Committee Meeting

Of

SENATE ENVIRONMENT AND ENERGY COMMITTEE

ASSEMBLY ENVIRONMENT, NATURAL RESOURCES, AND SOLID WASTE COMMITTEE

"The Committees will meet to discuss the issue of plastic pollution. The Committees will jointly receive testimony from invited guests on the extent of plastic pollution in the State, its potential and actual effects on human health, and methods that may be used to protect against, or to mitigate, the negative effects of plastic pollution on human health and the environment"

LOCATION: Committee Room 4
State House Annex
Trenton, New Jersey

DATE: April 22, 2024
10:00 a.m.

MEMBERS OF COMMITTEE PRESENT:

Senator Bob Smith, Chair
Senator Linda R. Greenstein, Vice Chair

Assemblyman James J. Kennedy, Chair
Assemblywoman Shavonda E. Sumter, Vice Chair
Assemblywoman Alixon Collazos-Gill
Assemblywoman Garnet R. Hall
Assemblywoman Andrea Katz
Assemblyman Michael Inganamort

ALSO PRESENT:

Eric Hansen
Adaline B. Kaser
Office of Legislative Services
Committee Aides

Celia Smits
Senate Majority
Committee Aide

Greg Harris
Senate Republican
Committee Aide

Elizabeth Theodore
Assembly Majority
Committee Aide

Natalie Ghaul
Assembly Republican
Committee Aide

Meeting Recorded and Transcribed by
The Office of Legislative Services, Public Information Office,
Hearing Unit, State House Annex, PO 068, Trenton, New Jersey

Bob Smith
Chair

Linda R. Greenstein
Vice-Chairwoman

John F. McKeon
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NEW JERSEY STATE LEGISLATURE

SENATE ENVIRONMENT AND ENERGY COMMITTEE

STATE HOUSE ANNEX • P.O. BOX 068 • TRENTON, NJ 08625-0068
www.njleg.state.nj.us

COMMITTEE NOTICE

TO: MEMBERS OF THE SENATE ENVIRONMENT AND ENERGY COMMITTEE

FROM: SENATOR BOB SMITH, CHAIR

SUBJECT: **COMMITTEE MEETING - APRIL 22, 2024**

The public may address comments and questions to Eric Hansen, Committee Aide, or make bill status and scheduling inquiries to Pamela Cocroft, Secretary, at (609)847-3855, fax (609)292-0561, or e-mail: OLSAideSEN@njleg.org. Written and electronic comments, questions and testimony submitted to the committee by the public, as well as recordings and transcripts, if any, of oral testimony, are government records and will be available to the public upon request.

The Senate Environment and Energy Committee and the Assembly Environment, Natural Resources, and Solid Waste Committee will meet jointly on Monday, April 22, 2024 at 10:00 AM in Committee Room 4, 1st Floor, State House Annex, Trenton, New Jersey.

The committees will meet to discuss the issue of plastic pollution. The committees will jointly receive testimony from invited guests on the extent of plastic pollution in the State, its potential and actual effects on human health, and methods that may be used to protect against, or to mitigate, the negative effects of plastic pollution on human health and the environment.

Issued 4/15/24

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NEW JERSEY STATE LEGISLATURE

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COMMITTEE NOTICE

TO: MEMBERS OF THE ASSEMBLY ENVIRONMENT, NATURAL RESOURCES, AND SOLID WASTE COMMITTEE

FROM: ASSEMBLYMAN JAMES J. KENNEDY, CHAIR

SUBJECT: **COMMITTEE MEETING - APRIL 22, 2024**

The public may address comments and questions to Adaline B. Kaser, Committee Aide, or make bill status and scheduling inquiries to Stephanie Cenneno, Secretary, at (609)847-3855, fax (609)292-0561, or e-mail: OLSAideAEN@njleg.org. Written and electronic comments, questions and testimony submitted to the committee by the public, as well as recordings and transcripts, if any, of oral testimony, are government records and will be available to the public upon request.

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SENATOR BOB SMITH (Chair): Welcome everyone to the *two* most interesting committees in the Legislature -- Assembly Solid Waste and Senate Energy and Environment.

Before we get started, let me introduce my members.

Senator Greenstein was *just* here -- are you here, Senator Greenstein?

UNIDENTIFIED SPEAKER: (indiscernible)

SENATOR SMITH: Oh, she's getting coffee. That's-- That's definitely a permitted absence.

And, Senator McKeon is out of state, I believe, traveling. And, then, the two members from the minority party said they would look today.

Chairman Kennedy, how about I turn it over to you and you can introduce your members.

ASSEMBLYMAN JAMES J. KENNEDY (Chair): OK.

Well, it's a pleasure to be here, I can tell you that.

And, I'll let my members introduce themselves, because I'm not sure which ones are my members anymore. (laughter)

I think I only have one.

UNIDENTIFIED SPEAKER: No, you actually have (indiscernible)

Oh, OK.

ASSEMBLYWOMAN SHAVONDA E. SUMTER (Vice Chair): Assemblywoman Shavonda Sumter, Vice Chair of the Committee.

Always good to be here with our Senate counterparts.

ASSEMBLYWOMAN COLLAZOS-GILL: Assemblywoman Collazos-Gill. I am in the 27th Legislative District.

ASSEMBLYWOMAN HALL: Good morning.

Assemblywoman Garnet Hall; 28th District.

ASSEMBLYWOMAN KATZ: Assemblywoman Andrea Katz, the 8th Legislative District.

ASSEMBLYMAN INGANAMORT: Good morning.

Assemblyman Mike Inganamort, the 24th Legislative District.

Thank you, Chairs.

SENATOR SMITH: So, the point of today's hearing is to bring New Jersey citizens up to date on the growing threat to the health of our citizens as well as the environment.

When people think about plastics, they think about the ocean of -- almost a continent -- of plastics in the Pacific Ocean. They're not really thinking so much about human health.

And, what we've been finding out over the years, if we took any of the Assembly people to the hospital here in Trenton and we had a blood test done on you, guess what's going to be in your blood? And, *Star-Ledger* recently did articles about brain surgery, where the brain surgeon is finding plastic particles in our brains. Rutgers just completed a study saying plastic particles are in our bottled water. And, I thought we were buying the bottled water because it had some exceptional level of purity.

Anyway, we're going to hear about all that today. And, my partner in the Assembly, Assemblyman Kennedy, has indicated this is a very important topic to him and the Assembly as well.

Anything you'd like to say, Jim?

ASSEMBLYMAN KENNEDY: No, I don't really have anything to add to that; that's fine.

SENATOR SMITH: All right, so--

ASSEMBLYMAN KENNEDY: Let's get going.

SENATOR SMITH: We have one pre-meeting order of importance, and that is the presentation of the Joint Legislative Resolution by all of us to Gary Sondermeyer. Gary is the good-looking guy with the almost perfect haircut.

Gary has been a major leader in New Jersey on environmental issues. And, one of the reasons for that is that he spent many decades with the New Jersey Department of Environmental Protection, and was a major leader in the Department. And, when he retired from the DEP, he then joined the largest recycling -- one of the major recycling entities in New Jersey, Bayshore, who are also very, very pro-environment in everything that they do.

With Chairman Kennedy's indulgence, I am just going to take a couple of excerpts out of the Joint Resolution.

Whereas, the Senate, General Assembly, and the State of New Jersey are pleased to salute Gary Sondermeyer, highly esteemed member of his community, on the felicitous occasion of his retirement from an illustrious career in the environmental sector that has spanned more than 40 years -- a whole bunch about his birth and growing up and all that. But, also, he was the Assistant Commissioner in the DEP's permitting programs; he was the DEP's lead for Homeland Security; and he was the Director of Solid Waste and the Recycling Programs. Thirty-year tenure with the DEP. Real, serious public service.

Whereas, widely admired for his tireless work ethic; his unwavering professionalism; and his thorough command of State processes

and procedures regarding sustainability, waste reduction, recycling, and more; this consummate public servant has lent his considerable expertise as the Chair of Sustainable New Jersey and its Waste Management Taskforce; as Vice Chair of the New Jersey Plastics Advisory Council; and as an active member of several prominent boards and commissions.

And, he has uplifted and inspired the next generation of environmental trailblazers through his efforts to create a sustainable New Jersey Schools Program, and through his mentorship of countless students and young professionals.

You've done a great job for all of us, and the resolution goes on to say the Senate and the Legislature -- the Assembly -- recognize all those efforts, and Assemblyman Kennedy and I have a very nice framed resolution to present to him.

Should we do that right now?

ASSEMBLYMAN KENNEDY: Sure.

SENATOR SMITH: Gary, come on up, get the resolution and a handshake and a cheer.

(audience applause)

Somebody should get a picture.

Gary, come on in between the two of us.

G A R Y S O N D E R M E Y E R: Thank you, sir, this is absolutely amazing.

SENATOR SMITH: Well, it's true.

MR. SONDERMEYER: Thank you, sir.

SENATOR SMITH: I'm wondering where the time goes.

So, it's official: Gary Sondermeyer is hereby recognized for his great work on behalf of New Jersey's environment.

And, somebody should get a picture.

MR. SONDERMEYER: I'm stunned.

SENATOR SMITH: OK, it's Chairman Kennedy and my intention to bring forward witnesses who can update the State of New Jersey on our current plastic situation.

We have four witnesses who we want to put up. The first one is Shanna Swan, but she asked if she could go last.

So, next in the batting order is Dr. Phoebe Stapleton, Associate Professor at Rutgers University, the Ernest Mario School of Pharmacy. By way of her background, she of course has a Ph.D.; she is currently an Associate Professor at the Rutgers University Ernest Mario School of Pharmacy. Her lab research focuses on identifying how particles inhaled during pregnancy may affect an expectant mother, developing fetus, and health of the next generation. She was recently involved in a landmark study that found a strikingly large number of nanoplastics -- which are smaller than microplastics -- in bottled water.

Dr. Stapleton, you are already at the fore. You don't have to swear. You don't have to have-- This is not sworn testimony, but we really are very respectful of what you're doing and being here today.

So, with Chairman Kennedy's OK, please take it away. Tell us what we're looking at.

P H O E B E S T A P L E T O N, Ph.D.: Thank you, Senator Smith, and your office, for inviting me to speak this morning.

And, thank you, Chairman Kennedy, for this opportunity.

And, thank the members of both the committees of the Senate Environment and Energy Committee, and the Assembly Environment and Natural Resources and Solid Waste Committee, for your time and attention this morning.

So, I have been asked to speak today regarding our work in micro- and nanoplastics, and the impacts of plastic pollution and human health.

So, first, I would like to begin this session with a definition of micro- and nanoplastics.

Microplastics are a small piece of plastic, less than 5 millimeters of a single dimension. These particles, or fragments, may be of any type of plastic, and may be seen with the naked eye. These are often described as the size of or smaller than a sesame seed or a grain of sand. And, in the handout I provided earlier, you can see these on Figure 1 in the back of the handout. Now, in fact, we've all been exposed to microplastics this morning, in the form of our toothbrush bristles.

Nanoplastics have two definitions, depending on -- depending on their source. In environmental studies, nanoplastics are defined as particles that are less than 1,000 nanometers, or one micron in size. This is beneath the level of detection with the naked eye. Furthermore, nanoparticles -- or nanoplastics -- in a laboratory setting are defined as particles less than 100 nanometers in a single dimension. Now, this is an important nuance, as the particles that are less than 100 nanometers have specific and unique characteristics and properties at this size, including the capability to cross biological barriers.

And, the question is, "Where are they coming from?" So, the majority of microplastics are released from larger products. These may include plastics from environmental sources, including tire wear; incineration or landfill; and plastic waste. The primary wearing of bulk products to microplastics is through mechanical wearing and UV and thermal stresses. These weaken and fracture the products. Nanoplastics are produced from the breakdown of microsized plastics. Plastics are initially produced through a series of chemical reactions. This unites a single monomer to a multi-chain polymer.

Now, it's because of these chemical reactions these cannot easily be broken back down to their monomer form. And, therefore, any breakdown or degradation of both products not only produces smaller micro-sized plastics, but, furthermore, nano-sized plastics. Which means they're not truly gone, and return back to their -- excuse me -- return back to their monomer form.

Now, microplastics have been found, as Senator Smith alluded to, on all continents and in all landscapes. They've been found in urban air, glacier water, and remote locations. These are not only concerns of "other places," but, here in New Jersey, scientists at Rutgers University have identified microplastics within the Raritan and the Passaic rivers, and the locations of where they've been identified can be found in Figure 2. Scientists have identified stormwater as a primary contributor to those found in the Raritan and Hudson estuaries.

Of equal concern, microplastics have also been measured in indoor air. These measures can often be more than 100 times greater than the measures in outdoor air.

Microplastics have also been identified in food and beverage sources. These are not limited to highly processed foods as one may assume, but they can be identified within the source products as well. This includes not only the well-identified ocean-based products, including the oysters and fish on the coast of New Jersey, but also includes the pollens to make honey, farmlands for agriculture, and water for irrigation as well. These products include tap water; bottled water; beer; wine; sea salt; honey; rice; a variety of different produce products, including apples and carrots; and a variety of protein sources as well, both meat-based and vegetable-based.

Nanoplastics or plastic particles are at least 1,000 times smaller than a microplastic particle. As microplastics have been identified in environmental and domestic settings, it is likely that nanoparticles persist in these settings as well. However, because of their small size, nanoplastics are exceedingly difficult to identify, visualize, and quantify. Only very few studies have measured nanoparticles within the environment or consumable products.

Recently, our collaborative group with Columbia University identified hundreds of thousands of nanoplastic particles within three brands of commercially available bottled water using a specialized microscope. It is notable that many of these nanoplastics were not derived from the packaging of this bottled water, nor the cap, but were identified as sources that were upstream before the water even reached into the bottle -- likely from filtration sources or from the source water itself.

Prior to our work, the National Institute of Standards and Technology have found the use of common disposable consumer products -- including tea bags and hot container cups -- found that these uses of these

products could release trillions of nanoplastic particles into that single-use product *during* that single use of the product. And, the temperature to which they are used could vary this concentration greatly.

Given this, it is clear that humans are exposed to micro- and nanoplastics through dermal, or skin; inhalation, or lung; and ingestion, or gut routes. Of greater concern, micro- and nanoplastics do not stay at or within the site of exposure. To date, plastic particles have been identified in the human lung; human liver; human kidney; urine; feces; heart; placenta; blood; and breast milk. Trends with human tissues have identified an increase in this particle deposition as well.

Recently, placental samples that were saved in the state of Hawaii and acquired over the last 15 years were evaluated for microplastic contamination. You can find this figure as Figure 3 in the handout. These studies identify that in 2006, only 60% of the samples contained microplastics -- only 60% of the samples. That rose to 90% in 2013, and 100% of the samples that were analyzed from pregnancies in 2021.

In animal models, we and others have recapitulated these findings. Not only have micro- and nanoplastics been identified throughout the organs of rodent models of exposure, but, concerningly, micro- and nanoplastic particles have been identified within the brain, kidney, lung, and liver after exposure via drinking water. My laboratory has identified nanoplastic particles within the placenta and fetal tissues. These include the lung, heart, kidney, liver, and brain of rat samples within 24 hours after exposure through either ingestion or pulmonary routes.

Further, our preliminary studies indicate that these particles persist and can be identified in the offspring for a minimum of six months --

a minimum of six months because we haven't analyzed the samples past that time point. Therefore, this bio-accumulation presents a significant concern for the next generation.

To date, few studies have identified a link between micro and nanoplastic exposure, or deposition directly to human health outcomes. And, this is the linchpin that we need in our studies. Recently, two studies have identified a positive correlation or association with microplastic particles and human health outcomes. These centralize around the state of inflammation within the system.

The first had identified that individuals who have significant amounts of microplastics within their fecal matter was associated with an increased severity of inflammatory bowel disease in these patients.

Second and most recently was a study that came out of the *New England Journal of Medicine* in March of 2024. The deposition of micro- and nanoplastics within the carotid plaque of cardiovascular-disease patients was correlated with increased inflammation within the site in the coronary artery and, furthermore, increased risk of cardiovascular episodes within these patients. Studies are currently ongoing to identify the doubt -- the dose, excuse me -- the route of exposure; the type of plastics found within these samples; and the cellular interactions that may lead to the greatest toxicities.

I will leave you with a number of closing points. First, according to the United Nations Environment Program, 9.2 billion tons of plastic was made between 1950 and 2017. In 2022, it was estimated that 400 million tons of plastics are produced per year. These production rates are estimated to continue to increase exponentially, leading to the production of 590 million tons per year by 2050. That's a 30% increase between 2025 and

2050. These products will inevitably be discarded, break down, and continue to collect within the environment and within human tissues as micro- and nanoplastic particles.

Sample collections or filtrations have often included netting with pores approximately 333 microns in size. This allows for the passage of all nano-sized particles. Thus, the studies underrepresent the number of micro- and nanoplastic particles within the environment and within the original samples.

Plastic has the capability to absorb and release additionally carried chemicals. These then can be highlighted, as the plastic material may be a vector for additional toxicants. These chemicals may be added during the production of plastic -- these are identified as plasticizing chemicals -- which have been identified as endocrine-disrupting compounds, including BPA and phthalates and PFOAs. They may also collect other toxicants due to their interaction during the product life cycle. This may be carbon-based products, metallics, or other organics during incineration or energy recovery attempts.

Overall, micro- and nanoplastics are ubiquitous and pervasive. These products and particles have been found everywhere scientists have looked. If there's a location, product, or tissue that has not yet been identified, it is likely that this product or tissue has not yet been examined. We know that these particles are entering our environment and entering our bodies. We do not yet understand how, if, or when they may be eliminated from our bodies. Therefore, bio-accumulation of micro- and nanoplastics over one's lifetime, including that of fetal development, is of great concern.

Federal and State support is paramount to unravel the human health concerns of micro- and nanoplastic particle exposure.

I thank you each for your time and attention this morning.

SENATOR SMITH: That was very shocking news.

That-- What was the figure you used for plastics production? The huge figure?

DR. STAPLETON: The huge figure of current time?

SENATOR SMITH: I remember the words "billions of tons."

DR. STAPLETON: Yes, from 1950 to 2017 -- 9.2 billion tons of plastics have been produced during that time period.

However, in 2022, 400 million tons of plastics were to be produced in that year.

SENATOR SMITH: Right.

And, I'm probably going to say this for Gary Sondermeyer, but my understanding of the rate of recycling in Western countries -- we're not talking about Asia, Africa, wherever -- the Western countries is 9%.

So, take all those billions and millions of tons -- 90, over 90% of it is in the environment and working its way down to microplastics and nanoplastics. And, it's not just us, it's fish, it's everything.

But, the good doctor is open for questions. Any questions?

Yes, ma'am.

ASSEMBLYWOMAN KATZ: So, when you're talking about the--

SENATOR SMITH: You might want to hit your mic.

ASSEMBLYWOMAN KATZ: Sorry. I forget that my voice isn't quite that loud.

When you were talking about the microplastics in the air, would air-filtration systems like those of the schools and public facilities that were upgraded during COVID, would they filter out those particles within the air?

DR. STAPLETON: They would filter out a portion of the micro-sized plastics. Unfortunately, even the HEPA-sized filters have a struggle filtering out those nano-sized plastic particles, just because of the size and diameter of that range.

ASSEMBLYWOMAN KATZ: Thank you.

DR. STAPLETON: One other point -- I'm sorry -- additionally, many times those filters are often made out of plastic materials themselves. So, with the wear of those filters, there's a concern to add to those filtrations as well.

SENATOR SMITH: Thank you so much for your participation today.

Chairman Kennedy.

ASSEMBLYMAN KENNEDY: OK, next we have Gary Sondermeyer, Vice President of Operations at Bayshore Family.

SENATOR SMITH: There is a request to move the microphone as close to your mouth as possible so everybody can hear.

G A R Y S O N D E R M E Y E R: Let me turn this on.

Is that right? You hear me OK?

Terrific.

Well, good morning, Chairman Smith, Chairman Kennedy, esteemed members of the Joint Committees. Happy Earth Day.

It is certainly an honor to be here.

Gary Sondermeyer, Vice President of Operations for Bayshore Recycling in Woodbridge Township.

And, today, I have the honor or representing the Association of New Jersey Recyclers to speak about how recycling helps to mitigate the impacts and reduce the amount of virgin petrochemical used in plastic manufacturing.

Plastics recycling in New Jersey is highly effective -- highly effective. Through the Recycling Enhancement Act as well as DEP regulations, we have among the most detailed databases on recycling at the State level, county level, and municipal level, with information -- tonnage information calculated every single year. I don't know of any other state that does that.

From that database, our most recent data year tells us we recovered 113,000 tons of plastic containers and 14,000 tons of plastic scrap, for a total of 127,000 tons of plastics that take away from the need for virgin material manufacturing. So, highly, highly effective.

We achieved an overall 75% container recycling rate in New Jersey -- that's all containers, glass, aluminum, plastics -- and a 57% container recycling rate. And, this trend in plastics recycling is very consistent. I looked at the data from DEP over the past five years and we averaged 133,000 tons of plastics recovered per year during that time.

From a climate perspective, according to U.S. EPA -- I'll throw out a metric from EPA -- approximately 1.67 metric tons of carbon dioxide equivalents are avoided for every ton of municipal solid waste recycled. And, from a plastics standpoint, for every pound of recycled PET or Number 1

plastic flake used in lieu of virgin petrochemical (indiscernible) greenhouse-gas emissions are reduced by 71%, which is a very impressive statistic.

As general background, which you know very well through our Legislature, we're the first state in the country to adopt mandatory recycling 37 years ago back in 1987. And, one of the amazing things in New Jersey is almost every single town -- 564 towns and 9.2 million people -- have access to curbside collection. It's really important, because recycling is about convenience for people, and getting everyone to participate in that. Our 21 counties all require the recycling of Number 1 and Number 2 plastics -- it's mandated -- and many -- and, we're approaching most -- also require the recycling of Number 5 polypropylene plastic as well.

And, where does this material go? New Jersey, over time, has built an infrastructure of some 23 -- they're called "intermediate processing facilities," the acronym of art that is commonly used is a MRF. We have 23 MRFs; Bayshore is a MRF. What a MRF simply does is takes back apart what you mix together in your kitchen or your garage and then sends that material, separated, as individual commodities out to markets.

There's been a lot of rhetorical information in the media that I really want to address that recycling isn't real; that material simply is collected and goes in the garbage. And, I'm sure you hear this from your constituents. It is utter nonsense and economically absurd. And, I want to give you an example.

I work for Bayshore. We take curbside material from about 60 New Jersey towns -- aggregate population of 1.2 million people, about 15% of the state's population. Again, we take all that stuff back apart and we send it out to markets. The average cost of disposal at disposal facilities, landfills,

and incinerators, is $90 a ton. If we took that stuff and were disingenuous and we sent it for disposal, it would cost Bayshore $125,000 a week -- or, $500,000 a month; $6 million a year. That's a quick pathway to bankruptcy. Absolutely does not happen -- doesn't happen at all.

Plastics, in fact, are the highest revenue for MRFs next to aluminum. Aluminum is Number 1, but after aluminum it's plastics. They are highly valuable to recyclers. The average revenue for plastic containers exceeds $300 per ton, and that metric comes from one of our public MRFs. So, here's the choice: If it weren't recycling material, we'd be paying $90 a ton versus getting paid $300 a ton. Assertions that recycling isn't real are absurd. And, it's a big country, maybe it's different in other states. That's not what we do in the State of New Jersey. This material is getting recycled.

I would like to turn quickly to waste reduction. Waste reduction, as we know, is the highest element within the hierarchy of sustainable-materials management. And, this is where we have to do more in particular. EPA has an amazing line graph on their sustainable-materials management website, and it shows just about 60 years of data which shows that solid waste generation -- material generation -- has continued to increase. Every one of those nearly 60 years. This is where we need to make a difference, and there's some really creative waste-reduction strategies nationally and in-state, but, unfortunately, they're not yet at scale. And, this is where we need to go. To supplement, again, reducing the amount of material that we need to make from virgin petrochemical feed stocks.

So, one of the other honors that I have is serving as Vice Chair the last two years of the Governor's Plastics Advisory Council. And, we really took this issue of waste reduction up this year and studied it. And, what we

did -- which was really interesting -- one of my colleagues, Nandini Checko from NJEC, New Jersey Environmental Commissions, and I convened 34 national and State experts in the area of waste reduction to see what specific things we could do. We focused on things like -- a lot of it is very fundamental -- disposable-free dining. We have nearly 20,000 restaurants in the State of New Jersey. We should have no single-use plastics that are used. That should be a common goal that we strive for. We should have zero-waste events, in particular looking at government-sponsored events where we don't need to generate any waste. We also looked at opportunities for plastic waste reduction in schools -- 3,200 schools in New Jersey; we shouldn't be generating plastics. We shouldn't be buying plastics, if possible, from these schools. Also, opportunities in businesses and in government facilities.

So, our second-year report of the Plastics Advisory Council should be finished in a month or two. And, one of the things that was very obvious to us, and this will probably be one of our recommendations, is to form an ongoing waste-reduction steering committee as part of the Plastics Advisory Council, to really focus and drill in on things we can do to push the envelope on waste reduction. We also will hopefully be identifying some short- and long-term strategies that this steering committee can consider working -- but not out of DEP, so the committee would be making recommendations to DEP. And, some of them certainly will lend themselves, I believe, to coming forward to your committees to talk about potential legislation to push the envelope on waste reduction.

So, in closing, I do want to focus on the need to do better and recycling -- flipping back to recycling. We certainly recognize we need to do better. Your committees have done some absolutely amazing things -- the

recycled content legislation, that we hit some important milestones, I think it was January 18 when the initial targets came in for the recycled content numbers. When we testified, Senator Smith, I think I testified (indiscernible) saying that this is the most important piece of recycling legislation since the mandatory law was first enacted. Very, very, important, so we need to track and follow that.

Another thing that your committees did is pass a law to create a Recycling Market Development Council. That body did its work; it produced a report in April of 2022. There were 15 very specific recommendations. I'm certainly not going to go through the recommendations, but I did want to just touch upon some of the areas where we need to improve.

First one is statewide recycling education. Recycling is still confusing. It's too confusing. We need to make it simpler. And, we need to do that through statewide education.

Second thing we're contemplating and looked at through ANJR and some stakeholder discussions is creating one uniform list of what's required for recycling in New Jersey. The allegation is we have 21 different lists. That's a little bit overplayed. The lists are very similar. But, they are a little different, and it does lead to confusion, so we're really looking at trying to develop a platform for having one uniform list. Three states have done this, and they're really good models that we've been looking at -- in particular, Colorado, Oregon, and Connecticut.

Another area that we've been focusing on in stakeholder discussion is truth in labeling. And, truth in labeling kind of goes hand in hand with a uniform list. You know, it's all about the chasing hours, whether

they make sense and we should not have them anymore. So, we're trying to look at those two public policy issues at the same time together.

Financial-assistance programs -- we used to have really aggressive -- progressive, I'm sorry -- financial-assistance programs through the Recycling Enhancement Act, that sunset, to build additional recycling infrastructure and to improve it and to make it better. That's another area that I think we need to focus on. And, really, the game changer for changing the whole platform of recycling and waste reduction in the State will be extended producer responsibility.

ANJR has come to the table, Senator Smith, at each of your hearings, to testify in support of EPR. I really think this is an absolutely critical element for us to focus on -- in particular, the needs-assessment component, to understand our full system before we go forward with EPR legislation.

So, in closing, there's really no question that recycling is a core element of fighting plastic pollution and displacing significant amounts of our virgin petrochemical feedstock. And, we look forward to continuing to work with the Legislature; with the DEP sister nonprofit organizations; to push the envelope to improve our system and reduce plastics.

Thank you.

Any questions, I can probably answer.

SENATOR SMITH: We have a lot of questions.

First of all, we're looking forward to the Plastics Council's recommendations. They have a very distinguished crew, including the Chair, Cindy Zipf, on that crew. I think the product of your deliberations are going to be very much sought after by the Legislature.

Now, that being said, in some states where they have plastic bottle deposit legislation, the rates of recycling plastic are at least five times more than the State of New Jersey. And, I'm talking about the 9% figure versus over 60%. Should we be thinking about plastic bottle deposit legislation?

MR. SONDERMEYER: The position of ANJR is absolutely not.

We think that a bottle bill would basically dismantle the system that we currently have in New Jersey. We simply built a different system, Mr. Chairman, and I'm sure you know this. Back when our mandatory law went in place, seven out of the 10 bottle-bill states already have bottle-bill legislation. It is far more limited. It deals with, essentially, bottles and cans. Bottles and cans are 13% of what we recycle.

The determination in '87 by the Legislature is we should do something far more comprehensive; we should focus on total recycling. And, that's what we do. Two-thirds of all recycling is fiber. And, what I mean by fiber -- it's cardboard; paper; junk mail; all that stuff. That's really important for climate as well. Very important, you know, we need our trees -- carbon sequestration, all the things we talk about.

We have put in place a very strong platform for total recycling. A bottle bill would take us backward, and there are incredibly negative potential repercussions of a bottle bill. But the things that have run the State -- that the Legislature put in place economically: Our municipal tonnage grants program, where $22 million a year is generated and it goes, largely, to support municipal recycling coordinators. They're our little engines that could, that drive recycling in the state.

As you know really well, right before mandatory recycling, we passed the Clean Communities Law in 1986 -- incredibly comprehensive -- to address *all* litter, not just bottles and cans. Who pays for that? The Clean Communities Law was New Jersey's first extended producer-responsibility law 38 years ago. And, I think sometimes we forget that. It's paid for by the litter-producing industries. And, they're not going to pay twice. They're not going to pay for Clean Communities and pay for a bottle bill, because it's expensive for manufacturers when you have a bottle bill in place.

So, Clean Communities would be in jeopardy; municipal tonnage grants would be in jeopardy. As I testify -- and, this is really important -- we built a recycling infrastructure of these 23 MRFs in New Jersey. The highest-value material is aluminum. Aluminum can be as much as 30% of the revenue stream for MRFs. If you put aluminum and plastics together, it's as high as 40%. Imagine running any business and you have taken away from you 40% of your revenue. What you're going to do is put in jeopardy the entire recycling infrastructure of the State of those 23 MRFs. I don't know how Bayshore would stay in operation; I don't really think we could with that kind of an impact.

And, the last thing I'll say-- I'm sorry I'm rambling on, sir, but I think it's important--

SENATOR SMITH: You're trying to answer the question.

MR. SONDERMEYER: Yes--

SENATOR SMITH: And, that may be something we're going to consider, so we'd like to hear what you have to say.

MR. SONDERMEYER: The last one, which is very, very important is the word "convenience."

And, I think we have to remember this. As I said, it's important to remember the chronology here. Most of the bottle-bill states adopted their legislation in the '70s -- that was their first initiative in recycling. We did not do that. We chose -- our Legislature chose -- to do something a lot more comprehensive -- again, mandatory recycling. So, each one of us -- each one of your constituents -- has nearly 40 years of curbside collection. I mean, what do you have to do to recycle? Basically, you've got to clean your stuff out in the kitchen, put it in the garage, and wheel it out to the curb.

That doesn't happen with a bottle bill. You've got to put your stuff in the car, and you've got to drive to a supermarket to put it in one container at a time into a reverse vending machine, or drop it off at what's called a redemption center. Incredible change to what the norm has been in New Jersey.

And, I'll tell you -- I'll speak, if it's OK, a little bit from a personal standpoint. My family has been honored to have a home in New York State. And, whenever we go there and we go to recycle and go to the reverse vending machine, they are most commonly either full or broken. And, if they're not, you wait in line. So, where it would take, normally, at your house to wheel out that cart, what, a minute or two? For the convenience of recycling. The line, sometimes, are hours long to be able to recycle. And, our greatest concern with ANJR is people just aren't going to do it. So, instead of it enhancing recycling, you're going to go way, way backward.

And, the last thing I want to say, Senator, we've looked at recycling numbers and numbers are very difficult because there's never been a national standard. The states all count differently, so it's really hard to compare, but the numbers we've looked at show that New Jersey's recycling

rate for containers is better than seven out of the 10 of the bottle-bill states. So, we don't really even understand why we would have to have that discussion, because we think it only -- for all the reasons I said -- is going to take us backward.

SENATOR SMITH: Are there questions from Committee members?

Senator Greenstein.

SENATOR GREENSTEIN (Vice Chair): Thanks very much for the testimony.

I wanted to ask, since today's topic is plastics, and I know you did talk a bit about it. But, generally speaking, are there any types of plastic that can't be recycled, and, how does that work in terms of your process?

MR. SONDERMEYER: Yes, absolutely, Senator.

The polyvinyl chloride -- PVC, like the pipes, stuff -- there's no market for that. It's junk; it's waste. We happen to know of markets where we actually accept one to seven plastics, and we don't really get any PVC; it's really not there. But, we will take the other plastics.

We individually-- We actually market six different blends of plastics. There's clear PET -- clear polyethylene terephthalate; there's color; then clear high-density polyethylene; there's different films. And, we can market a blend of three to seven plastics to a further processor that mines out the polypropylene. The value -- beyond ones and twos -- the real value is Number 5's polypropylene, and they'll mine that out for polypropylene recycling uses in products.

And, then the balance they use for lower-level products like composite things. We've heard of Trex lumber and other different products

that are made with composites of plastics. So, for the most part, ones, twos, and fives are the strong markets and the others are not. They truly are not.

SENATOR GREENSTEIN: In terms of the issue of deciding whether recycling is successful or not, there's no question that you're -- that Bayshore is the number of communities you serve.

What about the rest of the industry? And, if it isn't that successful, what do you think it would take to make it more successful?

MR. SONDERMEYER: Yes, that's a great question.

And, you're right. I mean, in your question, it sort of draws a question of these-- I mentioned 23 MRFs -- they're not all at the same of technology of Bayshore. Our system is 100% fully automated, and it's like crazy, we have optical scanners that are so precise they can tell a difference between a Number 1 and a Number 2 plastic instantaneously and blow a different stream of air at one versus the other and they go in different places. That's the highest end of technology.

There probably are more like a dozen of our level of facilities that are out there that would be just like Bayshore -- very, very successful. There are less automated systems out there, and that's where the comment I made about EPR comes in, and financial-assistance programs. Bringing up -- we should build off of the very successful platform we have, right to your question, and make it better, and make it better, and get *all* the facilities that are taking substantial amounts of curbside material up to the same level of automation and recovery as Bayshore. That's really what it was argued our objective should be, because they're not all at the same level.

Are any of them disposing of a (indiscernible) -- no, they're just not. I gave an example because I wanted to sort of put some numbers out there of how absurd that is; they're not disposing of this material.

SENATOR GREENSTEIN: Thanks; thank you.

SENATOR SMITH: Assemblywoman.

ASSEMBLYWOMAN HALL: Thank you.

And, thank you for all the information.

I hail from the 35th District City of Paterson, and a lot of the confusion is around what to recycle.

And, you touched on that, so what do we need to do to create that list, if you will, that people can keep in their homes?

And, also, is there a business partnership in that regard? Because, it seems that the residents have the curbside pickup, but I think for businesses, it's scheduled private contracting pickup, without the same onus of separating plastics from your general garbage.

MR. SONDERMEYER: Yes.

And, first, I grew up on the corner of Main and Grand, on top of Irving's Pharmacy in downtown Paterson.

ASSEMBLYWOMAN HALL: Oh, there we go. (indiscernible)

MR. SONDERMEYER: And, yes, it is very confusing.

Each of the 21 counties, there's a piece of the Recycling Enhancement Act. It's 10% that goes to education, and the counties all have very clear websites on what you can and can't recycle.

But, to your good point, as an older person -- at this point, as a senior citizen -- we rely too much on people going to websites. We need to

do more outreach like we used to do to get to community folks who have a lot of other things to do.

And, I like what you just said. Middlesex County, Mr. Chairman, has a magnet that you put on the refrigerator, and says, "This is what I can recycle, this is what I can't recycle."

The other thing -- and, this is a real tribute to DEP -- there is an app. It is called "Recycle Coach." I hope every single member has Recycle Coach; it's free to download it. DEP bought this app for all 564 towns in the 21 counties, and it is an amazing tool. To your point, it's not for everyone. If you're an older person who's not comfortable with stuff like apps, then it's like the old-fashioned calendar, but the app is amazing. It tells you everything about when your solid-waste collection is; household hazardous waste day; consumer electronics day; what I can recycle; what I can't recycle. They just added a module on it for litter abatement, on cleanup from Clean Communities. I am actually working with them on doing a food component of it to try to get real-time recovery of food from the 20,000 restaurants in the state to food pantries on a nightly basis.

A really effective tool. But, to your point, we have to do better. We really do have to do better. And, we think that this uniform list might make it simpler to take away at least some element of that confusion. Because if you don't know what to recycle, we have two things that happen: One is wishful recycling, and all that stuff that comes to us that's junk -- I mean, at Bayshore we could open a sports store. We get bats, balls -- I don't know, bowling balls; everybody thinks they can recycle bowling balls. The other one are garden hoses -- we get so many garden hoses. Pool liners; bags of

needles and syringes from at-home diabetics, because they think one part is metal, one part is plastic, it must be recyclable. We have to do better.

But, I think the uniform list -- hopefully, before the end of this year, we'll have recommendations to potentially come forward to the committees about the uniform list. Because, the way it works now, it was pretty brilliant. I think in 1987, the law said every county plan has to embrace (indiscernible) and it was a ban on leaf disposal. But that was a floor.

So, the average number of materials required for recycling in county plants is 16. So, it's very comprehensive. So, the question becomes, do we need to change the law or not change the law? Connecticut actually did their uniform list voluntarily, and that's something we're looking at because it might be a more expedient way to move forward.

ASSEMBLYWOMAN HALL: Thank you for your information today.

I come from and represent Maplewood. Maplewood, New Jersey, has been a leader in recycling and environmental issues, so we have gone through the papers on the refrigerator, and the arguments between Number 1 and Number 7 and Number 5 and whether it's recyclable.

So, I would suggest that we need to start talking to the youth in the schools as a requirement for graduation, or -- they're the ones who are using the product.

You mentioned convenience. That's why they use the plastic bottles -- for convenience. And, parents like us want to use that as a convenience, too.

So, I think that we have to look at the youth in the schools to promote the change, not so much--

MR. SONDERMEYER: I could not agree with you more. You are so right.

And, another hat I get to wear -- I am Chairman of the Board of the Sustainable New Jersey Program. We're up to 466 towns, 1,185 schools actively involved. And, a big part -- I actually manage what's called the Waste Management Action Area, it's all recycling and waste-reduction actions; we have 16 of them to do exactly what you said.

And, look at what New Jersey did. Look what our Legislature did. First state in the country to require climate education K-12 schools. Absolutely awesome. And, what that gives us is a platform to do exactly what you said, and to make recycling a part of the curriculum -- to make composting a part of curriculum. Every single school in New Jersey should have a school garden; they should harvest that material through the kids; they should serve it in the cafeteria; they should have separation of food in the cafeteria and go right to a composter on site and then back into the school garden. That's called sustainability.

So, you are spot on. We really need to focus on our schools, because they're our future. That's the next generation.

ASSEMBLYWOMAN HALL: Thank you.

SENATOR SMITH: Any other questions?

ASSEMBLYWOMAN KATZ: I have one.

Thank you for all the information.

How much wishful recycling do you get a year? Like, just a ballpark of how much is coming in that people are trying to recycle, but just can't?

MR. SONDERMEYER: Yes, and that's -- that translates in recycling nomenclature to residue -- "How much residue do you get?"

And, on average, it's about 10%. It's about 10% of what comes in. And, that's -- you know, the variety of materials, it's fascinating to us on what people pick. Like, I mentioned some of the examples. It's kind of crazy.

But, I really think people are just well-intended. And, like, when you're sitting there, you have that moment. It's in my hand -- do I drop it in the garbage container or the recycling container? And, you want to put it in the recycling container. So, most of the counties have campaigns, and it kind of hurts for me to say this, but the pitch is, "When it doubt, throw it out," and don't put it in the recycling stream, because then it goes through this whole system and winds up onto the landfill anyway.

So, what I would say to your big question is every county has an excellent website on what you can and can't recycle. So, the best advice is to look at what the county plan says and follow that, and we'll really reduce the amount of wishful recycling.

But, what we feel is more important-- Because we have 21 pockets of education, which each county, doing an education platform, we also need to bring back something we have in the past -- statewide education. So, we have a uniformity of messaging, which we haven't had in many years.

SENATOR SMITH: Sir.

ASSEMBLYMAN INGANAMORT: Thank you, Chairman.

Thank you, Mr. Sondermeyer.

Congratulations on your award, obviously well deserved.

I was getting my kids out the door this morning for school, and we were talking about the three R's: Reduce, reuse, recycle. And, it strikes me that we've spent a lot of time and emphasis as a state on the reduce component; the various material bans, straws and bags and so forth. And, I really appreciate your perspective and expertise when it comes to recycling, which is critically important. I think that's really our way out of this.

I want to ask about the reuse part of that triangle, if you will, because I think it sometimes gets overlooked. Can you speak to what amount of the recycling material that you're collecting is ultimately reused? Either by the consumer -- which we can't speak to, because that's before the point at which you collect it -- or by those who are -- those entities to whom you're selling this material, so that we don't have to create an additional 400 million pounds next year.

MR. SONDERMEYER: Great question.

And, so, just to say this -- recycling is an extraordinarily complex business and industry. It is -- the floor -- I've always explained this, when I teach, it's the floor of the New York Stock Exchange. It is commodities exchange.

So, I can say in the aggregate, 90% -- round numbers -- of what recyclers get go to markets. People are paying us for that material, which means they're going to use it in some form. Exactly how they do that, I can't answer. It's so complicated. We have people who do nothing all day who look for outlets to be able to market our materials. But, about 90% are being used, and that's what's important.

That goes to the, I think, misinformation that this stuff goes in the garbage. It doesn't go in the garbage; it's going to markets, and it's making new-- And, it depends on the commodity. Aluminum cans are going back to new aluminum cans; Number 1 and Number 2 plastics are going back to make those products. Others, it's ancillary. Third -- other side kind of products, like I mentioned Trex is an example with plastics. So, it depends on the commodity.

Cardboard -- huge. Paper, we continually capitalize to bring in more equipment to get better and better paper separation, because if you get sort of too much color material in paper, that can only go to make toilet paper. If you have a higher grade of paper, that can go to paper towels. If you have *really* good paper, it can go back to making new ledger; new writing paper. So, you understand what it means.

I think the metric is 90% is going back to the market.

ASSEMBLYMAN INGANAMORT: Got it.

And, 90% sounds good. Is 90% good? Are there things we can be doing to enhance that efficiency? Do we have consumers and residents recycling?

MR. SONDERMEYER: Yes, and that's a great question.

That's why the committees created -- passed a law to create that Recycling Market Development Council, and the report lays out 15 recommendations. I mentioned a bunch of them in my testimony today. We've got to do them all.

It's really-- It's a combination of education; financial-assistance programs to upgrade the infrastructure to be mechanized like Bayshore is, at all the core recycling facilities to make it simpler for folks so they know what

they can and they can't recycle. And, these other really important public policy platforms like extended producer responsibility; recycled content; truth in labeling-- So, unfortunately, it's very complicated. What I would say from a statewide standpoint, New Jersey recycles over 50% of the stuff that it generates. Like I said, generation, sadly, continues to increase. We continue to buy and make more waste every year. We need to change that. But, we're recycling over 50% of that stuff. The national recycling metric is 32%.

So, we're doing *much* better than the vast majority of states in the country. I think we're in the top echelon of recycling in the country. But, as I said, we constantly strive as our association to do better. And, we can do better, and we need to do better.

SENATOR SMITH: OK, if there are no other questions, thank you, Gary, once again, for your service to the State.

Our third witness of four is Judith Enck. Judith Enck is the founder of Beyond Plastics. She's a Senior Fellow and Visiting Faculty Member at Benington College, Vermont; and she is the former EPA Region 2 Regional Administrator.

Ms. Enck.

J U D I T H E N C K: Good morning.

Happy Earth Day.

I have such great respect for Gary Sondermeyer, and congrats on passing the resolution for his impressive public service career.

But, while we're talking about recycling, I am going to go out of order with my testimony, which mostly deals with health.

I want you all to understand that for 40 years, the plastics industry has said, "Don't worry about the massive amount of plastics we are producing. We can just recycle it." That turns out not to be true. Less than 10% of plastics are actually recycled. It's not just my report from Beyond Plastics -- these are numbers from Department of Energy; from EPA. And, I want to explain why, because numbers get numbing. I travel with plastic packaging.

And, I want you to understand why plastic recycling doesn't work. Let's keep recycling everything else. I started my town's recycling program as a volunteer in Upstate New York. Keep recycling paper, metal, glass, cardboard; compost yard waste and food waste if you've got the space. But, we have to be honest that plastic recycling has been an abysmal failure.

The reason is because if you have an aluminum can, you can recycle it into a new aluminum can. If you have newsprint, you can recycle it into another paper product or cardboard. But plastics have 16,000 different chemicals, many different colors, and many different plastic polymers. These three items cannot be recycled together, and that's why the plastic recycling rate is so low.

The plastics industry has launched a pretty significant PR campaign saying "Recycling is real." I would just an asterisk -- "Recycling is real, except for plastics." And, plastics is Plan B for the fossil fuel industry. Thankfully, we are shifting to more renewable energy and electrification of vehicles. The two big markets for fossil fuel companies is power generation at power plants, and petroleum that they sell at the gas pump. Little mom-and-pop companies like Shell and Exxon Mobil recognize that they're losing

their market for electricity generation and transportation, so they are shifting to plastic production.

None of us asked for more plastic; nothing tastes good in plastics; but we have a glut of plastic because the fossil fuel industry wants to sell more fossil fuel -- specifically fracked gas.

In 1950, 2 million tons of plastic were produced a year. Now, we're producing 450 million tons of plastic a year. Congress is not expected to take significant action, and there's only so much we can do as individuals. So, we need the State of New Jersey to act.

When I served as EPA Regional Administrator, I zipped around the region. I visited sewage-treatment plants, Superfund sites, recycling centers. I was living the dream. I really loved visiting sewage-treatment plants, I learned a lot. But, I met with the gentleman who ran material recovery facility in the Hudson Valley, and they were collecting one through seven plastic when I knew there were only markets for Number 1 and Number 2 plastic. And, for the soda bottles, most of the plastic gets recycled if you're in a bottle-bill state. So, I very gently said to this man, "So, I'm surprised you're telling everyone to put one through seven in the recycling bin. Where are your markets? Where is it going?" His response was, "A waste broker takes it off my hands, and I'm not sure where it goes."

Where a lot of it probably went -- other than Number 1 and Number 2 -- is export to countries like Malaysia, Vietnam, Philippines, Turkey, and, now, Africa. Because plastics are fundamentally not recyclable; plastics are a human health threat. You heard from the distinguished doctor from Rutgers. We've got a real problem with plastics and health. They may

leach directly from the packaging into food and beverages; chemicals hitchhike on microplastics or nanoplastics, exposing us to chemicals.

And, while it's been mentioned before, I want to direct you to Page 2 of my testimony. We really need to understand this. Scientific journal articles are coming out at breakneck speed. Microplastics and nanoplastics have been found in human lungs; in human blood; liver; fatty tissues. Plastics have been found in our kidneys; and in breast milk. Microplastics have been found in the human placenta -- both the maternal side and the fetal side. And, remember, the baby is just hanging out in the placenta for eight or nine months, so that's a short period of time.

Now, the plastics industry will say, "Well, there's no evidence that this causes harm." I am willing to go out on a limb and say microplastics in our bodies are not helping us. It's not like they have nutritional value.

And, we are very interested in a report that was published in the distinguished *New England Journal of Medicine* just about a month ago. They did a study with over 40 medical researchers, and they identified microplastics in samples of plaque taken from arteries in the heart; and, unfortunately, they found a four-fold increased risk of cardiac incident. Specifically, they looked at patients who had microplastics in their heart and arteries, and those who did not. Patients who had microplastics and nanoplastics in their heart and arteries increased risk of heart attack, stroke, and premature death. The plaque specimen studied included polyvinyl chloride -- PVC -- and polyethylene; both are used in plastic packaging.

From a health perspective, this is also an environmental-justice issue. I work closely with allies in Louisiana, Texas, Appalachia. You've heard of Cancer Alley in Louisiana. It kind of hurts my heart to even say

there's a region in the United States today referred to as "Cancer Alley." That's where there's a concentration of petrochemical facilities and plastic production facilities. I am speaking to a group in Louisiana tomorrow night. They are getting seriously sick from the pollution from plastic-production facilities. It's called Cancer Alley because of the higher rate of cancer in these communities. So, the production of plastic is a health issue.

Because plastic recycling is so abysmally low, that means that a lot of plastics wind up at landfills and incinerators. I am particularly concerned about the four garbage incinerators operating in New Jersey, specifically Camden, Essex, Gloucester, and Union counties. When you burn plastic, you get a number of air contaminants, including dioxin -- which is the most toxic chemical known to science.

As Senator Smith mentioned in the opening, plastics are in the ocean. What got me really, really interested in the plastics issue-- So, I worked at EPA during the Obama Administration. It was an honor to be appointed by President Obama to serve at the EPA. And, I actually got most of my work done after 5 o'clock, when the endless meetings would wrap up and I could actually read things. And, I read a scientific report that said by 2030, unless we change public policy -- like at the state level -- for every three pounds of fish in the ocean there will be one pound of plastic. And, that just stopped me in my tracks.

Further, if we don't adopt strong policies like strong bottle bills and strong packaging-reduction law, by 2050 it's going to be one-to-one -- for every fish in the ocean, there will be one pound of fish to one pound of plastic. And, what happens when plastic gets into the ocean is it's exposed to sunlight, so it gets really brittle, and then the wave action will break this bottle into

hundreds if not thousands of pieces of plastic. And, it's eaten by fish; by sea birds; by marine life.

As a coastal state, New Jersey has a keen interest in the health of the ocean. One estimate places the value of commercial and recreational fishing in New Jersey at $8 billion per year. We are seeing microplastics in fish around the world.

So, what the plastics industry is mostly saying now -- a lot of them will say -- "Yes, you know, we can't argue with the consistent numbers that plastic recycling is under 10%." So, now, they've launched something called "chemical recycling." And, that absolutely is not the answer. Chemical recycling is taking high heat and attempting to turn plastics into pyrolysis oil, a type of fossil fuel. *Or*, a few of the facilities attempt to turn plastic into plastic, but they need to use a massive amount of hazardous waste -- hazardous materials -- to do that, which becomes hazardous waste. Most of these facilities are cited in low-income communities or communities of color, making this another environmental-justice issue.

My organization, Beyond Plastics, produced a major report last October called, "Why Chemical Recycling Won't Solve the Plastic Pollution Problem," which we co-published with the international group IPEN. If I haven't convinced you on the environmental and health problems with chemical recycling, I want to tell you that only 1.3% of total plastic generated in the United States is handled by chemical recycling facilities. And, this is not new. They've been trying this since the '80s. They always say, "Oh, the breakthrough is around the corner." So, let's say they double. Well, that gets us to 2.6% of the plastic. Triple, still under 10%. So, it is not a solution to the plastics problem.

Just two weeks ago-- I want to direct you to an important article in *The New York Times* on chemical recycling. The title in *The New York Times* article is, "There is an Explosion of Plastic Waste," "Big brands like Procter & Gamble and Nestlé say a new generation of plants will help them meet environmental goals, but the technology is struggling to deliver."

So, unfortunately, keep recycling your other material, but let's be honest about the failure of plastic recycling. Let's be honest that chemical recycling is not a solution. Twenty-five states have adopted laws to promote chemical recycling, to classify it as manufacturing. Why are they doing that? So there's less environmental regulation and access to taxpayer subsidies. Because the average plant costs $500 million, and lots of taxpayer dollars are spent on that.

What is the real solution? I have two important policy recommendations for you, but I want to start with an illustration about what this means. Assemblyman, you mentioned the hierarchy that we are all familiar with: Reduce, reuse, recycle. Very little is being done with reduction and reuse. We need a strong packaging-reduction law in New Jersey for the following reason:

I have a wonderful colleague at Beyond Plastics, and she really pays attention to what she purchases. But, she orders from Amazon. You're familiar with this package, right? So, she ordered something, and it came in this. And, then it came in this. And, then it came in this. And, then, finally, another package for her eco highlighters. So, if you want to reduce packaging, you need to adopt a law that requires an actual reduction in plastic packaging. Amazon is a very innovative company; they can get stuff to us pretty quickly. Who pays for all of this? We do, as taxpayers.

And, there was an important report by John Weber's group, Oceana, that just came out last week that said when Amazon is selling products in states and countries that have strong packaging-reduction laws, you get your package in this, and not all of this. Right now, packaging companies have no skin in the game, because we, as taxpayers, pay to get rid of all of this. And, it is super expensive.

So, packaging-reduction laws-- Here's how I want you to think of it. At the Federal level, we have the Clean Air Act, and we have fuel-efficiency standards. So, cars that you buy today are much more efficient than a car you even bought 10 years ago. When I served at EPA, EPA rolled out some new fuel-efficiency standards for cars. And, I remember-- I was just like a little regional administrator. I wasn't like Lisa Jackson, making big policy in Washington. I just tried to clean up the environment in two states and two territories in the Indian nations. But, when EPA would announce a fuel-efficiency standard regulation change, the regional administrators were sent out to meet with stakeholders.

So, I had the opportunity to meet with car dealers. And, I was explaining the fuel-efficiency standard update so you and I pay less at the pump. I hate paying for gasoline, so a hybrid electric car, an electric car, gives us options. I remember one gentleman who owned a car dealership said, "Judith, it sounds like what you're trying to do is force the market toward electric vehicles." And, I said, "Hmm, that's one way to look at it. Yes." We need fuel-efficiency standards for cars, for appliances. If you buy a refrigerator today, it's much more energy efficient than even if you bought it five years ago. So, what packaging-reduction laws do -- also known as

extended producer responsibility -- is it's environmental standards for packaging, so that taxpayers don't have to keep carrying the load.

We've got to get the details right. The plastics industry knows that laws are coming, and, so, they're promoting bills that don't really get the job done and that allow for chemical recycling, which would be a mistake.

Quickly, I want to make a pitch for a bottle bill -- a refundable deposit container law. One of the best benefits of bottle bills is litter reduction. If you go to a bottle-bill state, you do not see soda and beer and water bottles littered in any community. And, the recycling rate is much higher. I rely on numbers from the Container Recycling Institute, because they pay a lot of money purchasing industry market data. They looked at states that have bottle bills versus states that don't. So, if you are in a bottle-bill state, your aluminum can recycling rate is 77% versus 36%. Glass bottles are recycled at 66% as opposed to 22%, and PET plastic bottles, 57% versus 17%.

The only real recycling success story with plastic is beverage bottles in bottle-bill states. And, why? Because the material is kept separate. I go to my supermarket; there are reverse vending machines; and you feed the empty bottles and you get a little receipt back. There's also innovation. There's a company -- and, I'm not pitching particular companies, but there is a company called Clynk -- C-L-Y-N-K -- I hate it when they spell words wrong, like Dunkin' Donuts. But, with Clynk, you just take -- you take all your deposit containers; you put it, unfortunately, in a plastic bag; you drop it down the shoot; and there's a little barcode you get when you sign up. I used it recently; it took me 10 seconds. I've never heard of anyone standing on line for hours to return containers.

So, my strongest recommendation to you today is we need environmental standards for packaging in the form of a strong packaging-reduction law. Fifty percent of plastic packaging should be reduced in the next 10 years. And, you can do a glide path -- 10% reduction in the first two years; 20% in four years; etc. Companies can innovate when legislative bodies tell them the rules of the road.

And, then, second, there's *so* much data about the benefits of bottle bills across the country, and I would also recommend that a New Jersey bottle bill, long awaited, include a provision to promote refillable containers. Coca-Cola announced last year that they want 25% of beverage containers in refillable containers. They say they're going to do it voluntarily; I'm not sure I believe that, so let's put that in statute.

Happy to take any questions.

SENATOR SMITH: Any questions?

Yes.

ASSEMBLYWOMAN KATZ: Thank you.

Thank you for your testimony.

What other states have those packaging laws? You referenced a few. Which ones, specifically, are they?

MS. ENCK: So, there are extended producer-responsibility laws on the books in the last two years in California, Maine, Oregon, and Colorado.

And, they're not very strong, because they rely on the myth of plastic recycling as opposed to reduction. California has a reduction requirement.

I would say, of the four, the weakest is Colorado. You do not want to use that as a model.

SENATOR SMITH: What do you think is the strongest?

MS. ENCK: California. But, it has some terrible loopholes. Like, there's a sentence in the California law that says, "Packaging that presents unique challenges in complying are exempt from the law." That's terrible, because polystyrene will say, "We have unique challenges in complying."

I think that's the sort of sentence that gets added in the middle of the night. So, California, we've got to make sure we close loopholes.

So, California, the reason they adopted it is because the plastics industry wanted to keep an initiative off the ballot. California voters were going to vote on whether or not to ban polystyrene statewide, and there was private, behind-closed-doors negotiations; knocked that initiative off the ballot and do a weaky PR bill.

The other problem with the California law is that it's really murky on chemical recycling. It is unclear whether chemical recycling can count as recycling. And, here's the big picture: We finally have some honesty that plastic recycling mostly doesn't work. And, remember, collection is not recycling. So, now, the plastics, chemical, and fossil fuel industry is saying, "Shift to chemical recycling." And, chemical recycling is *not* going to work; it won't handle most of the plastic waste; and it gives us a whole new generation of problems.

California says they're not going to have chemical recycling in the state, but what they could do is send plastics out of state to other chemical recycling facilities. And, you don't want that to count as recycling.

SENATOR SMITH: So, on that topic, the-- If plastics recycling was defined in New Jersey as plastics to plastic pellets, which could be reused to make new plastic materials, that's not offensive or objectionable, right?

MS. ENCK: No.

SENATOR SMITH: It's the chemical recycling that's the problem.

MS. ENCK: Chemical recycling is the big problem. And, I think-- You know, plastic recycling, it's just going the way of the dodo bird; it's just collapsing on its own.

Where a lot of the plastics that are collected-- For years, it was sent to China, and China said, "You're sending us too much non-recyclables," in the recycling bins, the shipping containers that were sent over. So, China warned the U.S. and the E.U. for eight years, "Stop sending us so much non-recyclables." We kept doing it. So, China actually closed their door to plastic and all recyclables from the U.S.

So, what did these plastic waste brokers do? And, by the way, New Jersey exports the second-most amount of plastics in the country besides California. And, that's a whole different topic, plastic exports, which I urge you to look at and watch the PBS *Frontline* segment called, "Plastic Wars," where they document the devastating health and environmental impacts of what happens when this gets sent to Indonesia; to the Philippines; to Vietnam.

So, we want to make sure that New Jersey stops exporting so much plastics to other countries as well.

SENATOR SMITH: One more question from me -- (indiscernible) from anybody else who would like to.

But -- and, I'm not trying to do *Saturday Night Live* point-counterpoint -- but, Gary Sondermeyer said that if there was a bottle bill that the recyclers would be in big trouble. Do you have any response to that?

MS. ENCK: I do, and I don't want the recyclers to be in big trouble.

But, a lot of this is, "Who pays?" So, right now, taxpayers are paying to collect the recyclables and get it processed at the MRF. Bottle bills are extended producer responsibility. It means Coke and Pepsi and Coors -- they have to take responsibility for all the recyclables. So, yes, MRFs will get less material, which could translate into taxpayer savings, but there's so much potential for composting yard waste and food waste.

I mean, I could envision-- If you've got municipal waste trucks going around neighborhoods, right now they've got compartments. A lot of them collect regular trash in one compartment, recyclables in another. And, if the recyclable section is smaller because we're getting rid of beverage containers that are part of bottle bills -- now, don't get upset with this new idea -- but maybe another section could be for yard waste and food waste, and bring that for composting. There is no shortage of opportunities for recycling and composting.

But, yes, we're going to have fewer beverage containers going to MRFs, and that can translate into taxpayer savings when they re-negotiate contracts.

SENATOR SMITH: Other questions?

Assemblywoman.

ASSEMBLYWOMAN COLLAZOS-GILL: Thank you.

So, I completely agree with the need to reduce and (indiscernible) in plastics. I mean, at my house we recycle; we do all of those kinds of things. And, yes, I am constantly trying to find a way to use less plastic. So, I completely agree. I really do like the idea of just destroying the idea of most of the packaging it comes in. It doesn't (indiscernible) things that I (indiscernible) with.

But, on this bottle bill, just so I can understand a little bit more about this. Right now, the way we recycle -- to your point -- we recycle. We have our containers, our blue plastic container; we put our recyclables, plastic, and glass; and then we put it on the curb. This is the way families and residential-- This is how it happens right now.

With the bottle bill, families would have to go to a specific place, is that what we're saying, to recycle? To just bring your materials?

And, I'm just thinking out loud. How much complicated would that be for your residents? Because a couple of years ago, we did the plastic bag ban, and it worked. It's working out really well, in many different ways. But, one of the things is that we said, "OK, now we have this additional plastic bags that can be made out of plastics," and we're not recycling it now, although they are making it so you can actually recycle your recyclable bags -- you can just bring it to different locations. And, I don't think we're doing enough on that end.

So, my question is, on the bottle ban, or bottle bill, how do we see that working for residents, just your regular consumers?

MS. ENCK: Sure, yes; great question.

So, you're super busy. I'm super busy. I'm hanging on by my fingernails. I am just going to meeting, to meeting, and every so often I stop

at a supermarket and I buy food. And, my husband cooks it and we have a good dinner, because he cooks. But, I am in the supermarket once or twice a week, and that's where I bring my empty containers back. So, I'm there anyway, and then I spend my redeemable money in that supermarket.

Now, environmental justice groups have raised a really important issue. There are a lot of food deserts. There are neighborhoods where you don't have access to supermarkets. The solution there is the creation of redemption centers. There's one I want to particularly mention in Brooklyn called "Sure We Can." They are a nonprofit redemption center. Low-income people go around collecting empty bottles and cans and they get the deposit for people who don't want to go to the supermarket.

I am old enough to say I worked on the original bottle bill in New York, which passed in 1982. I was an infant when I worked on it. And, we never envisioned what would happen. We thought this would be supplemental money for Boy Scouts and Girl Scouts -- and they *do* do bottle and can drives. It's now a major source of income for people who are economically struggling. There are 11,000 people in New York City who rely on that money. I have met amazing women who put their kids through college because they go out and they collect bottles and cans from people who just want to keep putting it in their-- And, you can keep putting it in your recycling bin.

I am very fiscally frugal, so I return my bottles and cans, and it is simple because I am at the store anyway, and then these redemption centers are a supplement. Most redemption centers are for-profit; they're small business; they're creating local jobs. The nonprofit redemption center model is unusual, but it could happen in food deserts in New Jersey.

Compared to other issues we're working on-- I mean, climate change is huge; cleaning up federal Superfund sites takes billions of dollars. We have to protect wetlands; we have to clean the ocean. The bottle bill is easy compared to the other challenges. And, we have the benefit of 10, 11 states that have already done it. And, it gets better over time.

For instance, if New Jersey does a bottle bill, don't just do beer and soda -- do Snapple bottles, because those bottles are the same as other bottles. New York and other -- I think Connecticut just added wine and liquor. And, the amazing thing is the reduction in litter; not having the litter is key.

At Beyond Plastics, we hear a lot from people who are very concerned about-- Do you know the problem with these little liquor bottles called "nip" bottles? And, they are on the side of the road everywhere. We need to put a deposit on them, and then people will pick it up. Even for a nickel, but you should start with a dime deposit. It's not regressive, because when you return your containers, you get your deposit back.

ASSEMBLYWOMAN KATZ: I share the concerns here, that you want to make this easier for people to recycle. And, I know that I myself am running around like a crazy person all the time. I could see myself forgetting to take things to a grocery store. You know, my municipality doesn't accept grass clippings, or they don't pick up grass clippings, and I will tell you every weekend I say potty words as I am mowing my lawn and trying to deal with my grass clippings. It's just easier when I'm able to put things at the curb to be able to be dealt with in my busy life.

And, I just think a lot of my peers might have that same-- And, I want recycling to continue to happen; I don't want people to say, "Oh, that's

going to be too hard, let me put it in the garbage instead." I don't want that, you know?

But, you did reference the rates of recycling in bottle-bill states compared to not bottle-bill states. But, the gentleman who testified -- I'm so sorry, I'm bad with names; in the wonderful tie -- had mentioned that we have a 75% container recycling rate in New Jersey.

So, how does that sort of measure-- What are our numbers here in New Jersey with our low-cost programs that we already have in place?

MS. ENCK: That would make New Jersey like no other state in the world. And, those numbers don't match with the industry numbers that we have.

And, I am a member of the "running around like a lunatic club," you know, that's my every day. But, I want to ask you, when the plastic bag ban took effect in New Jersey -- so, maybe the first two times you went to the store and you forgot your bags, but now you remember your reusable bags all the time, because you leave them in the car, or if-- Right? Or, if you don't leave them in the car, you get those little collapsable bags you put in your purse, the ChicoBags.

So, that's how the bottle bill works. It just becomes second nature. It's really not hard.

SENATOR SMITH: Yes, sir.

ASSEMBLYMAN INGANAMORT: I am a lunatic running around a lot, and I'll be holding everything in my hands walking out of Shop Rite. So, it's a double whammy.

Just a couple quick questions while we're still on the bottle bill. A lot of great questions on that subject, but I just want to point a really fine point out.

Do you prefer the bottle bill *in place of* curbside, *in addition to* curbside? How do they -- how do they work together? We heard testimony that this (indiscernible)

MS. ENCK: They are perfect together. So, keep curbside in place, do a bottle bill -- which has the enormous benefit of litter prevention -- and then you have Coke, Pepsi, Coors taking financial responsibility to either refill or recycle all of that rather than taxpayers. And, then, the third lane is a strong packaging-reduction bill.

But, I would keep the bottle bill separate from packaging because bottle bill has a very deep history in the United States, an existing return process -- which you don't have, for instance, for like baby food plastic pouches. They're going to have a whole other approach on that.

ASSEMBLYMAN INGANAMORT: Thank you.

And, I think, just reacting in real time at a very high level, I think intuitively you're right that we could probably reduce litter -- those bottles, you know, on the side of the road and whatnot.

And, candidly, I'm intrigued by a concept that provides a financial incentive to influence human behavior. I prefer that to a ban of certain products, but that's a conversation for another day.

Going in a separate direction if I could. You have concerns with chemical recycling. What is your preferred method of recycling plastic -- without getting too technical. Is there a rearranging of the particles that you support?

MS. ENCK: I support reducing plastics, full stop. Because we have tried plastic recycling for decades, and it just doesn't work because it's all different colors; 16,000 different chemicals; all different polymers.

So, you know, you could say in New Jersey, you can only sell Number 1 and Number 2 plastic, which you do have a fighting chance of getting recycled.

I don't think that would work. I think the emphasis has to be on reduction, reuse, refill.

ASSEMBLYMAN INGANAMORT: I'm just going to push you a little bit if I can.

So, I mean, is there a scenario where you think we can be more effectively -- strike effectively -- recycling plastic in New Jersey?

MS. ENCK: No.

ASSEMBLYMAN INGANAMORT: No; OK.

I am going to ask you one last time, and then I'll move onto another question.

If we eliminated plastic recycling in New Jersey, would it have any impact on the environment?

MS. ENCK: I'm not suggesting you eliminate plastic recycling, but I am suggesting that you be honest with the public and say it's really just Number 1 and Number 2 plastic that, realistically, gets recycled.

ASSEMBLYMAN INGANAMORT: OK.

My last question: You mentioned the 10% figure on plastic recycling. Is that New Jersey, or broadly?

MS. ENCK: It's a nationwide figure. It's actually 5-6% recycling nationwide.

It's 5-6% nationwide, and that's not just my numbers. That's U.S. Department of Energy. EPA is very late on its numbers, but it's under 10%.

ASSEMBLYMAN INGANAMORT: Nationally.

MS. ENCK: Nationally.

ASSEMBLYMAN INGANAMORT: Do we know the number in New Jersey?

MS. ENCK: I do not.

ASSEMBLYMAN INGANAMORT: OK, because that's the part I'm a little bit unclear on coming out of this hearing. I heard 9%, 10%, 50%, and 90% on what amount of New Jersey plastics are recycled. I don't know the answer--

MS. ENCK: But, let me-- Let me maybe help figure this out.

The word was used, "recovered," the word was used, "collected." That does not necessarily translate into acted, actually being recycled.

And, I really think you want to take a look at exports to other countries. I was surprised in the last year to read that New Jersey is the Number 2 exporter of plastic to other countries. That's not good, because other countries do not have markets and infrastructure to handle it.

ASSEMBLYMAN INGANAMORT: Thank you.

SENATOR SMITH: Thank you, Judith.

We're going to need a lot more of your advice as we go forward.

MS. ENCK: Thank you.

ASSEMBLYMAN KENNEDY: OK, last, we have Dr. Shanna Swan joining us on video.

SENATOR SMITH: Would you do her background, too?

S H A N N A H. S W A N, Ph.D.: Hi, can you all see me? I guess there's a screen somewhere.

SENATOR SMITH: Hold on one second.

DR. SWAN: Yes.

SENATOR SMITH: We just want to make sure the audience knows of your distinguished background.

ASSEMBLYMAN KENNEDY: Her distinguished background includes she's the Professor of Environmental Medicine and Public Health at the Icahn School of Medicine at Mount Sinai.

DR. SWAN: Thank you.

Yes, my department is Environmental Medicine and Public Health. I am an epidemiologist, and I am a reproductive and environmental epidemiologist. My work examines the impacts of environmental exposure on health -- particularly reproductive health and neurodevelopment.

Why am I talking to you today? Well, I am committed to use my science and the science of my colleagues to protect public health and the environment. Hopefully, this will help that. (laughter)

So, I appreciate the opportunity to talk to you today about chemicals in plastic and their impacts on human health. We've heard a great deal about recycling. This has been a fabulous discussion about recycling; we've heard about microplastics; but, we haven't heard much about health. And, so, as an epidemiologist, that's what I'm going to focus on.

And, it's timely. I want to point out that this hearing is taking place on today: This is Earth Day, Earth Day 2024, and it's also the time that governments and NGOs from around the world are gathering in Ottawa

to -- and, the meeting starts tomorrow -- to continue negotiating the terms of the United Nations Global Plastic Treaty. I invite you to follow those discussions, because they're going to be really informative about the problems we're discussing today.

OK, so, plastic -- which includes a wide range of synthetic or semi-synthetic polymer-based materials, as you've heard, has been produced at an exponentially increasing rate. The number of tons in the billions that has been produced since it was introduced in the 1950s is perhaps arguable. You'll hear many numbers, but perhaps 10 billion tons.

And, more than 15,000 chemicals are used to manufacture these materials. Twenty-five percent of these chemicals have been classified as "chemicals of concern." That's a general term, but it refers to chemicals that have been associated with potential acute or chronic human health effects. So, that's 25% of 15,000 chemicals. That's a lot of chemicals that are of concern. But, this number is actually an underestimate, because for at least 40% of chemicals in plastic, we don't know about their health risks. So, we have this huge number of chemicals whose risk is unknown, and another huge number, which is of concern. And, these things are affecting human health.

I am going to give you two examples of how they can affect human health. But, before I do that, I just want to say there is a wide range of harms that have been demonstrated for chemicals in plastic chemicals of concern. And, these include cancer; neurodevelopment; obesity; reproductive failure; immune dysfunction; every system in the body can be affected by chemicals that have the ability to affect our body's hormones.

That's maybe new to some of you -- I hope not. But let's-- That's what I'm going to talk about next. So, some chemicals in plastic act through

the same pathways as our body's natural hormones. Everybody-- Every man knows about his testosterone, or knows about his testosterone level. Women are interested in the hormones that affect their menstrual cycle. So, we're very familiar with these steroid hormones that affect sexual and reproductive function.

And, the chemicals that affect the body's hormones have been called endocrine-disrupting chemicals, or EDCs. And, this is a class of chemicals that is regulated separately from carcinogens, for example, in some places, such as the state of California.

So, let me give you two examples. Bisphenols -- I think most people have heard of Bisphenol, BPA, that's an example of a Bisphenol -- this is a plasticizer. It's put in plastic for the purpose of making that plastic hard. And, it is estrogenic, like your body's own estrogen, or estrogenic pills that you take for medical reasons -- similar pathway. On the other hand, we have the chemicals that kind of -- I call these the evil twins -- that make plastic soft and flexible. And, those are the phthalates. And, so, every time you see a squishy bottle, think rubber duckies, you're looking at something that contains a lot of phthalates.

OK, so, these are examples of endocrine-disrupting chemicals. More than 25 years of research has shown that these endocrine-disrupting chemicals *can* and *do* damage our health in multiple ways by interfering with our body's own hormones. So, they mess up the signaling that these hormones are trying to conduct; they interfere with the transport of these hormones; and so on and so forth. And, one of the most clear pictures is that they can sit in the receptors that are there to lodge the estrogens and the progesterones, and actually displace them so that you're not getting the real

thing, you're getting this mimic. And, they enter our bodies silently, all the time, without our knowledge, and -- of course -- without our permission. California's Prop 65 has listed over 900 chemicals as known or potential endocrine disruptors.

So, today, I have a little time, I'm just going to talk about what happens when a pregnant woman is exposed to the chemical class phthalates, those chemicals that make plastic soft and flexible -- in those bottles that we've been discussing, for example -- and the impact of that exposure on male reproductive health. This is an area I've worked in for over 20 years.

So, let's go back a quarter of a century. The National Toxicology Program, in 2000, showed that when you fed these phthalates to pregnant rats, it caused changes in the reproductive system of their male pups when they were born. Measurable, demonstrable, clear, significant changes in the genitals of the male offspring. I hope everybody in this room is cringing a little bit about this, because it's not comfortable.

They called this -- they named this -- the Phthalate Syndrome. This is unusual to have a syndrome named after a chemical class. I don't know of any other. And, at the same time that this information was coming out, the Centers for Disease Control was testing representative samples of people in the United States and seeing what was in their bodies. Now, I can't ask you how much phthalate is in your body. You have no idea -- I have no idea. How do we know this? We look in the urine for phthalates, or in blood for fat-soluble chemicals. Phthalates are water-soluble. They actually leave the body very quickly -- in four hours. So, if we take the urine from pregnant women, we can see what they are carrying, and then what their fetus is exposed to, because these cross the placental barrier.

OK, so, I looked at that literature on the Phthalate Syndrome and I thought, "Well, that's rats and we're exposed, so, natural question, is there a Phthalate Syndrome in humans?" Now, if you want to think about how hard it is to answer this, just bear with me for a second and just do this little experiment. You want to study this; you think it's plausible; you think it's important. What do you have to do? Well, first of all, you've got to get a lot of money. And, the only way I know to do that is you go to NIH. To do that, you have to write a grant. That process is a multi-year process, but I did that, I got the money, and then I have to conduct the study.

What do I do? Well, I have to what? I have to have urine from pregnant women, because I know that will show me how much phthalates are in their body, and then I have to see what it does to their male offspring. So, I have to have them bring in their babies. That makes sense, right? And, then, I have to examine the babies; what do I look for? Well, I have to look for changes in the male offspring that are analogous to what the NTP saw in their pups, male pups, right? So, we had to design an experiment, design an exam, to actually measure the right thing-- So, we really looked for the human Phthalate Syndrome, if it existed.

So, I did that. I did that, I did that in a large study for which I got a lot of NIH money -- about $5 million, it cost -- and I happened to have urine stored from pregnant women, which was extremely lucky, and so I looked. And, I found the Phthalate Syndrome in humans. When this was published in 2005, it was really big news, and it did influence legislation -- for example, the Consumer Protection Act of 2008, after I testified about this.

And, then, I had to repeat the whole thing, because in science you have to replicate your work. And, so, I did that. Another $5 million, another five years, and we found it *again*. And, at that point, we had this finding in rodents and in humans and replicated in humans, and I could confidently say that when the pregnant woman is exposed to phthalates, her male offspring may exhibit the Phthalate Syndrome.

Now, does this matter? Who cares if the genitals are a little different? It turns out it *does* matter. And, here we were at sort of an impasse, because these were babies. And, they don't produce sperm, and they don't try to get pregnant for a long time. And, I didn't want to wait 20 years, 25 years, to see whether that exposure or that Phthalate Syndrome made a difference for their function.

So, what I did was I went to college students, and I said, "Would you let us measure your genitals and give us a semen sample?" And, what we found was that the aberrations that we had seen in the Phthalate Syndrome were directly related to sperm count. So, the more changes we saw in these measurements -- I'll just mention the most important one, don't cringe -- it's called the anogenital distance or AGD, known on the street as the taint or the gooch. This measurement -- which is a measure of the size of the genitals -- if that's small, then the male has, on average, a lower sperm count.

And, then, a colleague did a similar thing in California and showed that men who had never had children had a shorter measure than men who had had children.

So, together, this body of research, that took I would say over 10 years -- 10 to 15 years -- established that when the mother is exposed to

phthalates, the fetus is exposed, the fetus is affected, the male -- particularly for this chemical class -- and, finally, that he will have trouble having a baby.

Now, we looked at sperm count in another study worldwide, and I published a study in 2017 which showed that worldwide sperm counts -- you may have heard this -- sperm counts are declining. They're declining pretty rapidly, and they've decreased -- since we started studying in about 1970 -- 50%, on average, worldwide. Fifty percent. And, that's about a rate of 1% per year. Now, you think 1% per year is not very much -- nothing, right? But, think about 50 years, 50%. If I told you that over the past 50 years, I, too, have dropped 1% per year, you would be really concerned. I think we should be really concerned about this decline in sperm count.

And, by the way, we updated this study recently. In 2023, we published that the rate of decline has not leveled off. It has significantly increased. So, the decline is now faster.

What about fertility? Fertility is a hard thing to measure. One measure it called "total fertility rate," it's the number of pregnancies that a woman will have in her lifetime. So, the total fertility rate has been tracked by the World Bank, of all things. If you look up, "World Bank fertility data," you will see that fertility has declined worldwide at exactly the same rate as sperm count: 1% per year. And, this is everywhere. One exception being Israel. Why? Because the total fertility rate includes assisted reproduction and in Israel citizens are paid -- can recover the costs of two -- of IVF for two live births. And, so, the number of births in Israel has not declined because of the use of assisted reproduction.

I don't think this is a healthy situation for our species. But, when I talk about fertility, skeptics will say, "Well, these are voluntary declines.

People are delaying childbearing because they *want* fewer children, or because they now have contraception available," and so on and so forth. That's correct. And, skeptics will say, "Well, people are smoking more; they're more stressed" or, they're more obese and all these are interfering -- that is correct.

However, this is not the case for non-human species. And, if we look at non-human species worldwide, the number of endangered species has more than doubled between 2007 and 2022. And, if you do the numbers, this is an increase of somewhat more than the same 1% per year. So, it's not just humans, it's all species. And, these are species that cannot use contraception or delay their childbearing voluntarily. These are species that are exposed to the same chemicals -- chemicals in plastic and other endocrine-disrupting chemicals -- that is driving down everyone's fertility.

I cannot stress how important this is, and I think you get the picture that this is-- In East Asia, the rate of fertility, the fertility rate is now, in some countries like South Korea, down to 0.8 children for a woman or couple. To replace the population, we need 2.1 children per couple. So, we're not doing that, and the economic and social implications of this are huge. And, there are direct links between these declines and chemicals in plastic.

OK, let me turn to something else, if I can find these notes.

(laughter)

Sorry.

OK, so, I am going to give you one more example, and it's very different; it's breast cancer.

So, there was a recent study -- a quite brilliant, small study -- which showed that EDCs increased the risk of breast cancer. And, what this

study did was take volunteers in California and ask them to reduce their use of personal-care products that contain EDCs -- phthalates and others. They gave them substitute products. And they did this for 28 days -- one month only -- and what they found was a reduced risk of progression to breast cancer using genetic markers that predict who will go on to get breast cancer. These changes indicated a reduced risk, and showed that healthy breast cells are programmed to be pre-cancerous by EDC chemicals that have been assumed to be safe and have been put into market.

So, this is a very small study. It's a pioneering study, but it's very important because it clearly makes the link between-- These are makeup, personal-care products, and progression to breast cancer. It's-- These things come in everywhere. They come in our makeup; they come in our personal-care products; they come in our food; they come in our cleaning products; they come in our laundry detergents. They are everywhere and by every means that they get into our body, they are disrupting our hormones and increasing our health risks. I've only given you two examples.

So, I want to close by saying that it is unacceptable to assume that a chemical is safe before it is put into commerce. That is the status quo in the United States. That is not the status quo in the E.U., which has legislation that requires a chemical to be proven safe before it's put into commerce.

The studies I described each cost millions of dollars, and took a very long time. And, they only could examine a limited number of health outcomes and a limited number of exposures. Think about the job of testing every chemical for all of these outcomes. It's not possible.

So, we cannot wait for human health risks to be established before we remove these (indiscernible) from our daily lives.

Thank you.

SENATOR SMITH: Thank you, Dr. Swan.

Questions for Dr. Swan? (no response)

OK, thank you very much.

And, I think you're tuning in from California?

DR. SWAN: Yes, I am.

SENATOR SMITH: Thank you for how early you got up this morning.

DR. SWAN: (laughter)

It was a bit of a (indiscernible)

SENATOR SMITH: We appreciate the information.

Dr. Swan is our last witness.

Assemblyman Kennedy and I are planning to close the hearing, *but*, special event -- within five minutes we're going to put on the TV the *We are All Plastic People Now* movie -- it's an Emmy-winning documentary, featured at the 2024 Sante Fe Film Festival. The documentary focuses on the pervasiveness of plastics in our environment and in our bodies and the detriments that plastics have on public health.

Is there anything anybody wants to say? (no response)

So, we have a whole bunch of bills that are being constructed, and Chairman Kennedy said he would like to take responsibility for the distribution of bills, if you're interested -- especially after today's program, but we're doing the same thing on this side.

And, I hope this is the first of many meetings of the Joint Environment Committees in April of every year. And, usually, in August, we do a joint hearing at the shore. Followed by a party. So, hopefully we can all get together again.

So, Assemblyman Kennedy, thank you so much for all your help today. Is there anything you want to finish up with?

ASSEMBLYMAN KENNEDY: I really have nothing, you pretty much summed it all up.

So, I guess we could just adjourn.

SENATOR SMITH: Adjourned.

Movie, five minutes.

(MEETING CONCLUDED)