pervasive, and increasing." *Proceedings of the National Academy of Sciences of the United States of America (PNAS),* August 31, 2015

with a 22% chance of death for sea turtles.[8] A 2015 international study led by the University of Australia Queensland found that half of all sea turtles had ingested plastic.[9] Marine mammals are also at risk. In 2019, a young cuvier beaked whale washed up on a beach in the Philippines–it had died of starvation and dehydration with 88 pounds of compacted plastic trash in its stomach.[10]

These pieces of plastic in the ocean both *contain* toxic materials and also act as sponges that *attract and absorb* toxic pollutants in the water, including pesticides and hormone-disrupting chemicals.[11]

According to researchers, 70-80% of the plastic in our ocean comes from land-based sources.[12] The flow of plastic from humans to the ocean is increasing as new plastic production increases. Today, the well-respected international environmental group Oceana is releasing a new report revealing that Amazon.com generated an estimated 709 million pounds of plastic packaging waste last year. That's 18% more than they estimated just two years ago. It's also enough plastic to circle the Earth more than 800 times in the form of the plastic air pillows that you find in their shipping boxes. Oceana estimates that up to 26 million pounds of this plastic waste will end up in the ocean and waterways.[13]

Plastics Are Harming Human Health

While plastic is clearly a huge threat to our ocean and all its inhabitants, it's not just a problem for ocean creatures; it's also a threat to human health that goes far beyond people who eat a diet high in seafood. Unlike paper products that are biogenic and break down into carbon and other elements that are recycled back into the natural ecosystem, plastics are made from fossil fuel-based carbon compounds that don't *break down*. Instead, they *break up* into smaller and smaller pieces, eventually ending up as little bits known as microplastics—technically any piece of plastic that is five millimeters or less in length. These tiny plastic particles are getting into the water we drink, the air we breathe, the soil our food is grown in, the fish we eat, the salt we flavor our food with, and more.

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[8] "How much plastic does it take to kill a turtle?" CSIRO news release, Sept. 14, 2018.
[9] "World's turtles face plastic deluge danger." University of Queensland, Australia, news release. Sept. 14, 2015.
[10] "This young whale died with 88 pounds of plastic in its stomach." *National Geographic,* March 18, 2019.
[11] "The Plastics Plague: Marine Mammals and our Oceans in Peril." International Marine Mammal Project of Earth Island Institute, 2022.
[12] "Plastic waste in the marine environment: A review of sources, occurrence and effects." *Science of the Total Environment,* Elsevier, Oct. 2016.
[13] "The Cost of Amazon's Plastic Denial." (Oceana), December 15, 2022.

In fact, a 2019 study by the World Wildlife Fund estimated that adult humans are all ingesting 50 grams—roughly a credit card's worth—of plastic each week.[14] It should not come as much of a surprise that whenever scientists look for microplastics, they find them. In the past two years, scientists have found microplastics in the human placenta,[15] in blood,[16] in breast milk,[17] in feces,[18] and in lungs.[19]

Plastics are made from a combination of fossil fuels and chemicals. This means our bodies are being exposed to thousands of chemicals—some of which like fluorine, cadmium, benzene, per- and polyfluoroalkyl substances (PFAS), bisphenol A (BPA), bisphenol S (BPS), and phthalates—we already know are harmful to humans. Scientists are just beginning to study the impacts of these chemical "plasticizers," and early results indicate increased rates of cancer, hormonal changes, endocrine disruption, obesogenic effects, decreases in sperm count and fertility–to name a few.

This is just the tip of the iceberg. There are literally thousands of chemicals used in plastics about which we still know very little or nothing.[20] Canada and some European countries (including Denmark, Sweden, and Germany) adhere to "the precautionary principle,"[21] which means that a chemical must be proven safe before it is introduced to the market. Here in the United States, by contrast, chemicals are presumed innocent until proven guilty, at which point the government *may* take action and pull them off the market–a rare occurrence. Unfortunately, many chemicals used in plastic production continue to be used long after multiple scientific studies have identified them as harmful. Polychlorinated biphenyls (PCBs) are a perfect example of this legacy problem.

The process of introducing a new chemical to the consumer goods marketplace is completely different from the process pharmaceutical companies go through when they introduce a new blood pressure medication or measles vaccine which require a lengthy

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[14] "No Plastic In Nature: Assessing Plastic Ingestion from Nature to People." An Analysis for WWF (World Wildlife Fund) by Dahlberg & The University of Newcastle, Australia, 2019.
[15] "Plasticenta: First evidence of microplastics in human placenta." *Environment International*, Dec. 2, 2020.
[16] "Discovery and quantification of plastic particle pollution in human blood." *Environment International*, 163 (2022) 107199.
[17] "Raman Microspectroscopy Detection and Characterisation of Microplastics in Human Breastmilk." *Polymers*, June 30, 2022.
[18] "Analysis of Microplastics in Human Feces Reveals a Correlation between Fecal Microplastics and Inflammatory Bowel Disease Status." *Environ. Sci. Technol.* 2022, 56, 1, 414-421.
[19] "Detection of microplastics in human lung tissue using μFTIR spectroscopy." *Science of The Total Environment,* Volume 831, 20 July 2022, 154907.
[20] "Plastic Products Leach Chemicals That Induce *In Vitro* Toxicity under Realistic Use Conditions." *Environ Sci Technol.* 2021 Sep 7;55(17):11814-11823.
[21] "The precautionary principle."Arh Hig Rada Toksikol, 2005 Jun; 56(2):161-6.

process to prove a drug's safety. The situation we're witnessing play out right now with PFAS is a troubling example of what happens as a result of our lax chemical regulations. This backwards system means that Congress and federal regulators need to examine the safety of plastics used in food and beverage packaging.

Plastics Are Speeding Climate Change

Plastics pose a major threat to our ability to avoid the worst projected impacts of climate change. Made from chemicals and fossil fuels (primarily ethane, produced by hydraulic fracturing of gas), plastics produce climate-warming greenhouse gasses at every stage of their lifecycle: from extraction to production to creation to usage to disposal. As we note in our 2021 report, "The New Coal: Plastics and Climate Change," the U.S. plastics industry's contribution to climate change is on track to exceed that of coal-fired power in this country by 2030.[22] As of 2020, the U.S. plastics industry is responsible for at least 232 million tons of carbon dioxide-equivalent greenhouse gas emissions each year. This is equivalent to the emissions from 116 average-sized (or 500 megawatt) coal-fired power plants.

Petrochemical companies see falling demand for their products in their traditional markets for transportation and electricity generation. In response, they are increasing plastics production to make up the difference. In the process, they are largely canceling out any greenhouse gas reductions gained from the recent closures of 65% of the country's coal-fired power plants.

The Plastics Industry Plans a Massive Expansion

According to the Organisation for Economic Cooperation and Development (OECD), annual production of fossil fuel-based plastics is set to top 1.2 billion tons by 2060, with plastic waste to exceed one billion tonnes.[23] The World Economic Forum (WEF) predicts that plastic production will double in the next 20 years as the petrochemical industry rushes to build new plastics production plants to profit from turning a glut of cheap U.S. hydraulic fracked shale gas into plastic. According to the International Energy Agency (IEA), petrochemicals–the category that includes plastics–now account for 14% of oil use and are expected to drive half of oil demand growth between now and 2050.[24]

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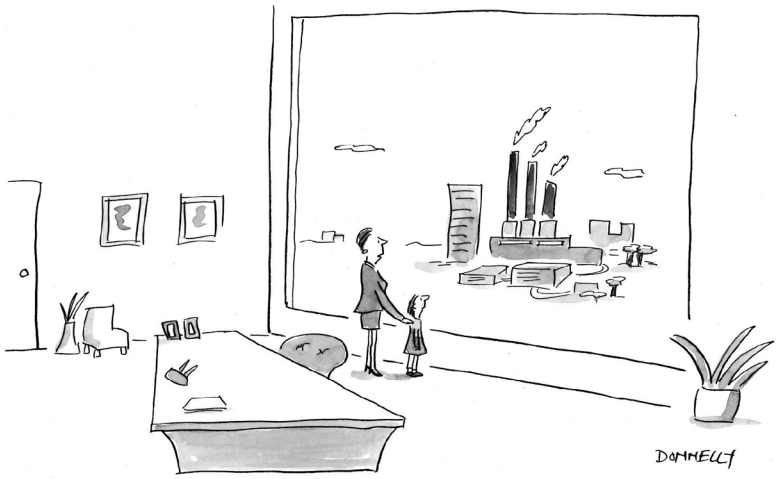
[22] "The New Coal: Plastics and Climate Change." Beyond Plastics, October 2021.
[23] "Global Plastics Outlook: Policy Scenarios to 2060. "The Organization for Economic Co-operation and Development (OECD), June 21, 2022.
[24] "The Future of Petrochemicals: Towards a more sustainable chemical industry." PDF, International Energy Agency, Oct. 2018.

The growth of plastic production and related emissions is accelerating in the United States. In 2020, the plastics industry's reported greenhouse gas emissions increased by 10 million tons over 2019 levels. Since 2019, at least 42 plastics facilities have opened, are under construction, or are in the permitting process. If they all become fully operational, these new plastics plants will release an estimated 55 million tons of greenhouse gasses a year—an amount equivalent to the emissions from 27 average-sized coal plants.[25]

The U.S. is already one of the world's largest producers of plastics, and we are leading the world in the expansion of even *more* new plastic production intended for export to global markets.[26] These new domestic petrochemical facilities are being built to increase company profits, not to meet the domestic demand for plastics, and these facilities will have harmful impacts on U.S. communities through pollution to the surrounding air, water, and soil.



"Someday, daughter, all this will be yours, and you'll just have to deal."

Art courtesy of Liza Donnelly: https://lizadonnelly.com

[25] "The New Coal: Plastics and Climate Change." Beyond Plastics, October 2021.
[26] "How the fossil fuel industry is pushing plastics on the world." Katie Brigham, CNBC, Jan. 29, 2022.

Plastics Are a Major Threat to Environmental Justice

It's important to note that not all Americans are bearing the negative impacts of all this plastic equally. The U.S. plastics industry reported releasing 114 million tons of greenhouse gasses nationwide in 2020, 90% of which occurred in just 18 communities where residents earn 28% less than the average U.S. household, and are 67% more likely to be people of color. In addition to releasing greenhouse gasses, these facilities also emit massive amounts of particulates and toxic chemicals into the air, threatening the health of residents in fenceline communities. When plastics arrive at the end of their (often very short) lives, the landfills and incinerators they are sent to are also overwhelmingly located in low-income communities and communities of color,[27] burdening residents with the adverse health impacts of air pollution, including asthma and chronic bronchitis.[28]

At Beyond Plastics, we believe that your zip code should not determine the condition of your health. Sadly, this is not the reality for many of our sisters and brothers living in communities where there is a concentration of petrochemical facilities. Reducing the production of plastics by half will provide some relief.

UNMASKING FALSE SOLUTIONS

Conventional Plastics Recycling is an Abysmal Failure

For decades, the plastics industry has been promoting conventional recycling as the solution to plastic waste, and blaming individuals for its failure. The industry has focused on the need for individuals to take greater personal responsibility while intentionally hiding the fact that it's the local taxpayers who are footing the bill to deal with their waste: municipalities are bearing the burden of collecting and sorting all this plastic waste. At the same time, the plastics industry has been quietly working to block measures such as container deposit laws (or "bottle bills") that are proven to be a highly effective means of increasing collection and recycling rates.

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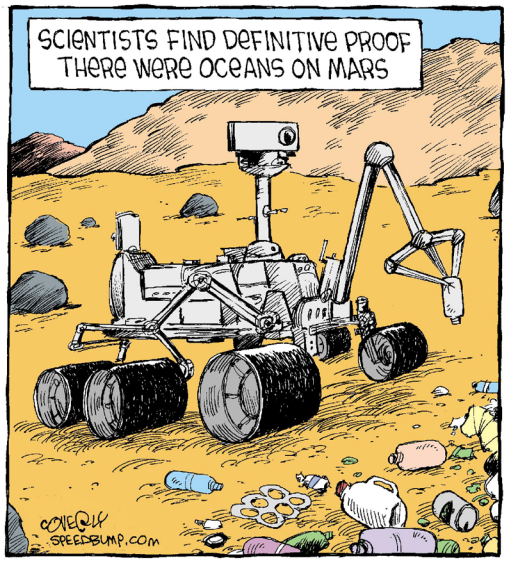
[27] "New Jersey's Dirty Secret: The Injustice of Incinerators and Trash Energy in New Jersey's Frontline Communities." Earth Justice and Vermont Law School Advocacy Clinic, Inc., February 2021.; "U.S. Municipal Solid Waste Incinerators: An Industry in Decline." Tishman Environment and Design Center, The New School. May 2019.

[28] "Written Report of George D. Thurston Regarding the Public Health Impacts of Air Emissions from the Wheelabrator Facility." Chesapeake Bay Foundation, November 20, 2017; GAIA's Breathe Free Detroit webpage, accessed December 10, 2022.

I want to state clearly for the record that I am a staunch supporter of recycling. In fact, I started my town's recycling program more than thirty years ago, and it's still going strong. Some materials—such as paper, glass, and metal—*can* be effectively recycled and safely made from recycled content. The U.S.'s high paper recycling rate (68% in 2021) proves this point.[29] But that's just not the case for plastics. The plastics recycling rate is abysmal, and the end-products made with recycled plastics are sometimes laden with toxics.



Art courtesy of Dave Coverly: www.SpeedBump.com.

In 2021, the U.S. had a dismal recycling rate of about 5% for post-consumer plastic waste.[30] This rate is down from a still-paltry high of 9.5%[31] in 2014, when the U.S. exported millions of tons of plastic waste to China and counted it as recycled—even

[29] "US tallies higher paper recycling rate in 2021," Marissa Heffernan. *Resource Recycling,* May 24, 2022.
[30] "NREL Calculates Lost Value of Landfilled Plastic in U.S." National Renewable Energy Laboratory (NREL) news release, April 28, 2022.
[31] "Advancing Sustainable Materials Management: 2014 Fact Sheet Assessing Trends in Material Generation, Recycling, Composting, Combustion with Energy Recovery and Landfilling in the United States," U.S. Environmental Protection Agency, November 2016.

though much of it was not actually recycled, according to a report by *The Guardian.*[32] And we're learning now that even when we *do* recycle plastics, we may not want to use some of the resulting products. A "bottle-to-bottle" process has long been considered the holy grail of recycling, but new evidence suggests that food-grade packages should not be made with recycled plastics because there are too many toxic additives that leach out into the food and drink they contain.

After years of earnestly promoting plastics recycling, it's time to admit that these efforts have failed. Plastics recycling does not work and will never work. **We cannot recycle our way out of the plastic pollution problem.**

The failure of plastics recycling lies not with the concept or the process, but with the material itself. The first problem is that there are thousands of different plastics, each with its own composition and characteristics.[33] They all include different chemical additives and colorants that cannot be recycled together, making it impossible to sort the plethora of discarded plastics into separate types for processing. For example, polyethylene terephthalate (PET#1) bottles cannot be recycled with PET#1 clamshells, which are a different PET#1 material, and green PET#1 bottles cannot be recycled with clear PET#1 bottles (which is why South Korea has outlawed colored PET#1 bottles.)[34] High-density polyethylene (HDPE#2), polyvinyl chloride (PVC#3), low-density polyethylene (LDPE#4), polypropylene (PP#5), and polystyrene (PS#6) all must be separated for recycling.

Another problem is that the reprocessing of plastic waste—when possible at all—is wasteful and polluting. Plastic is flammable, and the risk of fires at plastic recycling facilities[35] affects neighboring communities—many of which are located in low-income communities or communities of color. Unlike metal and glass, plastics are not inert. As mentioned, plastic products are made from many different chemicals and many different colorants. According to a report published by the Canadian government, toxicity risks in recycled plastic prohibit "the vast majority of plastic products and packaging produced" from being recycled into food-grade packaging.[36]

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[32] "Where does your plastic go? Global investigation reveals America's dirty secret." *The Guardian,* June 17, 2019.
[33] "Types of Plastic: How Many Kinds of Plastics are There?" Plastics Make it Possible®, January 18, 2012. Website accessed Dec. 11, 2022.
[34] "No colour, no PVC: South Korea bans hard-to-recycle plastic materials for F&B packaging." Pearly Neo, *FoodNavigator-Asia.com,* January 31, 2020.
[35] "Fires at Plastic Recycling Facilities." The Last Beach Cleanup, webpage accessed Dec. 11, 2022.
[36] "Assessing the State of Food Grade Recycled Resin in Canada & the United States." Environment and Climate Change Canada/STINA, 2021.

Yet another problem is that plastic recycling is simply not economical. Recycled plastic costs significantly more than virgin plastic made from petrochemicals because collecting, sorting, transporting, and reprocessing plastic waste is exorbitantly expensive. As I've already stated, the petrochemical industry is also rapidly expanding to increase production, which will further lower the cost of new plastic made from fossil fuels.

Despite this stark failure, the plastics industry has waged a decades-long public relations campaign to perpetuate the myth that the material is recyclable.[37] This campaign is reminiscent of the tobacco industry's efforts to convince smokers that filtered cigarettes are healthier than unfiltered cigarettes.

So-Called "Chemical Recycling" & "Advanced Recycling" are Expensive, Polluting Distractions That Will Not Solve the Problem

Conventional mechanical recycling,[38] in which plastic waste is ground up and melted, has been around for about three decades. Recently, even the plastics industry is showing signs of conceding that conventional plastic recycling is a failure. Now the industry has pivoted to aggressively promoting so-called "chemical recycling" or "advanced recycling"—an umbrella term for a suite of problematic technologies that attempt to turn plastics into fossil fuel or break it down into its chemical components.

In practice, **"chemical recycling" is just greenwashing for burning plastic**. It amounts to a two-step process that superheats and boils plastics down into gasses or chemicals or tars or oils. Despite recent claims, there will be some oxygen present during the process, resulting in combustion, and the plastic waste gasses are typically combusted to heat the process. Fuels produced from plastic waste will be combusted elsewhere. These facilities do not recycle plastic; they're just the next generation of trash burning with a misleadingly eco-friendly sounding name.

"Chemical recycling" is more of a marketing strategy than an actual solution to the plastics problem. Currently, there are only eight "chemical recycling" facilities operating in the United States, and two are under construction. It is estimated that the existing facilities can only process 0.26% of the plastic waste generated in the U.S. each year.[39]

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[37] "Plastic Wars." *Frontline*, PBS. March 31, 2020.
[38] "Infographic: How does the process of Mechanical Recycling work?" Blue Vision website, accessed Dec. 11, 2022.
[39] "Is chemical recycling greenwashing?" Conor McGlone, Engineering and Technology, Nov. 7, 2022.

The public relations push by petrochemical companies and others wants you to believe that this is a new, breakthrough technology. It is not. "Chemical recycling" processes have been proposed by the plastics industry for more than 30 years, with no real success.[40] For example, in its 1991 Congressional testimony, Eastman Chemical Company announced its plans to "close the loop" by producing PET plastic with recycled content for food packaging, using plastic soda bottles. Eastman stated they would use their existing methanolysis unit in Rochester, New York, to convert recycled PET into its raw materials that would be blended with virgin feedstock at Carolina Eastman Company. Eastman stated that it would produce about 50 million pounds of plastic a year.[41] Despite Eastman's claims, no evidence could be found that this PET bottle facility was ever operated, and the overall facility was fully shut down in 2012.[42]

Disturbingly, the industry-backed "chemical recycling" bills that have been introduced in legislatures around the country in the past two years attempt to exempt these facilities from important state and federal regulations that ensure some level of health and environmental safety by classifying the facilities as "manufacturing" rather than waste management or recycling facilities. Most have not involved the basic step of writing an environmental impact statement. According to a recent *Oil and Gas Watch* review of state permit documents, chemical recycling plants could release 96 different types of hazardous and toxic air pollutants during normal operations.[43] It's important to note that like all the other facilities involved in plastics production and disposal, "chemical recycling" facilities are almost always built in low-income communities and/or communities of color—another threat to environmental justice.

The Natural Resources Defense Council (NRDC) analyzed U.S. "chemical recycling" facilities in its September 2022 report "Recycling Lies," and found that these technologies generate copious amounts of hazardous waste, have large carbon footprints, are mostly constructed in environmental justice communities, create fuels which generate the same harmful air pollution as burning fossil fuels, and, significantly, require the ongoing production of new plastics from fossil fuels.[44] Greenhouse gas emissions from

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[40] ""FDA Approves Kodak Plan To Recycle Plastic For Food Containers." *AP News,* August 22, 1991.
[41] "National Recycling Markets: Hearings Before the Subcommittee on Commerce, Consumer Protection, and Competitiveness of the Committee on Energy and Commerce, House of Representatives, One Hundred Second Congress, First Session, on H.R. 2746, a Bill to Develop, Assist, and Stabilize Recycling Markets." June 26 and July 18, 1991, Volume 4.
[42] "Kodak Closing Rochester Unit; 80 Jobs Impacted." *Associated Press,* May 15, 2012.
[43] "No plastics panacea: chemical recycling causes pollution, promotes waste." Oil and Gas Watch, Dec. 7, 2022.
[44] "Recycling Lies: 'Chemical Recycling' of Plastic Is Just Greenwashing Incineration." Veena Singla, NRDC. Sept. 7, 2022.

"chemical recycling" facilities can be as bad as those from conventional garbage incinerators, which are, in turn, worse for the climate than coal-fired power plants.[45] In 2018, Dow Chemical claimed that the Renewlogy chemical-recycling plant in Salt Lake City was able to reprocess mixed plastic waste from Boise, Idaho, households through the "Hefty EnergyBag" program and turn it into diesel fuel.[46] However, as Reuters exposed in a 2021 investigation, all the different types of plastic waste contaminated the pyrolysis process.[47] Today, Boise burns its mixed plastic waste in cement kilns, resulting in climate-warming carbon emissions. This well-documented Renewlogy failure has not stopped the plastics industry from continuing to claim that "chemical recycling" works for "mixed plastics."[48]

These projects have a history of frequent (and very expensive) failure, and they rarely survive without substantial taxpayer subsidies. Investing time, energy, and taxpayer dollars in more of these "chemical recycling" projects serves one true purpose: it allows the plastics industry to create the public relations cover they need to continue expanding plastics production–at the risk of public health and our climate.

The General Services Administration should be directed to exclude chemically recycled plastic in any definition of recycling. Even though chemical recycling is being pushed hard by the chemical industry, it is entirely the wrong tack for the federal government to take.

"Chemical recycling" is not viable. It has failed and will continue to fail for the same real-world reasons that the conventional mechanical recycling of plastics has consistently failed. Worse yet, its emissions of toxics and greenhouse gasses could cause new harm to our environment, our climate, and the health of our most vulnerable people.[49]

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[45] "Trash Incineration More Polluting than Coal." Energy Justice Network, website accessed Dec. 11, 2022.
[46] "How Dow Chemical and Boise are taking aim at plastics." Cassandra Sweet, *Greenbiz,* April 23, 2018.
[47] "The Recycling Myth: Big Oil's Solution for Plastic Waste Littered with Failure." *Reuters,* July 29, 2021.
[48] "ACC's Baca to Announce Stepped-Up Awareness Efforts on Advanced Recycling at World Petrochemical Conference." American Chemistry Council news release, March 22, 2022.
[49] "New NRDC 'Chemical Recycling' Analysis: Process is Harmful, Misleading, Not Solving Plastic Pollution." NRDC news release, March 7, 2022.

THE SOLUTIONS TO THE PLASTIC POLLUTION CRISIS

Fortunately, proven solutions to these plastic waste and pollution problems already exist in many places–and with federal leadership, can be replicated across the country. There is no shortage of practical, sensible solutions to reduce the use of plastics. What's missing is the strong political leadership to address this problem and embrace the many effective solutions available to us right now.

The smartest and most economical move is to focus on reduction. Over-packaging is a needless waste of resources and money. This is particularly true for e-commerce—think of your own experience of buying a product online and having it arrive in too much packaging. Most companies will not stop over-packaging their products unless there is a law requiring them to do so.

In addition to waste reduction, there are commonsense changes focusing on transitioning away from single use plastics by investing in reuse and refill infrastructure. Some examples include ensuring widespread access to water fountains and water refilling stations in public buildings, airports, and train and bus stations; installing dishwashing equipment in schools to allow students to eat their food off real dishes with real cutlery rather than single-use plastics; and providing funding to enable Meals on Wheels and other meal delivery programs to switch from serving meals in single-use plastic dishes and trays to reusable dishware. Federal funding will help advance all of these solutions.

The National Park Service has said it will ban the sale of single-use plastic water bottles in national parks and install water fountains, but that it will not implement this policy for ten years. *What are they waiting for?* Congress should require the National Parks Service to move faster and to end the sale of all beverages in plastic containers. This commonsense policy should be implemented at all federal facilities as well.

The public is often confused by plastics recycling and ends up putting non-recyclable plastic items in recycling bins because the items feature the iconic chasing arrows recycling symbol, or because waste haulers unwisely urge their customers to throw all their plastics in their recycling bins, knowing that most of it never gets recycled.

This issue of widespread deceptive advertising can be addressed by the Federal Trade Commission by updating the FTC "Guides for the Use of Environmental Marketing Claims" (also known as Green Guides) and initiating a rulemaking to turn them into enforceable laws. The Green Guides are essential to ensure that false marketing is addressed and, notably, have not been updated since 2012. However, they are only guides. It is also essential for the FTC to take steps to enforce its own policies; it is a

mistake to keep leaving this vitally important role up to state governments to tackle. Consumer protection agencies in other countries, including Canada and the United Kingdom, are actively working to protect consumers from false recyclable labels on plastic products, but the U.S. is lagging.

On the legislative front, there are many effective solutions that Congress can and must support, starting with the priorities outlined below.

1. Introduce and Support a Strong Packaging Reduction and Recycling Bill

Extended producer responsibility (EPR) is a policy tool that makes producers legally and financially responsible for mitigating the end-of-life impacts of their products and packaging. EPR is a strategy used around the world, and is gaining in popularity in the United States, with four states adopting state laws in the last two years, albeit with some with significant problems. These programs can be a vital part of the solution to our growing packaging waste and plastic pollution crisis–but only if designed correctly.

In theory, shifting costs from taxpayers to the companies creating the waste encourages companies to use less packaging and choose items that are more recyclable. However, we have learned from other EPR systems that the program will only achieve these outcomes if the legislation includes specific reduction requirements, standards for recyclability, and mandates the elimination or reduction of toxic substances. In order to be effective, we recommend that any federal packaging reduction legislation include the following ten pillars, which Beyond Plastics and our partner organization Just Zero have developed as a checklist[50] for policymakers and activists considering new EPR laws at the state level:

1. **Establish Environmental Standards for Packaging.** Similar to fuel efficiency standards for cars and appliances, we need environmental standards for packaging: 50% reduction in packaging over ten years—achieved either through elimination or by switching to reuse/refill systems—and the rest must achieve a 70% recycling rate. Waste reduction comes before recycling in every waste hierarchy and will only be achieved if it is required. Plastics recycling is a failure, and we cannot rely on recycling to solve the plastics problem.

2. **Reduce Toxics in Packaging**. Packaging that contains toxic chemicals is harmful to human health and the environment and can make it unsafe to use recycled materials in future products. Known toxic chemicals and substances, such as PFAS, formaldehyde, styrene, mercury, and lead should be removed from packaging.

[50] "Ten Requirements for Effective Packaging Reduction Policies." Beyond Plastics and Just Zero, 2022.

3. **No Plastic Burning a.k.a. "Chemical Recycling" or "Advanced Recycling."** Chemical and advanced recycling is mostly waste-to-fuel, and these facilities are almost always placed in low-income communities and communities of color. The last thing we need is to create more fossil fuels or to waste taxpayer dollars and valuable time on false solutions. These technologies should not be considered recycling–the definitions in any policy must make that clear.

4. **Include a Modernized Beverage Deposit Law, a.k.a Bottle Bill**. As covered in more detail below, bottle bills work. Deposit return laws are the best example of EPR, and the most effective way to handle beverage containers. Most beverage containers should be managed by a modernized deposit law that sets the minimum deposit at ten cents, requires a certain percentage of refillable containers, has minimum reuse and recycling targets, and makes it easy for people to return their containers at stores that sell beverages. Redemption centers or depots should supplement but not substitute for mandatory return to retail.

5. **Provide Financial Relief to Taxpayers and Consumers**. Packaging companies should pay fees that are used to reimburse municipalities and consumers for the cost of recycling packaging material, provide new funding for projects that reduce packaging waste and improve recycling, and fund state agencies for managing the program and enforcing the law. Companies should pay no fees for packaging used in reuse and refill systems.

6. **Include Both Residential and Commercial Waste**. Commercial waste makes up between 40% and 60% of the waste stream. The policy should apply to packaging generated in all sectors.

7. **Do NOT Put the Packaging Industry in Charge**. We would not expect the tobacco industry to implement effective anti-smoking efforts, and we should not allow consumer brands to self-regulate through Producer Responsibility Organizations (PROs). There need to be binding performance targets set in statute and strong accountability and oversight by agencies, including the ability to completely disband poor-performing PROs.

8. **Ensure Strong Oversight and Accountability**. A law is only as strong as its enforcement. Create a new Office of the Inspector General specifically to enforce the program and make sure agencies receive the funding necessary to implement and enforce the law.

9. **Avoid Glaring Loopholes**. Make sure the bill language does not allow packaging producers to wiggle out of compliance. For instance, Section 42060(3) (A) of the California EPR law exempts "single-use material that presents unique challenges in complying." This provision alone could make California's new EPR law ineffective.

10. **Seek Transparency and Inclusion in the Process.** Do not negotiate this complex and important policy behind closed doors. Hold public hearings and roundtables. Invite ordinary citizens into the process. Hear all sides and then decide what is best for the people and the environment.

2. Introduce and Support a National "Bottle Bill" Which Includes a Requirement for Refillable Containers

It is past time for Congress to pass a national bottle bill with mandatory refill targets. Today *I am calling on the beverage companies and plastics industry to stop blocking the adoption of these effective laws* in the 40 states that do not yet have them, as well as at the federal level.

Single-use plastic bottles are a big part of our current plastic pollution crisis. More than one million plastic bottles are purchased around the world every minute,[51] and more than half a trillion plastic bottles will be sold this year—about 120 billion of them in the United States. According to industry data, only 26.6% of the plastic bottles were collected for recycling in the U.S. in 2021. The percentage collected for recycling has decreased each year since 2013 while production has expanded.[52] Bottles that are not recycled end up clogging our neighborhoods, parks, rivers, the ocean, and landfills, and damaging air quality when they're burned in incinerators.

There are ten U.S. states with bottle bills. These deposit laws have proven effective at:

- Reducing the amount of waste sent to landfills and incinerators
- Dramatically reducing litter
- Increasing beverage container recycling rates significantly

[51] "Reusable Water Bottle Market Size, Share & Trends Analysis Report By Material Type (Glass, Plastic, Stainless Steel), By Distribution Channel (Supermarkets & Hypermarkets, Online), By Region, And Segment Forecasts, 2022 – 2030," Grand View Research.
[52] "PET recycling report(s)," 2013-2021. National Association for PET Container Resources (NAPCOR) website, accessed Dec. 11, 2022.

- Conserving natural resources such as timber, water, and minerals
- Saving energy, reducing air and water pollution, and reducing greenhouse gas emissions, and
- Helping to create new jobs in the recycling and manufacturing industries

We need a national bottle bill because our current collection systems haven't kept up with the skyrocketing volume of containers sold. Curbside recycling systems have never succeeded in recovering even half of plastic containers sold. Recycling experts estimate that up to 15% of PET bottles collected curbside are lost in sortation.[53] Residential curbside recycling programs also can't recycle what they can't collect: the billions of single-use bottles and cans consumed away from home. But a dime deposit creates a powerful financial incentive for people to bring these containers back to collect the refund. In Oregon and Michigan—the two U.S. states with dime deposits—80 to 90% of deposit containers are returned for recycling.

- Deposits are **fairer** than the current system where the local taxpayer shoulders the burden of running recycling programs or trash disposal. Deposit systems put the financial and operational responsibility for recycling collection and processing where it belongs: with the *producer* of the discarded goods.
- Deposits also produce material of **higher quality** than material recovered through curbside recycling programs. Mixing everything together in one blue bin, and then one compactor truck, leads to breakage, contamination, and high rates of residuals that are ultimately landfilled. Because deposit materials are kept separate from the outset, they are clean and more marketable than curbside material. They command higher prices, and they can be used to manufacture higher quality products.
- Deposits are **more effective** than any other type of recycling program. In 2019, more than three quarters (77%) of aluminum cans with a deposit were recycled, versus only one third (36%) of cans without a deposit. Two thirds of deposit glass bottles (66%) were recycled, compared to only one fifth (22%) of non-deposit glass bottles. The difference is most stark for PET plastic bottles: 57% of deposit PET was recycled, versus only 17% of non-deposit PET: a forty percentage point spread.[54]

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[53] "In My Opinion: PET recycling lessons can transform industry." Adam Gendell, *Plastics Recycling Update,* June 29, 2022.
[54] "U.S. Nominal Recycling Rates by Deposit Status, 2019." Container Recycling Institute website, accessed Dec. 11, 2022.

- Finally, it is very important to make redemption systems **easy for consumers**. That is why all stores that sell deposit containers should be required to also accept them for return. "Return to retail" enables busy people to easily drop off their empty containers when they are doing their regular shopping. Redemption centers or depots are a *supplement* to return to retail, but they should not be seen as a *replacement* for return to retail. Technological innovations, such as reverse vending machines, have made it very easy for consumers to make these returns and get their deposits back. Requiring return to retail is important, particularly for people without cars or without time to make extra stops.

I want to recognize the hard work being done by low-income people in bottle bill states who collect empty containers in order to redeem the deposit money. Known as "canners" (though I prefer to call them "redeemers)," these people help keep our communities clean and boost recycling rates. We should make it much easier for them to return empty containers. It would of course be better for them to have a living wage job with health insurance, but they are out collecting empty containers every day in every bottle bill state, and their hard work is valuable.

If the U.S. were to adopt a national container deposit system, we'd be in very good company. More than 300 million people currently live in 52 countries, states, provinces, and territories with deposit systems. Another 20 jurisdictions that are home to more than 230 million people are in the process of implementing or planning deposit systems.[55] They must be onto something.

Congress should bring container deposits' winning strategy to the national level to boost recycling rates for the whole country, not just for the 10 states where container deposit laws are in place now. A national bottle bill is also the perfect policy through which to require refillable beverage containers to help reduce our reliance on single-use containers. Congress should pass a national bottle bill that includes a mandatory 25% refillable container requirement for each brand by 2030. Coca-Cola has voluntarily pledged to transition to 25% refillable bottles by 2030 and Pepsico has pledged to achieve 20% refillables in the same timeframe. Either this transition is doable and should be required, or the promises of these companies are merely a public relations ploy. It's time to make refillable requirements mandatory and hold the entire industry to the same standard with 25% refillables by 2030.

[55] "Global Deposit Book 2022: An Overview of Deposit Return Systems for Single Use Beverage Containers." Reloop Platform, 2022.

3. Support *The Break Free From Plastic Pollution Act*

The Break Free From Plastic Pollution Act (H.R. 2238, S.984) is a comprehensive approach to reducing plastic pollution and reforming our broken waste and recycling system, and Congress should pass it. Major provisions include:

- Require producers of packaging, containers, and food-service products to design, manage, and finance waste and recycling programs.
- Launch a nationwide beverage container refund program to bolster recycling rates, and to encourage the use of refillables.
- Ban certain single-use plastic products that are not recyclable.
- Ban single-use plastic carryout bags and place a fee on the distribution of the remaining carryout bags, which has proven successful at the state level.
- Channel massive investments in U.S. domestic recycling and composting infrastructure.
- Prohibit plastic waste from being shipped to developing countries.
- Protect state and local governments that enact more stringent standards.
- Require EPA to partner with the National Academies of Science to conduct a comprehensive study on the environment and cumulative public health impacts of incinerators and plastic "chemical recycling" facilities.
- Establish a pause on permitting new and expanded plastic production facilities while the EPA creates and, as necessary, updates regulations on plastic production facilities to protect frontline and fenceline communities from direct and cumulative impacts on public health.

4. Support the *Protecting Communities from Plastics Act*

Introduced earlier this month by Senator Cory Booker (D-NJ) and Representative Jared Huffman (D-CA), together with U.S. Senator Jeff Merkley (D-OR) and Representative Alan Lowenthal (D-CA), this legislation[56] addresses the plastic production crisis that is fueling climate change and perpetuating environmental injustice. This bill includes elements of the larger *Break Free From Plastic Pollution Act* detailed above and has a much-needed strong focus on environmental justice as well as including provisions mandating non-toxic reuse and packaging reduction. It also should be passed.

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[56] "Protecting Communities from Plastics Act would target plastic production." *Recycling Today,* Dec. 2, 2022.

THE TIME TO ACT IS NOW

The data is clear. The crisis is real. Your constituents in every district and every state are paying attention to this issue, and they are looking for leadership. In February 2022, Oceana released a nationwide poll conducted by Ipsos which found that 81% of American voters support local, state, and national policies that reduce single-use plastic.[57] This support is bipartisan.

The world is watching, too. A global poll conducted by Ipsos earlier this year found that about 75% of people worldwide want single-use plastics banned.[58] **We need Congress to make this a priority and find the political will to act.** Every day that Congress does not act, the intertwined plastic pollution, climate change, and environmental injustice problems grow deeper, becoming more difficult and more costly to fix. These urgent problems are only getting worse.

In the five minutes I've spent testifying today, the equivalent of five garbage trucks full of plastic waste have entered the ocean around the world. Much of that plastic was originally made in the United States. We're already flooding the world with plastic, and the plastics industry wants to crank up production and open the taps even wider. We call on you to take action to keep us all from drowning in this flood.

The clock is ticking.

[57] "8 in 10 American Voters Support a National Policy Reducing Single-Use Plastic." Oceana website accessed Dec. 11, 2022.
[58] "Three quarters of people in global survey want single-use plastics banned." Ipsos, Feb. 22, 2022.

Senate Committee on Environment and Public Works
Hearing Entitled, *"Examining the Impact of Plastic Use and Identifying Solutions for Reducing Plastic Waste"*
December 15, 2022
Responses to Questions for the Record from Judith Enck, Beyond Plastics
Responses Submitted January 11, 2023

Ex-Officio Chairman Carper:

1. ***Technology and science have come a long way in recent decades. It is my understanding that chemical recycling facilities have the capability to produce products from plastic waste, including plastic resin and chemicals, as well as fuel for transportation or other purposes. Some have argued that a process that makes fuel that is burned - and emits greenhouse gasses into our atmosphere – should not be considered, or referred to as, recycling.***

   a. ***Do you agree that converting plastics-to-fuel should not be considered to be recycling?***

Yes, I agree that converting plastics-to-fuel should not be considered recycling. Turning waste into fuel and then burning that fuel is similar to burning the waste. Plastics-to-fuel plants inflict harm on the communities where these facilities are located, and using plastics as a fuel emits even more greenhouse gasses and pollution than burning extracted fuel before it's turned into plastic. Burning is not recycling.

While technology and science have advanced in recent decades, there is nothing particularly new or helpful in what the plastics industry is marketing as "chemical" or "advanced" recycling: pyrolysis and gasification are technologies that have been around – and regulated by the Environmental Protection Agency (EPA) as incinerators under section 129 of the Clean Air Act[1] – for decades.

The only thing new is the industry greenwashing: re-branding pyrolysis and gasification incinerators as "recycling." The greenwashing has three purposes:

1) **to justify the deregulation of pyrolysis and gasification incinerators** at the state and federal levels including, particularly, escaping existing pollution controls under section 129 of the Clean Air Act;

2) to help the plastics industry build the case for **state and federal taxpayer subsidies** including funding for research, tax breaks, and minimum content procurement requirements for "chemically recycled" plastic waste; and

[1] "Clean Air Act Guidelines and Standards for Waste Management." U.S. EPA website, accessed 1/9/23.

3) to give the plastics industry an **argument against reducing plastic production** - which is the most important strategy that policy makers should support.

The plastic waste problem cannot be solved without significantly reducing the quantity of plastic that is manufactured and sold. In particular, we need to ban the use and production of the majority of single-use plastics. So-called "advanced recycling" and "chemical recycling" are just misleading words for technologies that include burning plastics, and far from solving the waste plastics problem, they exacerbate the harms that plastic production already causes. The injuries to public health and environmental justice communities will be especially severe if the deregulation and subsidies are allowed to take effect. The "chemical recycling" greenwashing marketing campaign is also central to the plastic industry's strategy to support the massive **buildout of plastic production in the U.S.** Because "chemical recycling," even if it worked perfectly and was only used to actually make plastic (as opposed to fuel, wax, and other industrial products), would only be able to handle a small fraction of plastic waste. It cannot legitimately be considered part of the "solution," or a "tool in the toolbox."

b. ***Are there any risks to public health created from the burning of plastics for fuel or resin that should be considered by the federal government when regulating these facilities?***

Yes. Pyrolysis and gasification, like other incinerators regulated under section 129 of the Clean Air Act, generate both hazardous waste and air emissions of a large number of highly toxic chemicals including: styrene, benzene, toluene, mercury, arsenic, dioxins, ethylbenzene, xylenes, naphthalene, acetaldehyde, formaldehyde, hydrochloric acid, methanol and hexane. These toxic substances are associated with a range of adverse health effects including toxicity to the heart, liver, lungs, kidneys, skin, and eyes, as well as neuro developmental and reproductive harm, and cancer.

EPA should absolutely consider the pollution coming from these technologies as it decides whether to eliminate existing federal protections under the Clean Air Act – whether by changing the definition of what is an incinerator or re-defining the idea of "waste" to exclude plastic waste.

2. The Break Free from Plastic Pollution Act of 2021 builds on state laws across the country and outlines plastic reduction strategies in the form of extended producer responsibility actions, the reduction of single-use products, recycled content mandates, and other means.

a. ***What state and local policies in the United States have successfully reduced plastic waste?***

Plastic Bans: The state and local policies which have been the most successful at reducing plastic waste have been outright bans on unnecessary, single-use plastic products. State and local governments have enacted a series of effective bans on items such as polystyrene packaging, bags, straws, cups, plates, utensils, and intentional release of balloons. For example, the states of California, Connecticut, Delaware, Hawaii (de

facto), Maine, New Jersey, New York, Oregon, Vermont, and Washington, and the territories of American Samoa, Guam, Northern Mariana Islands, United States Virgin Islands, and Puerto Rico have all banned single-use plastic bags in some form. Each ban is slightly different from the next, and some are more effective than others, but most of these bans have contributed to a reduction in plastic waste. The United Nations Environment Program (UNEP) estimates that 85% of single-use plastic food containers end up in a landfill or in the environment as mismanaged waste. It's time to enact a nationwide ban on unnecessary single-use plastic items to significantly reduce our nation's contribution to the global plastic pollution crisis.

Reuse + Refill Infrastructure: Another effective state and local policy tool has been investment in infrastructure that reduces our reliance on single-use plastic items. Examples of this type of infrastructure are: water refill stations and drinking fountains on public property; dishwashing equipment and durable serviceware at schools, hospitals, and other institutions; and future financial support for regional bottle washing facilities for shared refill networks and other infrastructure that supports the growth of the reuse + refill economy. If done at the federal level these investments should extend out to federally subsidized programs. They will reduce waste and create local jobs.

Procurement: When governments use their purchasing power to reduce the use of plastics within their own operations, they also help to move markets. This makes procurement a dually effective tool that has been used at the state level and could be used to significantly reduce plastic waste at the federal level. Policies that prohibit the use of tax dollars by government agencies and grantees to purchase single-use plastics, except in special circumstances, have the potential to significantly reduce plastic waste.

Meals on Wheels Programs: Serving more than one million meals each week day to America's elderly and homebound, Meals on Wheels provides an incredible service to our nation. Unfortunately, the majority of Meals on Wheels programs use single-use plastic trays to deliver their meals. Cumulatively this creates at least 45 million pounds of plastic waste each year, filling up more than 1.1 million cubic yards of landfill space. A few dozen programs across the United States have switched to durable, reusable trays with great success. Beyond Plastics studied these programs and wrote a guide for Meals on Wheels programs that are seeking to make the switch, available HERE. We found that the programs save money in the long run and that there was increased satisfaction from both the volunteers and the meal recipients. However, most programs do not have access to dishwashing equipment or the upfront capital that they need to make this cost-effective and waste-reducing shift. Congress should include funding in the federal budget for Meals on Wheels programs to purchase dishwashing equipment and durable, reusable trays and cutlery.

Extended Producer Responsibility: Extended Producer Responsibility (EPR) is a tool for reducing plastic waste, but only if it is well-designed. Dozens of EPR programs for a myriad of products exist at the state level. Common programs cover tires, electronic waste, paint, and carpet. Four states have adopted EPR for packaging laws: Maine, Oregon, California, and Colorado. Of the four laws passed, only California's law has

mandatory plastic reduction targets, but only requires 10% reduction through elimination or a switch to reuse and refill. The law allows for up to 8% of recycled content to count as reduction, which is not real reduction. It is too early to tell how effective the law will be in reducing plastic waste, but Beyond Plastics believes, based on a 2020 study by Pew Charitable Trusts, "Breaking the Plastic Wave: A Comprehensive Assessment of Pathways Towards Stopping Ocean Pollution," that the new law did not go far enough and was not commensurate to solving the problem. The Pew report provides analysis showing that it is both necessary and feasible to reduce our use of plastics by 47%.[2]

b. Are any of those state or local policies feasible to implement at the national level?

Yes, all of the policies listed above can and should be implemented at the national level, plus the following additional policies:

1. Classify plastic as a "toxic substance" as Canada did in 2021, and direct the Environmental Protection Agency to regulate it accordingly
2. Enact a moratorium on new ethane crackers and plastic and petrochemical production facilities and infrastructure
3. Ban plastic waste exports and manage it all domestically
4. Enact a nationwide deposit return system for beverage containers, a.k.a. a "National Bottle Bill" that contains mandatory reuse, refill, and recycling targets. We discuss this in more depth below.
5. Phase out the sale of single-use plastic water bottles at all federal facilities and install water refill stations or water fountains. Exemptions for emergency situations should be included. The National Park Service has announced they will stop selling single-use plastic water bottles, but that will not take effect for ten years. The phase-out should be much sooner.

c. How can organizations like Environmental Health Sciences and Beyond Plastics help find middle ground solutions to our plastic pollution problem, and what is the proper balance between unabated plastic production and an outright ban on plastics production?

Beyond Plastics and many other organizations are committed to ending plastic pollution and will work with members of Congress who are interested in enacting policies that reduce plastic pollution.

If Congress is serious about solving this problem, a 50% reduction in plastics production is a reasonable middle ground and well-supported by the 2020 Pew Charitable Trusts report titled "Breaking the Plastic Wave: A Comprehensive Assessment of Pathways Towards Stopping Ocean Plastic Pollution." In that report, Pew provides a roadmap for avoiding the devastation to our ocean that is guaranteed if plastic production and mismanagement continues unabated. This roadmap is a thorough analysis of what is

[2] Figure 5, pg 22, "Breaking the Plastic Wave: A Comprehensive Assessment of Pathways Towards Stopping Ocean Plastic Pollution" by Pew Charitable Trusts, 2020

feasible with the technology currently available today. Pew calls for a 30% elimination of unnecessary plastics that includes switches to refill and reuse systems[3] and a 17% elimination of plastic waste by switching to other more recyclable or sustainable materials such as aluminum, glass, and paper.[4] These policies will not only help prevent turning the ocean into a watery landfill, but they will also create jobs and save tax dollars. There are many small businesses that are providing innovative products and services to reduce single-use plastic. They need more support and expanded markets.

In order to achieve a 50% reduction in plastic production, we will need to 1) end the production and sale onto the market of non-essential single-use plastic, including such product categories as utensils, check-out bags, ring-carriers, straws and stir sticks, all of which were recently banned by Canada; 2) support the development and scaling of reuse and refill models; 3) incentivize the development of non-toxic materials to replace fossil-fuel derived plastics; 4) scale up proven recycling and clean composting solutions.

Another essential element of any policy solution is to not lift or weaken existing pollution controls on plastic disposal (or manufacturing), but rather to increase public health protections from production of plastic through use, recycling, and disposal.

Other important elements of a balanced approach would be to require reporting on production, use, and disposal of plastic products (using TSCA), including polymers and chemical additives; and eliminating the use of the most problematic chemicals in plastics.

d. ***Please describe the elements that are needed to enact a strong and effective national extended producer responsibility (EPR) program for plastic packaging.***

A strong and effective national extended producer responsibility (EPR) program for packaging would include the following elements:

1. Establish Environmental Standards for Packaging

Similar to fuel efficiency standards for cars and appliances, we need environmental standards for packaging: 50% reduction in packaging over ten years—achieved either through elimination or by switching to reuse/refill systems — and the rest must achieve a 70% recycling rate at minimum. Waste reduction comes before recycling in every waste hierarchy and will only be achieved if it is required. Most plastics recycling is a failure, and we cannot rely on recycling to solve our plastics problem.

2. Reduce Toxics in Packaging

[3] "Breaking the Plastic Wave: A Comprehensive Assessment of Pathways Towards Stopping Ocean Plastic Pollution" by Pew Charitable Trusts, 2020.
[4] "Breaking the Plastic Wave: A Comprehensive Assessment of Pathways Towards Stopping Ocean Plastic Pollution" by Pew Charitable Trusts, 2020

Packaging that contains toxic chemicals is harmful to human health and the environment and can make it unsafe to use recycled materials in future products. Known toxic chemicals and substances, such as PFAS, formaldehyde, mercury, and lead should be removed from packaging.

3. No False Recycling

False recycling has no place in any EPR system and should not count towards recycling targets. The following processes should be considered false recycling for the purposes of EPR:

A. Any process that turns plastic into a fuel or fuel substitute or the general use of plastic in energy production; and/or
B. The following processes:
    a. gasification;
    b. pyrolysis;
    c. solvolysis;
    d. hydropyrolysis;
    e. methanolysis;
    f. enzymatic breakdown;
    g. combustion; or
    h. any other chemical conversion process used to transform plastic or plastic-derived materials into plastic monomers, chemicals, waxes, lubricants, chemical feedstocks, crude oil, diesel, gasoline, or home heating oil.

The petrochemical industry may claim that some of these facilities will turn plastic waste into feedstocks for making more plastics. However, unlike glass and metal, plastics cannot be recycled indefinitely; there are technical limitations to doing so. Ultimately the majority of plastics produced from the end-products of these "chemical recycling" facilities will be discarded as problematic plastic wastes again.

All of these processes have by-products that are toxic and that end up as air pollution and/or waste ash, and they are almost always placed in low-income communities and communities of color— communities that bear the brunt of toxics releases.

The technologies as a whole are ineffective at managing plastic waste, and building more of these facilities involves substantial public risks. These risks are not limited to greenhouse gas emissions or to local health impacts due to air pollution. From an infrastructural and budgeting perspective, it is risky to direct scarce public resources into ineffective technologies that will inevitably ***reduce the amount of funding available for proven, safe methods of waste reduction***, such as building out a reuse and refill infrastructure. We should be spending

public dollars on solutions that will **reduce plastic waste at the source,** not use multi-million dollar industrial facilities to transform one form of waste into other forms of waste in Cat-in-the-Hat-like fashion.[5] These technologies should not be considered recycling—the definitions in any EPR policy must make that clear.

4. Include a Modernized Beverage Deposit Law, a.k.a Bottle Bill

Bottle Bills work – deposit return laws are the best example of EPR and the most effective way to handle beverage containers. Most beverage containers should be managed by a modernized deposit law that sets the minimum deposit at ten cents, requires a minimum percentage of refillable containers, has minimum reuse and recycling targets, and makes it easy for people to return their containers at the stores where the consumer paid the deposit. Ten states already have a Bottle Bill. In a later section of this document, we discuss the steps necessary to develop an effective National Bottle Bill.

5. Provide Financial Relief to Taxpayers and Consumers

Packaging companies should pay fees that are used to: reimburse municipalities and consumers for the cost of recycling packaging material, provide new funding for projects that reduce packaging waste and improve recycling, and fund state agencies for managing the program and enforcing the law. Companies should pay no fees for packaging used in reuse and refill systems.

6. Include Both Residential and Commercial Waste

Commercial waste makes up 40% to 60% of the waste stream. The policy should apply to packaging generated in all sectors.

7. Don't Put the Packaging Industry in Charge

We would not expect the tobacco industry to implement effective anti-smoking efforts—do not allow consumer brands to self-regulate through Producer Responsibility Organizations (PROs). There needs to be binding performance targets set in statute, and strong accountability and oversight by state agencies, including the ability to completely disband poor-performing PROs.

8. Ensure Strong Oversight and Accountability

A law is only as strong as its enforcement. Create a new Office of Inspector General specifically to enforce the program, and make sure state agencies receive the funding necessary to implement and enforce the law.

[5] "The Cat in The Hat." Seuss, Dr. (Theodor Geisel), 1957.

Beyond Plastics and Just-Zero have drafted a model EPR bill, the "Packaging Reduction and Recycling Act, which is found here. It can be adapted for enactment at the federal level.

e. ***Please describe key elements that are needed to enact a strong and effective National Bottle Bill.***

Steps to establish a robust national beverage container deposit law ("bottle bill"):

Background: A national beverage container deposit law ("bottle bill") is necessary because more than 180 billion beverage containers were wasted (landfilled, incinerated, or littered) in the United States in 2019. In terms of weight, this is almost 800,000 tons of wasted aluminum, more than 2.5 million tons of wasted plastic, and about 9 million tons of wasted glass, as well as about half a million tons of wasted multi-material packaging.[6] Those numbers grow each year as Americans' consumption increases. At the national level, beverage container recycling has stagnated for years. According to the U.S. EPA:[7]

- **fewer than 50% of aluminum cans** have consistently been recycled for five years,
- **peak recycling of plastic PET bottles was 33%** in 1990; it had dropped to 27% by 2018,
- **about a third of glass bottles** are returned for recycling.

When contamination is factored in, actual recycling rates are lower still, such that on average, ***two out of every three beverage containers sold in the United States are not being recycled.***

However, beverage container recycling rates are not uniform across the country or even within deposit states themselves. Ten U.S. states have existing bottle bills where a deposit of 5-15¢ is placed on a certain set of beverage containers (beverages covered varies from state to state), and is fully refunded when the containers are turned in for recycling ("redeemed"). Recycling rates for container materials on deposit in those states are much higher than the recycling rates for non-deposit containers. Nationwide in 2019:

- **aluminum cans** with a deposit were recycled at a rate of 77%, vs. 36% for non-deposit cans,
- **Plastic PET bottles** with a deposit were recycled at a rate of 57%, vs. 17% for non-deposit PET, and
- **glass bottles** with a deposit were recycled at a rate of 66%, vs. 22% for non-deposit glass.[8]

[6] "Tipping Point: Beverage Container Wasting, Plastic Pollution, and the Failed Promise of Curbside Recycling." Container Recycling Institute, forthcoming in 2023.
[7] Table 25, "Advancing Sustainable Materials Management: 2018 Tables and Figures. Assessing Trends in Materials Generation and Management in the United States." U.S. Environmental Protection Agency, November 2020.
[8] "U.S. Nominal Recycling Rates by Deposit Status, 2019." Container Recycling Institute website, accessed 1/6/23.

Containers redeemed through a deposit system are also of a much higher quality and are therefore more valuable as an industrial feedstock than containers collected through curbside recycling programs where contamination is rife. A national bottle bill would enable all container materials to achieve high recycling rates *and* be of a higher quality, thereby eliminating millions of tons of container waste, reducing greenhouse gas emissions from replacing wasted containers, reducing litter, and adding thousands of recycling sector jobs to the U.S. economy. The litter reduction benefits are immense!

Key points for Congress to analyze when considering a national bottle bill would include (but not be limited to):

1. **Incentivizing refillable containers:** The "reduce" and "reuse" parts of the "reduce, reuse, recycle" mantra have largely been paid lip service over the years. Refilling was standard for almost all beverage containers until the late 1950s and early 1960s when this practice was abandoned in favor of the perceived convenience of disposable, one-way containers. Since the refilling infrastructure–which was local and regional in nature–was dismantled, there have been significant logistical, financial, and operational obstacles for local or regional brands wishing to sell their beverages in refillable bottles. A national deposit system is an opportunity to create structures for incentivizing reuse and refill. Options that Beyond Plastics supports includes:
    a. **Requiring a percentage of all beverage container sales to be made in refillable/reusable containers.** Coca-Cola announced that they will sell 25% of their products in reusable/refillable containers by 2030,[9] and Pepsi has made a similar announcement.[10] We know that these companies have not achieved the majority of their other recycling and waste reduction pledges;[11] it is time to amend federal law to make it mandatory rather than voluntary to increase the use of refillables.
    b. **Developing a grant program** to spur investment in new refilling infrastructure.
    c. **Creating one or more standardized bottles** that can be delivered to any number of bottle-washing operations across the country and refilled by various bottlers and distributors. Oregon[12] has done this, as has the Beer Store in Ontario, Canada, with its "industry standard bottle," or standard brown long neck.[13]
    d. **Placing a higher deposit on refillables** to encourage return for refill.

2. **Redemption options:** for maximum consumer convenience and participation**,** there should be multiple redemption channels available to the public, including systems that allow consumers to aggregate their containers (such as Oregon's Bag Drop or Maine's CLYNK), independently-owned and/or state-operated redemption centers,

[9] "Coca-Cola Commits to Bold Reusable Packaging Goal." *Plastics Today*, Feb. 11, 2022.
[10] "PepsiCo aims to double amount of reusable packaging to 20% by 2030." *Waste Dive,* Dec. 6, 2022.
[11] "Coca-Cola and rivals fail to meet plastic pledges: Beverage company is one of worst offenders among consumer goods groups for missing own targets, report finds." *Financial Times,* Sept. 6, 2020.
[12] "Oregon Launches First Statewide Refillable Bottle System In US." Oregon Public Broadcasting, 8/27/18.
[13] "The average beer bottle is refilled 15 times in its environmentally-friendly life cycle." *Toronto Star,* Jun. 28, 2013.

unmanned reverse vending machines, and return-to-retail. It is also important to ensure that sufficient redemption access is maintained in rural areas and in densely-populated urban areas. Steps should be taken to prevent "redemption deserts" where convenient redemption access is unavailable.

Most importantly, stores that sell beverage containers with deposits must be required to take the empty containers back and refund the deposit to the consumer. Redemption centers and bag drops are *supplements* to returning to retail stores, not a substitute. This is especially important for consumers who do not have cars and for busy people who do not want to make extra stops.

The return process for people who collect large numbers of empty containers, sometimes known as canners or waste pickers, should be substantially improved. They provide an important public service at no cost to taxpayers, and their work should be supported at the local level.

3. **Covered beverages and materials**: rather than be limited to the containers that have traditionally been included in state bottle bills (metal cans, glass bottles, and plastic bottles), a national bottle bill is an opportunity to create markets for harder-to-recycle materials at scale. (We do not advise putting a deposit on containers that have historically been nearly impossible to recycle, such as bag-in-box and foil pouches; these container types should be phased out in favor of more reusable recyclable packaging). A national bottle bill is also an opportunity to place deposits on a full range of beverage types, including carbonated and non-carbonated beverages, wine and spirits, milk, and dairy alternatives, as is done in Canada and other countries. The best way to achieve maximum coverage in the context of an ever-changing beverage market is not to identify all the beverage and material types that are included in the law, but rather to *exclude* a much smaller subset of containers, such as those used for medical purposes.

4. **Enforceable recycling rate targets:** to *meaningfully* reduce environmental impacts from container wasting, a national bottle bill should set strong recycling rate targets in the 85-90% range. These targets should be achieved in an incremental manner over a period of not more than 8 years. These targets should be enforceable: if material types (or brands) fail to hit milestones along the path to achieving their targets, there should be changes. These might include raising the deposit value on the poor-performing containers or requiring producers to switch to another package type that has a higher recycling rate.

5. **Continuity of operations:** should the deposit programs in the 10 existing deposit states (whose laws and operating parameters vary significantly) continue to operate independently as they do now, or should they be folded into a national system? Beyond Plastics does not support pre-empting existing state laws.

6. **Deposit value considerations**:

a. **Modification**: rather than adopt static deposit value(s), as most U.S. deposit states have done, a national bottle bill should have provisions to tie deposit value(s) to the Consumer Price Index, so that they may increase with time in order to serve as effective financial incentives in the face of inflation.
b. **Efficacy at reaching targets:** whether a single deposit value or a tiered approach (multiple deposit values based on container size or beverage type) is adopted, the deposit value should be high enough to serve as an *effective financial incentive* for consumers to redeem containers at rates that ultimately reach the targets established. If a material type fails to hit redemption rate milestones according to the schedule established, there should be provisions that require the deposit value to increase automatically, as was done in raising Oregon's deposit value from a nickel to a dime when the redemption rate fell below 80% for two consecutive years.[14]

7. **Reporting requirements:** deposit initiators (original sellers) and redeemers (entities issuing deposit refunds) should be required to report quarterly and annually on sales and returns in *units*, *by material* (not just overall). Other reporting requirements should include number of points of redemption, average population served by each point of redemption, complaints received and addressed, and weight of containers sold and redeemed by material. This information should be made available to the public.

8. **Auditing & enforcement:** an organization outside of the beverage industry must be established *and adequately funded* to audit distributors, redemption centers, retailers (when applicable), and other relevant entities for compliance with the law and to levy fines or penalties for non-compliance. The penalties must be high enough to not be just the cost of doing business. This organization could be housed in an existing federal agency such as the EPA, or it could be a new office of an inspector general, or a neutral third-party organization hired through a competitive bidding review process.

3. ***Earlier this year, the Recycling and Composting Accountability Act passed the Senate chamber by unanimous consent. This Act would require the U.S. Environmental Protection Agency to collect, and make publicly available, data on recycling and composting rates across the country.***

   a. ***What is the importance of data collection in helping to better understand the plastic pollution crisis?***

      Good data is at the heart of good public policy. If we have a better handle on what exactly is in our waste stream and what the outcomes are for the materials we place in our recycling bins, we can more easily diagnose where the failures are and identify new policies needed to address the problems. However, we do not need to wait for years of

[14] "Oregon bottle deposit will go from a nickel to a dime next year." *Oregon Live,* 8/2/16.

new data to know that waste reduction is the most environmentally effective and cost effective way to address the solid waste problems facing the nation. Waste reduction has been at the top of the solid waste hierarchy for decades but has never been taken seriously. Waste reduction is the most important issue for Congress and the EPA to work on.

4. ***Americans want to be good recyclers, but there is a great deal of confusion when it comes to knowing what materials should or should not be placed in the recycling bin. As we all know, not all recycling programs are made equal – a bottle that can be recycled in Delaware may not be recyclable in another state. This creates a great deal of confusion for citizens trying to decide what can be placed in their recycling bin.***

   a. ***Would you comment on the role of product design and its importance in ensuring products can be widely recycled across the majority of states?***

      Design for recyclability plays a key role in reducing confusion and increasing recycling rates. If all products on the market were designed with recyclability in mind, then Americans could recycle many items where facilities exist. Adoption of a strong Extended Producer Responsibility law at the state or federal level would result in fewer non-recyclable products being sold.

   b. ***What other actions can we take to help educate consumers and reduce confusion when it comes to recycling?***

      Consumer confusion is primarily a result of brand owners often presenting false or misleading recycling claims on their products and packaging. Examples include putting the recycling logo on the packaging when they know full-well that the package is not recyclable. These practices mislead Americans into thinking that plastics are recyclable when most of them are not. The Federal Trade Commission's Green Guides that are currently in effect allow the chasing arrows to be used on a product when a minimum of 60% of communities have recycling programs **"available"** that accept a given material. Availability or access does not equal recycling.

      More and more brands are putting recycling labels on packaging that, in most instances, is not recyclable in practice. From plastic bags to granola bars, many packages made from film plastics carry labels that indicate that these products can be recycled at store drop-off bins; or "where locations exist." Such language is the root of much consumer confusion.

      The Attorney General of California is investigating deceptive advertising claims around recyclability. Congress should consider doing the same. Ask brands that have recycling claims on their packaging how much is actually getting recycled and where. Congress should direct the FTC to review and rewrite the Green Guides so that they are both meaningful and enforceable.

5. ***Under current law, pyrolysis and gasification are regulated under section 129 of the Clean Air Act as waste incineration units. However, there has been an effort at both the state and federal level to reclassify chemical recycling as a manufacturing process.***

   a. ***Would reclassifying chemical recycling from a waste incineration process to a manufacturing process change how these facilities are regulated under the Clean Air Act?***

      Yes, reclassifying "chemical recycling" from a waste incineration process to a manufacturing process would effectively exempt these facilities from all requirements to control, monitor, or report their toxic emissions. One of the claims that the chemical industry and its allies make is that pyrolysis and gasification incinerators don't need to be regulated as incinerators under Clean Air Act § 129 because they can be regulated as sources of hazardous air pollutants under § 112. That claim is deeply misleading for three reasons:

      1. **There is currently no category of gasification and pyrolysis units under § 112, which regulates major stationary source categories,** and EPA is not required to list them as a new category. Therefore, EPA cannot currently regulate pyrolysis and gasification incinerators as manufacturing facilities.

      2. **It is extremely unlikely that a new category of gasification and pyrolysis units would ever be created and regulated, despite a proposed rulemaking process underway** ("ANPR," discussed further below)**.** Prior to creating a new major category of gasification and pyrolysis units, EPA would have to make a scientific determination that these facilities present a threat of adverse effects to human health or the environment and then list them as a matter of discretion. Even if such a new category were listed, however, it still would have to be regulated from scratch. Setting the standards would be another resource-intensive, multi-year process. Overall, the chances of ever getting gasification and pyrolysis incinerators controlled under § 112 are extremely small, and if it ever happened, it would take a decade or more. Even then, the new standards wouldn't actually generate reductions until 3 years after rule promulgation because the incinerators would have been built already and would get a 3-year compliance window.

      3. **Any new regulations for gasification and pyrolysis incinerators under § 112 would be unlikely to reduce their toxic emissions meaningfully**. For "area source" manufacturing facilities, such as gasification and pyrolysis incinerators (if EPA were to list them as a manufacturing source category), EPA typically sets "GACT" (***generally*** available control technology) standards that require little if

any reduction in toxic emissions, in contrast to the "MACT" standard (***maximum*** available control technology) required by § 129, under which these facilities are currently regulated.

It is very important to understand that just because gasification and pyrolysis incinerators are not currently listed as "major sources" of hazardous air pollutants under § 112, that doesn't mean they aren't dangerous; it only means that they don't emit the **high-volume** hazardous air pollutants (HAPS), such as hydrogen chloride, that enable other § 112 facilities to be classified as "major." But gasification and pyrolysis units **absolutely do emit toxic pollutants,** including dioxins, arsenic, cadmium, benzene, lead, and mercury. These pollutants are dangerous even in minute quantities. ***This is exactly why Congress enacted section 129 in the 1990 amendments to the Clean Air Act: to regulate incinerators with highly toxic emissions that were not captured by section 112.***

To recap: adding gasification and pyrolysis as major source categories under § 112 of the Clean Air Act would entail delays of a decade or more, with no guarantee of meaningful control of very hazardous air pollutants. Instead, it would be much easier, and more effective from a pollution control-standpoint, to just adhere to EPA's long-standing, **existing classification of gasification and pyrolysis units as waste incinerators**:

- no new listing in § 112 is required
- no new standard setting: all the standards already exist
- no delay in controlling HAP emissions – new gasification and pyrolysis incinerators will be subject to protective MACT standards as soon as they are built.

The plastic industry knows that removing pyrolysis and gasification incinerators from regulation as incinerators under § 129 is a way to deregulate them. It knows that promises of regulation under § 112 would, in fact, effectively mean complete deregulation and a blank check to pollute without ever installing MACT controls, monitoring their emissions, or reporting those emissions to the people in the communities where they operate (which will primarily be in environmental justice communities). That is why the plastic industry is cynically asking that pyrolysis and gasification incinerators be regulated under § 112 instead of § 129.

It is important to note that the chemical industry is lobbying at the state level to have these facilities exempted from various state environmental laws and, in some instances, have them considered manufacturing facilities, which would open the door to taxpayer subsidies.

b. Are area source manufacturing processes subject to the same emissions regulations as waste incinerators?

No, area sources are typically only required to meet Generally Available Control Technology (GACT) standards, which are essentially toothless and ineffective. Waste

incinerators are subject to MACT standards (Maximum Available Control Technology): the standards used in § 129.

c. ***Is there a category of pyrolysis and gasification manufacturing facilities to regulate under the Clean Air Act?***

No, not under Section 112. § 112 regulates source categories, and there is no category of gasification and pyrolysis units to regulate. It is extremely unlikely that a new category of gasification and pyrolysis units would ever be created and regulated, as I described above. If it ever did happen, the process would take more than a decade and be very resource-intensive for EPA.

d. ***What impact might this reclassification have on communities living near chemical recycling facilities?***

The reclassification would have a very negative effect on those communities living near "chemical recycling" facilities, as those facilities would no longer be subject to emissions limits for a range of chemicals that are highly toxic at even small doses, including styrene, benzene, toluene, mercury, arsenic, dioxins, ethylbenzene, xylenes, naphthalene, acetaldehyde, formaldehyde, hydrochloric acid, methanol and hexane. As described above, such facilities would also escape Clean Air Act requirements for monitoring and reporting on emissions. Finally, these facilities would be able to burn other kinds of waste without pollution controls or monitoring and reporting requirements, including PFAS waste, if they were not covered by Clean Air Act protections.

6. ***In September of 2021, the Environmental Protection Agency issued an Advanced Notice of Proposed Rulemaking (ANPR) requesting comments to assist in the potential development of regulations for pyrolysis and gasification units, such as chemical recycling facilities, that "convert solid or semi-solid waste into products such as energy, fuels, and chemical commodities." EPA has stated that a primary goal in this process is to address the confusion currently surrounding these facilities and their continued regulation under section 129 of the Clean Air Act.***

a. ***Do you believe that pyrolysis and gasification facilities should be excused from compliance with the Clean Air Act if they are being used to convert waste plastic into useful products?***

No. There is no reason to exempt pyrolysis and gasification facilities from compliance with the Clean Air Act just because they may be potentially turning plastic waste into products. The hazardous waste generated and toxic air pollution emitted from pyrolysis and gasification units is no different and no less harmful to the public – particularly those living near these facilities – simply because they are potentially making "useful" products. Congress has never adopted any provision that would provide such an enormous and harmful loophole to the Clean Air Act. To be clear, nothing is currently stopping any company from using pyrolysis or gasification for plastic-to-fuel,

plastic-to-plastic or plastic-to-anything else. The industry is simply seeking to avoid the responsibility of complying with pollution controls so it can further externalize the already enormous cost of plastic production and waste onto taxpayers and those living near pyrolysis and gasification facilities.

b. How should EPA assess comments submitted under this ANPR?

EPA should consider whether it is under any legal obligation, whether from Congress or the courts, to amend its current regulations that treat pyrolysis and gasification as incinerators under Section 129, and that treat discarded plastic as "waste" under the Resource Conservation and Recovery Act (RCRA).

Recognizing that no such obligation exists, EPA should consider the potential harm to public health – particularly for those communities living near existing or projected pyrolysis and gasification facilities – from de-regulating these two technologies by removing them from Section 129 of the Clean Air Act.

Based upon these two factors, and consistent with the Agency's mission and mandate from Congress under the Clean Air Act, EPA should have no difficulty in concluding that a change to how pyrolysis and gasification are regulated under the Clean Air Act, (including whether plastic waste is treated as such under RCRA) is not only unwarranted but would be dangerous and wrong.

7. ***Pyrolysis plants are known to emit a number of the most toxic hazardous air pollutants including: Styrene, Benzene, Toluene, Mercury, Arsenic, Dioxins, Ethylbenzene, Xylenes, Naphthalene, Acetaldehyde, Formaldehyde, Hydrochloric Acid, Methanol and Hexane.***

c. Will there be any pollution controls on the release of these Hazardous Air Pollutants into surrounding communities if pyrolysis and gasification are removed from Section 129 of the Clean Air Act, or if plastic waste is no longer classified as "waste" under the Resource Conservation and Recovery Act (RCRA)?

No. Industry is pursuing two de-regulatory paths to get out from under the pollution control requirements of Section 129 of the Clean Air Act: 1) change the definition of what is considered an incinerator under Section 129, 2) amend EPA's regulations under RCRA to exclude plastic waste from being classified as "waste." Either of these two actions, whether taken by EPA or Congress, would eliminate existing Clean Air Act protections for communities from toxic pollution and hazardous waste coming from "chemical recycling" facilities. This would particularly threaten environmental justice communities.

While the chemical industry says that it can comply with the Clean Air Act if their facilities are covered by Section 112, this is only because the highly-toxic pollutants from pyrolysis and gasification technologies are not emitted in high enough volumes to ever trigger regulation under that section. In addition, as stated earlier, were EPA ever to

embark upon setting pollution limits for pyrolysis and gasification under Section 112, it would take at least a decade to do so, and likely much longer.

To the extent that it is the priority and obligation of EPA and the Congress to protect public health, there is no reason to change the existing scope of what is considered an incinerator or the current inclusion of plastic waste as "waste" under RCRA. Nothing compels EPA to change the status quo in either respect; the Agency would only need to do so if it sought to eliminate existing (and long-standing) pollution controls to favor the interests of the plastics industry over public health and the environment.

8. In your testimony, you said that plastic production is becoming the "new coal" with significant implications for climate change, and the global communities' efforts to mitigate it.

d. How does plastic production (including manufacturing, use, and disposal, as well as oil and gas extraction and transport) currently contribute to climate change?

Plastic produces greenhouse gas emissions at every stage of its life cycle. As of 2020, the U.S. plastics industry was responsible for at least 232 million tons of CO2e gas emissions per year, which is equivalent to the average emissions from 116 average-sized (500-megawatt) coal-fired power plants.[15] To provide context, if plastic were a country, it would be the world's fifth largest greenhouse gas emitter, beating out all but China, the U.S., India and Russia. This analysis was thoroughly documented in a 2021 report by Beyond Plastics, titled, "The New Coal: Plastics & Climate Change." The report's conclusions are based on an examination of these ten high-impact stages of plastics production, use, and disposal:

1. Fracking for plastics
2. Transporting and processing fracked gasses
3. Ethane gas crackers
4. Other plastics feedstock manufacturing
5. Polymer and resin manufacturing
6. Exports and Imports
7. Foamed plastic insulation
8. "Chemical Recycling"
9. Municipal Waste Incineration
10. Plastics in water

e. What are the implications of the projected tripling of plastic production over the next 40 years?

Absent legislative or regulatory intervention, plastic production is on track to double by 2040 and triple over the next 40 years. As the plastics industry continues to build

[15] "The New Coal: Plastics & Climate Change," Beyond Plastics, 2021.

infrastructure for export and production, its CO_2e contributions will increase as well. Plastic pollution entering the ocean is projected to nearly triple by 2040 to 29 million metric tons per year and will continue to increase exponentially beyond that. The anticipated impacts to the ocean and to human health of this scenario are severe.[16]

f. Regarding new plastic production facilities, what is the carbon footprint for the numerous facilities that are currently proposed for the U.S.?

At least 42 plastics facilities have opened since 2019, are under construction, or are in the permitting process. If they become fully operational, these new plastics plants could release an additional 55 million tons of CO_2e gasses – the equivalent of another 27 500-megawatt coal-fired power plants.

g. What percentage of the climate benefits from Inflation Reduction Act investments and reductions will be erased by new plastics manufacturing (including the greenhouse gas emissions from production, use and disposal, as well as oil and gas extraction and transport)?

There are many factors that go into calculating such an estimate, and such a calculation is beyond the scope of this question and answer process. For background, note the following:

Estimates show that the Inflation Reduction Act puts the United States on a path to cut its greenhouse gas emissions by 40% by 2030.[17] As of 2020, the U.S. emits 6 billion metric tons of greenhouse gas each year, therefore in real numbers a 40% reduction is equivalent to a reduction of 2.4 billion tons of greenhouse gas emissions. Given that plastic production is expected to double by 2040, greenhouse gas emissions from plastics production are also likely to double: from 232 million tons to 464 million tons.

[16] "Breaking the Plastic Wave: A Comprehensive Assessment of Pathways Towards Stopping Ocean Plastic Pollution." Pew Charitable Trusts, 2020.
[17] "The Inflation Reduction Act Is The Most Important Climate Action In U.S. History." *Forbes*, August 2, 2022.

Senator MERKLEY. Thank you very much for your testimony.

Each of our first two witnesses went 2 minutes over their time, so we will establish the same possibility, should you wish to use it.

We will next turn to Mr. Matt Seaholm, who serves as CEO of the Plastics Industry Association.

Senator WICKER. But in 5 minutes, we are going to turn the light out.

[Laughter.]

STATEMENT OF MATT SEAHOLM,
CEO, PLASTICS INDUSTRY ASSOCIATION

Mr. SEAHOLM. Any distraction is welcome.

Good morning, Chairman Merkley, Ranking Member Wicker, and esteemed members of the Committee. Thank you for the opportunity to appear before you today.

My name is Matt Seaholm, and I am the President and CEO of the Plastics Industry Association. Founded in 1937, we represent the entire supply chain of the plastics industry in which nearly 1 million Americans are employed. Our membership includes material suppliers, equipment manufacturers, processors, and recyclers.

Let me first say we appreciate the commitment of this Committee to pursue solutions that reduce waste. There is a saying in our industry, we love plastic, we hate plastic waste. The way we see it, any molecule of plastic material that leaves the economy is truly a waste. We need to collect, sort, and ultimately reprocess more material. And that goes for all substrates, not just plastic.

But today's hearing is first about the impacts of plastic use. So I would like to discuss a few of those, more importantly, the variety of people impacted.

A husband hit head on at 50 miles per hour, and even though they had to cut him out of the car with the jaws of life, he surprised even the medics onsite as the deployment of air bags made from plastic fibers left him unharmed. A teenager who only has access to nutrition thanks to plastic packaging because he lives in a food desert right here in our Nation's capital.

A retiree with Type 1 diabetes since childhood who remains active because of the sterile, interchangeable plastics used to support decades of treatments through the loss of kidney function. A young family without running water for an entire week because a hurricane flooded their neighborhood along the Gulf Coast, but were not thirsty because of plastic water bottles delivered to them in their time of need. A single mother who, during a crucial time of the baby formula shortage, was able to utilize pre-sterilized plastic milk collection bags to safely store breast milk for her baby.

The list can go on and on. And before it is suggested, these aren't the types of applications truly at the heart of the discussion, I would point to three pieces of proposed legislation in this Congress that have called for the stoppage of production of plastics used in each of these scenarios.

If there is one thing a pandemic and now war on the European continent has taught us, stable supply chains are imperative. Producing plastic in America is a good thing and something that I believe should be embraced as essential, not abruptly stopped.

Plastic has become a preferred material in most applications because it uses the least number of resources to manufacture and transport as well as providing greater performance. However, we must also acknowledge that the incredible innovations in plastic materials and products have outpaced our ability to recycle them because infrastructure has not kept up. Our Nation's recycling rates are too low. That is why companies across our supply chain work tirelessly to improve recyclability and invest billions of dollars into the prevention of waste and the technologies to recycle.

However, our industry does not control the entire value chain of recycling in America. And that is why we need partners to help get these rates where we all want them to go.

We see Congress as a very important partner in that process, and appreciate this hearing for the opportunity to talk about solutions to reduce plastic waste. A few policy approaches I might suggest: Increase investments in critical recycling infrastructure to ensure the collection, sortation, processing that can keep up with the complexities of all materials in the marketplace. The EPA has started their process for granting resources included in the Infrastructure Investment and Jobs Act that stem from Save Our Seas 2.0 legislation passed in 2020. It is a great start, but certainly more is needed.

Promote end market development for the variety of plastic resins to ensure demand remains for recycled materials. Reasonable and attainable recycled content requirements can help spur investment and guarantee markets for recyclable material.

Encourage innovations in recycling technologies to ensure materials that cannot economically be recovered through traditional methods can still be recycled, moving us toward a more circular economy. But perhaps more importantly, I urge Congress to avoid stifling innovation and promising new technologies that are absolutely needed.

There is already real value in post-consumer plastic. These policies will help us better capture it and keep it in our economy. At the end of the day, plastic is essential, plain and simple. We need it in our lives. But America does not recycle enough of it. Our industry wants to recycle more, and that is why every day we recycle more than we did the day before.

Working together, I know we can get these rates up. And together is the most important word in that sentence. I hope that is the spirit of today's discussion.

I thank you again for the opportunity to offer testimony on behalf of our industry. I look forward to answering your questions.

[The prepared statement of Mr. Seaholm follows:]

PLASTICS
INDUSTRY ASSOCIATION

Opening Remarks
Matt Seaholm, President & CEO
Plastics Industry Association

U.S. Senate Environment & Public Works Committee
Subcommittee on Chemical Safety, Waste Management, Environmental Justice, and Regulatory Oversight
December 15, 2022

Good morning, Chairman Merkley, Ranking Member Wicker, and esteemed members of the committee.

Thank you for the opportunity to appear before you today. My name is Matt Seaholm, and I am the President & CEO of the Plastics Industry Association. Founded in 1937, we represent the entire supply chain of the plastics industry, in which nearly one million Americans are employed. Our membership includes material suppliers, equipment manufacturers, processors, and recyclers.

Let me first say, we appreciate the commitment of this committee to pursue solutions that reduce waste. There's a saying in our industry: We love plastic. We hate plastic waste. The way we see it, any molecule of plastic material that leaves the economy is truly a waste. We need to collect, sort and ultimately reprocess more material. And that goes for all substrates, not just plastic.
But today's hearing is first about the impacts of plastic use, so I'd like to discuss a few of those. More importantly the variety of people impacted:

- A husband, hit head-on at 50 MPH, and even though they had to cut him out of the car with the jaws of life, he surprised even the medics on site as the deployment of airbags made from plastic fibers left him unharmed.

- A teenager who only has access to nutrition thanks to plastic packaging because he lives in a food desert in our nation's capital.

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The list can go on and on and before it's suggested these aren't the types of applications truly at the heart of the discussion, I would point to three proposed pieces of legislation in this Congress that call for the stoppage of production of the plastics used in each of these scenarios. If there's one thing a pandemic

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and now a war on the European continent have taught us, stable supply chains are imperative. Producing plastic in America is a good thing and something that I believe should be embraced as essential, not abruptly stopped.

Plastic has become the preferred material in most applications because it uses the least number of resources to manufacture and transport as well as providing greater performance. However, we must also acknowledge that the incredible innovations in plastic materials and products have outpaced our ability to recycle them because infrastructure has not kept up.
Our nation's recycling rates are too low. That is why companies across our supply chain work tirelessly to improve recyclability and invest billions of dollars into the prevention of waste and the technologies to recycle. However, our industry does not control the entire value chain of recycling in America and that is why we need partners to help get these rates where we all want them.
We see Congress as a very important partner in this process and appreciate this hearing for the opportunity to talk about solutions to reduce plastic waste. Policy approaches I might suggest are:

1) Increase investments in critical recycling infrastructure to ensure that collection, sortation and processing can keep up with the complexities of all materials in the marketplace. The EPA has started their process for granting resources included in the Infrastructure Investment and Jobs Act that stem from Save Our Seas 2.0 legislation passed in 2020. It's a great start, but certainly more is needed.

2) Promote end-market development for the variety of plastic resins to ensure demand remains for recycled materials. Reasonable and attainable recycled content requirements can help spur investment and guarantee markets for recyclable material.

3) Encourage innovations in recycling technologies to ensure materials that cannot economically be recovered through traditional methods can still be recycled, moving us toward a more circular economy. But perhaps more importantly, I urge Congress to avoid stifling innovation and promising new technologies that are needed.

There is already real value in post-consumer plastic. These policies will help us better capture it and keep it in our economy.

At the end of the day, plastic is essential. Plain and simple. We need it in our lives. But America does not recycle enough of it. Our industry wants to recycle more and that's why every day, we recycle more than we did the day before. Working together I know we can get these rates up. And "together" is the most important word in that sentence. I hope that is the spirit of today's discussion.

Thank you again for the opportunity to offer testimony on behalf of our industry and I look forward to answering your questions.

1425 K Street NW, Suite 500, Washington, DC 20005
P 202.974.5200 | **F** 202.296.7005 | www.plasticsindustry.org

Senate Committee on Environment and Public Works
Hearing Entitled, *"Examining the Impact of Plastic Use and Identifying Solutions for Reducing Plastic Waste"*
December 15, 2022
Questions for the Record for Matt Seaholm

Ex-Officio Chairman Carper:

1. A national survey conducted in 2021 on behalf of the American Chemistry Council found 87% of Democrats, 74% of Independents, and 64% of Republicans see plastic waste as a critical issue that we should address now. A 2022 study conducted by the World Wildlife Fund found that 74% of the American public believes that the United States needs to reduce our reliance on plastic, and 86% agree that the recycling system for plastic needs improvement. It is clear there is widespread and bipartisan support to address the plastic pollution crisis.

    a. Given that the public would like to see the Federal government act to reduce plastic waste, what are your top three recommendations to Congress as to what we should do to reduce plastic waste and limit the harms caused by plastics to public health and the environment?

The plastics industry agrees that too much plastic leaves the economy and enters the environment. The key to reducing this is improving the collection and sortation of recyclable materials and getting them efficiently to reprocessing facilities to be recycled and kept in a more circular economy.

Three policy solutions that Congress should consider are:

- *Greater support for recycling infrastructure. There is no doubt that the innovation in plastic products has surpassed our country's ability to effectively recycle. We need to modernize material recovery facilities and the collection and sortation process in order to get high quality material to recycling centers. The Infrastructure and Investment Jobs Act included $275 million over five years for recycling grants that stem from the Save Our Seas 2.0 legislation passed in 2020. This is a start, but only a beginning for what truly needs to be appropriated to modernize our recycling system.*
- *Consider reasonable and attainable recycled content requirements for non-food contact applications. By increasing the guaranteed end-market for recyclable material, Congress could help inject additional private investment into the recycling stream.*
- *Support emerging recycling technologies that will increase the scale of recycling operations by breaking down hard-to-recycle plastic products and molecularly recycling them to create pure recycled content resin that can be used in more sensitive applications, such as food-grade packaging.*

2. Several states have passed laws to incentivize the construction of chemical recycling facilities, including state and local tax breaks and access to government bonds to support construction. The number of chemical recycling facilities is expected to increase globally in the coming years – in fact, a recent study by McKinsey and Company found chemical recycling could provide up to 8% of the global demand for recycled plastic polymers by 2030.

   Another 2020 report by McKinsey & Company found that the oil and gas industry's operations account for 9 percent of all human-made greenhouse-gas (GHG) emissions. If chemical recycling facilities in the United States continue to increase in numbers, it would be important for all of these facilities to operate in a way that does not adversely affect the environment or produce harmful greenhouse gas emissions.

   a. Does the United States need a strong regulatory framework for chemical recycling facilities before the number of chemical recycling facilities surpasses the supply of recycled feedstock?

First, a point of clarification on the studies cited: The referenced 2020 McKinsey study only focuses on the global emissions in the production of oil and gas, not for the manufacturing of plastic. The production of plastic products has a lower environmental footprint compared to that of other materials (McKinsey 2022 report). Making plastics products from mechanically recycled plastics have a lower carbon footprint than from Virgin plastic resin (APR 2018). Advanced technologies are also showing the potential to do so as well.

With that said, we believe that a strong regulatory framework already exists for polymerization and manufacturing facilities, which is what these are. Advanced recycling is a chemical manufacturing process and is already robustly regulated at the federal and state level. For example, several states have adopted legislation that defines advanced recycling processes to include both pyrolysis and gasification, and regulation of pyrolysis and gasification technologies already exists in at least 14 states—including Arizona, Arkansas, Florida, Georgia, Illinois, Iowa, Ohio, Oklahoma, Louisiana, Pennsylvania, Tennessee, Texas, Virginia, and Wisconsin. The relationship between the number of facilities and the amount of plastic available to be recycled is irrelevant, though we would not expect additional facilities to come online without sufficient supply of recycled feedstock for them to process.

States have incentivized advanced recycling facilities because legislators recognize that these technologies are integral to increasing recycling rates and reducing carbon emissions. We would encourage Congress to avoid stifling innovation and instead encourage that we are pursuing every option to reduce plastic waste.

3. Earlier this year, the Recycling and Composting Accountability Act passed the Senate chamber by unanimous consent. This Act would require the U.S. Environmental

Protection Agency to collect, and make publicly available, data on recycling and composting rates across the country.

a. What is the importance of data collection in helping to better understand the plastic pollution crisis?

The Recycling and Composting Accountability Act is a great example of helpful legislation: it provides data collection that policymakers, industries, and various stakeholders can use to determine the most impactful and effective approaches to reducing waste while allocating funds to the appropriate programs. This bill was not specific to plastic because it recognized that waste should be addressed for all materials in efforts to conserve. In most cases the reduction in the use of plastic products can actually increase waste by using materials that require more resources to produce and more energy to manufacture and transport. The Recycling and Composting Accountability Act should be reintroduced in the 118th Congress and passed as soon as possible.

4. In 2021 the U.S. Environmental Protection Agency set a National Recycling Goal to increase the national recycling rate of recyclable materials – like paper, glass, and plastic – to 50% by 2030. Similarly, States, municipalities, and companies have established their own plastic recycling goals. For example, America's Plastic Makers have committed to creating a circular economy where 100% of plastic packaging in the U.S. is reused, recycled, or recovered by 2040. These goals are commendable, but there is limited information on how they will be met.

a. If the Federal government required widely used consumer packaging and products to be made from material that is 100% recyclable by the recycling facilities that are actually operating today, would that be an effective policy to help us meet recycling targets?

b. Would such a policy help level the playing field among plastic product manufacturers, by holding them all to the same standard?

Sustainability and recyclability do not have the same meaning. Circularity is one part of sustainable materials management, an approach that the EPA (Environmental Protection Agency) supports as does our industry. The best material and product to be used in any application must take into account its entire life cycle and the environmental impact of the alternative.

We believe a policy of this magnitude and rigidity would stymie innovation and, in many cases, force the use of material that isn't necessarily better for the environment. Recycling technology has evolved greatly over the past decade and while material recovery facilities are still largely outdated, the ability to greatly improve their efficiency exists. To peg any type of policy to the technology of today will cause the oversight of advancements that are now happening at an increasingly rapid scale.

5. There is a great deal of confusion when it comes to knowing what materials should or should not be placed in the recycling bin. As we all know, not all recycling programs are made equal – a bottle the can be recycled in Delaware may not be recyclable in another state.

    a. Would you comment on the role of product design and its importance in ensuring products can be widely recycled across the majority of states?

Designing for recyclability is an important consideration, but not the only one. Our members work with their customers to improve the designs of their products every day to conserve resources and in many cases, improve recyclability. But in the case of packaging, it must also protect and preserve the item inside, market it to consumers, provide information such as nutritional content, or instructions for use, etc. If a food item is contained in packaging that keeps it fresh for 45 days and that packaging is changed to a material that is currently more recyclable but can only keep it fresh for 15 days, does recyclability justify the change? Based on the principle of sustainable materials management, the answer is no.

    b. What other actions can we take to help educate consumers and reduce confusion when it comes to recycling?

A national standardization of definitions and labeling would contribute to reducing consumer confusion. We would support a national law that eliminates state requirements for "chasing arrows" around the existing resin ID codes and replaces them with clearer information that more accurately indicates the recyclability of a product and the best way for consumers to get it into the recycling stream.

The Infrastructure Investment and Jobs Act included $75 million for recycling education for consumers. This is a good start, but more must be done to encourage recycling. Efforts to demonize recycling or to suggest that recycling is a "myth" are not only factually inaccurate, they are also counterproductive to the success of global environmental goals. Recycling is being done and the industry wants to do more. The biggest impediment to the growth of recycling in America is participation at the collection point. We need to make it as easy as we can for consumers to recycle and proper labeling is an important part of that process.

6. There are different and often conflicting definitions across federal agencies and state or local jurisdictions for key circular economy terms, like "compostable", "recyclable." The Recycling and Composting Accountability Act includes several definitions that would create clarity for these terms at the federal level.

    a. Are consumers experiencing confusion because of these definitional differences?

The confusion is not between recycling and composting, but rather the different types of composting that exist. If a product is labeled simply as compostable, a consumer could assume that it is able to break down in their home composting pile. That is why we recommend as an improved practice that companies label a product as "commercially" or "industrially"

compostable and provide certification to provide additional clarity and confidence for the consumer. Most people in the U.S. do not have access to commercial composting facilities, or curbside pick-up for commercially compostable materials. Because the use of compostable plastics has been shown to divert organic food waste – the largest component of annual waste to landfill - into composting, recognizing, and encouraging composting infrastructure would significantly reduce the overall US carbon footprint.

b. What impact is that consumer confusion having on communities' ability to improve collection and processing rates for traditional and biobased plastics?

This question itself highlights a common point of confusion in this discussion. Biobased does not necessarily mean compostable nor does it mean it can't be recycled. Traditionally widely recyclable resins like polyethylene (PE), polyethylene terephthalate (PET) can be produced from renewable feedstocks like sugar cane. A more detailed explanation of bioplastics can be found in "Bioplastics Simplified" (link).

For any product to be recycled or composted, it needs to find its way into the correct stream. The consumer is typically the end-user of a product and if direction is not clear – recycling becomes a guessing game. Those who do not practice "when in doubt, throw it out" in the immediate term may contaminate recycling or composting streams. Longer term, improved communication and education is necessary to provide clarity and confidence to the consumer which is something our association is working in partnership with others to improve.

7. EPA data show extraordinarily high cancer risks from toxic air pollution in communities around plastics production facilities, sometimes 100s of cases per million residents.

a. Given the health harms -- including cancers, reproductive harm, and learning disabilities -- caused by exposure to the toxic chemicals used to produce plastic (whether during manufacture, use or disposal), what actions is the plastic industry taking to reduce and mitigate these harms?

The plastics industry cares about its fence line communities, and, like all industries, should comply with all applicable regulations first and foremost, to protect them. We take health and safety seriously and while use of any chemical in any industry, in any product, does not equal exposure or risk, it's important to remember that there are regulations in place for worker, consumer, and community protection—from CPSC, to EPA, to FDA, to OSHA and others.

All communities deserve clean air. We support the use of EPA data and other reliable data in sound decision making to reduce or mitigate harms, recognizing there can be a degree of uncertainty. Guidance for one EPA tool notes that "[e]ven for indicators that directly estimate risks or hazards, as with the air toxics cancer risk indicator, estimates have substantial uncertainty" because of the uncertainty with emissions, ambient levels in the air, exposure of individuals, and toxicity.

The plastics industry also goes beyond regulatory requirements. For example, pollution prevention activities reported under EPA's Toxics Release Inventory program include more than 4000 source reduction entries for the plastics material and resin manufacturing and the plastics processing sectors combined, for the last ten reporting years alone. These source reduction measures—the most preferable in the waste management hierarchy—include, at a high level: reformulating or developing a new product line (e.g., reducing formaldehyde); implementing a new technology, technique, or process (e.g., reducing ethylbenzene); modifying or updating equipment or layouts (e.g., reducing styrene); substituting raw materials (e.g., reducing ethylene glycol), and installing vapor recovery systems (e.g., reducing methanol). Companies will continue driving and encouraging innovation and sustainability throughout the value chain.

b. What additional steps could the industry take to assist those communities living in close proximity to plastic production facilities that bear the greatest burden of plastic pollution exposure?

In any community where a manufacturing facility is located, it's important for the manufacturer to be a part of that community and support the people who reside there. We are proud to say that when members of the plastics make an investment in a new or expanded manufacturing facility they are investing not just in the structure and operations, but in the community. As part of their commitments to social responsibility, industry members have established community advisory panels and various mechanisms to enhance transparency and communication. Being a strong corporate citizen includes both minimizing the negative impacts and enhancing the positive ones.

When it comes to preventing pre-production plastic pollution, our industry has invested in the education of our employees as well as design or operational changes to reduce plastic resin spills throughout the supply chain. Through the program Operation Clean Sweep, industry members make the commitment to work to eliminate plastic resin loss.

c. Should options such as relocation or reimbursement for medical costs be considered by the plastics industry?

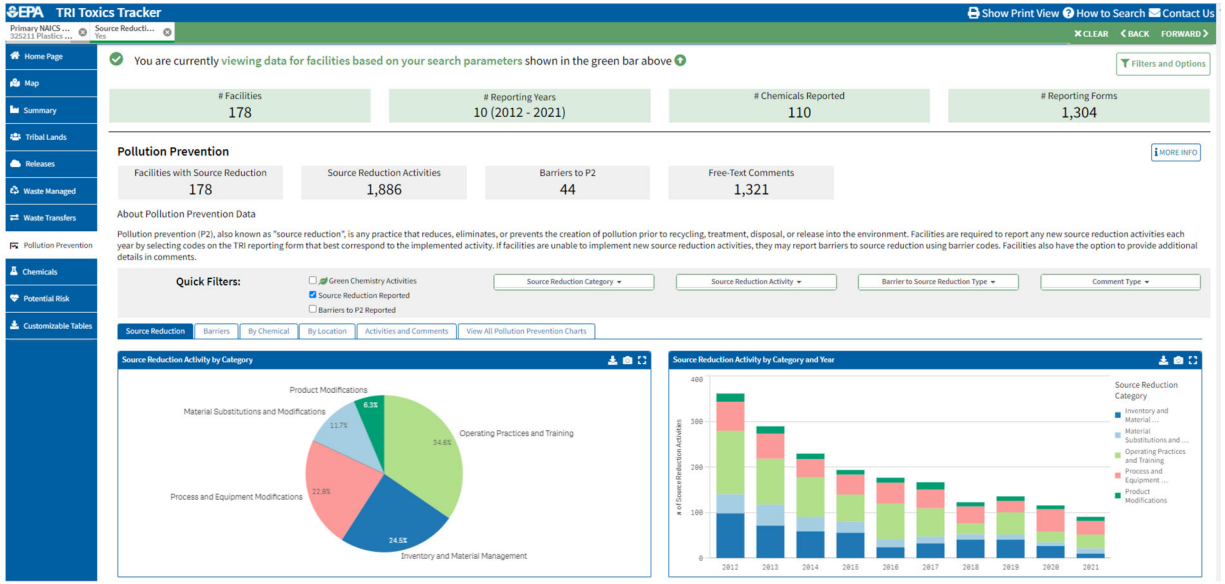
The plastics industry, like all industries, should comply with all applicable regulations and requirements. Any circumstance where any law or regulation has been broken should be dealt with on a case-by-case basis. Fortunately, those situations are the exception and not the rule. The plastics industry is proud of its environmental record and in no way agrees with the premise of the original question.

8. Technology and science have come a long way in recent decades. It is my understanding that chemical recycling facilities have the capability to produce products from plastic waste, including plastic resin and chemicals, as well as fuel for transportation or other purposes. Some have argued that a process that makes fuel that is burned - and emits

greenhouse gases into our atmosphere – should not be considered, or referred to as, recycling.

a. Do you agree that converting plastics-to-fuel should not be considered to be recycling?

Converting plastics to fuel is a type of recovery and based on the EPA's waste hierarchy, is better than landfilling. But determining whether a product should be considered recycled content should be based on the output and not the process. There are advanced recycling technologies that can be used to convert plastic into plastic. But those same processes can also be used to convert plastic into other products like waxes, lubricants, and fuels. The goal of recycling is plastic to plastic.


EPA TRI Toxics Tracker
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Contact Us
Primary NAICS ... 325211 Plastics ...
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Chemicals
Potential Risk
Customizable Tables
You are currently viewing data for facilities based on your search parameters shown in the green bar above
Filters and Options
Facilities
178
Reporting Years
10 (2012 - 2021)
Chemicals Reported
110
Reporting Forms
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Pollution Prevention
MORE INFO
Facilities with Source Reduction
178
Source Reduction Activities
1,886
Barriers to P2
44
Free-Text Comments
1,321
About Pollution Prevention Data
Pollution prevention (P2), also known as "source reduction", is any practice that reduces, eliminates, or prevents the creation of pollution prior to recycling, treatment, disposal, or release into the environment. Facilities are required to report any new source reduction activities each year by selecting codes on the TRI reporting form that best correspond to the implemented activity. If facilities are unable to implement new source reduction activities, they may report barriers to source reduction using barrier codes. Facilities also have the option to provide additional details in comments.
Quick Filters:
Green Chemistry Activities
Source Reduction Reported
Barriers to P2 Reported
Source Reduction Category
Source Reduction Activity
Barrier to Source Reduction Type
Comment Type
Source Reduction
Barriers
By Chemical
By Location
Activities and Comments
View All Pollution Prevention Charts
Source Reduction Activity by Category
Product Modifications
Material Substitutions and Modifications
Operating Practices and Training
Process and Equipment Modifications
Inventory and Material Management
6.3%
11.7%
34.6%
22.9%
24.5%
Source Reduction Activity by Category and Year
# of Source Reduction Activities
Source Reduction Category
Inventory and Material ...
Material Substitutions and ...
Operating Practices and Training
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Product Modifications
2012
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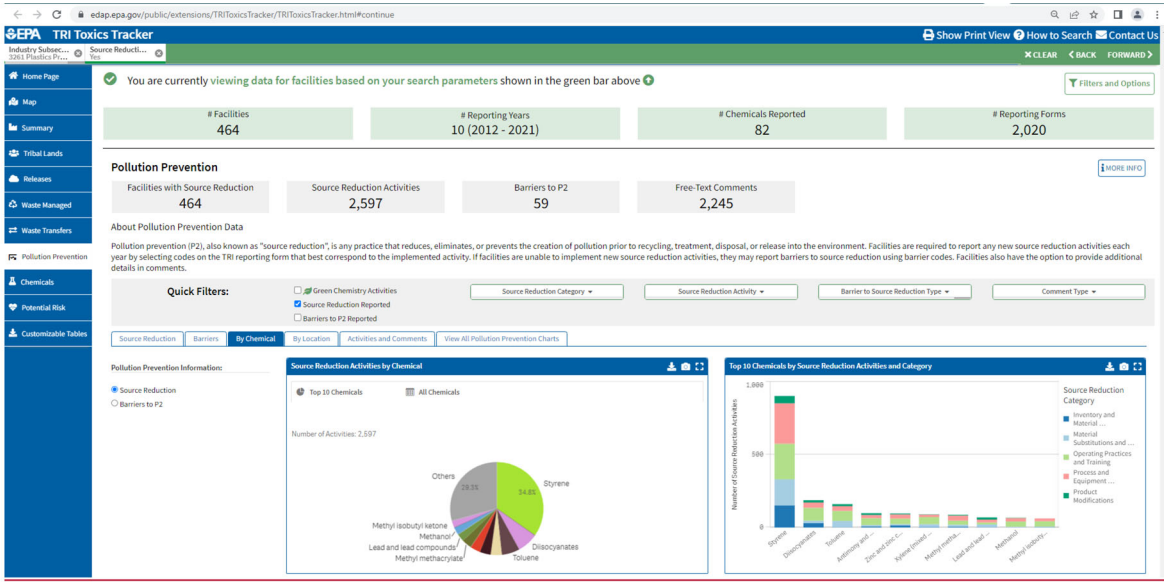
edap.epa.gov/public/extensions/TRIToxicsTracker/TRIToxicsTracker.html#continue
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How to Search
Contact Us
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Releases
Waste Managed
Waste Transfers
Pollution Prevention
Chemicals
Potential Risk
Customizable Tables
You are currently viewing data for facilities based on your search parameters shown in the green bar above
Filters and Options
Facilities
464
Reporting Years
10 (2012 - 2021)
Chemicals Reported
82
Reporting Forms
2,020
Pollution Prevention
MORE INFO
Facilities with Source Reduction
464
Source Reduction Activities
2,597
Barriers to P2
59
Free-Text Comments
2,245
About Pollution Prevention Data
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Green Chemistry Activities
Source Reduction Reported
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Source Reduction Activity
Barrier to Source Reduction Type
Comment Type
Source Reduction
Barriers
By Chemical
By Location
Activities and Comments
View All Pollution Prevention Charts
Pollution Prevention Information:
Source Reduction
Barriers to P2
Source Reduction Activities by Chemical
Top 10 Chemicals
All Chemicals
Number of Activities: 2,597
Others
29.1%
Styrene
34.8%
Methyl isobutyl ketone
Methanol
Lead and lead compounds
Methyl methacrylate
Diisocyanates
Toluene
Top 10 Chemicals by Source Reduction Activities and Category
1,000
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Number of Source Reduction Activities
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Material Substitutions and ...
Operating Practices and Training
Process and Equipment ...
Product Modifications
Styrene
Diisocyanates
Toluene
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Lead and lead ...
Methanol
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Senator MERKLEY. Thank you for your testimony.

Now, I would like to introduce our final witness, Mr. Eric Hartz, the co-founder and CEO of Nexus Circular.

STATEMENT OF ERIC HARTZ,
CO-FOUNDER AND PRESIDENT, NEXUS CIRCULAR

Mr. HARTZ. Good morning, Chairman Merkley, Ranking Member Wicker, Senator Whitehouse, and other members of the Subcommittee.

My name is Eric Hartz. I am co-founder and President of Nexus Circular. We are an advanced recycler that transforms used plastics for re-use with the objective of reducing plastic waste. While there are a variety of companies that process used plastics, Nexus Circular is unique. I am here to discuss what Nexus does and appropriately, what it does not.

I appreciate the opportunity to provide information to Subcommittee members regarding our real, proven solution to the challenge of used plastics. Nexus Circular is a commercial scale solution today that handles a wide array of plastics, including hard to recycle films that most recyclers cannot.

We convert these plastics in one single heating and cooling cycle to produce products that our partners can convert into virgin equivalent plastics using the same equipment they use to produce plastics today. Nexus does this without chemicals, catalysts, water, special treatments, or burning.

Since our founding by Jeff Gold, our team has been laser focused on taking used plastics and turning them into circular products safely, economically, and with the ability to scale in a way that has a positive impact on the environment and the communities we serve. We have an experienced, passionate team that is literate in chemistry, operations, engineering, logistics, safety, and finance.

Our philosophy from the start has always been, if our technology is not economical, environmentally friendly and scalable, then it will fail to provide the solution to the plastics challenge we all seek.

The used plastics we accept are not waste. They are materials that have been segregated from the waste stream and are often bound for landfills. We do some light sorting for suitability. We cover a broad array of plastics: Polyethylene, polypropylene, polystyrene, and as mentioned, an expertise in handling hard to recycle, films. All can be mixed together, and there is no special recipe.

We heat the used plastics in the absence of oxygen at 580 to 750 Fahrenheit. At this temperature, the plastics not only melt but they depolymerize, breaking down at the molecular level. Turning into vapors, they are then cooled into circular liquids in an entirely closed system. These liquids are then made into new, virgin equivalent plastics by our partners.

It is also why advanced recycling is referred to as molecular recycling. Because we recycle at the molecular level, these plastics can go through this process again and again, indefinitely. Our products and those of our partners represent a true circular plastics economy.

There is no burning, gasification, nor incineration, which all occur in the presence of oxygen at much higher temperatures of

1,800 to 2,700 Fahrenheit. Some mistakenly equate advanced recycling to incineration. Besides being three to four times hotter, incineration requires oxygen, whereas our process has practically none. Actually, our process would fail with oxygen present, since it would not yield sellable circular outputs.

Our land facility operates in compliance with all Federal and State laws in an industrial park in Fulton County, Georgia, a Clean Air Act non-attainment area under the purview of the EPA at the Federal level, and permits from the State of Georgia. We and our partners are ISCC Plus certified and follow audit procedures ensuring all materials are recycled. Our operating footprint is small, so we can site our facilities in similar areas across the Nation.

Advanced recycling complements mechanical recycling. It does not compete. The recycling hierarchy remains the same: Re-use, repurpose, if necessary, mechanically recycle, which is melting and reforming of plastics, now, if able, advanced recycling, which is recycling at the molecular level, and if absolutely necessary, landfill.

Further, this is not an either-or solution. It is a both-and, meaning our approach supports both converting used plastics into new ones and finding ways to reduce plastics where merited.

The demand for Nexus Circular's output far outstrips supply, because plastics producers have set ambitious recycled content goals to meet the demand of their own customers who ultimately down the line make products for consumers. We are proud to provide all of them an environmentally friendly, job creating approach while concurrently addressing the plastics challenge that impacts us all.

In short, our advanced molecular recycling process is an elegant solution to a seemingly intractable problem. It is lights out. But please, don't just take my word. We cordially invite all of you, any time, to visit our commercial scale operation in Atlanta, just 20 minutes from the airport or downtown. Once you see first hand what we are doing, how we are doing it, and most importantly how it differs from what some think, we believe it will clear up any confusion about our approach.

Better yet, we expect it will generate true excitement about the potential of providing a real solution to addressing the used plastics problem.

Innovation is never easy. And Chairman Merkley, as you will appreciate, this is a marathon. We have started this run together, and we are here to solve it together as well.

I appreciate the opportunity to share our on the ground experience. I look forward to your questions and comments. Thank you.

[The prepared statement of Mr. Hartz follows:]

Testimony of Eric Hartz

Co-founder and President, Nexus Circular

Before the Senate Committee on Environment and Public Works

Subcommittee on Chemical Safety, Waste Management, Environmental Justice and Regulatory Oversight

"Examining the Impact of Plastic Use and Identifying Solutions for Reducing Plastic Waste"

December 15, 2023

Good morning, Chairman Merkley, Ranking Member Wicker and Members of the Subcommittee. My name is Eric Hartz. I am Co-founder and President of Nexus Circular. We are an advanced recycler that transforms used plastics for reuse with the objective of reducing plastic waste.

While there are a variety of companies that process used plastics, Nexus Circular is unique, and I am here to discuss what Nexus does, and appropriately, what it does not. I appreciate the opportunity to provide information to subcommittee members regarding our real, proven solution to the challenge of used plastics.

Nexus Circular is a commercial scale solution, today, that handles a wide array of plastics, including hard-to-recycle film that most recyclers cannot. We convert these plastics in one single heating & cooling cycle to produce products that our partners can convert into virgin-equivalent plastics using the same equipment they use to produce plastics today. Nexus Circular does this without chemicals, catalysts, water, special treatments, or burning.

Since our founding by Jeff Gold, our team has been laser focused on taking used plastics and turning them into circular products safely, economically and with the ability to scale in a way that has a positive impact on the environment and the communities we serve.

We have an experienced, passionate team that is literate in chemistry, operations, engineering, logistics, safety, and finance. Our philosophy from the start has always been: if our technology is not economical, environmentally friendly and scalable, then it will fail to provide the solution to the plastics challenge, we all seek.

Our solution is simple pyrolysis. We heat used plastics in the absence of oxygen, breaking down those plastics into circular materials that can be used to make brand new recycled plastics. Repeatedly.

A few details:

- The used plastics we accept are not waste. They are materials that have been segregated from the waste stream and often bound for landfills. There are no odor issues where we operate. We do some light sorting for suitability. Almost all the used plastics we process meet the ISO 14021 definition of post-consumer plastics. We cover a broad array of plastics: polyethylene, polypropylene, polystyrene and, as mentioned, an expertise in handling hard-to-recycle films.

- We heat the used plastics in the absence of oxygen at 580-750F (300-400 C). At this temperature, the plastics not only melt but depolymerize – break down at the molecular level – turning into vapors that are then cooled into circular liquids. These liquids are then made into new virgin-equivalent plastics by our partners. It's also why Advanced Recycling is referred to as Molecular Recycling. Because we recycle at the molecular level, these plastics can go through this process again and again, indefinitely. Our products and those of our partners represent a true circular plastics economy.

- There is no burning, gasification, nor incineration which all occur in the presence of oxygen and at much higher temperatures of 1,800 to 2,700 F (980 to 1,500 C). Some mistakenly equate advanced recycling to incineration. Besides being 3-4 times hotter, incineration requires oxygen, whereas our process has none. Actually, our process would fail with oxygen present, since it would not yield sellable circular outputs.

- The only by-products are small amounts of non-condensable gases (about 10%-15%) converted to heat or electricity for use in our system. There is also char (about 4-5%) generated from cellulosic and other types of contamination, like labels or fillers, which have other applications or can be safely landfilled.

- Our Atlanta facility operates in compliance with all federal and state laws in an industrial park in Fulton County GA, a Clean Air Act non-attainment area, under the purview of the EPA at the federal level and permits from the State of Georgia. We and our partners are ISCC Plus certified and follow audit procedures ensuring all materials are recycled. Our operating footprint is small, so we can site our facilities in similar areas across the nation.

- Advanced Recycling compliments Mechanical Recycling, it does not compete. The Recycling hierarchy remains the same – Re-Use, Re-Purpose, Mechanically Recycle (which is melting and reforming of plastics), Advance Recycle (which is recycling at the molecular level) and, if necessary, landfill. Further, this is not and Either/Or solution, it is Both/And, meaning our approach supports both converting used plastics into new ones and finding ways to reduce plastics, where merited.

The demand for Nexus Circular's output far outstrips supply because plastics producers have set ambitious recycled-content goals to meet the demand of their own customers who, ultimately down the

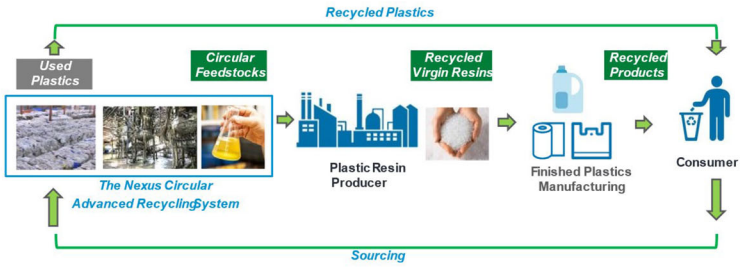
line, make end products for consumers. We are proud to provide all of them an environmentally friendly, job-creating approach while concurrently addressing the plastics challenge that impacts us all.

In short, our advanced, molecular recycling process is an elegant solution to a seemingly intractable problem.

But please don't just take my word. We cordially invite all of you, any time, to visit our commercial-scale operation in Atlanta – just 20 minutes from the airport or downtown. Once you see first-hand what we are doing, how we are doing it, and most importantly how it differs from what some think, we believe it will clear up any confusion about our approach. Better yet, we expect it will generate true excitement about the potential of providing a real solution to addressing the used plastics problem.

I appreciate this opportunity to share our on-the-ground experience, and I look forward to your questions and comments.

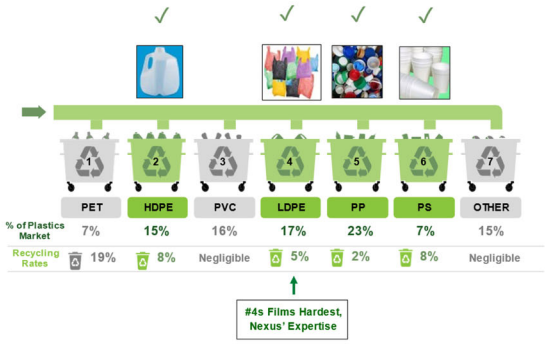
Advanced Recycling Supports Existing Value Chain Creating Circular Plastics



Source : Nexus Circular

Plastics Best Suited for Advanced Recycling

Nexus Circular is Specifically Designed to Utilize Abundant and Hard -to-Recycle Plastics, such as Films



Source: National Geographic, Plant of Plastic2018, Nexus Circular

Senate Committee on Environment and Public Works
Hearing Entitled, *"Examining the Impact of Plastic Use and Identifying Solutions for Reducing Plastic Waste"*
December 15, 2022
Questions for the Record for Eric Hartz

Ex-Officio Chairman Carper:

1. Technology and science have come a long way in recent decades. It is my understanding that chemical recycling facilities have the capability to produce products from plastic waste, including plastic resin and chemicals, as well as fuel for transportation or other purposes. Some have argued that a process that makes fuel through the burning of plastics, there by emitting greenhouse gases into our atmosphere, should not be considered, or referred to as, recycling.

    a. Do you agree that converting plastics-to-fuel should not be considered to be recycling? **[Response]** Yes. Many have proposed that plastics-to-fuel (liquid hydrocarbons) be considered "advanced recovery" to emphasize its distinction from recycling. Advanced recycling occurs at the molecular level and can be done repeatedly, circularly, to make virgin-equivalent plastics. By definition, all plastics, virgin or otherwise, are produced from liquid hydrocarbons (e.g., crude oil, natural gas). This is no different and advanced recycling seamlessly bolts into existing plastics production infrastructure.

    b. Are there any risks to public health created from the burning of plastics for fuel or resin that should be taken into account by companies when siting chemical recycling facilities? **[Response]** As stated in testimony, this is not burning. From testimony: *We heat the used plastics in the absence of oxygen at 580-750F (300-400 C). At this temperature, the plastics not only melt but depolymerize – break down at the molecular level – turning into vapors that are then cooled into circular liquids in a closed system. These liquids are then made into new virgin-equivalent plastics by our partners. It's also why Advanced Recycling is referred to as Molecular Recycling. Because we recycle at the molecular level, these plastics can go through this process again and again, indefinitely. Our products and those of our partners represent a true circular plastics economy. There is no burning, gasification, nor incineration which all occur in the presence of oxygen and at much higher temperatures of 1,800 to 2,700 F (980 to 1,500 C). Some mistakenly equate advanced recycling to incineration. Besides being 3-4 times hotter, incineration requires oxygen, whereas our process has practically none. Actually, our process would fail with oxygen present, since it would not yield sellable circular outputs.* Regardless, Nexus is committed to the well-being of its workers and the community, and its activities are subject to permitting requirements which are set by government authorities to protect public health and safety.

2. There is growing concern about the ability of chemical recycling facilities to generate new products from recycled plastic. I recently learned about a chemical recycling facility that was slated to be constructed in Macon-Bibb County, Georgia. This facility, once completed, would have diverted 400,000 tons of plastic waste per year from landfills and incinerators. However, the company responsible for building the facility was unable to show Macon-Bibb County officials that their chemical recycling facility in Indiana could generate the recycled products at scale, so the contract was terminated.

    a. Would you elaborate on the current status of chemical recycling technology? Specifically, how chemical recycling is expected to be implemented at a national scale with the challenges we've seen in these first plants getting up and running? **[Response]** As stated during hearing Q&A, like any new innovation, there are investments, risks, successes and failures. Innovators, like Nexus, have seen the problem of used plastics, are passionate and motivated to solve it and are going beyond just words by investing finances, people, and time to achieve goals. It is proving itself as shown by Nexus Circular's commercial scale, operating and expanding plant network. The market is also supporting continued growth of advanced recycling through further investments. Advanced recycling has shown an ability to scale environmentally with plants located at the source of used plastics. Further, there are concurrent efforts for expanding used plastics collection and sorting that will accelerate the capture and recycling of used plastics through solutions like those Nexus has developed. Lastly, the demand for recycled plastic materials continues to grow. Companies like Nexus are a component in helping meet that demand and accelerate a circular plastics economy which everyone seeks.

    b. What kinds of products are actually being made from resins generated through the chemical recycling process? **[Response]** All types, since using advanced recycling results in the exact same resins produced from virgin inputs. These resins, made from advanced recycling can likewise, be made into the same outputs made from virgin plastics and can even be combined together.

    c. What is the temperature range at which pyrolysis units operate? And what is the temperature range at which dioxins are produced? **[Response]** From Testimony: dioxins are created at higher temperatures than Nexus' Advanced Recycling: *We heat the used plastics in the absence of oxygen at **580-750F (300-400 C).** At this temperature, the plastics not only melt but depolymerize – break down at the molecular level – turning into vapors that are then cooled into circular liquids in a closed system. These liquids are then made into new virgin-equivalent plastics by our partners. It's also why Advanced Recycling is referred to as Molecular Recycling. Because we recycle at the molecular level, these plastics can go through this process again and again, indefinitely. Our products and those of our partners represent a true circular plastics economy. There is no burning,*

*gasification, nor incineration which all occur in the presence of oxygen and at much higher temperatures of **1,800 to 2,700 F (980 to 1,500 C).** Some mistakenly equate advanced recycling to incineration. Besides being 3-4 times hotter, incineration requires oxygen, whereas our process has practically none. Actually, our process would fail with oxygen present, since it would not yield sellable circular outputs.*

3. Several states have passed laws to incentivize the construction of chemical recycling facilities, including state and local tax breaks and access to government bonds to support construction. The number of chemical recycling facilities is expected to increase globally in the coming years – in fact, a recent study by McKinsey and Company found chemical recycling could provide up to 8% of the global demand for recycled plastic polymers by 2030.

   A 2020 report by McKinsey & Company found that the oil and gas industry's operations account for 9 percent of all human-made greenhouse-gas (GHG) emissions. In addition, the fuels created by the industry contribute another 33 percent of global emissions. If chemical recycling facilities in the United States continue to increase in numbers, it would be important for all of these facilities to operate in a way that does not adversely affect the environment or produce additional harmful GHGs.

   a. How do the GHG emissions created by the process chemical recycling compare to those GHG emissions associated with the use of virgin resins? **[Response]** A review of multiple studies has indicated advanced recycling of plastics can yield lower GHG emissions than the production of virgin resins. Another recent study indicates pyrolysis and related advanced recycling technologies may yield lower CO_2 equivalent emissions compared to primary virgin naphtha production- an input to plastics production.

   b. Does the United States need a strong regulatory framework for chemical recycling facilities before the number of chemical recycling facilities surpasses the supply of recycled feedstock? **[Response]** This question indicates existing regulatory frameworks for advanced recycling facilities may be inadequate. Regulatory policies already in place allow for proper development of Advanced Recycling facilities. Policies for incentivizing plastics collection and conversion however could accelerate these efforts further, in a positive way.

   c. How is your facility working to ensure that it does not cause adverse impacts to public health and the environment? **[Response]** Nexus designed facilities are intended to not only meet, but exceed a number of regulatory requirements at Federal, State and Local levels. Nexus is also subject to emissions limitations, monitoring, and recordkeeping requirements under the Clean Air Act and operating permit requirements under applicable federal, state, and local regulatory

authorities. Nexus Circular's approach seeks to maintain economics that are scalable, sustainable – e.g., high efficiencies which lowers environmental footprint and lowers costs; accepting plastic films as-is which removes need for additional processing and redirects plastics currently headed to landfills; production of products that do not require additional processing which lowers environmental footprint and lowers costs. Taken together, these and other practices limit any impacts. Also, the Nexus team would not be pursuing this solution if these efforts were creating adverse outcomes elsewhere.

4. In 2021 the U.S. Environmental Protection Agency set a National Recycling Goal to increase the national recycling rate of recyclable materials – like paper, glass, and plastic – to 50% by 2030. Similarly, States, municipalities, and companies have established their own plastic recycling goals. For example, America's Plastic Makers have committed to creating a circular economy where 100% of plastic packaging in the U.S. is reused, recycled, or recovered by 2040. These goals are commendable, but there is limited information on how they will be met.

    a. If the Federal government required widely used consumer packaging and products to be made from material that is 100% recyclable by the recycling facilities that are actually operating today, would that be an effective policy to help us meet recycling targets? **[Response]** Although Nexus is not a policy making body, requirements that target realistic goals can help, provided they are implemented with reason and understanding of processes while complementing existing production already in place. They can be written in a way that allows for modification of market realities. Like coal sulfur removal, auto MPG improvements, or unleaded fuels – a balanced approach based on credible data is needed. Perhaps to encourage the development of efficient recycling systems, a national standard could be considered, e.g., one that requires all plastic packaging to include a minimum % of recycled plastic; in the next 5-10 years through a recycled-plastic standard.

    b. Would such a policy help level the playing field among plastic product manufacturers, by holding them all to the same standard? **[Response]** It's unclear what playing field may need leveling. As a general principle, all players in an industry operate to be leaders. For advanced recycling, Nexus has not experienced one type of advanced recycler advantaged over another and hopes this would never be the case. There are different methods, approaches and abilities to execute. In the end, the markets – looking at those who can deliver the best products at lowest costs (both financially and environmentally) - should determine who succeeds on a sustained basis.

5. Earlier this year, Nexus Circular joined the U.S. Plastics Pact. The Pact consists of 119 "Activators" – which are businesses, nonprofits, government agencies, and research institutions committed to achieving four plastic waste goals by 2025. These goals include: making 100% of plastic packaging reusable, recyclable, or compostable by 2025; recycling or composting 50% of all plastic packaging by 2025; and achieving 30% recycled content or bio-based content in plastic packaging by 2025.

    a. What kind of federal policies or legislation would help Nexus Circular and other Activators meet these plastic waste goals? **[Response]** Please see above.

6. There are concerns from the mechanical recycling industry that chemical recycling facilities may start to take plastic feedstock that has traditionally been recycled through a more traditional process.

    a. Does Global Nexus separate out all the PVC waste it receives? **[Response]** Nexus Circular complements mechanical recycling. Advanced Recycling does not compete with mechanical recyclers for plastic feedstock. Yes, Nexus seeks to remove as much of any inbound PVC received, which is already low today because chlorides are detrimental to plastics production processes downstream. From Testimony: *Advanced Recycling complements Mechanical Recycling, it does not compete. The Recycling hierarchy remains the same – Re-Use, Re-Purpose, Mechanically Recycle (which is melting and reforming of plastics), Advanced Recycling (which is recycling at the molecular level) and, if necessary, landfill. Further, this is not and Either/Or solution, it is Both/And, meaning our approach supports both converting used plastics into new ones and finding ways to reduce plastics, where merited.*

    b. If so, what is the process for doing so? **[Response]** Acquire smart and prepare/process in advance, i.e., don't intake PVC plastics. Instead, handle hard-to-recycle plastics that currently head to landfills, e.g., LDPE (Low-Density Polyethylene) plastic films. Simply sort out what is received through human, machine interface methods.

    c. What percentage of the plastic waste processed by Global Nexus is post-commercial, and what percentage is post-consumer? **[Response]** Per the ISO 14021 definition of post-consumer, Nexus Circular processes >99% post-consumer materials. In that number are consumer sources from grocery stores, films and consumer collection programs developed by consumer packaging companies (CPGs) and others. Nexus also works with dedicated groups that intake all types of plastics in order to divert plastics from landfills. To the policy question above, efforts to help these groups expand would accelerate collection of these materials.

Senator MERKLEY. Thank you very much for your testimony.

We will now have 5 minute rounds of questions. We might be able to get through a couple rounds if we are fortunate. I encourage you to keep your responses as succinct as you can so that we can get through as many points as possible.

Mr. Myers, I am going to start with you. You made reference to the endocrine disrupting chemicals in plastics. Are plastic producers required by law to inform the public of all the chemicals that are in the different plastics they produce?

Mr. MYERS. Not only are they not required by law, but it would be physically impossible. Because many of the compounds in plastics are what are called non-intentionally added substances, which get there basically by accident. They get there because they are impurities.

Senator MERKLEY. In terms of the chemicals that are added deliberately, for flexibility, for hardness, for colors, are those required to be disclosed to the public?

Mr. MYERS. To my knowledge, they are not. It would be a good move if they were required.

Senator MERKLEY. Mr. Seaholm, do you support full transparency for the chemicals that are added to the plastics that go into the public realm?

Mr. SEAHOLM. We have full faith in the FDA's approval and decisionmaking process. When it comes to food contact in particular, we never cut corners when it comes to safety.

Senator MERKLEY. So you support full disclosure of all the chemicals that go into the plastics that go into the public realm?

Mr. SEAHOLM. I guess it depends on which kind of plastics you are referring to. But if you are talking about food contact, which is really where safety comes first and foremost, I think the FDA approval process is certainly sufficient. We participate and fully support it.

Senator MERKLEY. OK. I appreciate your point about those things that come in contact with food. But certainly, one of the challenges we have is all the other plastics degrade and have a huge impact that aren't touching food as they become microplastics, as they release chemicals over time.

I want to go to the impact that you noted, Mr. Myers, over the question of those specific chemicals that affect human reproduction. During my lifetime, we have seen a big increase in breast cancers, a big increase in prostate cancers. You noted a 50 percent decline in male sperm production.

Now, are all three of those related to the presence of endocrine disrupters in the products that are released into the public realm?

Mr. MYERS. Those, all three are predictable consequences of being exposed to certain endocrine disruptors. But they aren't all three due to the same endocrine disruptor. It is a very complicated system. There are hundreds if not thousands of EDCs. And they all have their unique characteristics of harm.

Senator MERKLEY. A few years ago, there was a whole movement across the country saying, well, one in particular, not being a chemist, maybe I will mispronounce it, bisphenol A?

Mr. MYERS. Bisphenol A.

Senator MERKLEY. Bisphenol A, or BPA, as it came to be called in the public realm, it was like, wow, we have to get this out of the lining of our tuna cans, and oh, my goodness, how about out of water bottles too. Has that actually changed by law, or is it just that some makers of water bottles now advertise that they are BPA free?

Mr. MYERS. One BPA product that has been eliminated by the FDA in the market is baby bottles. But that was done at the behest of the manufacturers of baby bottles, because they were getting such bad press from all the big stories about BPA harm. Most products that include BPA have not been removed from the market.

Senator MERKLEY. So what about the water bottles that we buy in the store?

Mr. MYERS. Those are largely motivated by marketers, by companies who have an alternative to BPA and want to advertise that they are BPA free. The problem is that most common replacement for BPA in water bottles is BPS, which is a minor variant on BPA. And subsequent research since that substitution became known has shown it is just as bad, if not worse, than BPA.

Senator MERKLEY. So you also mentioned in your written testimony phthalates and perfluorinated compounds. Is that the same as PFAS?

Mr. MYERS. Yes, it is.

Senator MERKLEY. So we have PFAS in plastics, we have phthalates. But I can't pick up a piece of package recycling that is going to exist in the universe for thousands of years to come and find out how much PFAS is in it, or phthalates are in it, because that disclosure is not required, isn't that right?

Mr. MYERS. That disclosure is not required. Actually, there are loopholes in the FDA requirements for what you disclose in food packaging content. The common practice of fluorinating high density polypropylene with fluorination is not widely known, but is very common.

Senator MERKLEY. I have 1 second left, so I am stopping, and I am going to encourage my colleagues to please stop at 5 minutes, since we have quite a few members who are here to ask questions.

Senator Wicker.

Senator WICKER. Thank you very much, Mr. Chairman.

Mr. Myers, some very startling testimony about male sperm count basically being ineffective by 2040, brain wiring, autism being caused by this.

Is it your testimony that there is scientific documentation that lower sperm count is being caused by plastic waste?

Mr. MYERS. There is extensive scientific documentation. I would refer you to a book called Count Down by one of the principal scientists involved in those studies, which not only documents the study, which is published in the peer reviewed literature, but also the book explains what is the basis of the evidence for including plastic chemicals as part of the causation.

Senator WICKER. And the same for autism?

Mr. MYERS. Yes.

Senator WICKER. OK, now, Ms. Enck, is it your testimony that plastic production should be cut by 50 percent in 10 years, or plastic pollution?

Ms. ENCK. Production.

Senator WICKER. Production, OK.

Ms. ENCK. Yes, because of the impact in low income and minority communities where the production is taking place. If you cut the production, we will get what we all want, the reduction of pollution.

Senator WICKER. Mr. Seaholm, how about that? How practical is that? And what do you say to the testimony that there is scientific documentation, peer reviewed, concerning autism and sperm count?

Mr. SEAHOLM. Thank you, Senator. First, on the production question. If we don't produce plastic in the United States, it is going to be produced elsewhere. The likelihood that it is going to be produced with some sort of better environmental standards is unrealistic.

So the best thing for us to do is actually produce the plastic here. We can certainly talk about reduction, recycling, and re-use all day long. But actually stopping the production of it is really going to be detrimental.

Senator WICKER. What about 50 percent reduction?

Mr. SEAHOLM. One, it is not attainable. Nor should it be. It would absolutely cripple supply chains and economic progress in the United States.

On your second question, I think Dr. Myers in his opening statement actually said, most have not been tested, few have been tested thoroughly. I think to respond to that with, has there been significant scientific evidence, I think for the vast majority of the discussion on chemicals, no.

One thing I would say is in Senator Merkley's recently introduced bill, there are studies that would be funded for it, and we would welcome studies to be done looking at things like microplastics. Because there isn't sufficient scientific evidence to report the claims.

Senator WICKER. Mr. Hartz, with regard to your high temperature procedure that doesn't include oxygen, has that been peer reviewed? Has anyone reviewed that and what do outside sources and scientists say about what you are doing?

Mr. HARTZ. Thank you, Ranking Member Wicker, I appreciate the question. I think first we are talking about a two tier problem here. One is plastics production, the impacts that it has, how it ends up in oceans, coming from land, of course.

Then the second is what we do with the plastics that are there. With all due respect, we don't actually run at a high temperature, relatively speaking. We actually, incineration occurs at a much higher temperature, so pyrolysis, the concept has been around since the 1960s. It has been something that has been involved.

The challenge has been doing it efficiently and doing it environmentally. That is beyond kind of peer reviewed in that we are judged by the marketplace. The companies that we work with are also sincere about addressing this issue as well. They want to make sure we are doing it the right way.

So there are a couple of things that come into play. First, the efficiency side is we only heat once and cool once. We do it at a lower temperature that doesn't incinerate. And we make a product that is clean and pure enough to run through the current plastics pro-

duction system. That is the best review you can get. We have a very tight spec we have to meet.

Then second, on the environmental side, our footprint is quite small as a result. This has been something that has been scientifically reviewed for some time. But you have to go beyond the technology, because it is really about how you do it economically, or else we are not going to have an answer that——

Senator WICKER. Are you able to scale it yet?

Mr. HARTZ. We are actually able to scale. We are running a commercial scale operation today, and again, invite anyone in this room to please come visit us and see it.

Senator WICKER. Ms. Enck, have you visited them, and what is wrong with what Mr. Hartz said?

Ms. ENCK. I have not visited. What is wrong is they are superheating or almost boiling plastics. There is very little plastic actually being handled by chemical recycling facilities. Currently only 0.26 percent of the plastic waste is handled by this technology. The plastics industry has suggested they want to have 150 plants in the U.S. That would only handle 5 percent.

Senator WICKER. Mr. Hartz, what do you say to that?

Mr. HARTZ. Without being flip, any innovation has to start somewhere. Low flow toilets, when they started, had to be produced at small volumes to get to larger ones. When you can prove scalability, that is the cusp that we are on now. That is the job we have made about being efficient and environmentally friendly. That is where we are headed now.

So we actually believe, our footprint is quite small. We can go near the feedstock; we can multiply the plants that we have, and we can process that material. I agree with Ms. Enck, this is a problem that is enormous. Even if we are successful on our own, we are not going to solve it alone. Our cohort needs to solve it together. There is a way to do that.

Senator WICKER. Thank you, Mr. Chairman.

Senator MERKLEY. Senator Whitehouse.

Senator WHITEHOUSE. Thank you very much.

Let me first welcome the witnesses and agree with our Chairman, that plastics in the environment is an under-appreciated threat to wildlife, to the quality of life, and to human health. So I am really pleased that we are having this hearing to elucidate those things.

Senator Sullivan is here, and he and I have worked together to get some bipartisan legislation done with respect to marine ocean plastic. We have done, I think, extremely well considering the constraints we began with, which is, Congress had never regulated in this space before, and we are going to have to pass our bill by unanimous consent. Considering that, I think we have actually gotten a lot done, and I look forward to continuing to work with Senator Sullivan on Save Our Seas 3.0, which our staffs are in discussion on right now.

Particularly 2.0 also created a platform that allowed the United States to move forward in the international arena. I think the Nairobi deal is positive. The U.N. process is very promising. We need to lean in very hard, because I am sick to death of reports coming out of the ocean plastics meetings that the U.S. was the

weak link and the laggard. We need to move from being laggards to leaders. I am hoping that with Secretary Medina's initiative, we will be doing that.

I share Ms. Enck's view that plastic recycling is essentially phony. As Mr. Hartz said, even if we can get to something effective with high temp or chemical recycling, it is still only a very small piece of a much broader solution that we need.

So it is not a panacea that allows us to take our eye off the ball, the fact that we are flooding our work with plastics. And there may be no constituency for the albatross here or other seabirds, but when essentially every caught seabird has plastic in its gut, it is a signal from Mother Nature that we need to pay attention here.

I offer anybody the chance to respond to my comments in the way of response or a question for the record. I would flag that in addition to the plastics problem on the land and in the human environment, we also have a really significant ghost fishing gear problem. Because plastic fishing gear lasts forever, and after people lose it, the long lines keep catching fish, the nets keep catching fish. They are just massacres flowing through the ocean.

We need to make sure that it is very lucrative for a fisherman, when they get near ghost gear, to haul it out of the water and have that be their catch for the day. Because that will help clean up our oceans a lot.

The last thing I think I will mention is that we can do a lot more here. And the industry can do a lot more here, particularly if you look at the areas of industry leadership. You know that it is feasible when industry is already doing it.

I was in Norway at the Our Oceans conference when Unilever announced its pledge, it is a major seller of goods, major distributor of plastic and packaging, and they made the pledge that for every pound of plastic that they put out into the economy, they were going to find a pound of plastic in the ocean or in the environment, and get it back and dispose of it properly.

To me, at the moment, I think that is the corporate high point for responsibility. I would like to see every major plastics manufacturer make that exact same commitment, and then we can look on what else needs to be done.

But it is to me a little bit ridiculous when we have a problem of this magnitude and an industry that is responsible for it that when the industry sets a high water mark of good behavior, the rest of the industry isn't already there with them right away.

So I think we need to take this a lot more seriously. I am very grateful to Chairman Merkley for having this hearing. Again, I have used my limited time here to make those points. I encourage anyone who has a response to them to feel free to respond to me in the nature of a response to a question for the record, because my time is out. QFR responses have to be written.

So I see your hand up, Mr. Myers, but I am afraid I have run out of time.

Senator MERKLEY. You can respond in 10 seconds, then it is Senator Capito's turn.

Mr. MYERS. Senator Whitehouse, we are a both-and solution. We agree that it is a large problem, and that we can do it that way.

Second, Judith, I think you quoted Mario Bono, and I agree with the quote, that zero waste done perfectly by a few is not enough. But zero waste done by millions imperfectly would be great. Regulatory and other behaviors that we can incent would be great to do that.

Senator MERKLEY. Mr. Myers, you are at 20 seconds.

Mr. MYERS. I think it would be useful if members of the Committee, if they are not already familiar with it, examine the chemical strategy for sustainability in implementation in the European Union. It answers a lot of the questions that we have been talking about today. It is the best thing that is happening in the world right now on these issues.

Senator MERKLEY. Thank you.

Senator Capito.

Senator CAPITO. Thank you, Mr. Chairman, and thank the witnesses for being here today.

I have a big interest in recycling. We have had hearings on recycling in more general terms, not just focused on plastic. We see some other industries have been very successful in recycling for many, many years. I will use the paper industry as an example of that.

Chairman Carper and Senator Boozman are the Senate Recycling cochairs. Senator Lummis and Senator Merkley and I are members of that. We also have two recycling bills; I am going to shout out to the House and ask them to try to get those moved.

Some people would say that recycling is kind of a myth and sort of a scam. So Mr. Seaholm, I would like to hear what your response is to that.

In terms of one of the comments that I heard, Ms. Enck, to stop the production of plastics. You look around, I am sure this sweater probably has some, certainly this has. You can't even look anywhere without seeing plastic somewhere.

Is there a movement in your business to even consider this? Let's talk recycling first, and then manufacturing.

Mr. SEAHOLM. Thank you, Senator. No, recycling is not a myth. Nor is it phony. I think Mr. Hartz would probably take umbrage to that as well.

But we don't do enough of it. We recognize that. Recycling is not a single act. It is a system. It is a process.

But I have got to tell you, I have been to dozens of facilities where they are actually reprocessing the material. I ask them all the same question: What is keeping you from expanding? The answer is always availability of material. Availability of feedstock. They can't get enough material. That means there is a breakdown in the system of just getting the material there.

So to the thousands, tens of thousands of hardworking men and women in the recycling industry, absolutely not a myth. But we have to grow it.

Senator CAPITO. I would say too, that is a point of several of our bills, is to get recycling into smaller and more rural areas. We have heard this, you said it nicely, we need more materials. Some people say we need more trash.

If I look at just computers alone, the old computers that we had back when our kids were going through school, what do you do with all of that.

I don't know, Mr. Hartz, is that the type of recycling that you are doing? Why is your technique called advanced recycling, as opposed to just recycling?

Mr. HARTZ. Senator, to answer the second question first, thank you, by the way, Senator Capito. Advanced recycling is a nomenclature I think that kind of became what it was. The reason I refer to it as molecular recycling, I think that makes it sound really complex. But the fact that we are operating at the molecular level allows this to be done repeatedly over and over. These plastics can come back.

I share that in theory, all plastic currently above ground is all we would ever need if we do this properly. And to Senator Whitehouse's point, that doesn't solve the production issue, that doesn't solve the size of the problem. If we can do that concurrently, back to the both-and point, I think that would be great.

In terms of types of plastic that can go through, there are also some misnomers sometimes. The chemistry is that polypropylene, polyethylene, and polystyrene are the ideal plastics to go through the system. And there are ample amounts. Films are also incredibly difficult for mechanical recyclers. It fouls their equipment. They don't want to see it, which is why we complement what we are doing.

But if someone says, gee, we take all plastics, PET is an oxygenated plastic. You are going to get char, you are going to get benzoic acids, other things that clog your system. PVC has chlorides in it. We have to meet a parts per million spec, so we want to avoid those as well.

So you can't just say, gee, we will take all plastics. But the system is such that we can get the plastics we need, and concurrent with that, build an infrastructure and habit set that allows the plastics to come to us, and we have an answer to the problem.

Senator CAPITO. Well, I would encourage this. What is the percentage now of plastics that are recycled? Was that the .026?

Ms. ENCK. It is 5 to 6 percent.

Senator CAPITO. Five to six. I will go back to the paper industry. I think they testified 80 percent. I might be wrong on that.

Ms. ENCK. About 65.

Senator CAPITO. They have been doing it a lot longer, too.

So I think that goes to your point, Mr. Hartz, you have to start small before you can get big. So I appreciate you all coming in today.

Thank you, Mr. Chair.

Senator MERKLEY. We are checking on our supply stream of Senators here.

[Laughter.]

Senator MERKLEY. Senator Sullivan was here; is he ready to step in? Senator Duckworth is not on right now, and Senator Carper is on his way. So if Senator Sullivan would like to step in, if not, I am happy to ask a question. Senator Carper is here?

While we are waiting for Senator Carper to arrive, Mr. Hartz, you have a permit to, you sought through Georgia Environmental

Protection Division to be able to emit hydrochloric acid, is that correct?

Mr. HARTZ. I am not sure when you are saying emit hydrochloric acid. We have a general permit for air, for water, and that may be part of that.

Senator MERKLEY. It is. I just wanted to note that, because it sounded from your testimony like it is a closed loop, nothing escapes. Were you not cited for violations in your emissions in two quarters of the last year, 2021?

Mr. HARTZ. Actually, it was in the last two quarters, and the actual violation by definition was a flow meter on a device. It had nothing to do with the system. We built our system out, we obviously went through all the permitting process. When they came back and revisited, they actually requested a flow meter on the system, which we rapidly repaired.

But I would not consider that a violation of our system as much as a violation, if you will, of a rule about the flow.

Senator MERKLEY. Thank you.

Senator Carper is now here. So we will turn this over to him.

Senator CARPER. Thanks, Mr. Chair.

I want to thank our Chairman, I want to thank our Ranking Member, Senator Wicker, for holding this hearing, a really important hearing today. I want to welcome our panel of guests, and I want to thank our Ranking Member of the full Committee, Senator Capito, for her support, not just in discussing this topic, but addressing this challenge. And we thank all of our witnesses, again, for joining us.

As some of you know, this is something I care deeply about, have forever. I am 75 years old, and I have been working as a private citizen on recycling for, gosh, ever since I was a lieutenant JG in the Navy a million years ago in Palo Alto, California, during the Vietnam war. I have never stopped caring about it. I was a treasurer of Delaware, Congressman, Governor of Delaware, and I think we have made real progress in our State.

I like to run, I like to exercise, a bunch of us like to exercise. We have folks who were walking not too far from where we live, and there is too much litter, everywhere. It is not just in the areas, the part of the State where we live, it is all over our State. It is other States, it is in neighboring States, it is all over the country.

Sometimes people think I go to run just to pick up recyclables. The good news is, I do. And I can recycle that stuff. But there is a lot of stuff that I pick up that can't be recycled, and it is going to end up in the trash, in a landfill some place in my State.

Anyway, I am going to ask unanimous consent to enter for the record a statement if I could.

Senator MERKLEY. I hear no objection.

[The prepared statement of Senator Carper was not received at time of print.]

Senator CARPER. And I would like to turn to my first of 12 questions.

Senator MERKLEY. You are the Chairman.

[Laughter.]

Senator CARPER. I promise you it is not 12.

Mr. Seaholm, as a Navy guy, I like your name.

Mr. Hartz, nice meeting with you briefly earlier today.

I have heard concerns from the plastics recycling community that increasing the number of chemical recycling facilities in the U.S. could hurt the financial liability of mechanical recycling facilities, as increased demand would restrict access to plastic feedstocks. This could further reduce our already very low plastic recycling rate.

Question, if I could, Mr. Seaholm, for you. Would you discuss this concern, please?

Mr. SEAHOLM. Sure. Our belief is that it should be an all of the above approach. In order for us to get where we want to go, it should be mechanical and molecular recycling as part of the solution. There are certainly applications that molecular recycling does better in terms of purity, in particular, and when it comes to food contact, it is actually presenting us with some fantastic options.

So our belief is the demand is going to be there. And we strongly support both types.

Senator CARPER. All right.

Mr. Hartz, would you identify any backstops that the industry has in place to make sure that as chemical recycling grows, the industry does not take feedstock from the mechanical recycling facilities? And do we need for the Government to provide those backstops?

Mr. HARTZ. Chairman Carper, thank you again for your questions. In terms of backstops, I was mentioning earlier that mechanical recycling is actually less work, if you will. There is some heat, you cut plastics up, you reform them. There is a lot of plastics that can go there. Those are not the plastics we seek.

So we do not see ourselves going after the plastics. The numbers we hear, 5 to 8 percent, are mechanically recycled today, and there is a reason for that, because those are the ones that work. So the other materials that are flowing by, those are the ones that we are interested in. Those are the ones that work.

So the other materials that are flowing by, those are the ones that we are interested in. Particularly, we are interested in those plastic films.

The other part of the economics of this, it is generally just cheaper to mechanically recycle. You shouldn't be doing advanced recycling if you can mechanically recycle. We actually support that.

So the backstop is going to be the marketplace that allows for that to happen. If we find ourselves in a situation that we are all going after the same material, then to Senator Whitehouse's earlier point, we are not solving the problem in the first place.

Senator CARPER. All right, thank you.

Mr. Seaholm, back to you. Last fall, we held a roundtable series and a Committee hearing on the concept of a circular economy. We heard from stakeholders from a variety of industries and organizations, as well as State and local governments about what it would take to transition to an economy that values and promotes circularity at every step of the industrial process, including in the plastics industry.

Senator Merkley's bill, the Break Free from Plastics Act, includes several policies that are designed to help reduce plastic pollution, as you know. My question is, would you elaborate on why the plas-

tic industry has advocated for recycled content mandates, extended producer responsibility laws, and bottle bills to be implemented together? And could you explain how these policies could interact with one another to improve overall plastic recycling rates?

Mr. SEAHOLM. Absolutely. Thank you, Senator. Everything you just described falls into two categories. One is demand, and the other is supply. Recycled content requirements, done reasonably, actually can help spur investment in the infrastructure side of things, because the demand is guaranteed to be there. So increasing demand is most important for the value to be ensured.

Then on the extended producer responsibility component of it, the industry has come to a point of accepting a fee on products in order to fund recycling infrastructure, because at the heart of the matter is the infrastructure has simply not kept up. That is what we have to fund.

Senator CARPER. Good.

My time is expired. Thanks, Mr. Chairman.

Ms. Enck, I have a question I am going to submit for the record, and you would take the time to respond to it, regarding turning plastics into fuel should not be considered recycling on that particular issue. If you would respond, I would appreciate it.

Ms. ENCK. Could I just say no and then respond for the record?

Senator CARPER. If you could, that would be great.

Mr. Myers, we look forward to having a question for you next time, maybe later today.

Mr. Chairman, thank you very much for a timely and important hearing. And for those on our Committee that have worked on this as well, you know who you are, thank you very much.

Senator MERKLEY. Thank you, Senator Carper.

Senator Sullivan.

Senator SULLIVAN. Thank you, Mr. Chairman.

Greetings to our witnesses on this very important topic. I appreciate your holding the hearing, Mr. Chairman.

Senator Whitehouse mentioned already the work that he and I have been doing for a number of years now on the Save Our Seas Acts, Save Our Seas 2.0 and following up on that. We will continue to work on it.

One of the reasons this is so important to me and my State on the ocean debris issue is Alaska has more coastline than the rest of the country combined. People don't know that. We have a very important fishing industry where we care deeply about sustainable fisheries and healthy fisheries. Two-thirds of all seafood harvested in America, commercial, sport, recreational, subsistence, comes from Alaska. Two-thirds. So these are big issues for my constituents and my State.

One question I want to ask all four of the panelists is this issue, at least for remote communities like mine in remote States, we do these big beach cleanups of ocean debris and waste. NOAA estimates that after the Japan tsunami, some of the worst affected beaches in Alaska had 30 tons of waste per mile. So we get this enormous amount of waste and plastic, and to Senator Whitehouse's point, derelict fishing gear that winds up on our shores. Mostly it is from Asia, not from Alaska.

Once the marine debris is collected, there is no place to put it. Most landfills in Alaska can't accept it. So we have to then ship it to the lower 48. By the way, this is the same issue with PFAS. We ship PFAS to Oregon. None of this makes sense, particularly when most building materials that we get in Alaska are imported, mostly from Asia.

So the technology now exists to have a local solution, convert some of this plastic waste into components for building materials. So that is just one idea.

Given this situation in Alaska and other remote communities, how would you help to solve this problem? It is a big problem for my State, but I am sure it is a big problem for other States as well.

Why don't we just go down the line, starting with you, Mr. Hartz?

Mr. HARTZ. Sure, Senator Sullivan. Thanks for your question. I share your concern as well. I am an avid outdoor person, and I see the same things that you do.

I think at the end of the day it is a question of aggregation of plastics. I think the statistics you are talking about are very concerning. What we have found is when you have a good answer to a problem, like water, it finds the lowest point.

So even today we have materials usually within a 150, 250 mile radius that we source from. But we actually have materials coming much further away to us because they say they cannot find a place to properly recycle it, and we can.

Senator SULLIVAN. Right.

Mr. HARTZ. So to your point, I think it is getting the right answer out there. That will attract the plastics we need. And frankly, it will motivate all of us if there is an answer. So that is how we approach it.

Senator SULLIVAN. And to be able to do it in places that aren't big cities and stuff like that.

Mr. HARTZ. We actually have a relatively small footprint. But you can't go against the gravity of economics. So often you have to have a certain scale, but it doesn't have to be oversized. We have designed our operations to be a small footprint because it is better to be closer to the feedstock. Because there is less density, if you will, than the material we produce, which is easier then to transport to make new plastics.

Senator SULLIVAN. Great. Thank you.

Mr. Seaholm, how about you?

Mr. SEAHOLM. I think everything that Mr. Hartz just referenced on the economies of plastic and recycling I would agree with 100 percent. In addition, I would say that accessibility is an important issue across the entire country. We want to make it as easy as possible for that waste to get to where it needs to be. But a lot of times, that is the consumers getting it into the stream. Senate Bill 3742 by Senator Capito and Senator Carper is something we wholeheartedly support, in order to increase accessibility for rural communities.

But without a doubt, in those situations, especially with marine debris, by all means, let's figure out the best way to get it to where it needs to go.

Senator SULLIVAN. Good.

Ms. Enck.

Ms. ENCK. Hi, Senator. Scientists tell us that within the next decade, for every 3 pounds of fish in the ocean there will be 1 pound of plastic. Once it is in the ocean, it is virtually impossible to get it back. Most of it falls down to the sea floor, not the surface.

The solution is making less plastic.

Senator SULLIVAN. Right, no, I know. But I just want to give you, if you can answer my question that I posed to you, which is, if we collect a lot, we have to ship it, what do you think? I understand. I have seen your testimony.

But my direct question, if you can try to answer that, that is the reality my State deals with today. Our Save Our Seas Act tries to deal with this. But I just want, you guys are the experts. So if you can just answer that question.

Mr. Chairman, sorry I am going over. I just want to see if they have a quick answer.

Ms. ENCK. Well, there is very little you can recycle. I started my town's rural recycling program in upstate New York. There is just so much.

So if you are collecting all of this, the only thing you can do, which is a bad option, is ship it to a distant landfill or even worse, a garbage incinerator.

Senator SULLIVAN. OK.

Dr. Myers.

Mr. MYERS. You describe a really important issue and challenge to us. When I think about using marine plastics as building material, I think about what happens when that building burns. That means the people living in it or working in it will be exposed to very serious toxins.

And I don't know what the solution is. But I know that we can't contribute to tomorrow's problems with solutions today that ultimately don't make sense.

Senator SULLIVAN. OK, thank you.

Mr. Chairman, thanks. I have additional questions I will submit for the record.

Senator MERKLEY. Thank you very much. I will follow up with you. I think the point you are making is that the landfills that you are shipping to are because you can't open similar landfills in Alaska. I would be happy for you to open those landfills in Alaska and not ship it to Oregon.

[Laughter.]

Senator SULLIVAN. We ship PFAS contaminated soil to Oregon. And we could do it in Alaska.

Senator MERKLEY. More discussion to come. If we can keep the PFAS out of products, that would be helpful as well.

Senator Ernst.

Senator ERNST. Thank you very much, Chairman Merkley, and to as well Ranking Member Wicker, for having this Subcommittee hearing. This is a very important topic for all of us. I am grateful for the work that has been done on Save Our Seas.

Iowa does not have seas. But we care about it as well.

Mr. Hartz, let's start with you. Some of the opponents of advanced recycling have called it basically an unproven technology that is unable to operate at scale. Can you talk a little bit about

some of the investments that you see being made in advanced recycling?

Mr. HARTZ. Thank you, Senator Ernst. I appreciate it.

I was talking earlier that we are here really to talk about nexus, in terms of how the industry goes. But we are inviting anyone to come see what we are doing. So in terms of showing scale and showing something that is commercially viable, our plant in Atlanta is that. It is not a lab scale; it is not a pilot scale. It is a commercial scale plant.

So we ourselves have through sweat equity as well as financial investment built a plant that is doing just that, and are now looking to proliferate that. But you are correct, there are other investments being made elsewhere. The term advanced recycling is kind of an umbrella term. You can have various types of technologies under that.

We always push that economic and environmental footprint come first. The technology could work great, but if it can't scale in those ways, and I feel a little bit like a broken record, and I apologize, but that is how innovation happens.

So that is where the investments are being made. And like any new industry, there are going to be successes and failures. That is also kind of what we do here in this country, is try to create new things that way.

Senator ERNST. I appreciate that, because just as Senator Sullivan was saying, we have this problem, it is here, it is now. We can't just look toward the future with maybe not having different types of plastics out there. But we have to deal with what we have now. So I appreciate that.

Can you also talk, Mr. Hartz, about the environmental standards and safeguards that your particular facility in Georgia operates under?

Mr. HARTZ. Sure. So we are in a non-attainment area, under Federal purview by the EPA. We also obviously have State permits as well. We meet all air, water requirements, and we actually, in some areas are permit by rule.

Our footprint is actually smaller. For a non-attainment area, as you are well aware, it is very tight. We are actually tighter beyond that still.

And then we also manage very carefully. We try to keep a closed system. Of course, you are always going to potentially have, at valve points, you are going to have some VOCs that make it out. You manage for that as well. But we are very diligent about that. Because again, if we can't prove the point, this is not going to grow. We will be here trying to discuss regulation otherwise if we are not doing our job right.

Senator ERNST. Ok, very good. So I am from Iowa, wonderful home State. Eddyville, Iowa, is home to construction of the world's first bio BDO facility. GENO Technology will power the Qore and Cargill facility to produce bio BDO single use plastics, in addition to electronics, apparel, auto parts, and other consumer goods.

And notably, compared to conventional BDO produced using fossil fuels, bio BDO offers 90 percent greenhouse gas emissions savings.

Bio BDO is not only better for the environment, but producing it in the U.S. also supports our local farmers right there in Iowa. When the Eddyville facility comes online and in active production, it will process about 30,000 bushels of corn every single day, which is great for our farmers.

Mr. Seaholm, what role do you see the bio economy play in furthering this type of innovation with bio based plastic products?

Mr. SEAHOLM. Thank you, Senator. Similar to my previous answer, it is an all of the above. There are opportunities to use all sorts of different types of original feedstock, and bioplastics are a growing part of the marketplace.

We have members who are in the bioplastics division, and we strongly support bio as an option, especially for many of the restaurant type applications, where you have compostable streams, and it does present a good opportunity.

Senator ERNST. Very good. What have the consumer and markets reaction to these types of alternatives been?

Mr. SEAHOLM. I think it has been great. I think everybody is looking to use an environmentally beneficial product. I always say, people don't feel guilty when they use plastic, they feel guilty when they are done using plastic if they feel like it doesn't ultimately go where it is supposed to go. And that is why recycling is so important.

The same thing goes for bio-based. If it goes into a compostable stream, fantastic.

Senator ERNST. Yes, wonderful. Well, we wish great success to our folks in Iowa, and congratulations to our farmers that engage in this.

I will yield back. Thank you, Mr. Chair, and thanks to our witnesses.

Senator MERKLEY. Thank you very much.

A few decades ago, a scheme was developed regarding triangles printed on products with different numbers representing the different basic types of plastics. The idea was that oh, if we know the basic category of each plastic, each article can be grouped accordingly, and then an appropriate system can be found to recycle it.

We now hear that this system basically doesn't work. How many plastic forks do you put into your system, Mr. Hartz?

Mr. HARTZ. Excuse me, Chairman Merkley, how many plastic forks?

Senator MERKLEY. Forks. Utensils.

Mr. HARTZ. I would not know the answer to that.

Senator MERKLEY. Isn't the answer none?

Mr. HARTZ. No, sir. Forks can be made from polypropylene; they can be made from other plastic materials.

Senator MERKLEY. Sure, but you don't have an industrial stream feeding your plant. And forks are contaminated with food, so they go into the garbage bin, not even the recycling bin.

Mr. HARTZ. Actually, Chairman Merkley, we do actually take consumer type materials as well. It is not a large part of our stream, but we do take materials from grocery stores, for instance. We also take, we are part of the Energy Bag program, and we handle it that way, too.

Senator MERKLEY. OK, I am going to have some questions for you for the record. Because I am probably the only person up here who has actually visited a chemical recycling site. And in this site, they said, hey, we have a particular stream that we need to take advantage of, because we know what those chemicals are, we know what we are going to reduce. The purchaser of the oil that they were producing wants to make sure they know what that stream is.

If you go down to the cafeteria down below here, you will find that every piece of plastic that touches food is directed to be put into the waste stream, not into the recycling stream. And if you follow the recycling stream, it is probably dumped in with the rest of the garbage as well, as opposed to actually sent anywhere.

So one of the questions I will ask you is exactly how many pounds of forks or straws or plastic lids. Because that model does not fit with what I witnessed when I visited a chemical recycling site.

I think another interesting piece of that puzzle is going back to these triangles. Ms. Enck, why has the triangle system fallen apart? Why does it not work?

Ms. ENCK. Well, it was originally created just to identify the resin. And it doesn't work because plastic recycling is a failure. It is only 5 to 6 percent recycling.

So consumers are always flipping it over, the numbers seem to get smaller and smaller. You really should only put number 1 and number 2 into your recycling bin. That leaves the majority of plastics as non-recyclable.

It is even worse when companies put the iconic recycling logo on their packaging, a plastic bag film, and that will contaminate the waste stream. In fact, the California attorney general, Rob Banta, has launched an investigation around deceptive advertising around plastic recycling.

So people want to recycle. Americans really want to get it going. But other than bottle bills, where you have the deposit, the material is kept separate, you get a high recycling rate, other than plastics from bottle bill States, plastics recycling is a dead end. We should just call it that and move on to reduction.

Senator MERKLEY. Ms. Enck, I went to a hardware store recently, I needed to buy a hammer. I don't know why I misplaced my hammer. I had had it for 40 years. But I lost it.

I was fascinated to see that a hammer, which is designed for beating up on things, was wrapped at the hardware store in a plastic bag. Are we not using plastic in all kinds of settings where it is absolutely unnecessary?

Ms. ENCK. Yes, and it is because the company that packaged it has no skin in the game in terms of what happens to it after you buy the product. They will use different materials. They are not thinking in a circular way.

That is why we need strong, some call it extended producer responsibility, I call it packaging reduction and re-use requirements. Just like we have fuel efficiency standards for cars and appliances, we need environmental standards for packaging so things are not so overpackaged.

Senator MERKLEY. So I recently was given a gift box from a wonderful company, not from my home State. It had a nice little glass jar of peanut butter and a couple of jams in it. All nestled into this beautiful little nest of straw. And I thought, that is really cool.

I picked up the straw, and underneath it was plastic noodles. I thought, why are these plastic noodles in here? It didn't go with the whole theme of this nice package.

I have noticed that in a variety of packaging, as more and more of us order things online, and are brought into the Amazon-esque, you see a lot of different packaging coming in your front door. And I have noticed in some settings various strategies for corrugated cardboard to replace what was previously either Styrofoam or plastic noodles.

Is it possible to pack most things without using plastics?

Ms. ENCK. Yes. New York State has banned polystyrene for food packaging and also banned the little polystyrene peanuts. We are doing OK in New York not getting massive amounts of polystyrene peanuts with our packaging.

Another world is possible. But it was because the State legislature adopted a law. The voluntary initiatives just are not working.

Senator MERKLEY. So we have interstate commerce. Producers tell me, we want consistency as we move our products from State to State. New York doesn't ban products from out of State that are packed in plastic noodles, right?

Ms. ENCK. No, the industry is doing just fine.

Senator MERKLEY. But my point is that your State can change what you produce, but you can't change what you receive?

Ms. ENCK. Oh, no, it includes shipping into the State. You are prohibited from using plastic peanuts in shipping.

Senator MERKLEY. So this company I was just referring to that does these gift packages and ships them all over the Nation, it is actually illegal for them to ship to New York?

Ms. ENCK. Correct. I doubt there is an enforcement action being taken, but they are out of compliance with the New York law.

Senator MERKLEY. Wouldn't it make more sense for us to support the producers by not having a 50 State pattern and actually having packing rules that support replacing plastics with corrugated cardboard or so forth, rather than doing it State by State?

Ms. ENCK. We would welcome that, as long as—yes.

Senator MERKLEY. Well, I do hope we will continue in this Subcommittee to examine these issues. Because it seems like there is a lot that can be done, apart from plastics disappearing.

It has been pointed out on the panel today that there are advantages for plastics in medical gear, that there are advantages in certain other settings, perhaps in lighter weight automobile components or compression zones that makes cars safer. I am sure one could find an additional list, including in medical vaccine applications that have been mentioned and so forth.

But I think it also becomes clear from the testimony that there is a whole lot of plastic that is absolutely unnecessary to have in our economy. I have received interest for bottlers in saying, we know that our plastic bottles get a bad rap; we would like to see some recycling. I sat in, in 1976, on a Senate debate on the floor of the Senate, where Senator Hatfield had a national recycling bill

based on the Oregon bottle bill. Of course, it was ferociously opposed.

But I think we are at a different point in starting to understand the impacts of plastic on human health and on the health of animals and our environment. There is no way to get those microplastics out of the ocean, those that Senator Sullivan was concerned about and many of us are concerned about.

The idea that we now have plastics inhabiting basically, like anywhere you test, you find microplastics. We are starting to be aware that microplastics are produced including by washing our clothes, and plastic fibers being flushed into our streams.

Mr. Myers, you brought your scientific knowledge of the impact on human health, reproductive health. And I read that in detail in your extended testimony, and I encourage others to do so as well. Because the more you read about it, the scarier it gets.

If I read your testimony correctly, you noted that because of the way that these chemicals disrupt the way genes are turned on and off, that in studies of animals, that even after a second generation, where the DNA itself, the gene order has not been changed, but you see the impacts of these endocrine disruptors having changed how the genes are turned on and off affecting health, so that even a child of a child, if you will, could potentially in theory, in animal studies.

Did I understand this correctly that, there are effects that persevere beyond just the immediate health effects of the individual?

Mr. MYERS. You read correctly, and thank you for doing that. That phenomenon is called transgenerational epigenetic inheritance. And it has now been seen in multiple types of organisms. Lots of laboratory experiments have established it clearly. We don't know the detailed mechanisms by which it works, but it definitely works.

In animal experiments, we see effects down four generations. And it is too expensive to do tests on the fifth generation.

Senator MERKLEY. Mr. Seaholm, I know that you professionally represent the plastics industry. But when you hear about plastics appearing in human breast milk, and when you are aware of the impacts of endocrine disruptors as chemicals, do you have any concerns at all about the impact of plastics on human health?

Mr. SEAHOLM. Absolutely. Like I said earlier, the most important thing that our members, especially those manufacturing anything that is going to come in contact with the human body, care about, is safety. If they don't have a safe product, they don't have a sustainable business.

So safety is at the forefront of everything they do.

Senator MERKLEY. And you mentioned recycling. Is your industry supportive of nationwide strategy such as a bottle recycling bill to try to greatly reduce the amounts of bottles?

Can we hold up that picture behind me again, of those bottles that were in the Anacostia River?

This is not rare. I could take you out tomorrow, this is a couple of years ago, we would find the same thing. It is in our streams, it is being flushed out, it is becoming microplastics.

Would your industry support a national recycling bill for bottles?

Mr. SEAHOLM. Specific to bottles?

Senator MERKLEY. I say that because it is considered one of the easier things to do, the plastic is more consistent, about what is put into those bottles, States that have a bottle bill like mine, they basically recycle all the bottles that come through the system. The kids' clubs collect the bottles in blue bags and submit them, and they raise money for their Boy Scout troop or their swimming club or whatever.

It works. So we have a model that works, and it is a more consistent form of plastic than the huge variety of things that have different hardeners, different other colors, additives and so forth. So it is considered the lowest fruit. So that is why I am asking, on this lowest fruit, would you support a strong strategy to reach a very high level of national bottle recycling?

Mr. SEAHOLM. There is no doubt that bottle bills work. Bottle deposits work. We have seen it. Would the industry support a bottle bill, crafted correctly? I think it certainly would be open to that on a national scale. Again, crafted correctly.

Senator MERKLEY. Well, the details matter. But if crafted correctly means that we recycle a high amount, certainly my door is open. I would like to work with you all.

Mr. Hartz, when you hear about plastics being in breast milk and that some of the ingredients have these hormone disrupting impacts, and there is a close correlation and perhaps causation according to various studies, these chemicals' impact on human health reproduction, be it prostate cancer, breast cancer, low sperm counts, and so forth, do you share that concern? Is that concern a part of what has propelled you into the business you are in now, of trying to find a solution?

Mr. HARTZ. Chairman Merkley, I smile when you ask the question, it is the whole reason we got into this. All the team has had a history of wanting to address these kinds of issues. This particular one, the facts bear out.

I think there are two threads of discussion here. One is the problem of plastics as frankly, you are defining it, but there are also the benefits. I am not here to defend or not what the benefits are, but that is a thread of discussion that needs to be addressed.

Then there is the solution. That is why I am trying to offer today, is a real solution to that issue. So absolutely, I am concerned about these things.

To your earlier point, just for clarification, we do tolerate reasonable amounts of contamination, because you can't expect a clean stream of plastics to come in. We live in a very complex world. I just want to share that we do see those things, and we try to work with that. Again, any time, please come by and see us, because there are different ways to do this.

Senator MERKLEY. Thank you.

Yes, Mr. Myers.

Mr. MYERS. Thank you. I want to return to something I mentioned briefly, the chemical strategy for sustainability in Europe. One of the key concepts they are introducing is the importance of distinguishing between essential uses of plastic and uses that are not essential, and using that as a priority way to decide which ones you are going to work first to reduce. And once you reduce those,

then you can focus on the other types of plastics that are essential and find other ways to do the same thing that aren't plastic.

Europe is thinking very logically and very big about how to approach this question.

Senator MERKLEY. OK, essential versus non-essential.

Ms. Enck.

Ms. ENCK. On chemical recycling, Senator, I think it is important for you to know that the American Chemistry Council has gotten 20 States to adopt laws to exempt chemical recycling from some important environmental laws at the State level.

Then second, looking for public subsidies. I don't think it is a solution. It is not going to solve the problem.

I think we may have heard breaking news from Mr. Seaholm on a national bottle bill. We need a national bottle bill. If you just look at PET plastic beverage bottles in the 10 States that have bottle bills, the PET recycling rate is 63 percent. Without a deposit it is only 17 percent. Bottle bills not only prevent litter, but they work.

Senator MERKLEY. What was that again for the States that have it, the recycling rate is what?

Ms. ENCK. Bottle bill States for PET, if you have a deposit, 63 percent recycling rate. No deposit, 17 percent recycling rate. So having the plastics industry support a national bottle bill and getting the details right would be really helpful.

Senator MERKLEY. Are you going on to say Oregon is one of the highest recyclers of bottles?

Ms. ENCK. Oregon and Michigan, because you have had it a long time. I understand you championed it when you were in the State legislature there. Having a 10 cent deposit rather than 5 cents really works.

Then it is crucial to make it easy for consumers. If you pay the deposit, you should be able to return the container to the store. The redemption centers and the depots are nice supplements to return to retail. But I am super busy. In New York, I return my containers right to the supermarket where I shop. It is easy.

Senator MERKLEY. I will tell you, in Oregon it is much harder to return to stores now. However, there is an interesting model that has been developed by the State of green bags and blue bags. So you get these green bags, unless you are a non-profit, you put a quick response code on the sack.

When the sack is full, you throw it through the door at the recycling center. And it is then automatically sorted by computers that take a picture of all the bottles that were in that bag, immediately credits your bank account. And it does the same for non-profits.

Much easier than sticking a bottle one bottle at a time through a hole and having a machine try to register it and having the machine break down and all the other challenges.

I think we should explore the best strategies from around the country, what works and what doesn't. I think Maine is also very high and sometimes beats Oregon, and I am told that is because they recycle liquor bottles, which we do not. But more work to be done.

I think at least we need to take the pieces of this where we can find some common ground, and move forward while recognizing that that will help, but it will only modestly help against the mas-

sive amounts of plastics that are finding their way to being burned overseas.

We were shipping a ton of plastics overseas where it was often burned for power. China now says, we don't want that anymore. It was so polluting, thank you very much. That disrupted a lot of the strategies that we had here.

So we have a lot of work to do on this. I appreciate you all bringing your insights and perspectives to bear.

With that, I need to read the formal comments for adjourning. I would like to ask unanimous consent to submit for the record a variety of materials that include letters from stakeholders and other materials that relate to today's hearing.

I hear no objections. So ordered.

[The referenced information follows. Due to size constraints the following document is not included in this hearing record but is available on the Web.]

- Circular Claims Fall Flat Again, Greenpeace, October 24, 2022, https://www.greenpeace.org/usa/reports/circular-claims-fall-flat-again/

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140 Industrial Blvd
Bainbridge, GA 39817
danimerscientific.com|229-243-7075

January 10, 2023

The Honorable Jeff Merkley
The Honorable Roger Wicker
Subcommittee on Chemical Safety, Waste Management, Environmental Justice, and Regulatory Oversight
Committee on Environment and Public Works Committee
410 Dirksen Senate Office Building
Washington, D.C. 20510

Dear Chairman Merkley and Ranking Member Wicker,

I am writing to you in regard to your hearing on *Examining the Impact of Plastic Use and Identifying Solutions for Reducing Plastic Waste* conducted on December 15th, 2022. I ask that this letter be entered into the record.

Danimer Scientific is located in Bainbridge, Georgia with manufacturing in Winchester, Kentucky. We are a global leader in biobased plastics research, development, and commercialization. We produce 100% certified biodegradable and compostable biopolymers that can replace many types of petroleum and natural gas-based plastics. Danimer is a USDA BioPreferred company and our Polyhydroxyalkanoates (PHA) material is listed in the BioPreferred Catalog.

PHA biopolymers are renewable, sustainable and offer superior end-of-life scenarios for single-use plastics and other plastic applications. PHA is synthesized from biological feedstocks such as canola oil and is compostable and fully biodegradable in both aerobic and anaerobic conditions, including marine environments. Plastic products made from Danimer PHA based materials are fully ASTM D 6400 compliant and will break down at the same or faster rates as other compostable materials, including food waste. PHA biopolymers are currently in use by global brands as sustainable alternatives for packaging of food products and food service items.

Danimer is a member of the plastics industry but also a stakeholder in the fight against plastic pollution. Our company is founded on the principles of reducing plastic waste by providing an environmentally sound alternative to problematic items such as single use plastics (SUP), designing our products to be circular through ease of compostability, and enabling plastic products that, because of their biodegradability, will not contribute to the long-term problem of plastic pollution if leaked into the environment.

According to data provided by the United Nations Environmental Program, bioplastics such as PHA comprised only ~1% of total global plastic production as of 2019. Current estimates are that 46% of plastic waste is landfilled while 17% is incinerated. 15% is collected for recycling, but only 9% is actually recycled after losses. 22% of plastic

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Bainbridge, GA 39817
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produced becomes litter. Notably, there is no data given for composting of plastics. We believe that transition to certified compostable and biodegradable biopolymers wherever possible can be a major part of the solution, not only to the 22% of mismanaged plastic waste, but also in significantly reducing the amount of plastic being landfilled. The key to enabling this transition is food waste composting. We believe support for composting infrastructure is equally important as measures to improve recycling, and we urge the Subcommittee to consider the following:

- In addition to being compostable, PHA products are fully biodegradable under all natural conditions where biodegradation takes place. Products escaping the waste stream decompose into biomass in a matter of weeks or months, rather than lingering in the environment or breaking down into microplastic particles. One of the most problematic categories and a significant contributor to global plastic pollution are SUP (Single Use Plastics). PHA and other bioplastics are a mature technology that only require scale-up of manufacturing to be able to substitute for fossil-based SUPs globally on a one-for-one basis. We support regulatory, economic and trade measures that would incentivize and accelerate a transition to biobased and certified compostable SUP.

- Food remains one of the greatest challenges to achieving a fully circular economy. Because of its very nature, food cannot generally be reused. Additionally, food waste is a major component of landfills, both a finite resource and an environmental burden. Composting must be a major part of any strategy for a circular economy as it diverts waste food and contributes to new food production. PHA products are purpose-designed for food contact applications, including food service, packaging, and delivery. Examples include straws, cutlery, lids, cups, flexible films, and labels that can be composted along with food waste after use. Additional applications are coatings for paper products, bringing water, oil, and grease barriers while still allowing paper wraps, cups and containers to be composted with food waste. Traditional fossil-based polymers cannot offer this end-of-life functionality.

- Bioplastics can be readily composted in actual practice. PHA-based products break down at the same rate as food waste in both home and industrial composting operations. This streamlines the process especially for food waste by avoidance of sorting and other handling requirements for removing SUP from the composting stream and allows SUP's to remain a vital part of safe and efficient food delivery. Reduction in screening of SUP's greatly improves the efficiency and profitability of composting operations and further supports significant reductions of food waste in landfills.

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140 Industrial Blvd
Bainbridge, GA 39817
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- The most valuable contribution of PHA and bioplastics to reduction of plastic pollution is in applications where reuse or recycling is not practical or economical. For most food packaging, composting is the best end-of-life alternative followed by proper disposal in landfills. PHA production employs a microbial fermentation process of renewable seed oils, yielding polymers which are made by the microbes themselves, which will biodegrade under all natural conditions. The microbes themselves are naturally occurring, which enable products that will not persist if leaked into the environment. This is a key benefit of PHA-based SUP items, and one that will help end the plastic pollution crisis.

On behalf of Danimer and the bioplastics industry, I thank you for taking on this immense challenge of dealing with plastic pollution. As you continue this important work, we would ask that you include composting as a primary measure for reducing plastic pollution and consider ways to scale up production of bioplastics for critical applications like food contact packaging and SUP.

Sincerely,

Stephen Croskrey

CF:
Senator Tom Carper
Senator Shelley Moore Capito
Senator Jodi Ernst
Senator Jon Ossoff
Senator Raphael G. Warnock
Senator Mitch McConnell
Senator Rand Paul

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Portland Cement Association
200 Massachusetts Ave NW, Suite 200
Washington D.C., 20001
202.408.9494 Fax: 202.408.0877
www.cement.org

December 15, 2022

The Honorable Jeff Merkley
Chairman
Environment & Public Works Subcommittee on
Chemical Safety, Waste Management,
Environmental Justice, And Regulatory Oversight
410 Dirksen Senate Office Building
Washington, D.C. 20510

The Honorable Roger Wicker
Ranking Member
Environment and Public Works Subcommittee on
Chemical Safety, Waste Management,
Environmental Justice, And Regulatory Oversight
456 Dirksen Senate Office Building
Washington, D.C. 20510

Dear Chairman Merkley and Ranking Member Wicker:

The Portland Cement Association (PCA) appreciates you holding the hearing titled, Examining the Impact of Plastic Use and Identifying Solutions for Reducing Plastic Waste. This hearing is necessary to evaluate federal policy actions to our plastic and other solid waste challenges across the economy. Congress should take diverse and flexible approaches to waste disposal that will alleviate landfilling while reducing greenhouse gas emissions.

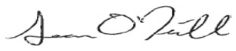
Regulatory and technical barriers also exist for cement plants to use alternative fuels, such as industrial byproducts that otherwise would end up in landfills, including plastics, fabrics/fibers, non-recycled paper and cardboard, tires, and other valuable non-hazardous secondary materials, that will help the industry reach its carbon neutrality goal by 2050. Since 1990, the industry has reduced its use of traditional fossil fuels by over 15% by using these alternative fuels. Reducing legal barriers to allow kilns to increase usage of these lower-carbon alternative fuels to replace traditional fossil fuels, such as coal and pet coke, can help reduce kiln CO2 combustion emissions.

The U.S. lags well behind the European Union (EU) in its adoption of alternative fuels, reflecting fundamental differences in the regulation of industrial manufacturing, their approach to conserving, recovering, and using secondary materials, and the EU's use of all available levers to discourage landfilling and drive carbon reduction. Cement kilns provide an effective and environmentally sound solution that avoids landfilling these materials, benefiting the cement industry and society at large.

We see a similar tremendous opportunity in the U.S. to reduce emissions with the right policies. The federal government can facilitate additional technical research to analyze the waste and non-hazardous secondary materials streams to ensure that these potential fuels have similar heating values and lower CO2 emissions profiles to traditional fossil fuels. Following such research, we hope that Congress can make pragmatic changes to federal environmental policies that will provide for increased alternative fuel usage while responsibly protecting the environment and enhancing our energy security.

Again, thank you for your leadership on climate change and the opportunity to weigh in on federal policies for tackling plastics disposal. PCA hopes to collaborate on realistic solutions to this challenge. If you have any questions or would like any additional information, please feel free to contact PCA's Senior Vice President of Government Affairs, Sean O'Neill, at soneill@cement.org.

Sincerely,



Sean O'Neill
Senior Vice President of Government Affairs
Portland Cement Association

PETRA
PET Resin Association

December 20, 2022

The Honorable Tom Carper
Chairman
U.S. Senate Committee on Environment and Public Works
406 Dirksen Senate Office Building
Washington, DC 20510

The Honorable Shelley Moore Capito
Ranking Member
U.S. Senate Committee on Environment and Public Works
456 Dirksen Senate Office Building
Washington, DC 20510

Dear Chairman Carper and Ranking Member Capito:

The PET Resin Association (PETRA) respectfully submits the following letter to be entered into the record for the December 15, 2022, hearing entitled, "Examining the Impact of Plastic Use and Identifying Solutions for Reducing Plastic Waste." PETRA appreciates the Committee's attention and dedication to addressing the critical issue of plastic waste. We hope that PETRA will be part of your ongoing conversations, as PET and plastics packaging save greenhouse gas emissions, reduce energy consumption, and reduce waste generation when compared to alternative packaging materials.[1]

PETRA is the industry association for North America's producers of polyethylene terephthalate (PET), the clear and lightweight plastic used around the world to package foods, beverages, personal care products, and other consumer items.[2] Due to the unique nature of PET and the growing national interest in reducing plastic waste, PETRA's member companies are deeply entrenched in the national recycling and collection discussion. PET is the most recycled plastic in the U.S. due to its ability to be almost infinitely recovered and recycled, its energy efficiency, and its significantly lower environmental impact being favorable to glass and aluminum. For many plastics, there is a shortage of demand for recycled product; however, in the case of PET, it is the opposite. Almost all individual-sized and 2-liter bottles of water and carbonated soft drinks sold in the U.S. are made from PET and, when recycled properly, create a true circular economy as they are recycled back into new bottles. Additionally, more than half of the world's synthetic fiber is made from virgin or recycled PET. Recycled, post-consumer PET resin is not only used to make

[1] "Addressing Single-use Plastic Products Pollution Using a Life Cycle Approach," United Nations Environmental Programme, 30 June 2021, https://www.unep.org/resources/publication/addressing-single-use-plastic-products-pollution-using-life-cycle-approach

[2] PETRA members include APG Polytech USA Holdings, Inc., DAK Americas LLC, and Indorama North American Subsidiaries.

new consumer product containers but can be recycled into other materials such as carpets, strapping, clothing fibers, automotive parts, and construction materials.

It is important to highlight that, beyond its favorable environmental benefits, PET is not toxic, as demonstrated by over forty years of use in packaging for all regulated food types without adverse health or safety issues. PET is used neat, meaning it does not require additives such as plasticizers or antioxidants. PET is non-degradable, meaning that it is biologically inert in the environment. The United States Food and Drug Administration (FDA) permits PET in food contact, regardless of whether it is virgin and or recycled PET.

The PET industry has made great progress in its efforts to play a significant role in the circular economy, and our members have already invested upwards of a billion dollars to support increased reclamation and recycling of PET. As the beverage industry continues to make significant commitments to increase its use of recycled PET in new containers, and recycled content requirements are being introduced across the country, U.S. reclaimers have responded positively by processing 1.76 billion pounds of post-consumer bottles in 2020 alone – nearly one billion pounds more than just ten years ago. PET is an integral part of solving the plastic waste crisis, as we encourage the shift from plastics that are not easily recycled to the one that can be easily, almost infinitely recycled – like PET.

PETRA's goal is to continue to work with elected officials and policymakers to support policies that promote a circular economy and increase content availability in the recycling stream, including many that were discussed in Thursday's hearing. U.S. policy should be encouraging the use of PET over alternative materials and require a percentage of post-recycled content be used in plastic packaging, such as has recently passed in state legislatures in Maine, Oregon, Colorado, and California.

Thank you for your consideration of PETRA's comments. Please do not hesitate to contact me with any questions.

Sincerely,

Ralph Vasami
Executive Director
PET Resin Association (PETRA)

355 Lexington Ave., 15th Floor
New York, NY 10017
(212) 297-2125 | rvasami@kellencompany.com | www.petresin.org

The Association of Plastic Recyclers

December 14, 2022

The Hon. Tom Carper, Chairman
U.S. Senate Committee on Environment & Public Works
410 Dirksen Senate Office Building
Washington, DC 20510

The Hon. Shelley Moore Capito, Ranking Member
U.S. Senate Committee on Environment and Public Works
456 Dirksen Senate Office Building
Washington, DC 20510

The Hon. Jeff Merkley
U.S. Senate
531 Hart Senate Office Building
Washington, DC 20510

The Hon. Roger Wicker
U.S. Senate
555 Dirksen Senate Office Building
Washington, DC 20510

Dear Chairman Carper, Ranking Member Capito, Senator Merkley, and Senator Wicker:

We deeply appreciate the opportunity to provide comments regarding the December 15, 2022, U.S. Senate Committee on Environment & Public Works (EPW) Subcommittee on Chemical Safety, Waste Management, Environmental Justice, and Regulatory Oversight hearing, "Examining the Impact of Plastic Use and Identifying Solutions for Reducing Plastic Waste."

The Association of Plastic Recyclers (APR) is an international trade organization and the only organization focused exclusively on growing and sustaining the plastics recycling industry. APR's membership includes independent recycling companies of all sizes who process numerous resins, as well as consumer product companies, equipment manufacturers, testing laboratories, organizations, and others committed to the success of plastics recycling. The APR Design® Guide for Plastics Recyclability is recognized across the globe as the solution to the design challenges facing plastics packaging. APR works to enhance recycling programs and performance through technical resources, testing programs, design solutions, corporate training, regulatory leadership, and education programs.

In short, APR members are the recycling industry. Plastics recycling is what we do each and every day. We know the challenges facing the industry and the solutions needed to scale recycling effectively as a key solution to reduce plastic waste and move toward a more sustainable, circular economy.

The Association of Plastic Recyclers

We are disheartened to see no designated speakers on the upcoming panel representing the recycling industry who can testify on the critical opportunity to improve recycling as an immediate and meaningful strategy to reduce plastic waste and its environmental impacts. We would like to offer our perspective on why recycling needs to be front and center in our national strategy and our recommendations for tangible, actionable solutions moving forward.

Our four recommended strategies outlined below include:

- Increase the supply of plastics for recycling through national Extended Producer Responsibility policy and national beverage container deposit policy
- Set national standards on what is labeled as "recyclable" to reduce consumer confusion and increase participation in recycling
- Require companies to use recycled plastics in all new plastic products and packaging
- Prioritize investment in mechanical recycling and explore innovations only in plastic-to-plastic forms of chemical recycling

HOW INVESTING IN PLASTICS RECYCLING CAN REDUCE PLASTIC WASTE

Plastics recycling works each and every day across the U.S.

In 2020, despite the challenges caused by a global pandemic and related lockdowns, American recyclers processed almost five billion pounds of post-consumer plastic material. That is five billion pounds of plastic that did not end up in a landfill or the ocean and was instead processed and made into new products and packaging.

U.S. plastics recyclers have capacity to nearly double recycling rates but need more plastics to recycle.

U.S. plastics recycling companies want more recyclable plastics and have the operational capacity to process more materials. U.S. plastic recyclers could nearly double the PET and HDPE bottle recycling rate today using our country's existing processing infrastructure if they were able to access more material. In other words, if more recyclable plastic products and packaging are put into recycling bins by consumers and collected, recycling rates would increase.

In addition, major consumer goods companies such as Coca-Cola, PepsiCo, Nestle, Mars, L'Oreal and many others have made substantial commitments to use more recycled plastics in their bottles. Yet these goals are in jeopardy because there is not enough recycled plastic collected from consumers. The supply of recycled plastics needs to nearly triple to meet projected demand, from 1.6 million metric tonnes in 2021 to 4.1 million metric tonnes in 2025. That's more than 26% increase required per year.

Over the past 30+ years, recyclers have lead innovation for improvement in the industry. They have invested millions of dollars in enhancing sortation, developed new technologies to expand their ability to recycle materials, and created a thriving market for recycled materials. Capital investment is flowing to the recycling industry, but the lack of supply is jeopardizing our growth. **The plastics recycling industry is ready to scale up as an effective solution to reduce plastic waste, and we need government policy to drive more recycling collection programs to increase the supply of recyclable plastics.**

The Association of Plastic Recyclers

Criticisms about recycling are misleading and counterproductive.
While you have heard doubts about recycling in the media and may hear them from the panel, we want to emphasize that every major government, scientific, and private industry overwhelmingly agrees we cannot create a circular economy of plastics without massive investment in recycling, recovery, and reprocessing infrastructure. This includes the U.S. National Academies of Sciences report which identified recycling as one of six key strategies to reduce plastic waste. Plastics are a valuable part of our economy and our manufacturing industries, and we need to rapidly accelerate plastics recycling to keep these materials in use as long as possible to maximize the environmental and economic benefits of plastics. The naysayers about recycling fail to acknowledge that recycling can and does work significantly better in certain U.S. states and across the world. **The solution is not to turn away from recycling—it's to recommit to U.S. recycling as a scalable solution.**

Further, the data being presented on the current recycling rate is misleading. The plastic items that most Americans buy, use, and put in their recycling bins – water and soda bottles, laundry detergent jugs, yogurt tubs – do get recycled. 80% of rigid plastic packaging is polyethylene terephthalate (PET), high-density polyethylene (HDPE) and polypropylene (PP). This is the kind of plastic packaging that is most used by businesses and available to consumers to put in their blue bins. Based on the latest EPA data, 19% of this kind of plastic packaging was recycled. The latest information available for PET and HDPE bottles alone is from 2020 and shows a recycling rate of 28%.

Still, recycling numbers can – and should – be much higher, and we are committed to working with you and state legislators to improve plastics recycling through proven solutions.

The U.S. lags behind in plastics recycling, but there are proven solutions to rapidly improve.
While the U.S. recycles millions of tons of plastics each year, this represents less than 15% of the plastic packaging and products used every year. By contrast, leading countries are recycling 50-60% of their municipal waste, including plastics. This means there are proven solutions and best practices to rapidly increase plastics recycling across the U.S.

Recycling varies wildly between states, and leading states show there are proven practices available to accelerate solutions. For example, Maine recycles 78% of water and soda bottles today, yet more than 15 states recycle less than 10% of these bottles. More coordinated federal action is needed to accelerate investments in recycling to underserved and underperforming regions, particularly in the Southeast and Midwest.

RECOMMENDATIONS FOR MOVING FORWARD

APR is intimately familiar with every aspect of recycling, and our members exist at every link along the chain of recycling. Consumers start the chain by putting their recyclable products in the bin, and companies at the end of the chain buy and use that recycled material for new products. It is that end-of-chain demand that drives the entire system. Recycling breaks down when there is no waiting destination for the paper, plastic, glass, and metal that consumers want to recycle.

The Association of Plastic Recyclers

The following key points outline how every link of the recycling chain could be strengthened in order to tangibly support and grow recycling in this country.

Public policy is needed to increase the collection and supply of recycled plastics

The biggest fundamental challenge to improving recycling is a lack of effective collection programs. Despite being 100% recyclable, the U.S. only collects fewer than 3 of every 10 water bottles and soda bottles for recycling. The two leading policy solutions to fund and improve recycling collection are Extended Producer Responsibility and Beverage Container Deposits.

Implement national Extended Producer Responsibility policy

Extended Producer Responsibility (EPR) policies require product manufacturers to be financially responsible for the end-of-life of their products by paying for the costs to take back, recycle, or properly dispose of their discarded products. This shifts the burden of paying for recycling from local governments and households to the producers. EPR is the only proven and likely mechanism to provide sufficient, ongoing, and dedicated funding to increase recycling and reduce plastic pollution.

Four U.S. states adopted EPR policies in the past two years. Colorado's new EPR law will provide free recycling to all residents and could double or triple the state's recycling rate in just a few years. The law had business support from Coca-Cola, PepsiCo, Walmart, Unilever, and others because these companies need the supply of recycled materials to meet their sustainability goals and to strengthen their supply chains. Over 15 states introduced similar bills in 2022 and more states are expected to adopt similar programs in 2023. Federal legislation would have the greatest impact on improving recycling for all packaging and across all states.

We suggest a National Academies of Sciences or an EPA study on the benefits and opportunities of Extended Producer Responsibility policy in the U.S. to improve recycling and reduce plastic waste. This could be included in new introductions of the Save Our Seas 3.0 Act or The Recycling and Composting Accountability Act (S. 3743).

Implement a national beverage container deposit policy

A beverage container deposit law requires a minimum refundable deposit on beer, soft drink and other beverage containers in order to ensure a high rate of recycling or reuse. States with bottle deposit policies recycle 62% of their water and soda bottles compared to only 13% in states with no bottle deposit policy. Thanks to its bottle deposit policy, Maine recycles 78% of water and soda bottles today, yet more than 15 states with no policies recycle less than 10% of these bottles.

Over four decades of success around the world has shown these policies to be the most effective in driving the highest recycling rates for plastic containers and for reducing litter. A well-designed national bottle bill could have significant environmental and economic benefits, projected to reduce regional greenhouse gas emissions by roughly 550,000 metric tons, save municipalities between $111 million and $160 million, and create over 2,700 jobs. In addition, these programs

are popular with consumers: 84% of Americans support a national container refund program to encourage recycling, where consumers get a small fee back when returning an aluminum can or plastic bottle for recycling.

There is a coalition working to introduce a national beverage container deposit policy in early 2023, and we urge this committee to engage in these discussions.

Set national standards on what is labeled as "recyclable" to reduce consumer confusion and increase participation in recycling

APR is eager to work with the Committee to develop a federal labelling system for products deemed to be recyclable. A better labelling system can provide a needed level of consistency with respect to recycling programs across the country. The current overwhelming differentiation in how packaging is labeled - and what packaging materials are accepted - is a major contributor to the lack of collection and proper sortation on the system.

We have repeatedly asked for the FTC to coordinate with the U.S. Environmental Protection Agency (EPA) and the recycling stakeholder community to develop new definitions and terms or refine existing ones. The FTC recently announced that it will vote on moving forward with this process this week, and **we urge the Committee to continue to pressure FTC and the EPA to provide this much needed national guidance.** California adopted its own labeling law in 2022, and a state-by-state approach would be extremely problematic for packaging companies and recyclers who serve multiple markets.

Prioritize investment in mechanical recycling and explore innovations only in plastic-to-plastic forms of chemical recycling

There is much work to do to scale plastics recycling using proven technologies and services, and this should be the primary focus for the next 3-5 years at least. However, there are also current limitations to the ability of mechanical recycling to produce food-grade quality recycled content plastic that can be used again in some packaging. This means not all products can contain recycled content, and it limits how much recycled plastics are used in some products. This challenge can potentially be overcome by non-mechanical processes known as chemical recycling.

However, chemical recycling encompasses a wide range of technologies, most of which focus on producing fuels and not producing new food-grade quality plastics. There is no role for plastics-to-fuel in a circular economy, and it should not be considered recycling. The EU Environment Commission, Ellen MacArthur Foundation, ISO standards (18604:2013), and many other leading organizations differentiate between chemical recycling technologies based on their outputs, and we strongly encourage the EPA and this Committee to only consider non-mechanical recycling technologies focused on increasing the amount of recycled plastic available for use in new products.

By enacting specific policies to advance proven mechanical recycling solutions, much more can be done at the local, state, and federal levels to improve the collection, sorting, and use of recycled plastics that will drive faster progress in the short term. Any investment in new

innovations should only be part of a dual-investment strategy to maximize mechanical recycling first while exploring the feasibility of new technologies.

Require companies to use recycled plastics in new plastic products and packaging
Recycled content requirements can increase – and, just as important, stabilize – the market for recycled material. Expanded and stable markets will also have a positive impact on the pricing of recycled material. This is one of the largest challenges facing the recycling industry, aside from the shortfall in supply.

The good news is that companies have made bold advances to use more recycled plastics. For example, in over just three years, Unilever moved from less than one percent recycled plastic to over 17% recycled plastic, and SC Johnson increased from 4.5% to over 19% in the same time. On average, leading companies pledging to support a New Plastics Economy through the Ellen MacArthur Foundation doubled their use of postconsumer recycled plastics in three years, which means the use of recycled plastics increased more in the past three years than in the entire history of plastic packaging.

However, history has proven we cannot rely on voluntary initiatives to improve recycling. Washington, California, and New Jersey recently passed laws requiring companies to use recycled plastics in beverage bottles, personal care products, and trash bags. These policies are strong steps forward but would be far more effective at the national level. The EU and Canada are calling for at least 30% recycled content in all plastic packaging, and we urge the U.S. to adopt similar targets, starting first with federal procurement standards.

Next steps moving forward
APR appreciates your leadership to address the plastic waste problems and drive a circular economy for plastics. Our goal is to work in cooperation with the Committee to ensure that any legislation or policy initiatives achieves the goals of increasing the supply of quality material, enhancing our recycling infrastructure, and expanding markets for recycled material. We are available at your convenience to discuss these solutions to improve recycling and answer any questions on the recycling of plastic packaging.

We look forward to continuing to work with the Committee in the coming year and wish you all the best for the holiday season.

Sincerely,

Kate Bailey
Chief Policy Officer
Association of Plastics Recyclers

Newsletter

Here's Why Recycling Plastic Isn't a Panacea

Packaged plastic bottles of water and soda for sale in Accra, Ghana. *Photographer: Nipah Dennis/Bloomberg*

By Dasha Afanasieva
November 11, 2022 at 6:00 AM EST

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Hi, it's Dasha in London. The world's plastic mountain keeps growing, with ugly consequences for the planet and those who inhabit it. I've been looking into why pinning all hopes on recycling may not be the way forward. But first...

Today's must-reads

At least 500,000 British workers have dropped out of the labor market due to poor health since the start of the pandemic.

Elon Musk's first email to Twitter staff says `no way to sugarcoat the message.' Remote work is over.

The shrunken Mississippi river slows US food exports, just when the world needs them the most.

Here's the rub with recycled plastics

As a reporter covering the world's largest packaged-goods companies and their efforts to reduce the use of plastic, I have often wondered why I'm still seeing so many of the same old soda bottles around.

Switching to mostly recycled plastic might give bottles a cloudy look, but surely consumers could be persuaded to accept that in the name of saving the environment?

Here's the rub, though: one of the lesser known challenges facing companies is that the recycling can cause some serious health risks.

Packaged plastic bottles of water for sale. *Photographer: Nipah Dennis/Bloomberg*

That helps explain why most of the planet's biggest plastic users look almost certain to miss a target of only using reusable, recyclable or compostable packaging by 2025, according to a report this month by the Ellen MacArthur Foundation and the UN Environment Program.
In fact, the report shows Coca-Cola Co., a controversial sponsor of the COP27 climate summit currently under way, and arch rival PepsiCo actually increased their use of newly-manufactured plastic, as did Mars.

We all know virgin plastics contain additives that have been linked to cancer, issues with brain function and a range of hormone-related effects like infertility and early puberty.

The issue with recycling is that that melting together different plastics can multiply the additives -- and their potential health hazards.

A study published in the Journal of Hazardous Materials earlier this year found more of the offending additives leach from recycled PET bottles into their contents than from virgin plastic ones.

The recycled plastic may become tainted by chemicals when it’s collected and sorted, the researchers said, but it’s still unclear exactly how the contamination happens.

Switching to another material carries pitfalls, too. Flogging more pop in glass bottles may increase drinks' companies' carbon footprint, for example. That's why the hunt for new plastics substitutes is so important. – *Dasha Afanasieva.*

The big story

This telehealth giant drew people with addiction. Bloomberg's Caleb Melby and Polly Mosendz take a look at what happened when the startup began treating complicated, vulnerable patients.

What we're reading

Billionaire CEO splurges after Covid gains: Gilles Martin, whose lab-test company Eurofins boomed during the pandemic, and his brother have bought four villas for more than €130 million in the French riviera's "Billionaire Peninsula, Bloomberg reports.

Pulses to the brain to curb binge eating? A small study, reported by the New York Times, demonstrated that deep brain stimulation, used for people with Parkinson's disease, can limit an urge to overeat.

Covid vaccine patent wars: In 2020 Moderna said it would not enforce its patents against rivals developing Covid-19 jabs. This year, however, almost two years after Pfizer and BioNTech beat it to the first approved mRNA jab, Moderna filed a lawsuit over patents for a technology that could open the door many more vaccines. The Financial Times considers how this might play out.

Ask Prognosis

Ask us anything – well, anything health-related that is! Each week we're picking a reader question and putting it to our network of experts. So get in touch via AskPrognosis@bloomberg.net.

13 October 2022 / Clare Kenyon

Shocking amounts of fishing gear abandoned, lost and discarded every year wreak havoc on our oceans

Ghost nets are polluting our marine environments.

Credit: Ahmed Areef/EyeEm/Getty Images

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Sydney shark attack triggers calls for a cull – but let's take a deep breath and look at the evidence

You may have missed...

Giant Arctic sponges feed on extinct ecosystems

Just under 2% of all fishing gear in the world makes its way into the oceans annually, new research has found. That's over 78,000 km^2 of nets, almost 740,000 km of longlines and more than 25 million pots and traps. Every single year.

Discarded fishing nets kill marine life. Credit: Josephine Jullian/Getty Images

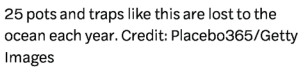
Seals are frequently caught in discarded or lost fishing nets. (This seal was apparently freed.) Credit: Ian Dyball/Getty Images

From these data, they were able to estimate the amount lost globally by multiplying by global fishing effort data. They found there was an overall loss globally of fishing gear of 1.82% of gear.

Not all of it is lost – some is abandoned or discarded – but all Abandoned, Lost, or otherwise Discarded Fish Gear (ALDFG) – sometimes referred to as 'ghost nets', represents a major contribution to ocean pollution and has social and economic impacts as well as serious environmental consequences including loss of marine and coastal habitats and wildlife.

Read more: Aussie penguins may help save seabirds from plastic nets

The researchers were able to gather information on what types of gear were lost more often. They found that on average, 3.94% of all bottom trawl nets, 3.58% of all longline branchlines and 2.86% of all longline hooks were lost globally every year. 0.74% of all pots and traps are lost annually.



25 pots and traps like this are lost to the ocean each year. Credit: Placebo365/Getty Images

Until now, writes Dr. Kelsey Richardson and coauthors, "empirical information on how much fishing gear is lost to the oceans has been limited, despite an outdated ill-quoted estimate of 640,000 metric tons lost each year.

Some of the measures already taken to reduce the impacts of ALDFG include gear marking and tracking, loss reporting and recovery and improving facilities for dealing with fishing gear at the end of its useful life along with strategies to minimise the effect of pollution events and regulation of destructive fishing practices.

Do you care about the oceans? Are you interested in scientific developments that affect them? Then our new email newsletter ***Ultramarine****, launching soon, is for you. Click here to become an inaugural subscriber.*

Originally published by Cosmos as Shocking amounts of fishing gear abandoned, lost and discarded every year wreak havoc on our oceans

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Clare Kenyon

Clare Kenyon is a science journalist for Cosmos. An ex-high school teacher, she is currently wrangling the death throes of her PhD in astrophysics, has a Masters in astronomy and another in education. Clare also has diplomas in music and criminology and a graduate certificate of leadership and learning.

380 million tons of plastic are made every year. None of it is truly recyclable.

Not even water bottles and milk jugs meet standards for recyclability, a new report finds.

Grist / Getty Images

Published Oct 24, 2022

Topic Climate + Accountability

No plastic is truly recyclable — not even the water bottles and milk jugs that people usually toss into their blue bins.

According to a new report released on Monday by Greenpeace USA, no plastic product meets a common industry standard for recyclability, even though they bear the familiar "chasing arrows" recycling symbol. The report says industry-backed recycling labels on yogurt cups, ketchup bottles, food trays, and other products perpetuate a "fiction" that recycling will ever scale up to handle the 380 million tons of plastic that companies churn out every year. The U.S. plastic recycling rate has never topped 10 percent,

"Corporations are hiding behind plastics recycling and hoping that it will completely solve the plastic waste crisis that they have helped create," said Lisa Ramsden, a senior oceans campaigner for Greenpeace USA. She called on companies to scale down plastic production and replace single-use products and packaging with reusable alternatives, like bottles that can be refilled.

Greenpeace's report, titled *Circular Claims Fall Flat Again*, builds on a previous report the organization published in 2020. Back then, the group found that only certain kinds of bottles and jugs met the federal government's definition for "recyclable" and could legally bear the chasing arrows symbol: Those bearing the numbers 1 and 2 to indicate the kind of material they're made of, polyethylene terephthalate (PET) and high-density polyethylene (HDPE), respectively.

The same is still true today: Most recycling facilities don't accept or recycle plastics numbered from 3 to 7, like polyvinyl chloride (PVC), polypropylene, and polystyrene because they are difficult to sort and often contaminated with toxic chemicals. But Greenpeace's most recent report also highlighted an abysmal recycling rate for those that meet the government's definition of recyclable, which only considers whether people have access to recycling facilities for a given kind of plastic. According to the organization's analysis, the actual reprocessing rate for bottles and jugs made of PET (number 1) is only 21 percent, and about 10 percent for HDPE (number 2).

These numbers fall far short of an industry-backed standard from the nonprofit Ellen MacArthur Foundation, or EMF, which defines a product as recyclable only if it is recycled 30 percent of the time. Hundreds of major companies — from Clorox to the food giant Mondelez — have signed a commitment agreeing to this definition, yet their products continue to feature the chasing arrows symbol.

Although industry groups insist that plastic recycling can be improved with better collection infrastructure, Greenpeace says this is a fallacy. All plastics share similar problems: They're extremely difficult to collect and sort, they release hazardous chemicals during the recycling process, and they are often so contaminated with toxic chemicals that they must be "down-cycled" into lower-value products, sent to a landfill, or incinerated. These challenges make plastic recycling too costly for corporations. "It's just cheaper to buy new plastic," Ramsden said.

Instead of doubling down on recycling, Greenpeace calls on companies to reduce their plastic packaging by at least 50 percent by 2030, either by eliminating it altogether or by replacing it with reusable materials. For example, a soft drink company could move toward the "milkman concept," as Ramsden put it — a refillable system in which consumers return glass bottles once they're done using them. The report also says companies should eliminate single-use plastics altogether, release annual data on their plastic packaging use and reduction rates, and push governments to adopt policies to slash plastic production, including the global plastic treaty that U.N. member states are planning to negotiate by 2024.

"Plastics recycling is absolutely not the solution" to the plastic pollution crisis, Ramsden said. As a first step, she encouraged companies to remove the recycling symbol from plastic products, since most of them are never recycled. The chasing arrows are

The selective accounting behind the plastic industry's climate-friendly claims

Industry groups are pushing the U.S. government to keep buying their plastics.

Grist / Getty Images

Published	Oct 20, 2022
Topic	Climate
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As the plastics industry ramps up production, plastic pollution continues to accumulate in the environment at an alarming pace. Up to 199 million metric tons of plastic is already swirling in the oceans — strangling marine life and leaching toxic chemicals into the food chain — and a study published earlier this year predicts this number could quadruple by midcentury. Meanwhile, plastic — most of which is made out of oil and gas — is also taking a toll on human communities. Production facilities located in majority-Black and low-income communities emit hazardous air pollution, contributing to wildly elevated rates of cancer and respiratory disease.

2018 found that single-use plastics accounted for between 60 and 95 percent of the planet's marine plastic pollution.

Given the scale of the problem and its increasing urgency, it seems only natural that the U.S. government is considering a straightforward step toward a solution: Stop buying single-use plastics.

Between July and late September, the General Services Administration, a federal agency that provides administrative support to other government agencies, sought public comment on a proposal to restrict federal procurement of single-use plastic items. "With single-use plastics being a significant contributor to the global plastic pollution concern," the General Services Administration, or GSA, explained, "it is a logical step for the agency to examine this."

But petrochemical industry trade groups have vociferously opposed the proposal. The Plastics Industry Association launched a whole new "awareness campaign" in response to what it said would be a costly and environmentally damaging regulation. Another plastic industry group, the American Chemistry Council, inveighed against the proposal with a 23-page public comment.

Both groups made similar arguments, trotting out talking points they frequently use in the face of proposed legislation to cut back on single-use plastics. Contrary to popular belief, they said, plastic is actually the most environmentally friendly option compared to

Experts dispute these claims, however, saying they are either outright false or that they rely on selective data interpretations that are meant to make single-use plastics look good while downplaying the full spectrum of their environmental impacts. The industry's arguments are based on so-called "life cycle analyses," or LCAs — a method used to determine all of the environmental impacts associated with something's production, use, and disposal. While these assessments can be useful, they have frequently been "misused" by the industry to place disproportionate weight on factors like transportation-related greenhouse gas emissions — which make plastic look good because it's lightweight — and less emphasis on considerations like chemical pollution, an area where chemicals perform poorly. Other factors may be too difficult to quantify and so are omitted altogether, like the number of marine animals that are strangled by plastic litter every year.

Elizabeth Balkan, North America director for the international nonprofit Reloop, said that life cycle analyses can allow interest groups to simply craft the story they want to tell — by "picking and choosing data and assumptions and crafting a methodology based on specific, target outcomes."

A plastic bag floats in the ocean off Cebu Island in the Philippines. ***Getty Images***

At the heart of the American Chemistry Council and Plastics Industry Association's claims to sustainability are LCAs suggesting that single-use plastics are less carbon-intensive than items made from alternative materials. To take the example of a beverage container, the analyses they cite find that a single plastic water bottle causes fewer greenhouse gas emissions over its lifetime than an aluminum can or glass bottle. This is because it generally takes more energy to melt, mold, and transport thicker and heavier glass and aluminum.

Although the plastics industry commissioned several of these LCAs, and although they contain notable omissions — they

independent studies. However, an LCA's outputs are only as useful as the questions they attempt to answer. Why not compare single-use plastics to reusable alternatives, Balkan asked? Why assume that all plastics must be replaced, rather than modeling a scenario with dramatically scaled-down demand for packaging and disposable foodware?

John Hocevar, oceans campaign manager for the nonprofit Greenpeace USA, also said it was inappropriate to highlight greenhouse gas emissions to the exclusion of plastic's many other devastating consequences to public health and the environment — from marine litter and toxic chemicals that leach out of plastics to hazardous air pollution from waste incineration.

"If something makes sense from a climate perspective but is going to disrupt entire ecosystems, cause extinctions, and cause death or serious health problems for large numbers of people," he said, "it would be ridiculous to claim it is an environmentally friendly choice."

Some of the plastic industry's other claims fall flat as well. For example, the trade groups lean heavily on the promise of recycling — one of the LCAs they cite says we can "recycle our way out of this problem" — even though the U.S. plastic recycling rate has never risen above 10 percent and advocates say it is unlikely to ever work on a meaningful scale. And to back up the ACC's assertion that single-use plastics prevent more material from

single-use plastics, but also plastic in things like cars, furniture, medical products, and "durable household goods" — a scope far broader than what the GSA covers in its proposal.

Furthermore, more waste does not automatically mean more environmental damage, since some types of waste are less damaging than others. Yet the plastics industry implies the opposite by pairing the findings of the 2016 LCA with those of a separate analysis, this one looking at a single-use plastic reduction policy in Canada. That analysis, written by a conservative-libertarian think tank called the Fraser Institute, says that a Canadian single-use plastics ban will cause a spike in other kinds of waste and lead to "increased environmental damage."

This is in direct opposition to what the Canadian government's own reports say. In a regulatory impact statement published at the end of last year, the country's health and environment departments estimated that its ban on the manufacturing and sale of six kinds of single-use plastics, which was announced this summer and will be fully implemented by the end of 2023, would create roughly 298,000 metric tons of additional waste from replacement materials within the first year of implementation. But this increase waste "would represent inherently less risk to the environment" than single-use plastics, as it would be comprised almost entirely of paper substitutes — which, unlike plastic, are widely recycled and compostable — as well as smaller quantities of biodegradable wood and molded fiber, a paper-based packaging material. While the policy is set to create some new plastic waste from non-single-use items — about 21,500 metric tons — this will be more than offset by the elimination of some 132,000 metric tons of single-use plastic waste.

To Madhavi Venkatesan, an economics professor at Northeastern University in Boston, this is just another example of the plastics industry handpicking arguments that align with its interests, even if those arguments are not backed by robust evidence. "It borders on unethical," she told Grist. Yet another example is the claim that restricting single-use plastics would cause a jump in food waste, which the ACC supports in its comment to the GSA by citing brochures from U.S. and U.K. packaging industry associations. One of these documents says that cucumbers wrapped in plastic

Balkan objected to this argument: Just because plastic can extend a cucumber's shelf life doesn't mean that it's needed to address food waste, a problem that is largely driven by consumer behavior — how much food people buy, cook, and serve — as well as agricultural practices. She called it an "inaccurate and deceitful attempt" to coopt an urgent environmental issue.

Again, Balkan and Venkatesan highlighted the need for a full reckoning with plastic's impacts: If it solves one environmental problem by creating another — like reducing food waste but exacerbating plastic pollution and all the harms that come with it — then "that's not a real solution," Venkatesan said. The same goes for many of the plastic industry's arguments in defense of plastic: Even if they are true — and several appear not to be — they should only be evaluated within the full context of plastic's burden to people and the planet, from its production to its use and disposal.

Neither the American Chemistry Council nor the Plastics Industry Association responded to Grist's request for comment.

In their own public comments to the GSA, environmental advocates say that such a holistic analysis will only support one conclusion: that single-use plastics must be eliminated. "Single use plastic is impacting our health, is creating serious environmental justice concerns, and is a significant contributor to the global plastic pollution crisis," said one comment written by

procurement of single use plastics and prompt movement toward truly safe and sustainable products and systems."

Editor's note: *Greenpeace is an advertiser with Grist. Advertisers have no role in Grist's editorial decisions.*

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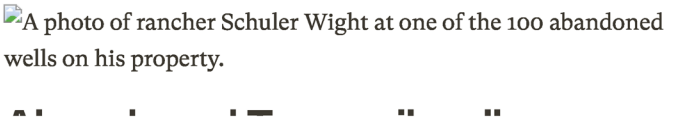

A photo of rancher Schuler Wight at one of the 100 abandoned wells on his property.

Seascape: the state of our oceans

'An invisible killer': how fishing gear became the deadliest marine plastic

Plastic in the depths: as 'ghost gear' chokes the ocean, campaigners call for mandatory measures including buy-back schemes and recycling

Emma Bryce

Mon 7 Nov 2022 01.00 EST

A trip to the remote north Pacific gyre provides a stark reality check on the scale of the planet's plastic waste crisis. "You've been sailing at 10 knots for five days, you're alone. You don't see any other boats. And then you find toothbrushes and lighters floating around you," says Laurent Lebreton, head of research at the Ocean Cleanup, a Dutch non-profit organisation that develops technology to extract marine plastics. "It's just very surreal."

What he finds most striking, however, are the metres of netting, ropes and line, luminous orange buoys, crab pots and fish traps: remnants of the global fishing industry, drifting around in what is known as the "great Pacific garbage patch".

From samples gathered by the Ocean Cleanup's floating boom system - which rakes in plastic from this swirling gyre - Lebreton's new research deciphered clues on some of the plastic fragments, which suggest that most of that waste can be traced back to five industrialised fishing nations: the US, Japan, South Korea, China and Taiwan.

Typically, the finger of blame for marine plastic is pointed at terrestrial pollution from rapidly developing economies in south-east Asia and elsewhere, Lebreton says. But his fresh discoveries highlight the contribution of industrialised nations to this problem, too.

Known officially as abandoned, lost or discarded fishing gear (ALDFG) - and unofficially as "ghost gear" - this marine waste comprises fishing nets, ropes, line, traps and other fishing paraphernalia, mostly made up of durable plastics. Highly buoyant plastic fishing gear is more likely to become concentrated in places such as the north Pacific gyre, but it is also dispersed across the ocean. The quantity is notoriously difficult to measure, but it is estimated that between 500,000 and 1m tons a year tumble into the seas.

Q&A
Plastic in the depths

Show

An October survey of 450 fishers from seven big fishing nations estimated that 2% of fishing gear used globally ends up in the ocean. The share may seem small but the scale of global fishing is enormous, says Kelsey Richardson, the lead author on the study.

It amounts to an estimated 3,000 sq km of gill nets, 740,000 km of longline mainlines, and 25m pots and traps. At the current rates of loss, the amount of stray fishing nets measured by area would be enough to carpet the surface of the planet in 65 years, the researchers found.

"Unfortunately, wherever fishing takes place, gear is being lost," says Ingrid Giskes, director of the Global Ghost Gear Initiative, a programme spearheaded by Ocean Conservancy that brings together fishers, conservation organisations, industry players and governments.

A team from the Papahānaumoku-ākea Marine Debris Project drags fishing nets from the beach of Midway Atoll, off Hawaii. The abandoned gear threatens endangered Hawaiian monk seals and other marine animals. Photograph: Matthew Chauvin/AP

Ghost gear contributes about 20% of marine plastic - with most of the rest coming from land-based sources - but underwater, its effects are profoundly worse. "It continues to operate as something that catches marine wildlife," says Christina Dixon, ocean campaign leader at the Environmental Investigation Agency. "It's an invisible killer."

The World Wide Fund for Nature calls fishing waste the deadliest form of marine plastic, finding that entanglement or entrapment by ghost gear affects 66% of marine animals, including all sea turtle species and 50% of seabirds.

Captured animals die due to suffocation, drowning and starvation, or because they are left unable to properly breed and migrate. “Everyone knows that video of the turtle with the straw in its nose, but kilometres of gillnets are way more deadly,” Giskes says.

Different types of ghost gear can form giant masses - such as the 9,000kg ball of jumbled rope, nets and line that Ocean Conservancy helped fishers haul up from the seafloor off the coast of Maine in 2019. It was “floating beneath the surface, out of sight”, Giskes says. These layers of waste can pose navigational hazards and crush ecosystems such as coral reefs and seagrass meadows, creating barriers and stifling marine life.

A dead humpback whale washed up in East Lothian, on Scotland’s east coast, after getting entangled in nets. Photograph: East Lothian Ranger Service/WDC/PA

All the while, ghost gear is costing millions of dollars to clean up, especially for small island nations that lie in the path of drifting gear that invades their reefs and beaches, Dixon says.

There are many reasons fishing gear ends up as marine waste - from stormy weather to poor storage and gear snagging on the seafloor. Fishers facing tough economic conditions may take more risks to catch fish, says Richardson, increasing the likelihood of damaging or losing gear. The especially risky conditions around illegal fishing mean that this shadowy phenomenon is probably contributing even more to the waste.

Whatever the scenario, "the majority of the loss is not because fishers throw gear overboard. It's unintentional," Giskes says. Equipment is often expensive to replace. Warren Unkert, a commercial crabber in New Jersey, says he loses about 30 crab pots annually, and at $40 (£35) a pot plus lost catch, the costs mount up.

Where exactly ghost gear comes from is still under-researched. Lebreton's study traced the national origins of fishing waste in the great Pacific garbage patch (which pointed, logically, to countries with the greatest fishing presence in that ocean) - but it does not tell us much about the other regions, he says. "I'd be curious to know what we'd find in the other [four] gyres."

To plug these knowledge gaps, the Global Ghost Gear Initiative is drawing together data from government members and fisher surveys to create what Giskes expects will be the largest global dataset on ghost gear. In the next five or 10 years, they hope to have a comprehensive picture of the problem.

A researcher pulls apart a mass of ghost nets to trace fishing gear that washed ashore in Hawaii back to the manufacturers and fisheries where it originated. Photograph: Caleb Jones/AP

In the shorter term, there has been innovation aiming to tackle ghost gear. Designers have developed biodegradable fishing gear and satellite-traceable buoys that allow fishers to track and retrieve lost traps. Gear recycling is now commonplace in several ports, and a handful of these include gear buy-back schemes for old or damaged gear.

In the US, the National Oceanic and Atmospheric Administration's Marine Debris Program funds dozens of prevention and retrieval projects: one of these has partnered with the New Jersey-based Stockton University with fishers including Unkert to identify sunken crab pots using sonar off the state's shoreline. "We've gotten at least 5,000 or 6,000 off the bottom, from one small bay over the last 10 years," Unkert says.

Canada has made it mandatory to report gear loss, as well as to mark certain gear, which makes it possible to trace lost gear back to individual vessels and nations, and is thought to increase accountability. Some momentum is building on the industry side too: Thai Union, one of the largest seafood companies in the world, requires its tuna suppliers to mark the non-biodegradable parts of fish-aggregating devices, says Adam Brennan, the company's group director of sustainability.

But efforts to tackle ghost gear have so far been piecemeal and mainly voluntary, which does not fit the enormous scale and transnational nature of the waste, Dixon says. "Fishing gear has really been falling through the gaps of global governance."

This may change with the legally binding international treaty to end plastic pollution, which will be drafted by 2024. Negotiations on its terms, which start this month, provide an opportunity to make measures to tackle ghost gear - such as gear-marking, buy-back schemes and designing recyclable gear - mandatory across all nations. Most solutions are "only really going to be effective if everybody is doing it", Dixon says.

There is a way out of the tangled mess of ghost gear if governments are willing to come together, Giskes says. "This does feel like a solvable problem."

A Gary, Indiana Plant Would Make Jet Fuel From Trash and Plastic. Residents Are Pushing Back

Fulcrum BioEnergy says its “sustainable aviation fuel” will divert waste from Chicago-area landfills and reduce airline carbon emissions. But critics say there’s nothing sustainable about it—and even question its viability.

By James Bruggers
December 12, 2022

Kimmie Gordon and Dorreen Carey stand in front of a former cement plant site in Gary, Indiana, where a California company, Fulcrum BioEnergy, wants to turn trash and plastic into jet fuel. They are founding members of Gary Advocates for Responsible Development. Credit: James Bruggers

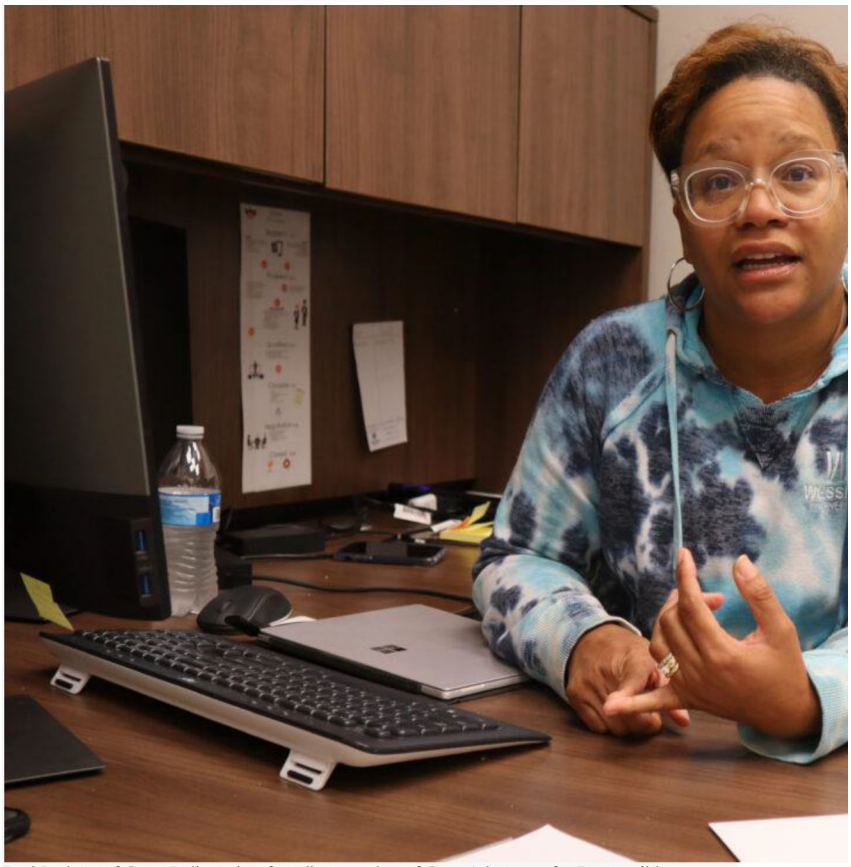
GARY, Ind.—For Lori Latham and four other self-described "badass women," the future of their hometown rests on a battle over 75 acres that lie between a giant steel mill and a failed casino once owned by Donald Trump.

The site sits behind parked railroad cars painted in graffiti, where abandoned concrete silos rise from the sandy southern shore of Lake Michigan, a remnant of a former cement plant that helped build the country's interstate highway system. Here, a California company called Fulcrum BioEnergy wants to construct a gasification plant and refinery to turn the Chicago area's trash—as much as 30 percent of it waste plastic—into jet fuel.

It's a bid, according to Fulcrum, to make a dent in the airline industry's contribution to climate change while reducing waste at landfills. The city's mayor, Jerome Prince, touts what he sees as a green energy future in this once-booming vestige of the Rust Belt.

But Latham and the group she co-founded, Gary Advocates for Responsible Development, along with some national environmental experts, smell a ruse.

They question the company's claims of sustainability in what amounts to a complicated, high-energy production process, and the company's ability to deploy a new combination of technology intended to turn the trash and plastic waste into a gas used to make aircraft fuel. They also say it's unfair to locate the plant in an environmental justice community already burdened disproportionately by a century of pollution from heavy industry.



Lori Latham of Gary, Indiana, is a founding member of Gary Advocates for Responsible Development, which is fighting a proposed jet fuel plant on a former cement plant site. Credit: James Bruggers

"We use the term greenwashing, where they make things seem like they're green technologies when they're really not," said Latham, a Gary native who works in business development for an engineering firm and also is chairwoman of the environmental justice and climate committee of Gary's branch of the NAACP, the nation's oldest civil rights organization. "I feel like Gary is

being used based on its location, and also based on its demographics just to be a solution for where to put Chicago's trash."

The company's plans, while embraced by the federal government and the airline industry, do not pass a common sense test, said Jane Williams, executive director of the environmental nonprofit California Communities Against Toxics, who has advised the Gary advocates.

"They are taking trash and applying massive amounts of heat to make a fuel, and then burning it," Williams said. The proposed gasification process uses intense heat to turn the trash and plastic into a synthetic gas, before another process turns the gas into synthetic crude oil, which in turn is used to make jet fuel in an on-site refinery.

"This is one of the most energy-intensive processes I have reviewed in my career," she said. "That's a massive carbon footprint."

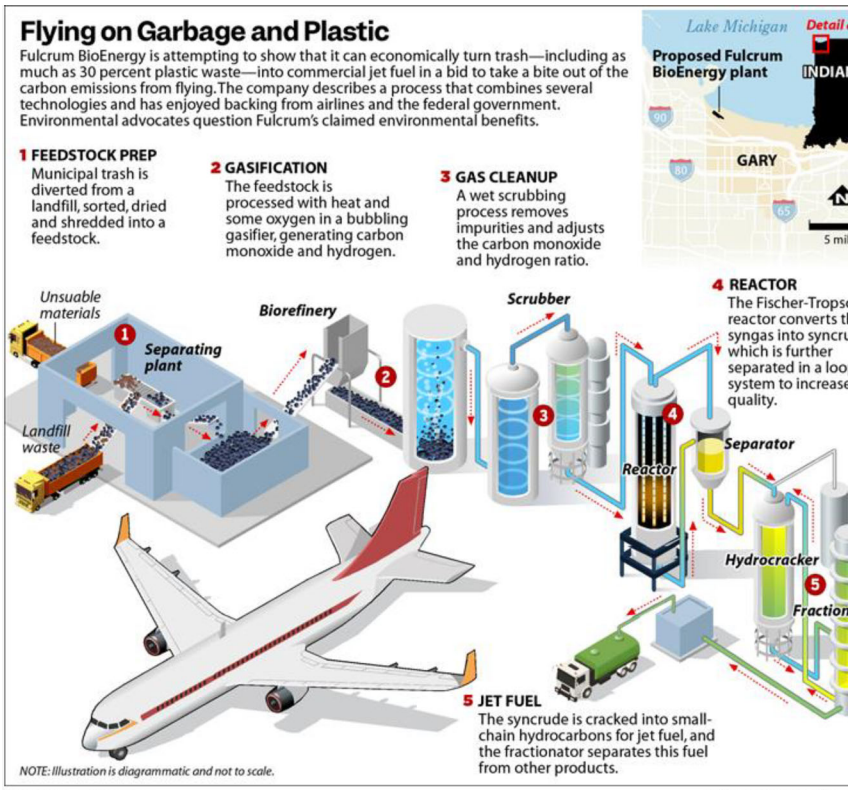
In the Fulcrum proposal, Earthjustice attorney James Pew sees an illustration of a national trend in which facilities that burn waste, including plastic, through a process like gasification or a similar method called pyrolysis, are working to skirt health protections in the Clean Air Act.

"This whole fight at the local, state, and federal levels is about getting gasification and pyrolysis incinerators rebranded as non-incinerators so they can … avoid installing pollution controls and monitoring and reporting their emissions," Pew said. "EPA's regulations have defined facilities like Fulcrum as incinerators for almost 30 years."

GARD is organizing opposition among area residents. It's challenged the proposed plant's air pollution permit from Indiana state regulators. And it has filed a Civil Rights Act complaint with the U.S. Environmental Protection Agency. The complaint argues that the Indiana Department of Environmental Management's decision to grant Fulcrum its air permit is part of a longstanding pattern and practice of local discrimination on the basis of race, color and national origin.

Gary's 68,000 residents, down from 175,000 in 1970, are 78 percent Black. One in three city residents lives in poverty.

For its part, Fulcrum, based in Pleasanton, California, is a sharp contrast with Gary. An affluent suburb of San Francisco with a poverty rate of 5 percent, it touts the economics of making what it describes as an $800 million investment in Gary, providing about 1,000 construction jobs and 130 to 200 permanent jobs.



"We just feel that we have created, designed and now are just a short time away from proving that garbage-to-fuel is possible," said Fulcrum's vice president of administration, Rick Barraza. "It's doable, and it is a sustainable source of renewable fuel going forward."

He also dismissed the Gary residents' opposition and encouraged Inside Climate News to do the same. "I certainly hope that you don't give too much time to the local citizens that just don't want that facility in their backyard," Barraza said. "There's a local group out there that just doesn't want the project. And so they're starting to get vocal."

$4 Billion in Federal Taxes to Develop Sustainable Aviation Fuel

Fulcrum has been working to turn trash into aviation fuel for more than a decade. The company broke ground on the second phase of its first plant near Reno, Nevada, in 2018, where it's still seeking to begin full production.

Those efforts are part of a global push to develop what the airline industry and federal government call "sustainable aviation fuel," or SAF. In theory, SAF is made by recycling renewable plant- or animal-based materials as feedstock, offsetting the need to use new fossil fuels that would unleash carbon that scientists say needs to remain locked underground to prevent the worst impacts of climate change.

Industry and government scientists are experimenting with different feedstocks ranging from animal fats, plant oils and wood waste to trash and plastics.

Nikita Pavlenko, a program leader with the International Council on Clean Transportation, a nonprofit environmental research group, says he does not like the term "sustainable aviation fuel" because regardless of what is used to make these new fuels, "it implies it is actually sustainable," or beneficial. "I always prefer the term 'alternative aviation fuel,' because there's such a wide variation in the climate impacts of those alternatives."

California-based Fulcrum BioEnergy wants to turn trash and plastic into jet fuel at this former cement plant in Gary, Indiana. Credit: James Bruggers

In all, aviation contributes about 2 percent of global greenhouse gas emissions. But when other impacts—including the heat-trapping effects of condensation trails planes paint across the sky—are factored in, aviation accounts for as much as 3.5 percent of warming caused by humans, according to research published last year in the journal Atmospheric Environment.

As aviation has soared, so has pressure to reduce its emissions.

"It doesn't make sense to give aviation a license to continue polluting if we're imposing climate policy on (motor vehicle) drivers or people who purchase electricity because those are a much more representative sector of society," Pavlenko said.

The 290 member airlines of the International Air Transport Association, a global trade association, have committed to achieving net-zero carbon emissions from their operations by 2050. In the United States, IATA members include American, Delta, United and cargo giants UPS and FedEx.

The industry is exploring various strategies including burning hydrogen made from renewable energy, making fuel from captured carbon dioxide and even using battery power in small airplanes; in 2015, United Airlines bought a $30 million stake in Fulcrum. Others suggest solutions such as replacing short-haul air travel with trains.

But the industry's main focus is on improving airplane efficiency and on the development of SAF.

"The newest commercial airplanes today for passenger or freight…are on the order of 25 percent more efficient than the planes they replaced," said Robert McCormick, a senior research fellow at the Department of Energy's National Renewable Energy Lab in Boulder, Colorado "And the aviation industry thinks they can do that, again, with the next generation of planes, which are still probably 10 years out."

The International Energy Agency expects passenger growth to offset efficiency gains, though, so the industry is still looking for alternative fuels.

Right now, there's only one kind of SAF used in the United States, in test flights, said McCormick. It's made with fats and oils, such as waste cooking oil, beef tallow or soybean oil, he said.

Widespread industry use could be a long time coming.

"As you might imagine, you have to meet some pretty stringent approvals to legally sell them as aviation fuel as compared to say, a diesel fuel, because trucks are not going to fall out of the sky," he said.

Decarbonizing air travel will be difficult, acknowledged Sebastian Mikosz, a senior vice president of IATA. "Unlike others in the transportation industry, we have to fight with something that they don't have to fight with, which is gravity," Mikosz said. "And our biggest problem is that we have to take our source of propulsion, our energy source, with us in the air."

The industry is getting help from the Biden administration, which has pledged more than $4 billion to support the research and development of low-carbon fuel. The Biden administration has set a goal for the U.S. to produce aviation fuels with half the carbon emissions of conventional fuel, and to make enough of it by 2050 to meet all domestic aviation fuel demand.

The Plastic Problem

Last year, Fulcrum secured $375 million in tax-exempt revenue bonds through the Indiana Finance Authority to support the Gary project.

For Fulcrum's production here, the company plans to collect and sort municipal waste that otherwise would head to a landfill, and shred it at up to two locations outside of Gary. In all, the company plans to divert 700,000 tons of municipal solid waste from the region each year; Chicago alone produced more than 4 million tons of solid waste in 2020, according to a 2021 University of Illinois at Chicago study.

The Gary plant's feedstock—about half paper and 30 percent plastic, along with wood and other trash—will be hauled into the city in about 90 trucks a day, the company has said.

The presence of plastic causes two main problems. Plastic is made from a myriad of chemical mixtures. Gasification systems function the best with a consistent feedstock, McCormick said, so plastic waste poses a technical challenge.

Plastic complicates the company's sustainability claims, as well.

With plastic waste as a feedstock, McCormick said, "you're going to have to answer the question, 'To what extent is it a sustainable aviation fuel compared to biomass?' It's not going to have as low of a carbon intensity … simply because the plastic is made out of petrochemicals, (or) fossil carbon."

At least one airline is specifically targeting plastic waste to make fuel. United Kingdom-based Virgin Group, which includes the airline Virgin Atlantic, announced in February that it was partnering with U.S.-based Agilyx to produce synthetic crude oil from plastic waste that will then be refined into what it claims will be a lower-carbon fuel.

Fulcrum officials acknowledge plastic in its feedstock reduces its fuel's climate benefits, even as it claims SAF from its Reno plant will represent an 80 percent reduction in greenhouse gases compared to traditional aviation fuel made from fossil fuels. And it expects that percentage to improve at its Gary plant.

Poetry stenciled on boards adorns one of Gary, Indiana's thousands of abandoned buildings.
Credit: James Bruggers

But the company has been less than transparent about how it got to that 80 percent figure. It appears to rely on environmental lifecycle analyses, the kinds of studies that experts often describe as being fraught with assumptions that can skew the conclusions.

And a 2015 lifecycle analysis for the company's Reno plant estimated that fuel produced there would result in a product claiming a less-robust climate benefit of 60 percent fewer greenhouse gas emissions compared with traditional fossil fuels.

Fulcrum officials said they updated the 2015 study for the California Air Resources Board, which lists the company's claims as certified. But Fulcrum did not provide a copy of the updated analysis for Inside Climate News to review. Fulcrum also did not provide any analysis of carbon emissions for the proposed Gary plant.

The company claims benefits to the climate from keeping trash out of landfills, where it rots and releases methane, a potent greenhouse gas. But that's an inexact science as well. Scientists and the EPA have been arguing over how to accurately calculate landfill gas emissions, Inside Climate News reported last year with NPR and Orlando public radio station WMFE.

Environmentalists are skeptical of the company's claims, though Pavlenko said its fuel would represent "one of the better options" as long as the plastic content is "kept to a limited contribution."

Municipal solid waste passed a Center for Biological Diversity assessment for potentially sustainable aviation fuels published in August, but the environmental group warned that the availability of those feedstocks will fall far short of meeting a Biden administration goal of 35 billion gallons of SAF for the U.S. aviation industry by 2050.

And, the group emphasized, plastic waste should never be part of any municipal solid waste feedstock for aviation fuel, since plastic left in a landfill doesn't break down, so it stores its carbon there. Also, the report concluded, using plastic to make fuel releases toxic chemicals during manufacturing.

A 2021 report from Global Alliance for Incinerator Alternatives (GAIA) specifically calls out Fulcrum.

"Such proposed solutions tend to facilitate a facade which outwardly supports corporate and governmental responsibility in the short term, but in the long term, provide a distracting diversion from the need to reduce waste production, ban single-use plastic, and leave fossil fuels in the ground," GAIA concluded.

Julie Peller, a chemistry professor at nearby Valparaiso University, said the combination of technologies proposed for Gary appears to be unproven, leaving the city's residents vulnerable.

"This is going to be a huge amount of waste that gets hauled into this city that is already an environmental justice community," she said. "Unfortunately, the residents of Gary have to be the suckers to deal with everybody else's garbage."

Years of Work and Investments—but No SAF Yet

In Reno, the company has been working for more than a decade to develop its "Sierra" plant, which was backed by a $70 million Department of Defense grant in 2014. It also won a $104 million loan guarantee from the Department of Agriculture that same year for the plant.

The Gary plant, called Centerpoint, will be three times the size of the one in Reno, producing about 31 million gallons of fuel a year, compared with 11 million gallons in Reno, according to the company. Company officials said they anticipate construction in Gary in 2024, and opening for business in 2025. Globally, the pre-pandemic demand for jet fuel was 106 billion gallons a year; that's projected to grow to over 230 billion gallons a year by 2050, according to a 2020 Department of Energy study.

"We look to be producing fuel (at the Reno plant) in the very near future," Barraza said. **"**And then we'll take whatever lessons learned we have from Sierra and then build that into our next plant, which will be the Centerpoint biofuels plant in Gary."

Prince, through a spokesperson, declined requests for an interview. But the mayor celebrated the Fulcrum proposal in a September state of the city address.

Gary, he said, "is poised to be a clean industry hub," and "Fulcrum Counterpoint has come along at the right time."

The Northwest Indiana Forum, a regional economic development organization, also supports the project, for similar reasons.

"Northwest Indiana is seeing multiple renewable energy projects developing in our counties," said Kay Nelson, director of environmental affairs for the business group. "Having these growth opportunities with jobs related to a green economy is exciting."

Humanity and Poetry Amid Industry Decline

The "badass women" moniker came from Carolyn McCrady, a retired English teacher and GARD co-founder who was drawn to Gary in the late 1960s to work for Richard Hatcher, one of the first Black mayors of a big U.S. city. She described her GARD colleagues from her ranch-style home in Miller Beach, a neighborhood adjacent to Indiana Dunes National Lakeshore and Marquette Park, with its oak woodlands, sandy shoreline and view of U.S. Steel's Gary Works steel mill nearby and the Chicago skyline in the distance.

"We've got some smart people, and dedicated people," she said of her GARD colleagues. "We're not big, but we know a lot of people and we're able to pull a lot. We have relationships with our legislative delegation."

Carolyn McGrady of Gary, Indiana, is a founding member of Gary Advocates for Responsible Development, which is fighting a proposed jet fuel plant on a former cement plant site. Credit: James Bruggers

Other GARD leaders include Jennie Rudderham, a home-schooling mom, who is in this fight for her young son. “He needs a future,” Rudderham said. “He needs a planet. The city needs a future.”

Dorreen Carey, who moved to Gary in the mid-1970s to get involved with the steelworkers union, is retired from a career working on environmental issues for the city of Gary and the

Indiana Department of Natural Resources. In addition to co-founding GARD, she has been active in efforts to protect the region's rare "dune and swale" ecosystem and local waterways.

Kimmie Gordon, another GARD founder, also established and directs the Gary nonprofit Brown Faces Green Spaces, which promotes diversity in outdoor recreation.

"I love this city," Gordon said. "I love the people who are still in my neighborhood that I went to grade school with."

But, she added, "there's sadness here."

Fulcrum BioEnergy has been working to make its trash-to-jet fuel plant near Reno, Nevada, fully operational. The company wants to build a similar plant three times the size in Gary, Indiana. Credit: Fulcrum BioEnergy

On a tour of the city and adjacent communities of East Chicago and Whiting led by Gordon and Carey, heavy industry and its remnants stand out along more than 10 miles of the Lake Michigan shoreline.

The sights include some of Gary's thousands of abandoned buildings, some with poetry written by teenagers stenciled on boards covering broken windows.

One poem reads: “I see kids playing in the grass, staining their knees. I see a big bright sun that’s yellow light cheese. Sometimes I think Gary isn’t as bad as it seems.”

A lot of the industrial property isn’t being used anymore, Carey said, navigating her Chevy Impala while pointing to smokestacks and Superfund toxic waste sites.

People have been thinking about developing trails along the lakefront through the mill or other former industrial properties, Carey said, “which is one of the things why Fulcrum is such a bad idea because it’s going in the opposite direction. It’s like re-industrializing.”

Gary ‘Turned Into Dumping Grounds‘

The GARD team has appealed permit decisions from the Indiana Department of Environmental Management, or IDEM, filed a civil rights complaint and persuaded the EPA’s regional office to visit Gary and hold a public meeting on how the Biden administration is stepping up its environmental justice program.

Gary and the surrounding area have “been turned into dumping grounds for polluting industries with predictable effects,” the civil rights complaint against IDEM alleges. It calls on EPA to force IDEM to pause issuing new permits, investigate allegations raised in the complaint and “incorporate environmental justice and racial considerations into all aspects of its work.”

The proposed Fulcrum plant’s air permit adds to the swirl of the uncertainty of its carbon footprint. Indiana does not regulate greenhouse gas emissions in industrial facilities they consider to be “minor sources” of air pollution, said Barry Sneed, a spokesman from IDEM, which is how the Fulcrum plant is classified.

The boarded-up and crumbling Palace Theater in Gary, Indiana, has come to symbolize the city's economic disinvestment. Credit: James Bruggers

But in a corner of the state that fails to meet federal ozone regulations, the permit shows IDEM allowing emissions from Fulcrum of new ozone-forming pollutants, dangerous tiny particles and an array of hazardous air pollutants, some with links to cancer.

IDEM also exempted the company from a solid waste permit under provisions of a July 1 change in state law that altered the definition of solid waste in an industry-friendly way.

In GARD's challenge to Fulcrum's air permit, it argues the plant should be regulated more strictly as a major pollution source. The group claims IDEM should have assessed how the Fulcrum emissions would add to the total burden of environmental impacts on Gary residents and evaluated the area's environmental justice concerns.

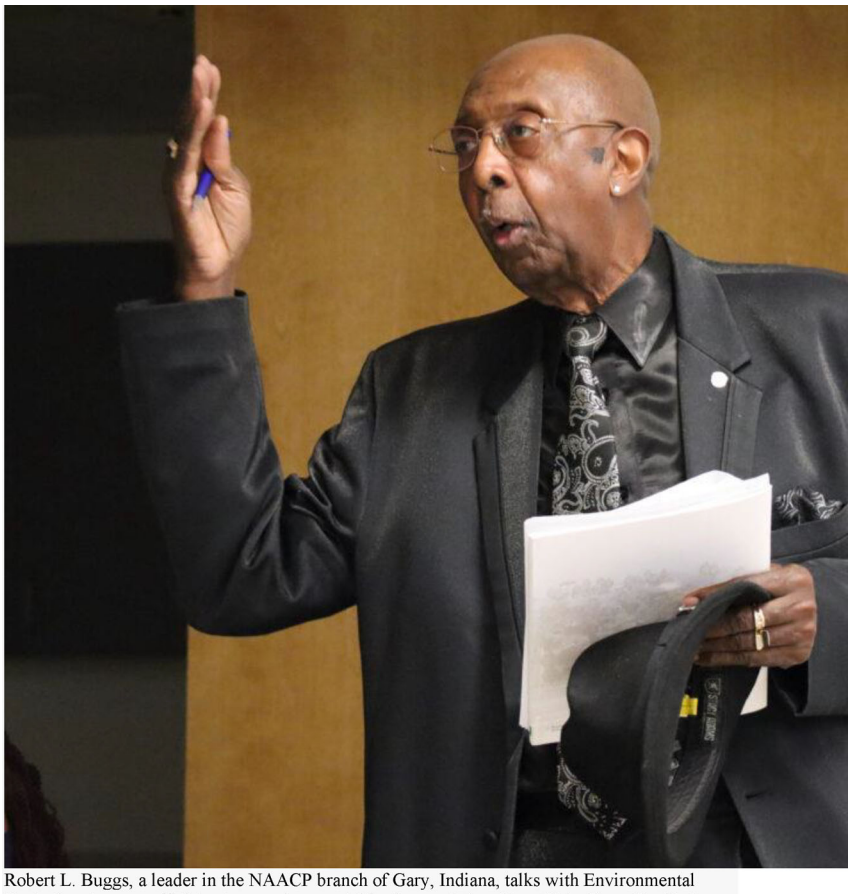
Regional EPA "representatives indicated that they were satisfied with our responses to their comments and our regulatory determination regarding solid waste and incineration," Sneed countered.

A regional EPA spokeswoman said the agency had recommended IDEM take further environmental justice steps but declined to comment on the Civil Rights complaint while it is under review.

Against the backdrop of the Fulcrum proposal, frustrations bubbled up at a recent EPA workshop in Gary, where an EPA official used an online tool, "EJ Screen," to provide a snapshot of where the community falls on the spectrum of race, poverty and the environment:

Gary ranks in the highest percentiles of the country for a variety of environmental justice measures, including cancer risk from toxic air emissions, exposure to soot, proximity to Superfund sites (there are five nearby), level of wastewater discharges, level of education and the number of people of color and residents who are low income or unemployed.

"We can jointly plan for change together consistent with the priorities of this administration," Alan Walts, who oversees environmental justice and other programs for EPA's Chicago-based office, assured the gathering. "There's a lot of resources coming."



Robert L. Buggs, a leader in the NAACP branch of Gary, Indiana, talks with Environmental Protection Agency officials at an environmental justice workshop Nov. 12 in Gary. Credit: James Bruggers

"Grants are great," said Robert Buggs, a vice president of the NAACP's Gary branch. But he wanted to know why EPA gives companies "a license to move forward" on projects like Fulcrum despite documented environmental justice concerns.

Stephen Mays, president of the NAACP's Gary branch, said: "We know where we stand. We've been hearing this for the last 30 years. What's the remedy?"

James Bruggers

Reporter, Southeast, National Environment Reporting Network

James Bruggers covers the U.S. Southeast, part of Inside Climate News' National Environment Reporting Network. He previously covered energy and the environment for Louisville's Courier Journal, where he worked as a correspondent for USA Today and was a member of the USA Today Network environment team. Before moving to Kentucky in 1999, Bruggers worked as a journalist in Montana, Alaska, Washington and California. Bruggers' work has won numerous recognitions, including best beat reporting, Society of Environmental Journalists, and the National Press Foundation's Thomas Stokes Award for energy reporting. He served on the board of directors of the SEJ for 13 years, including two years as president. He lives in Louisville with his wife, Christine Bruggers.

A Houston Firm Says It's Opening a Billion-Dollar Chemical Recycling Plant in a Small Pennsylvania Town. How Does It Work?

Gov. Wolf touted jobs and less plastic pollution when the plans were announced in April, but a professor from Carnegie Mellon who's studied the technology says it can lead to "sustainability fraud."

By James Bruggers
September 6, 2022

Refuse bags full of materials for recycling in different colored plastic bags. Credit: In Pictures Ltd./Corbis via Getty Images

POINT TOWNSHIP, Pennsylvania—Randall Yoxheimer, chairman of the locally elected board of supervisors here, has seen economic development proposals come and go, but the latest one—a $1.1 billion chemical recycling plant for plastic waste—has left him, and even some scientists, perplexed.

Announced in April, the plant would use first-of-its-kind technology and employ hundreds of workers to turn waste plastic into new plastic. With the promise of taking a bite out of a serious global plastics problem, the new facility sounds like a terrific idea, Yoxheimer said as he sat under the bright fluorescent lights of the township's office.

The Houston startup company, Encina, that wants to develop the plant seems to have "excellent motives," he said. But Encina officials provided township leaders with so little information that it's hard to discern the promises from reality, Yoxheimer said.

"I am used to the way companies present themselves, and this company has been somewhat vague on a lot of things," he said. "They are not terribly adroit in how they are trying to move forward. After they did that billion-dollar press release, we heard very little from them."

He said he intends to stay neutral in the matter, which has already stirred considerable local discussion. "But I am concerned about the functionality of this whole thing," Yoxheimer said. "The fact that it's prototypical concerns me."

Randall Yoxheimer, chairman of the Point Township Board of Supervisors, at a public meeting in July. Credit: James Bruggers

With the plastics industry facing global pressure to do something to curb its waste that has touched all corners of the planet—microplastics have also been detected in human blood, feces and even human placentas—chemical recycling proposals like Encina's have sprung up across the United States.

The concept of breaking down plastics into their core chemical elements and then using those chemicals to make new plastics in a sort of "closed loop" or "circular" economy, is advanced by many industry representatives as a desirable goal because it would, in theory, reduce the need to drill for more fossil fuels, the primary source of plastic products.

That's how Encina officials see their efforts, said Sheida R. Sahandy, the chief sustainability officer and general counsel for the company.

"When we say that it's circular, the idea is that you get it back to virgin quality, you can just keep reusing it and reusing it or reformulating it into another product and reformulating it into another product," she said.

Encina, she said, is working diligently to develop its first plant here in Point Township, a small community of suburban homes and farms along the wide-bodied Susquehanna River, about 60 miles north of the state capital of Harrisburg.

But close examinations by environmental advocates and media organizations over the last few years have found few commercial successes with the chemical recycling of plastics, and concerns about environmental risks. They've found plants that do little more than make new fossil fuels, and produce a lot of waste, falling short of the promise of a circular economy.

"This whole chemical recycling is a charade," said Jan Dell, a chemical engineer who has worked as a consultant to the oil and gas industry and now runs The Last Beach Cleanup, a nonprofit that fights plastics pollution and waste. "It's a hoax. And it's been perpetrated for 30 years. Every time the public has some interest in, 'Oh, there's too much plastic waste,' they trot it back out again."

Shrouded in Mystery

In Point Township, Encina plans to turn 450,000 tons of plastic waste annually—something like 150 truckloads a day, according to Yoxheimer—of plastic waste from urban centers like Pittsburgh, New York and Philadelphia, into benzene, toluene and xylene, hydrocarbons found in gasoline and feedstocks for the petrochemical industry.

While Encina touts its transparency, the details of its proposal remain shrouded in mystery, under a veil of proprietary technology. In broad strokes, Encina has said that it will be working with partners to create those feedstocks that can be used to make everything from furniture to fuels to sports equipment to plastic bottles.

PAUL HORN / Inside Climate News

Encina has released so little technical information—and state environmental regulators that have been talking to Encina officials are not commenting much on the company's plans—that the situation has left independent experts like University of Pittsburgh professor Eric Beckman, a chemical engineer with a Ph.D. in polymer science, not sure what to make of the company, its proposal or whether the plant can be economically viable.

From what Beckman can tell, Encina likely will turn the waste plastics into naphtha, a flammable liquid hydrocarbon mixture, and then turn the naphtha into benzene, toluene and xylene.

"I don't know if anybody has done that yet" at a commercial scale, Beckman said. "Encina has zero results on their web page. I find the lack of details somewhat disturbing."

Sahandy said the company's "process and value proposition are unique and previously not used. However, we have proven both the technology and the customer demand, including at our testing operations in San Antonio. I cannot provide any more technical insight than what has been otherwise publicly disclosed."

‘Advanced Recycling’

The United States leads the world in the generation of plastic waste, at nearly 300 pounds per person per year, according to a 2021 study from the National Academies of Sciences, Engineering and Medicine. Only a small portion—less than 6 percent—of plastics used by consumers in the U.S. actually get recycled, a recent analysis of EPA data by Beyond Plastics and The Last Beach Cleanup found.

The type of plastics that are recycled the most are those used, for example, to make soda bottles or milk jugs, often numbers one or two. These waste plastics typically go through a mechanical process involving sorting, grinding, shredding, cleaning, melting and remolding, most often into other products. As the plastic degrades, it’s “down-cycled,” a term to describe turning, say, bottles into carpeting or fleece until the plastic cannot be used anymore.

Encina will be gathering other types of plastic, numbers three through seven, used for some bags, cups, lids, films, toys and pipes that are much harder to recycle. For those types of products, the industry offers chemical recycling as a solution, saying that through heat and chemical reactions, they can turn these plastic wastes into new plastic, fuel or chemicals for other uses.

Trade and technical press articles have described the Encina plant as using a form of chemical recycling called catalytic pyrolysis—a melting of the plastic waste in a chamber with little or no oxygen and the use of a catalyst or catalysts. Sahandy has kept her descriptions vague, saying the “catalycic conversion” process can handle all plastics but Encina will be focused on numbers three through seven.

The company has already been able to take advantage of a plastics industry push to relax regulations on the chemical recycling of plastics. The industry, led by the trade group American Chemistry Council, has been working to grease the regulatory skids to favor chemical recycling, which it likes to call advanced recycling, in statehouses, the U.S. Capitol and at the U.S. Environmental Protection Agency.

Twenty states including Pennsylvania have since 2017 passed legislation aimed at regulating chemical recycling, including methods using pyrolysis, as manufacturing, not waste management or waste incineration.

The ACC applauded Pennsylvania Gov. Tom Wolf in 2020 for signing Pennsylvania's revamped recycling law, saying it would "help Pennsylvania attract new recycling businesses and support job creation while keeping more plastic out of landfills."

It turns out that legislation with its new definition of "advanced recycling" exempted the Encina plant from having to secure a waste management permit and other waste-handling requirements from the Pennsylvania Department of Environmental Protection, provided all other state and federal regulations are met, said Jamar Thrasher, spokesman for the Pennsylvania DEP.

The EPA is also weighing how it intends to regulate advanced recycling nationally under clean air and waste incineration rules. An EPA spokeswoman would not say when any new regulatory proposals might emerge.

Few Successes

Alarmed by a steady stream of research that shows how plastic waste has become ubiquitous in the world, environmental organizations are pushing for a global treaty and state and federal policies that will reduce plastic production and curb the use of single-use plastics like bottles, wrappers and bags.

But advanced recycling is gaining ground because consumers and companies that use plastics for packaging are demanding plastic bottles or packaging be made with at least some recycled content, said Joshua Baca, vice president of plastics for the chemistry council.

So far, there have been few successes.

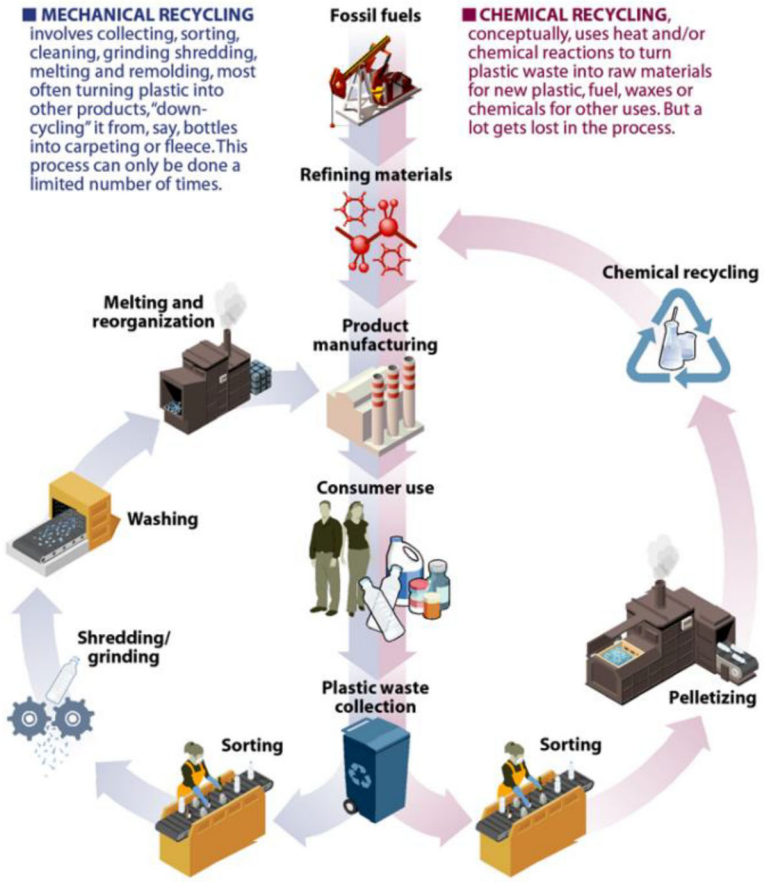
The global news agency Reuters last year published a report that found most of some 30 advanced recycling operations it examined internationally were operating on a modest scale or had shut down. The industry faces "enormous obstacles," the news agency found, including the cost of collecting and managing plastic waste and creating products that can compete economically with fossil fuels or virgin plastic.

Recycling Plastics Mechanically or Chemically

Americans are recycling less than 6 percent of plastic of the plastic they use, and nearly all of that are plastics numbered 1 or 2, such as bottles and jugs, that are put through a mechanical process. The plastics industry is aggressively advocating for chemical recycling of plastic waste for a wider array of plastics (numbers 3-7) that are harder to recycle and are largely not being recycled. What's the difference?

MECHANICAL RECYCLING involves collecting, sorting, cleaning, grinding shredding, melting and remolding, most often turning plastic into other products, "down-cycling" it from, say, bottles into carpeting or fleece. This process can only be done a limited number of times.

CHEMICAL RECYCLING, conceptually, uses heat and/or chemical reactions to turn plastic waste into raw materials for new plastic, fuel, waxes or chemicals for other uses. But a lot gets lost in the process.



• *Companies are claiming they have technology to chemically recycle plastics 3 through 7, but environmental advocates point out that certain processes can only handle limited types of plastics, and commercially viable chemical recycling remains problematic.*

SOURCES: U.S. Government Accountability Office; The Last Beach Cleanup; ICN research

PAUL HORN / Inside Climate News

Environmental organizations have come to similar conclusions.

Greenpeace in 2020 found that most advanced plastics recycling plants that were being promoted by the industry were not recycling plastic waste into new plastics, but rather they were making fuel for combustion and barely putting a dent in the glut of waste plastics.

Greenpeace sees the industry efforts more as a form of public relations known as greenwashing, rather than a viable solution, similar to other unproven or uneconomical industry-backed solutions to intractable environmental problems, such as capturing and storing greenhouse gases to curb climate change.

"'Chemical recycling' projects may be more likely than petrochemical projects to be approved for regulatory relief or public funding, as they carry an aura of 'green' and 'circular,' precisely because they are considered recycling," the report concluded. "Rather than pouring money into a declining oil and gas industry's self-imagined technological solution, money should be invested into a green and just recovery prioritizing a transition away from petro-based business models toward a climate-safe future with environmental justice."

The Natural Resources Defense Council this spring examined eight U.S.-based chemical recycling facilities touted by industry. "The majority of facilities are not recycling any plastic," the environmental group found. The facilities were also generating hazardous waste, releasing hazardous air pollutants and were often in communities that are disproportionately low income, people of color, or both, NRDC found.

"What we've seen are some major challenges, when you're using post-consumer, mixed plastic waste; that can be quite a contaminated stream," said Veena Singla, a senior scientist with NRDC.

The contamination can come in the form of some plastics being incompatible with the chemical recycling process and hard to remove, she said. Pesticides, paints or cleaners left inside plastic containers are other forms of contamination, she added.

Adding recycled content to plastic products like bottles or packaging made with virgin fossil fuels under the guise of sustainability is a form of "sustainability fraud," said Terrence Collins, professor of chemistry at Carnegie Mellon University in Pittsburgh and director of the CMU Institute for Green Science. It perpetuates an unsustainable fossil fuel economy laden with toxic chemicals that make people sick, he said, adding: "It's a continuation of the fantasy."

As the industry aggressively markets its vision of chemical recycling as a primary solution to the plastics crisis, another critic describes it as an intentional mirage, of sorts.

"It is a Potemkin village," said Neil Tangri, the science and policy director at the Global Alliance for Incinerator Alternatives, at a recent plastics conference at Bennington College in Vermont. That's a term used to describe a pretentiously showy façade intended to mask or hide something undesirable. The industry is saying, "'Look, we have the technology, don't look inside the box

too much," he said. Their real goal, he said, is instead to maintain their business model and avoid consumer scrutiny.

Some experts see chemical recycling efforts today as part of a path toward truly recyclable plastics of the future.

"Chemical recycling is not a panacea, it's not the solution," said Gregg Beckham, a senior research fellow at the U.S. Department of Energy's National Renewable Energy Laboratory in Colorado. "I don't think it's here and I don't think it's now," he added.

But some "pioneer" plants that are being developed now may be helping to make way for a new generation of greener plastics that are still decades away, Beckham said.

"I hope that in the next 50 years or so that humankind will transition over from fossil-based polymers made the way we make them today, to bio-based polymers that are more easily recyclable," said Beckham, who is leading a National Renewable Energy Lab research consortium focused on solving plastics recycling problems. "And I think chemical recycling can help be part of the bridge to get there," he said.

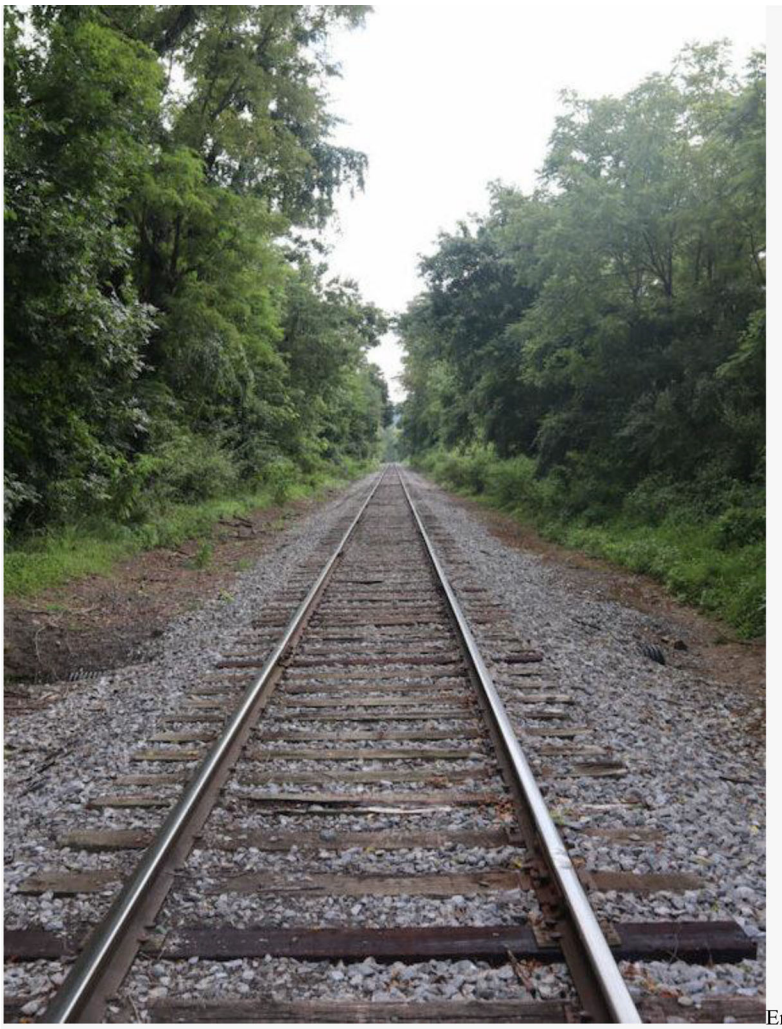
An Optimistic Timeline

Encina launched in 2016, led by David Schwedel, a venture capitalist and investor from Miami who told the Miami Herald in 2014 that his mother had printed him his first set of business cards for him when he was 12 years old. He parlayed his interests in boating and marine services into energy technology, including coal reclamation, and now, chemical recycling of plastics.

When the company put out what Yoxheimer called its "billion-dollar press release" announcing its Point Township Circular Manufacturing Facility and later met with community members in May, it promised to process annually as much plastic as can fit inside a domed football stadium each year.

A man searches for fishing spots on the Susquehanna River in mid-July. A few miles downriver from here, Encina plans for a $1.1 billion chemical recycling plant for waste plastics in Point Township. Credit: James Bruggers

The location of the proposed Encina chemical recycling plant for plastic waste in Point Township, Pennsylvania. Credit: James Bruggers



Encina says it will ship by rail on these tracks the benzene, toluene and xylene it plans to make at its chemical recycling plant for waste plastics. The project site is to be behind the trees on the right side of the photograph. The river is to the left. Credit: James Bruggers

Encina touted the benefits of the facility saying it would "reduce the need to produce new plastic from oil and gas resources, providing circular solutions to customers committed to reducing their impact on the environment to build a circular economy."

Gov. Wolf also hailed the project as a winner for jobs and the environment.

"Not only will they be creating new, good-paying jobs, but they're committed to doing it with an innovative approach that will lessen their impact on the climate and sustain a brighter future for all of us," he said in the press release.

Encina says the plant will inject $2.1 billion into the local and state economies over the next five years. It's saying construction will begin next year, employing as many as 750 people, with production in 2024. Encina said the plant would need 300 employees.

Dell, the chemical engineer with the Last Beach Cleanup, said she finds the company's plans fantastical, starting with its plan to secure 450,000 tons of mixed post-consumer plastic waste a year.

"It's not possible," said Dell, who has been studying what plastics are actually collected for recycling across the region and nationwide. "There is no system for collecting the three through sevens. The plastics they need are not going to be available."

Yoxheimer described the timetable as optimistic.

The company is still in early discussions with the Pennsylvania environmental regulators over its permits for water discharges and air emissions, so the plants' full potential pollution impacts remain unknown.

Documents and correspondence provided to Inside Climate News on Aug. 30 under the state's right-to-know law describe the types and sources of plastics the company will accept and construction phasing. The first phase will be a facility to accept post-consumer scrap plastics for sorting, baling and shipping out to markets. The second phase includes equipment to break down the waste plastics through chemical processing, with final chemical products shipped out on a nearby rail line for manufacturing.

Encina acknowledges it will have to work through traffic and stormwater concerns as well. The documents provided by Pennsylvania DEP show part of the project site within 100-year and 500-year floodplains. Local residents recalled a history of repeated flooding in the area.

Encina has also told officials they would need to draw as much as 1.7 million gallons a day from the Susquehanna River, and may need to discharge into the river as much as 2.9 million gallons a day. The withdrawals will require approval from the multi-state Susquehanna River Basin Commission, which coordinates the management of water resources in the 27,500 square-mile Susquehanna River Basin.

Encina is in "preliminary discussions" with the commission but has not submitted any applications, said Stacey Hanrahan, spokeswoman for the commission.

Sahandy said she was unable to predict when the company will be able to get the permits it needs. "It's hard to answer the timing question on the permitting side because we're really not in the driver's seat," she said.

To Beckman, the Pitt chemical engineer, the proposal seems as rushed as it is mysterious. He also said he wonders how it will be funded. The company's website, while seeking additional investors, notes having raised $75 million, but that's far from the $1.1 billion investment the company announced.

"Anytime you do a startup, you raise money, with the promise that you'll be able to deliver," Beckman said. There's a new trend in business where "you're trying to build the airplane while you're flying it," and that can be risky, he added.

More Questions Than Answers

Mysteries aside, the head of the regional economic development agency describes Encina's efforts as "very real."

Over the last year, the company has purchased and renewed an option to purchase the riverfront property, met with state environmental regulators, local academic officials at nearby Bucknell University, worked with the governor's office and held a community meeting, said Jennifer Wakeman, the executive director at DRIVE, a regional economic development agency.

Beyond the potential direct economic impact of jobs and indirect benefits of what she described as "the biggest investment that I have seen in my time here in the region," which is nearly 30 years, Wakeman said she's excited to be a part of a project "that is going to be a flagship." Encina, she added, is not receiving any special state financial incentives.

But at a township meeting in July, and in follow-up conversations at homes and cafes, there were more questions than answers.

The Encina proposal has turned Rocky Roshon, 46, into the civic watchdog he never imagined.

He's attending township supervisors' meetings and speaking out in ways he has never done before. That's because he and his wife, Holly, share a home that's 65 feet from the proposed plant's property line, and they view it as an existential threat to their quality of life and property values.

Rocky Rochon bought the property from his grandfather when he was 18, and does not want to see the neighboring cornfields turned into a chemical plant fed by dozens of incoming trucks hauling plastic waste daily, that produces toxic chemicals to fill railcars.

Beyond their concerns about traffic, odors, air pollution and changes on the land that could increase flooding, the Rochons are also worried that chemicals leaking from the plastic waste containers, the recycling process or railcar spills could pollute their drinking water well.

"I'd get my lawyer from around here and they'd get theirs from New York City and I'd have to live 20 years on bottled water," he said.

While the company's actual planned air emission and water discharge limits remain in the realm of private conversations between the company and state regulators, and its process is shielded by assertions of proprietary technology, Collins said he'd be concerned if he lived nearby.

"It's like a refinery," he said of chemical recycling plants. "You are going to have all kinds of chemicals escaping into the atmosphere that people are going to be breathing whether they like it or not."

Pollution and water quality are among the concerns of nearby resident Sandy Hein, who took time away from restoring a 1920s family home to discuss the project over lavender iced tea at a cafe in downtown Sunbury, where American flags and banners honoring fallen military heroes line Market Street. Hein said she was disappointed by the company's town meeting, held in May.

A retired chemist, Hein said company representatives on multiple occasions told her that the plant would produce no waste, something she said she does not believe to be possible. (Sahandy said Encina has only said it seeks to be part of a future "zero waste" world.)

Hein is active with a local chapter of the Washington, D.C.-based Climate Reality Project, an environmental group, and said she cannot yet say whether she supports or opposes the Encina project.

"I would like to see plastics recycled, but not to the detriment of the people," she said. "I do not have the information I need to make an informed decision," she said, adding she wants to see the company's proposed air and water permits, when they become available.

"I will be looking at their volumes and their discharges and that type of thing," said Hein, who knows her way around industrial environmental compliance and enforcement from her career in manufacturing. "I want to make sure that the people in this area are safe," she said. "That's my drinking water."

In the sunroom of her Lewisburg home, about 10 miles from Point Township, Sandy Field, a medical and science writer with a Ph.D. in biochemistry, said she's concerned about Encina's plan to burn fracked natural gas as a heat source, with its environmental health and climate impacts.

The project may sound great, she said, but wonders if there aren't better ways to tackle the plastics crisis.

"It's taking plastics, a toxic product, and making toxic products of them, next to our river, using fracked natural gas," she said. "As someone who is concerned about the climate crisis, we need to be moving away from natural gas."

Sandy Field, Chair of the Climate Reality Project's Susquehanna Valley Chapter in Pennsylvania. Credit: James Bruggers

'Treasured by All'

At a Bucknell University boat landing in Lewisburg, a great blue heron takes flight from the Susquehanna River, and Canada geese pass overhead, their honking calls dissipating as the birds disappear over tall shoreline trees. Professor Ben Hayes, director of the Watershed Sciences & Engineering Program at Bucknell, describes the Susquehanna River as "treasured by all," and the "lifeblood of the Chesapeake Bay, our nation's largest estuary."

Sitting on a picnic table under shade trees on a warm summer morning, he explained that the river is much cleaner than it was decades ago but faces emerging challenges from chemicals that mimic hormones and have other toxic effects. Research has also found microscopic plastic fibers in the water and tiny bits of plastic inside the river's fish, he said.

Hayes said he does not yet know much about the Encina proposal but sees it as a potential risk and an opportunity.

Ben Hayes, the director of the Watershed Sciences and Engineering Program at Bucknell University in Lewisburg, Pennsylvania, explains the ecological condition of the Susquehanna River within the Chesapeake Bay watershed at the university's boat launch. Lewisburg is about 10 miles, and downriver, from a proposed $1.1 billion chemical recycling plant for plastic waste planned for Point Township, Pennsylvania. Credit: James Bruggers

The risk to the river could include, for example, pollution caused by flooding or from the plant's operations, he said. The opportunity, he said, could come if the company opts to go beyond "minimum requirements" and adopts a full sustainability and transparency model, one that fully protects the river from chemicals or microplastics, and has transparent partnerships with the community and local research institutions, such as Bucknell.

Pennsylvania has been blessed with natural resources including timber, coal, oil, natural gas, steel and gravel, whose development has been vital to the region's communities, economy and culture, he said. But people who live in the region are also aware of the environmental costs of extractive industries, while also looking for new sustainable industries to sustain an economy, he added.

"What you're seeing now is, I think, an openness at the state to welcome industries' innovation. But we're going to be cautious," he said.

Driving in a black GM SUV from the township office to the planned construction site along a two-lane state highway, Yoxheimer, the township commission chairman, said the township will need to rely on state environmental regulators to make most of the decisions about how the plant will operate. But the township, with its population of about 4,000 residents, will have a say over land-use questions including stormwater management, set-back requirements and vegetative barriers.

The way he sees it, a lot is at stake, locally and potentially, nationally.

With the danger presented by plastics and the growth of the plastics industry, there's a potential for the Encina plant to be among the first of a new industry, with economic benefits locally. "If it works, we are going to see these all over the place," he said.

But he also said he sees a downside.

"I would say probably there are maybe 30 or 40 homes that are up there in that area," he said. "My concern largely is, when these people bought their homes, they didn't anticipate this.

"They have a quality of life that they enjoy now and I would not like to see them lose that just because someone wants to come in there and plop out a billion-dollar plan. I don't think it's fair to those residents."

James Bruggers

Reporter, Southeast, National Environment Reporting Network

A New Plant in Indiana Uses a Process Called ‘Pyrolysis’ to Recycle Plastic Waste. Critics Say It’s Really Just Incineration

After two years, Brightmark Energy has yet to get the factory up and running. Environmentalists say pyrolysis requires too much energy, emits greenhouse gases and pollutants, and turns plastic waste into new, dirty fossil fuels.

By James Bruggers
September 11, 2022

Jay Schabel, president of the plastics division at Brightmark, stands amid what he described as 900 tons of waste plastic at the company's new plant in northeast Indiana at the end of July. The plant is designed to turn plastic waste into diesel fuel, naphtha and wax. Credit: James Bruggers

ASHLEY, Indiana—The bales, bundles and bins of plastic waste are stacked 10 feet high in a shiny new warehouse that rises from a grassy field near a town known for its bright yellow smiley-face water tower.

Jay Schabel exudes the same happy optimism. He's president of the plastics division of Brightmark Energy, a San Francisco-based company vying to be on the leading edge of a yet-to-be-proven new industry—chemical recycling of plastic.

Walking in the warehouse among 900 tons of a mix of crushed plastic waste in late July, Schabel talked about how he has worked 14 years to get to this point: Bringing experimental technology to the precipice of what he anticipates will be a global, commercial success. He hopes it will also take a bite out of the plastic waste that's choking the planet.

"When I saw the technology, I said this is the sort of thing I can get out of bed and work on to change the world," said Schabel, an electrical engineer.

“My job is to set it up and get it running,” he said of the $260 million, 120,000 square foot building and adjacent chemical operations. “Then perpetuate it around the world.”

But the company, which broke ground in Ashley in 2019, has struggled to get the plant operating on a commercial basis, where as many as 80 employees would process 100,000 tons of plastic waste each year in a round-the-clock operation.

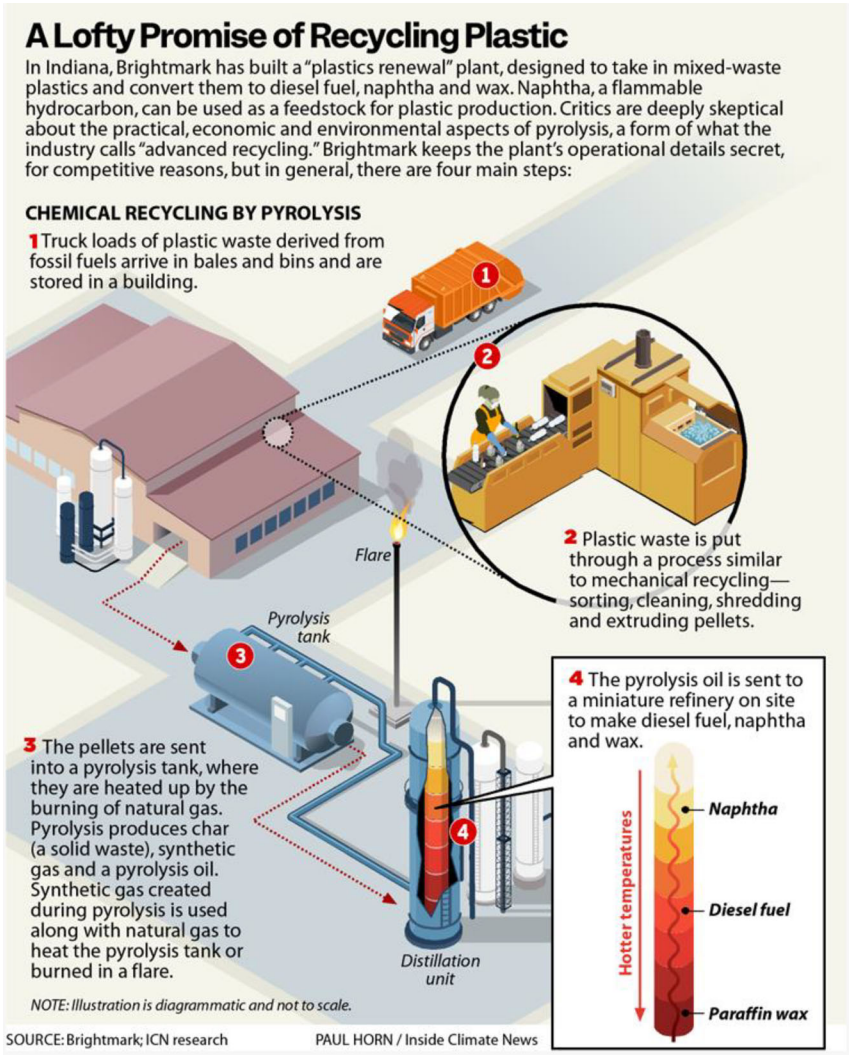
Schabel said that was to change in August, with its first planned commercial shipment of fuel to its main customer, global energy giant BP. But a company spokesman said in mid-August that the date for the first commercial shipment had been pushed back to September, with “full-scale operation…extending through the end of the year and into 2023.”

Even with that new timetable, the plant, located along Interstate 69 in the northeast corner of Indiana, Brightmark faces ongoing economic, political and—environmental critics and some scientists say—technical headwinds.

Its business model must contend with plastics that were never designed to be recycled. U.S. recycling policies are dysfunctional, and most plastics end up in landfills and incinerators, or on streets and waterways as litter.

Environmental organizations with their powerful allies in Congress are fighting against chemical recycling and the technology found in this plant, known as pyrolysis, in particular, because they see it as the perpetuation of climate-damaging fossil fuels.

“The problem with pyrolysis is we should not be producing more fossil fuels,” said Judith Enck, a former regional director of the U.S. Environmental Protection Agency and the founder and executive director of Beyond Plastics, an environmental group. “We need to be going in the opposite direction. Using plastic waste as a feedstock for fossil fuels is doubling the damage to the environment because there are very negative environmental impacts from the production, disposal and use of plastics.”



Plastics' Ubiquity

The global plastics crisis is well documented with annual plastic production soaring from 20 million metric tons to 400 million metric tons over the last five decades. Nearly all are made from fossil fuels and much is designed to resist biodegradation and can last in the environment for hundreds of years, increasingly as microscopic bits that are ubiquitous and have invaded the human body.

The amount of plastic discharged into the ocean could reach up to 53 million metric tons per year by 2030, or roughly half of the total weight of fish caught from the ocean annually, according to a December report by a committee of scientists with the National Academies of Sciences, Engineering and Medicine.

The U.S. produces the most plastic waste in the world, nearly 300 pounds per person in a year, the report found. But only a small percentage, less than 6 percent, of plastics used by consumers in the U.S. actually get recycled, a recent analysis of EPA data by Beyond Plastics and the Last Beach Cleanup found.

What does get recycled, such as soda bottles, typically goes through a mechanical process involving sorting, grinding, cleaning, melting and remolding, often into other products. But there are limits to the kinds of plastics that are acceptable for mechanical recycling and how many times these plastics can be re-used in this way.

Chemical recycling, called advanced recycling by the chemical industry— which touts it as almost a Holy Grail of solutions—seeks to turn the harder-to-recycle kinds of plastic waste back into plastics' basic chemical building blocks. Pyrolysis is among the chemical recycling technologies getting the most attention, with industry representatives saying pyrolysis can turn mixtures of plastic waste into new plastic, fuel or chemicals for making everything from detergents to cars to clothing.

With these plastic wastes, such as grocery bags, cups, lids, containers and films, the industry claims, pyrolysis heats them at high temperatures in a vessel, with little or no oxygen and sometimes with a chemical catalyst, to create synthetic gases, a synthetic fuel called pyrolysis oil, and a carbon char waste product.

It's a process that's been around for centuries, used for making tar from timber for wooden ships in the 1600s, for example, or coke from coal for steelmaking in the last century.

Brightmark describes its plant as the "largest-scale pyrolysis facility in the world." It is designed to take plastic waste hauled in from municipal and industrial sources. The waste is cleaned, chopped up and pressed into small pellets, then fed into pyrolysis tanks and heated by burning natural gas. The synthetic gas created by the pyrolysis process is then mixed with the natural gas to generate temperatures between 800 degrees and 1,500 degrees Fahrenheit, Schabel said.

"We flush the molecules out and condense them," Schabel said, describing what the high heat does to the plastic waste. "We are hitting them with a thermal hammer to break them into pieces. They want to come back together but we control how they come back together."

The char is sent to a landfill as non-hazardous waste, he said, and the pyrolysis oil goes to a small-scale refinery behind the warehouse, where it's separated into low-sulfur diesel fuel, flammable liquid naphtha, and wax for industrial uses or candles.

"We call this a hyper-local oil well," Schabel said on the tour.

But a lot of what comes into the plant gets lost in the process.

In a document Brightmark filed in December with the EPA, the company acknowledged that just 20 percent of the plant's output is its primary product—what it described as fuels. Most of the rest, 70 percent, is the synthetic gas that the company said is combusted with natural gas to generate heat, with 20 percent of that syngas burned away in a flare. The rest is the char, according to the filing.

The company now disputes its own numbers, with a spokeswoman saying company officials are working to get them corrected to reflect a larger percentage of output as diesel fuel or naphtha.

But the EPA filing plays into one of the sharpest criticisms of pyrolysis—that it's not really plastics recycling at all.

The Brightmark plant in Ashley, Indiana. The San Francisco company plans to turn waste plastic into diesel fuel, naphtha, and wax. Credit: James Bruggers

With pyrolysis, "what you make is what I would call, and I grew up in New Jersey, so forgive me, a dog's breakfast of compounds," said University of Pittsburgh Professor Eric Beckman, a chemical engineer with a Ph.D. in polymer science. "It's like everything you can think of, gases, liquids, solids," he said.

If plastic waste could be turned only into naphtha, a bonafide building block for plastics, a company could operate what Beckman called a closed loop, and circular system for plastics that *could* be considered recycling, he said. But that is not what pyrolysis does.

"And this is where it gets controversial," Beckman said, adding: "because you have people doing this who are saying, 'We're recycling it.' No, you're not. You're burning it." And any time that fossil fuels are being burned, he said, they are emitting greenhouse gas and air pollutants.

Jan Dell, a chemical engineer who has worked as a consultant to the oil and gas industry and now runs The Last Beach Cleanup, a nonprofit that fights plastic waste, agreed.

"The fact that pyrolysis operations have to burn so much of the material to get to the high temperatures is a fundamental flaw," she said.

EPA Rules Under Review

Brightmark and its expansion plans come as the Environmental Protection Agency weighs how to regulate pyrolysis, with air quality and economics on the line.

EPA regulations now consider pyrolysis to be incineration, which brings tighter clean-air controls. But in the waning months of the Trump administration, EPA proposed an industry-friendly rule change that stated that pyrolysis is not combustion and thus should not be regulated as incineration.

"The appropriate regulation of this is really critical if you want to scale advance recycling, and you want to use more recycled material in your products," said Joshua Baca, vice president of plastics for the American Chemistry Council, a leading lobby for the plastics industry.

Facilities that turn plastic waste into gas and then burn the gas to help generate heat for the pyrolysis process are in effect still burning the plastic, with at least some oxygen involved in both steps in the process, said attorney James Pew, director of the environmental group Earthjustice's clean air practice.

"The absolute crux of this issue is whether these new incinerators have to put on controls, like with conventional incinerators, or whether they can skip that and not control or monitor their pollution," said Pew.

Pressure is mounting on EPA, which, according to a spokeswoman, is gathering public input and still deciding its next steps for pyrolysis and a related technology known as gasification. In mid July, 35 lawmakers including Rep. Jamie Raskin, and Sens. Bernie Sanders and Corey Booker, wrote to the EPA, urging the agency to fully regulate plastic chemical recycling's emissions and to stop working to promote the technology as a solution to the plastics crisis.

"Chemical recycling contributes to our growing climate crisis and leads to toxic air emissions that disproportionately impact vulnerable communities," the lawmakers wrote.

Struggling to Meet Its Timetable

At the end of July, Brightmark Chief Executive Officer Bob Powell, in a Zoom interview from his San Francisco office, said the company was still working to iron the last kinks out of its system.

"We have operated it at startup levels," Powell said. "We're just now at the point where we're mechanically complete, and we're starting to … create those finished products."

Groundbreaking was in 2019, after the company secured a $260 million financing package that included $185 million bonds through the Indiana Finance Authority, underwritten by Goldman Sachs. Authority officials said the financing is not a state debt and Brightmark will be entirely on the hook to repay them.

The company has struggled to meet its timetable, Schabel acknowledged on the tour of the plant. He said it has taken time to secure an optimal stream of plastic waste for which there was no market, deal with delays caused by the Covid pandemic and navigate the challenges of developing new technology.

Dell said she's not surprised, adding that she believes that despite the overall abundance of plastic waste on the planet, securing a steady stream of the kind of plastic waste the company has targeted will be an insurmountable challenge. The company has said it will largely recycle mixed, post-consumer plastics, the kind that millions of Americans toss in their recycling bins every week.

But these wastes are made of many different kinds of plastics, with a range of chemical compositions, and they vary by city and season, she said. Some of the plastics harm the pyrolysis process by introducing oxygenated molecules which reduce yield and lower the quality of the pyrolysis oil output, she said.

Jay Schabel, president of the plastics division at Brightmark, holds plastic pellets in his hand the company's new chemical recycling plant in northeast Indiana at the end of July. Credit: James Bruggers

Polyvinyl chloride, or PVC, common in consumer product labels, films and packaging, adds chlorine atoms that can cause equipment corrosion and contaminate the pyrolysis oil, she said. Household plastic waste from municipal waste-handling facilities is also contaminated with other garbage that upsets the pyrolysis process, including liquids, food, dirt, paper, glass, metal and polystyrene foam, Dell added.

"There's this perception that there's so much plastic waste in the world and in the country, which there is," Dell said. "And then they hold up this magic plant that they say is going to recycle everything from households all mixed together, and people believe it. But it can't. It can't handle the changing variety of household plastic waste and the unavoidable contamination."

Beckman, the University of Pittsburgh professor, said he was particularly surprised to see the company plans to accept PVC.

"I do not know how they're taking in PVC, and not getting something you really don't want," he said. That could include dioxins or other possible unwanted chlorinated products and more char, he added.

The EPA considers dioxins to be persistent organic pollutants, highly toxic and potentially cancer-causing.

"There have been people who have looked at this in different ways over the years, asking, 'What can we do?' And honestly, what you can do is make sure (PVC) never goes into a pyrolysis unit," Beckman said.

For his part, Schabel acknowledged taking in mixed plastic wastes can be a challenge but said they can all be handled by the company's technology, which he described as proprietary. He declined to go into specifics about the proprietary nature of the company's technology, which was developed by RES Polyflow, the Ohio company he served as chief executive officer before joining Brightmark.

He said the plant can process PVC, but added: "If we pull out more of it, we get a better yield."

'Greenwashing Up the Wazoo'

The company, which is also developing manure-to-gas projects across the United States, markets its Ashley plant as a "plastics renewable facility" in an effort to try to position itself as a green solution to global plastics and climate crises. For the Ashley plant, it commissioned a study known in the industry as an "environmental lifecycle analysis" from consultants at Environmental Clarity, Inc.

The report found that, when compared to a typical waste stream in the United States where 17 percent of plastic waste is incinerated, the Brightmark pyrolysis plant produces 39 percent fewer greenhouse gas emissions than equivalent products made from virgin materials.

The study's carbon footprint analysis may be true, said Terrence Collins, a professor of green chemistry at Carnegie Mellon University and director of the CMU Institute for Green Science. But he said there are too many assumptions built into the study for him to know for sure.

The study was also silent on many other potential environmental impacts that are often included or should be, in any lifecycle analyses of an industrial process, Collins said.

Its biggest flaw, Collins said, was to give short shrift to the plant's potential environmental impacts from toxic chemical emissions, including dioxins and common additives to plastics that are known to be endocrine disruptors. Those are hormone-mimicking chemicals that, once inhaled or consumed, can cause reproductive and developmental problems in fetuses.

"I did not see a single measurement for dioxin, or even talking about it," in the report, he said. "You don't find endocrine disruption as a term. You don't find health" mentioned, he added.

"It's greenwashing up the wazoo," Collins said of the incomplete lifecycle analysis, combined with how Brightmark markets itself on its website using the children of one of its engineers using plastic toys and talking about the need to stop ocean-dumping of plastics.

"They are proposing to go into a regime of more sustainability technology, and they should be held to task," Collins said. They are "creating a case for no toxics without the science," and "having it done by a little kid whose generation will be impacted. If you market through children, you raise the stakes; you really need to prove it," Collins said.

In an email, Environmental Clarity's Evan Griffing, co-author of the lifecycle analysis, said the study's scope was established by Brightmark.

"Dioxin production in incineration and pyrolysis is certainly a well-known danger," he said. Dioxin production can be reduced by controlling the temperature of pyrolysis and removing chlorine. The lifecycle analysis mentioned that Brightmark used scanning technology to minimize PVC getting into its pyrolysis system, he said.

Griffing and the study's other co-author, Michael Overcash, defended their work and the company's plans in a joint statement in a press release in November.

"Brightmark's plastic renewal technology reduces fossil fuel extraction, reduces landfill and incineration of waste, and cuts down carbon emissions relative to current practice," said Griffing and Overcash. "We believe efforts to scale advanced plastic recycling technologies like Brightmark's solution will provide substantial environmental and sustainability benefits to society."

But numbers contained in the lifecycle analysis further strengthened the criticism that the company isn't really recycling plastic. In its analysis, the study shows that just 16 percent of the plastic waste entering the plant and just 20 percent of what enters the pyrolysis process after sorting, would actually be converted to naphtha, the plastics feedstock.

Regardless, "the benefit of this technology is substantial compared to the current fate of the majority of post-use plastics," said Chrystal Boone, a Brightmark vice president.

Is Chemical Recycling Possible?

From questions about what should be considered recycling to environmental and health concerns, the Brightmark plant showcases how the nation is at a potential point of inflection when it comes to what it will do about the crisis of plastic waste. A big part of that discussion is the role of chemical recycling and pyrolysis.

Brightmark's optimistic outlook in Ashley took a hit earlier this year, after delays at its Ashley plant caused the company pain in Georgia.

During the last year, Brightmark made a play to develop a second, even larger pyrolysis plant for plastic waste in Macon, Georgia. But an agreement with a local development authority that had included issuing $500 million in bonds to help pay for the project was terminated in April after Brightmark was unable to show how it could "deliver end-product to one or more off-takers" at its plant in Ashley, according to local news accounts and national trade press.

Local and national environmental advocates who saw the Macon deal as a potential launching pad for Brightmark's global aspirations are still celebrating what they see as a victory.

Brightmark is recalibrating while making a case for its role in what it sees as an emerging industry.

Powell, the company's CEO, described the Macon situation as "unfortunate" and said the company is looking for other potential locations in the Southeast while focusing on launching the Ashley plant.

As for Schabel, he said he's looking forward to getting the Ashley plant running. "I want to bring the critics in and show them," he said.

James Bruggers

Reporter, Southeast, National Environment Reporting Network

James Bruggers covers the U.S. Southeast, part of Inside Climate News' National Environment Reporting Network. He previously covered energy and the environment for Louisville's Courier Journal, where he worked as a correspondent for USA Today and was a member of the USA Today Network environment team. Before moving to Kentucky in 1999, Bruggers worked as a journalist in Montana, Alaska, Washington and California. Bruggers' work has won numerous recognitions, including best beat reporting, Society of Environmental Journalists, and the National Press Foundation's

Is ‘Chemical Recycling’ a Solution to the Global Scourge of Plastic Waste or an Environmentally Dirty Ruse to Keep Production High?

Diplomats, industry reps and environmentalists wrestled with this question during talks in Switzerland on guidelines related to the Basel Convention on hazardous wastes.

By James Bruggers
December 23, 2022

A Turkish diver dives amid plastic waste in Ortakoy coastline to observe the life and pollution of Bosphorus in Istanbul, Turkey on June 27, 2020. Credit: Sebnem Coskun/Anadolu Agency via Getty Images

Diplomats negotiating guidelines for an international convention on hazardous wastes this month in Switzerland debated a new section on the "chemical recycling" of plastic debris fouling the global environment.

The 1989 Basel Convention, which seeks to protect human health and the environment against the adverse effects of hazardous wastes, was updated in 2019 when 187 ratifying nations agreed to place new restrictions on the management and international movement of plastic wastes—and to update the treaty's technical guidelines.

Since then, the plastics industry has tried to quell mounting anger over vast mountains of plastics filling landfills and polluting the oceans by advancing chemical recycling as a means of turning discarded plastic products into new plastic feedstocks and fossil fuels like diesel.

Scientists and environmentalists who have studied the largely unproven technology say it is essentially another form of incineration that requires vast stores of energy, has questionable climate benefits, and puts communities and the environment at risk from toxic pollution. Some of them even view the inclusion of the chemical recycling language in the implementing guidelines as a threat, although it remains to be seen what that language will ultimately say.

"The text is nowhere near settled," said Sirine Rached, the global plastics policy coordinator for the Global Alliance for Incinerator Alternatives (GAIA), which with the Basel Action Network

has called chemical recycling of plastics “a fantasy beast that has yet to establish its efficacy and economic viability, while already exhibiting serious environmental threats.”

Rached said the group’s “priority is for the guidance to focus on environmentally-sound management and to refer to technologies only on the basis of sound peer-reviewed references, and not on industry marketing claims, and this involves not speculating on how technologies may or may not evolve in future.”

“The solution is making less plastic,” Judith Enck, founder and president of the environmental group Beyond Plastics and a former EPA regional administrator, told a subcommittee of the Senate Committee on Environment and Public Works at a hearing on Dec. 15.

U.S. lawmakers are weighing their own ideas for addressing the plastics crisis. “We need to cut plastic production by 50 percent in the next 10 years, and we can do it,” she told them, adding that chemical recycling produces “more fossil fuel and the last thing we need is more fossil fuel.”

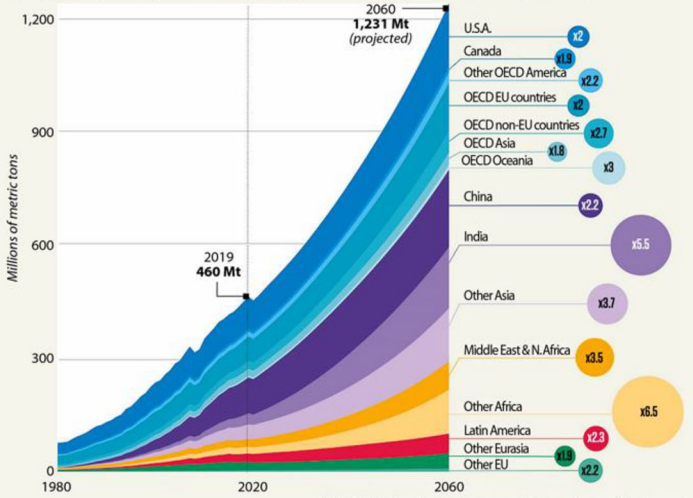
Such a dramatic cut in plastic would devastate the economy, said Matt Seaholm, chief executive officer of the Plastics Industry Association, which represents companies that produce, use and recycle plastic. “Our industry wants to recycle more,” and deploying more mechanical recycling and chemical recycling will help, he told lawmakers. “We love plastic,” he said. “We hate the waste. We need to collect, sort and ultimately reprocess more material.”

Plastics: A Growing Crisis

The U.N. describes plastics as a "triple planetary crisis of climate change, nature loss and pollution." In a business-as-usual scenario, plastic use is projected to triple by 2060, growing the fastest in developing countries. The recycling rate is expected to improve some but remain low.

GLOBAL PLASTICS USE

In millions of metric tons (Mt), 1980-2060 (projected)



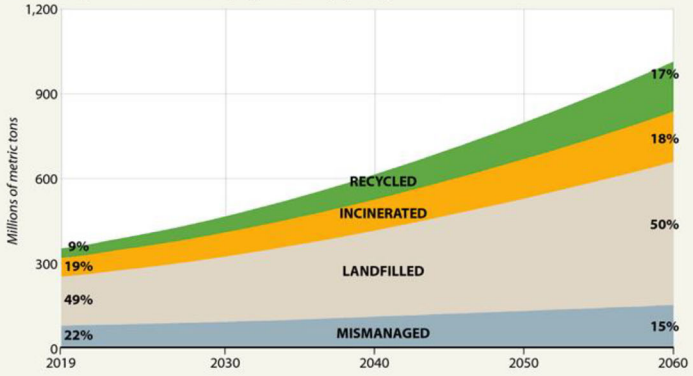
GROWTH OF PLASTICS USE

2019-2060 (projected)

NOTE: OECD: Organization for Economic Co-operation and Development

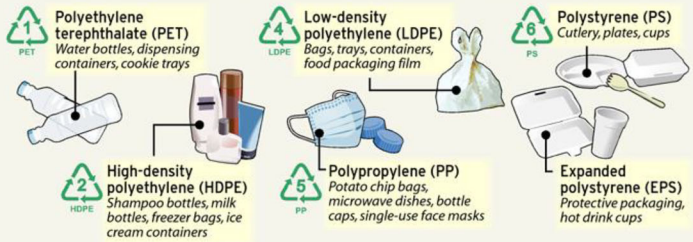
GLOBAL PLASTICS WASTE

Post-disposal, in millions of metric tons (Mt), 1980-2060 (projected)



SINGLE-USE PLASTICS WASTE

These types of single-use plastics are everywhere and among the biggest part of the problem:



SOURCES: Organization for Economic Cooperation and Development; UN Environment Programme

PAUL HORN / Inside Climate News

Wide agreement exists that the 11 million metric tons of plastic pollution that enters the oceans every year “is devastating,” Erin Simon, head of plastic waste and business for the World Wildlife Fund, a conservation group that operates in 100 countries, said in an interview. “It’s wreaking havoc on our species, our ecosystems and in the communities that depend on them.

“You really do need this coordinated global structure” that treaties can provide, she added. “Because it’s clear that it’s not going to happen just with voluntary initiatives alone.”

Writing Guidelines for Chemical Recycling

The world is making twice as much plastic waste as it did two decades ago, with most of the discarded materials buried in landfills, burned by incinerators or dumped into the environment, according to the Organization for Economic Co-operation and Development, a group that represents developed nations. Production is expected to triple by 2060. Globally, only 9 percent of plastic waste is successfully recycled, according to OECD.

Nearly all of the plastic that gets recycled goes through a mechanical process involving sorting, grinding, cleaning, melting and remolding, often into other products. But mechanical recycling has its limits; it does not work for most kinds of plastic and what gets recycled, such as certain kinds of bottles and jugs, can only be recycled a few times.

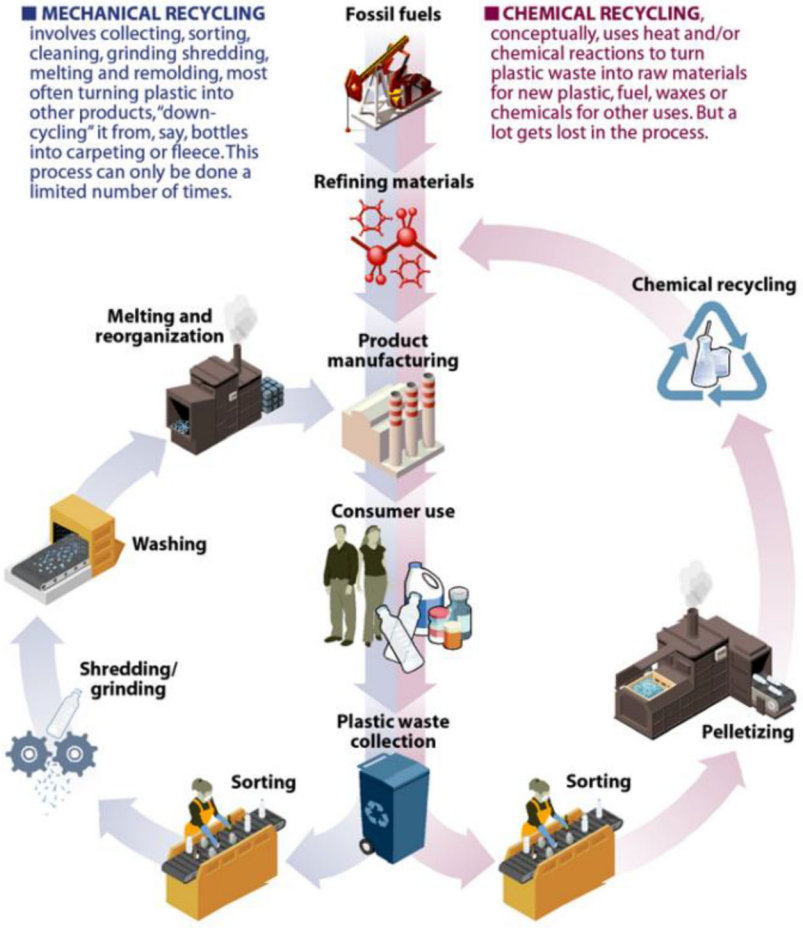
Chemical recycling consists of new and old technologies, hailed by the industry but seen as an unproven marketing ruse by environmentalists, that governments must now study and regulate if they are to successfully confront a menacing problem that spans the Earth and has even invaded our bodies with microplastic particles.

Recycling Plastics Mechanically or Chemically

Americans are recycling less than 6 percent of plastic of the plastic they use, and nearly all of that are plastics numbered 1 or 2, such as bottles and jugs, that are put through a mechanical process. The plastics industry is aggressively advocating for chemical recycling of plastic waste for a wider array of plastics (numbers 3-7) that are harder to recycle and are largely not being recycled. What's the difference?

MECHANICAL RECYCLING involves collecting, sorting, cleaning, grinding shredding, melting and remolding, most often turning plastic into other products, "down-cycling" it from, say, bottles into carpeting or fleece. This process can only be done a limited number of times.

CHEMICAL RECYCLING, conceptually, uses heat and/or chemical reactions to turn plastic waste into raw materials for new plastic, fuel, waxes or chemicals for other uses. But a lot gets lost in the process.



• *Companies are claiming they have technology to chemically recycle plastics 3 through 7, but environmental advocates point out that certain processes can only handle limited types of plastics, and commercially viable chemical recycling remains problematic.*

SOURCES: U.S. Government Accountability Office; The Last Beach Cleanup; ICN research

PAUL HORN / Inside Climate News

A Basel Convention committee met in the second week of December in Switzerland to debate whether the Basel treaty's technical guidelines should be updated to include chemical recycling, which is also sometimes referred to as "advanced recycling," and if so, under what terms.

The debate occurred within the framework of the Basel Convention and any language on chemical recycling that makes it into its technical guidelines will be seen as acceptable tools for managing plastic waste. The guidelines are likely to carry over into the negotiations over the next two years on an international treaty governing plastic pollution and ongoing plastics manufacturing.

Those treaty talks have barely begun, with a first negotiation session among delegates a few weeks ago in Uruguay.

The technical guidelines for the Basel Convention are supposed to represent the best available technology for protecting humans from various hazardous wastes, said Lee Bell, an Australia-based policy advisor for the International Pollutants Elimination Network (IPEN). He is also the co-author of a 2021 IPEN study that detailed how chemical recycling generates dangerous dioxin emissions, produces contaminated fuels and consumes large amounts of energy.

"Many parties and observers are of the view that there is no proof that chemical recycling is what you would call best available technology … or best environmental practice," he said.

The concern, he said, is that chemical recycling's inclusion in the technical guidance "becomes a sort of formal endorsement by the (Basel) convention, and therefore by the U.N."

It then would be possible for advocates of chemical recycling to point to the Basel technical guidance and say, "'let's just adopt those wholesale as part of the new plastics treaty,'" Bell said. "And I think this is exactly what's going on."

Stewart Harris, senior director of global plastics policy for the American Chemistry Council, said it's too soon to say what role chemical recycling might play in a global plastics agreement. But, he said, the Basel Convention technical guidance is important.

“The Basel Convention guidance on the environmentally sound management of plastic waste is a key resource for all countries looking to support the transition to a more circular economy for plastics,” Harris said. “Properly classifying chemical recycling will help governments assess how these technologies fit into national waste management plans.”

In a joint release with the International Council of Chemical Associations following the first round of plastics treaty talks, held Nov. 28 to Dec. 2 in Uruguay, the two industry groups favored an agreement that “moves nations closer to a future where plastics remain in the economy and not in the environment.”

Industry opposes caps on soaring plastic production, which Enck and other environmentalists say is the only way to ultimately solve the environmental crisis that is plastic waste and pollution.

Judith Enck, founder and president of the environmental group Beyond Plastics, speaking at a Bennington College seminar in August. Credit: James Bruggers

In the United States, the fight over chemical recycling has occurred in statehouses, local communities, in Congress and inside the Environmental Protection Agency. The American Chemistry Council, a leading industry advocate for chemical recycling, this year celebrated

adoption of legislation by 20 states over the past five years aimed at easing regulatory pathways for chemical recycling.

“The appropriate regulation of this is really critical if you want to scale advanced recycling, and you want to use more recycled material in your products,” Joshua Baca, vice president of plastics for the chemistry council, told Inside Climate News.

But plastics were never designed to be recycled, and environmental advocates have been fighting back, trying to block new chemical recycling facilities that have been proposed in various states across the country.

In Pennsylvania, a Houston start-up called Encina has proposed a $1.1 billion chemical recycling plant for plastic waste in Point Township that has left local officials and professors at Pittsburgh universities perplexed about whether the company’s plans were at all feasible. Nearby residents, meanwhile, worried about impacts to air, water and quality of life.

In northeast Indiana, Inside Climate News found Brightmark Energy struggling to get its chemical recycling facility, using a technology called pyrolysis, up and running. The company could not precisely say what percentage of plastic waste it would actually turn into fuel or plastic feedstocks.

Jay Schabel, president of the plastics division at Brightmark, stood amid some of what he

described as 900 tons of waste plastic at the company's new plant in northeast Indiana at the end of July. The plant is designed to turn plastic waste into diesel fuel, naphtha and wax. Credit: James Bruggers

And while Fulcrum BioEnergy does not market its waste-to-jet fuel plant proposed for Gary, Indiana, as chemical recycling, it would employ a similar technical process, gasification. Inside Climate News found that the company's plans to use municipal solid waste are complicated by an anticipated 30 percent plastic in its feedstock, which reduces carbon benefits and can gum up the production process. In Gary, an environmental justice community, residents have filed a Civil Rights Act complaint with the EPA against the state regulators who approved the Fulcrum air permit.

"Technologies that worsen the climate crisis, perpetuate a reliance on single-use plastics, and adversely impact vulnerable communities cannot be viewed as viable solutions moving forward," a group of 35 members of Congress wrote in July, urging the EPA to fully regulate chemical recycling emissions and to stop working to promote the technology as a solution to the plastics crisis.

A Global Solution

Plastic waste is a global problem and the countries of the world are working on a global solution.

In March, against the backdrop of what U.N. officials described as a "triple planetary crisis of climate change, nature loss and pollution," the United Nations Environmental Assembly voted to start two years of negotiations for a treaty to end global plastic waste.

At the Uruguay meeting, the discussion focused on a process for the negotiations and other preliminary matters. Early fault lines emerged. Some countries favored more of a bottom-up approach in which each of them would set their own goals, while others suggested a harder-line approach with global mandates.

The United States, a major plastics producer and consumer is advocating for a treaty that features national action plans, much like the 2015 Paris climate agreement. (The U.S. did not ratify the Basel Convention on hazardous wastes).

"Plastic pollution does not have a one-size-fits-all solution," a State Department official said in a written statement. "Many participants emphasized the importance of national action plans under a future agreement and the importance of allowing for country-driven approaches that reflect different national contexts."

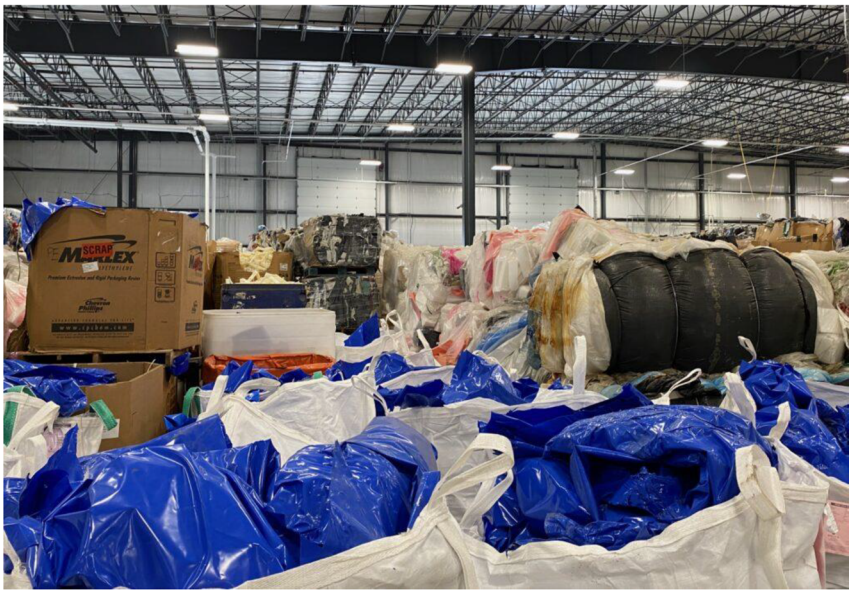
The U.S. approach amounts to "low ambition," said Neil Tangri, also from the Global Alliance for Incinerator Alternatives. "Every country is already doing what they want to do. The whole point of an international treaty is to get countries to go beyond what they want to do."

Scientists have also been weighing in on the proposed plastic waste treaty and chemical recycling.

"We know that we're using more than 10,000 chemicals in everyday plastic products," said Martin Wagner, a Norwegian University of Science and Technology associate professor of biology, who was among 13 scientists to jointly publish a letter in the journal Science, in November, urging plastics treaty negotiators to recognize the myriad of toxic chemicals that comprise plastic materials. "We know that 2,400 of those chemicals are actually classified as toxic and hazardous.

"Still, they're allowed to be used in everyday plastic products," said Wagner, who studies what plastics and endocrine-disrupting chemicals do to human and ecosystem health. "So we have clearly a shortcoming there with regards to regulating hazardous chemicals and plastics."

Wagner was also among nine scientists to write another letter in Science in April, advocating for a global cap on plastic production.



Baled and bundled plastic at the Brightmark chemical recycling plant in Indiana in July. The plant is designed to turn plastic waste into diesel fuel, naphtha and wax. Credit: James Bruggers
Capping plastic production will increase the price of making new plastics, and would then make recycling more economical, while helping to end plastic pollution, he said.

Chemical recycling likely needs to be in the mix of potential solutions, but it raises a lot of questions, Wagner said.

"It's unclear how (chemical recycling) would scale to deal with the mega- and gigatons of plastic waste that we are producing," he said. "And then there is the problem of chemical safety. And technically, I really don't understand how they would get rid of all those chemicals.

"That's why I'm cautious about promoting this chemical recycling as a silver bullet solution. It has a role to play but I am not sure how big of one."

Continuing the Negotiations, But with Skepticism

At the Basel Convention meeting in mid-December in Switzerland, environmental groups watched closely as a committee worked on language for the proposed new section on chemical recycling. Those conversations were kept confidential.

Environmental groups such as the International Pollutants Elimination Network, the Global Alliance for Incinerator Alternatives and the Basel Action Network have tried, without success, to keep the committee from including chemical recycling in the technical guidelines.

Another Basel working group will pick up the talks in February, before delegates from countries that are parties to the Basel treaty meet in May, where the technical guidelines could be resolved.

For now, however, records from the technical committee meeting show language inserted to interject a measure of skepticism about solutions from chemical recycling. For example, one change notes that "further scientific evidence for the ecological and economic benefits is still necessary for final evaluation."

Even the United States, which is not a party to the Basel Convention but participates in an advisory role, urged cautionary language around chemical recycling in the Basel technical guidelines.

"Given the uncertainty about the environmental impacts of chemical recycling and the role the technology can play in addressing plastic waste, we support the guidelines highlighting that further evidence is needed to assess the life cycle impacts of chemical recycling processes and demonstrate commercial viability," a U.S. official suggested.

Plastic recyclers in Europe offer a mixed assessment of chemical recycling.

"Chemical recycling could have the potential to build upon mechanical recycling processes if it can treat the waste which currently cannot be mechanically recycled into high-quality plastics," said Emilia Tarlowska, a spokeswoman for Plastics Recyclers Europe, a group representing European recyclers that closely follows the U.N. deliberations.

But she also said that “chemical recycling is in its infancy” and barely out of the “laboratory.”

“It is perhaps too early to tell if these technologies have the potential to significantly contribute to the challenges presented by plastics waste,” she said.

For its part, the U.N. Environment Program, in a document prepared in advance of the plastics treaty talks in Uruguay, identified chemical and mechanical recycling as two main ways for “closing the loop of plastics in the economy,” or getting away from a linear “take-make-waste” model.

“Chemical recycling includes a wide array of technologies that for the most part are not yet proven at scale,” the text said. “Chemical recycling tends to be energy intensive and should only be used when the overall environmental profile is comparable to or better than other proven management options.”

James Bruggers

Reporter, Southeast, National Environment Reporting Network

James Bruggers covers the U.S. Southeast, part of Inside Climate News’ National Environment Reporting Network. He previously covered energy and the environment for Louisville’s Courier Journal, where he worked as a correspondent for USA Today and was a member of the USA Today Network environment team. Before moving to Kentucky in 1999, Bruggers worked as a journalist in Montana, Alaska, Washington and California. Bruggers’ work has won numerous recognitions, including best beat reporting, Society of Environmental Journalists, and the National Press Foundation’s Thomas Stokes Award for energy reporting. He served on the board of directors of the SEJ for 13 years, including two years as president. He lives in Louisville with his wife, Christine Bruggers.

INDONESIA IS ACTUALLY PAYING FISHERMEN TO PULL TRASH OUT OF ITS WATERWAYS: ‘THIS WILL RAISE AWARENESS’

Within the next three years, Indonesia plans to reduce the plastic pollution entering its waterways by 70%.

By Ben SternNovember 30, 2022

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Indonesia’s fisheries ministry will be trying out a new program to keep its waters clean of debris and plastic, as reported by Mongabay.

The new program will offer fishermen across all of the nation’s major islands roughly 150,000 rupiah (around $10) per week, as long as they collect at least four kilograms (around 9 pounds) of plastic from the water. While this is not a lot of money, it is more than what many earn from fishing.

The country announced the program on Oct. 4 amid efforts to improve its environmental image and protect its marine ecosystems.

Indonesia, which is the fourth most populated country in the world, is a major contributor to ocean plastic, but if its efforts are successful, it

won't be for long. Within the next three years, Indonesia plans to reduce the amount of plastic pollution going into its waterways by 70%.

Marine plastics are an increasing problem for ocean ecosystems around the world. One recent study from Stanford University found that blue whales are actually consuming as much as 10 million microplastics every single day.

Considering that plastic products harm sea life and can take hundreds of years to break down, there need to be more efforts to reduce the pollution in our waters.

Meanwhile, the Great Pacific Garbage Patch is still an enormous problem, with some groups estimating it to contain around 1.8 trillion pieces of floating plastic. So while Indonesia will not be able to solve its plastic pollution issues with this program alone, it is a good step.

Sakti Wahyu Trenggono, who serves as Indonesia's Fisheries Minister, explained at a press conference that while this program isn't sufficient to solve the marine plastics problem, "this will raise awareness among the stakeholders at sea and the people around the world."

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The microplastics consumed by blue whales pose a greater risk to their health than was previously thought, say scientists
ALAMY

ENVIRONMENT

Blue whales 'swallow ten million pieces of plastic a day'

Rhys Blakely, Science Correspondent

Tuesday November 01 2022, 3.00pm GMT, The Times

Blue whales may swallow as many as ten million pieces of plastic in a day, a study has found.

Research suggests that the whales, which can weigh 150 tonnes, consume more microplastics — fragments and fibres smaller than 5mm — than any other animal. The findings mean that ocean pollution poses a greater risk to the health of the world's largest creatures than was previously thought.

The study drew on data on the feeding behaviour of 191 blue, fin and humpback whales, which were tagged and tracked as they foraged off the coast of California. Blue whales live off krill, tiny shrimp-like crustaceans, while fin and humpback whales also eat fish. All three species feed by opening their mouths as they travel at high speed beneath the surface of the ocean, swallowing up vast amounts of water and prey.

Humpback whales also eat fish but blue whales live off krill alone, which take in vast amounts of plastic

In one pass, a blue whale can gather up a volume of krill-laden slurry as large as its own body. The water is then drained off via their baleen — a filter system inside their mouths — leaving the krill behind to be digested.

Researchers from Stanford University found that the whales fed mainly at depths of 50-250 metres, which was where the most microplastics were found in the open ocean. The scientists estimate that almost all the microplastics that the whales consume come from the creatures that they eat, not from the enormous volumes of seawater that they gulp.

"They're lower on the food chain than you might expect," said Matthew Savoca, a postdoctoral scholar at Stanford's Hopkins Marine Station in California. "There's only one link: the krill eat the plastic and then the whale eats the krill."

Humpback whales subsisting primarily on fish such as herring and anchovies ingest an estimated 200,000 pieces of microplastic per day while those eating mostly krill ingest at least one million pieces, the researchers estimate in the study, published in Nature communications.

Scientists logged the feeding behaviour of 191 blue, fin and humpback whales, which were tagged and tracked off the Californian coast

Fin whales, which feed on both krill and fish, ingest an estimated three million to ten million microplastic pieces per day. Consumption rates are likely even higher for whales foraging in more polluted regions, such as the Mediterranean, Savoca said.

Shirel Kahane-Rapport, who led the research, said that the concern is that microplastics make the whales' diets less nutritious. Chemicals added to plastics may also be toxic. "We need more research to understand whether krill that consume microplastics grow less oil-rich, and whether fish [are] less meaty, less fatty — all due to having eaten microplastics that give them the idea that they are full," she said.

"This would mean that each energetically expensive feeding lunge made by a whale may reap fewer calories than it should — a price that an animal that measures twice the length of a double-decker bus may not easily be able to afford."

She added: "If patches are dense with prey but not nutritious, that is a waste of their time, because they've eaten something that is essentially garbage."

Whales are not alone in consuming plastic, which was first reported in marine food webs 50 years ago and has now been found in at least 1,000 species. "The unique concern for whales is that they can consume so much," Savoca said.

Senator MERKLEY. Additionally, Senators will be allowed to submit written questions for the record through close of business on Thursday, December 29th. We will compile the questions, send them out to all of you. We ask that you try to get replies in by Thursday, January 12th, in the new year of 2023, a year in which we will all dedicate ourselves to make our communities, our States, our country and the world a better place.

With that, I adjourn the last hearing of 2022.

[Whereupon, at 11:46 a.m., the hearing was adjourned.]