Testimony for The Pew Charitable Trusts Presented by Winnie Lau, Senior Manager, Preventing Ocean Plastics Project
House Committee on Appropriations
Subcommittee on Interior, Environment, and Related Agencies
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Chair Pingree, thank you for your invitation to discuss the growing problem of marine plastic pollution and possible solutions to address it. My name is Winnie Lau and I am the senior manager for The Pew Charitable Trusts' preventing ocean plastics project, which is aimed at proposing economically and politically feasible strategies to reduce the global ocean plastic pollution problem.

Plastic pollution in the ocean is a major environmental challenge that is growing worse each year, and yet, society has yet to coalesce around a strategy to reverse this trend. Plastic pollution stems from the fundamental flaws in the currently linear plastic system: the dominance of single-use plastic items and packaging means that 95% of the global aggregate value of plastic packaging, totaling $80 to $120 billion dollars a year, is lost to the economy often after only one short-lived use.[1]

Single-use items and packaging present a particular challenge to effective waste management, leading to mismanagement and environmental pollution. The growth of the linear plastic economy - where a product is produced and then discarded after use – as opposed to a circular one - where a product is "restorative or regenerative by design, enable[s] resources…[to be in use] for as long as possible and aim[s] for the elimination of waste"[2] – directly correlates with the impact of unchecked plastic pollution on people, the economy, and nature. The production, use, and disposal of plastics affect human health and quality of life, for example through the chemicals that leach into our food and drinks from plastic containers, the microplastics found in our seafood, and the plastic waste clogging waterways, hanging from trees, and littering our beaches. Plastic pollution in the environment is estimated to cost the global economy $1.5-2.2 trillion dollars across multiple sectors from shipping to tourism to fisheries.[3,4] Over 800 marine species are affected by plastic, including globally endangered species such as sea turtles. Impacts include salmon die-offs in the Pacific Northwest caused by chemicals in microplastics generated from tires[5], and coral reefs being more susceptible to diseases the more they encounter plastic waste.[6]

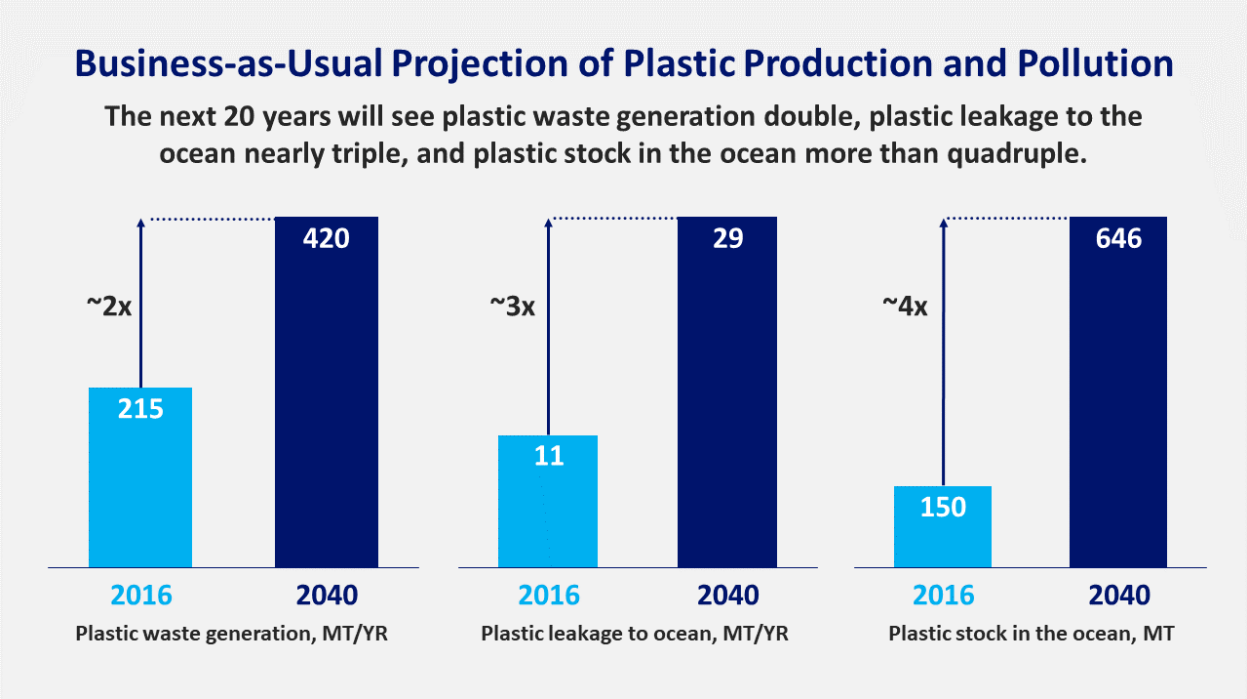
Between 2018-2020 Pew partnered with SYSTEMIQ, a consulting firm based in London, Munich, and Jakarta addressing system-level challenges, and four other organizations and worked with a panel of 17 global experts to undertake a comprehensive assessment of the different pathways the world could take to reduce, and hopefully stop, ocean plastic pollution. This effort culminated in Pew's 2020 report

[1] World Economic Forum, Ellen MacArthur Foundation, and McKinsey & Co. 2016. "The New Plastics Economy: Rethinking the Future of Plastics".
[2] The Save Our Seas 2.0 Act (S. 1982).
[3] Beaumont, NJ, Aanesen, M, Austen, MC, Borger, T, Clark, JR, Cole, M, Hooper T, Lindque, PK, Pascoe, C, and Wyles KJ. 2019. Global Ecological, Social and Economic Impacts of Marine Plastic, Marine Pollution Bulletin, 142:189-95.
[4] Forrest, A, Giacovazzi, L, Dunlop, S, Reisser, J, Tickler, D, Jamieson, A, and Meeuwig, JJ. 2019. Eliminating Plastic Pollution: How a Voluntary Contribution From Industry Will Drive the Circular Plastics Economy," Frontiers in Marine Science, 6. http://dx.doi.org/10.3389/fmars.2019.00627.
[5] Tian, Z, *et al.* 2021. A ubiquitous tire rubber-derived chemical induces acute mortality in coho salmon. Science, 371:185-189.
[6] Lamb, JB, Willis, BL, Fiorenza, EA, Couch, CS. 2018. Plastic waste associated with disease on coral reefs. Science, 359:460-462.

Breaking the Plastic Wave and the accompanying paper "Evaluating Scenarios Toward Zero Plastic Pollution" published in the journal *Science*. This morning, I will present our key findings and relevant recommendations for consideration by this subcommittee. All of the facts and figures below are from this report and paper, unless otherwise noted.

Plastic pollution today is a significant global problem and predicted to grow at an alarming rate

One of the starkest findings from Pew's assessment showed that, without action, the annual flow of plastic into the world's oceans, rivers, and lakes will increase from 11 million metric tons in 2016 to 29 million metric tons in 2040 – this would be equivalent to dumping 70 pounds of plastic waste along every foot of coastline around the world, and would quadruple the amount of plastic that is in the ocean today. Projected increases in plastic waste on land are even more stark, rising at nearly double the rate of ocean pollution – growing from 18 million metric tons per year in 2016 to 52 million metric tons in 2040.



"Plastic waste generation" refers to the total mass of plastic found in municipal solid waste. "Plastic leakage" refers to mismanaged or unmanaged plastic waste that is lost from the plastic system and enters the environment as pollution, including microplastics. "Plastic stock in the ocean" refers to the amount of plastic in all of the world's oceans, at all depths.

Flexible monomaterial plastics, like plastic bags and plastic packaging/shrink wraps, make up nearly 50% of the plastic pollution entering the ocean in 2016. Multilayer and multimaterial plastics - like chip bags and condiment and product sample packets - are the next most common, at a quarter of the pollution. Rigid monomaterial plastics – like water and detergent bottles – are nearly 20% of the plastic pollution,

with microplastics (defined as those that first enter the environment as microplastics, like microfibers and plastic pellets) rounding out the remaining 10%.

The projected growth in global plastic pollution will exacerbate the financial and ecological impacts already felt by people and natural ecosystems around the world, including in the U.S. Estimates have put damages already in the trillions of dollars globally.[7,8] While the public is increasingly demanding that governments solve the plastic pollution problem, businesses globally could face a financial risk of $100 billion dollars if governments pass the cost of plastic waste management to the private sector. The environmental impacts of unchecked plastic pollution would also include an increase in greenhouse gas emissions associated with the plastic value chain that would be 2.5 times that of the present day, growing to 2.1 gigatons of CO_2e per year by 2040.

Current government and industry commitments need to dramatically scale up

The impact of current plastic waste reduction commitments by the private sector and government policies (up to mid-2019), even if fully implemented, would only reduce 7% of plastic pollution going into the ocean or land by 2040. The industry commitments that Pew analyzed tended to focus on increasing recycling rates and, to some extent, increasing the use of recycled plastic for rigid monomaterial products. Additionally, many of the government policies we looked at predominantly focused on single-item bans, like bag bans. These commitments, while a good start, have limited impact on reducing plastic pollution given that they fail to address the scale of predicted future growth in plastic production and use, have predominantly focused solely on increasing recycling rather than on the use of recycled plastic, and are often narrowly focused on a small portion of plastic products polluting the environment or implemented by only a small number of countries or businesses.

Recent commitments by industry have predominantly focused on recyclability of products but some are beginning to pilot more upstream approaches such as plastic reduction targets and refill systems, though such efforts are currently very small-scale. Some governments are beginning to take a more comprehensive approach, such as establishing incentives for refill systems and collection (e.g., deposit-return schemes) and introducing extended producer responsibility. Scaling up these broader commitments and policies over the next few years and ensuring full implementation will be crucial to reducing plastic waste. Without immediate global action, we found that in as little as five years an additional 80 million metric tons of plastic waste could find its way into the ocean.

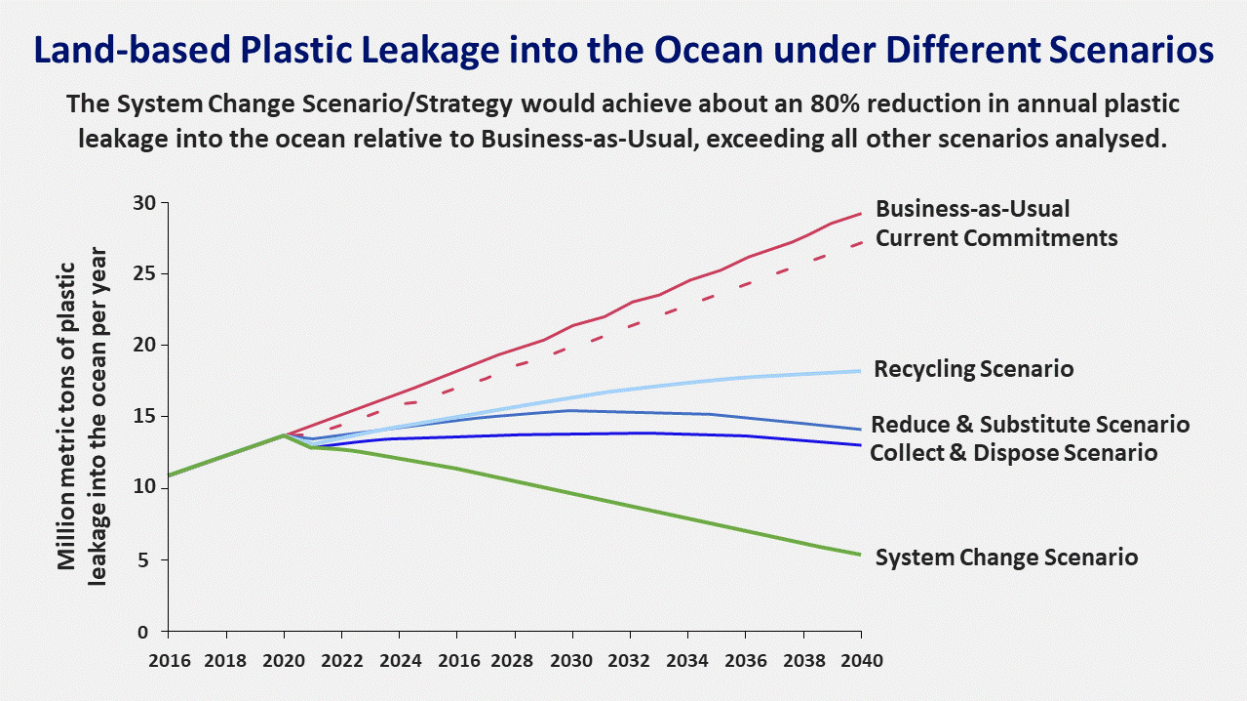
There is no silver bullet – a fundamental system change is needed

If implemented in isolation, the three single-solution strategies we assessed – recycling, reduction and substitution, and collect and dispose – will only keep ocean (and terrestrial) plastic pollution to around today's levels in 2040, and yet would still require considerable effort and resources to implement. In assessing these solutions, we worked with our expert panel to identify ambitious but feasible limits for each of these strategies. Even with maximum effort, if the U.S. were to focus on just one strategy in

[7] Beaumont, *et al.,* 2019.
[8] Forrest *et al.*, 2019.

isolation – such as recycling – it would not be able to recycle its way out of the plastic pollution problem by 2040.

The only strategy that could significantly reduce plastic pollution in the ocean (and on land) is the adoption of a system change approach that applies mitigation strategies synergistically across the whole plastics system. Using technologies and approaches that exist today, annual ocean plastic pollution could be reduced by 80% in the next 20 years, from 29 million metric tons to 5 million metric tons per year.



This system change approach begins by (1) assessing whether plastic is needed or the best material for a particular purpose, (2) eliminating unnecessary plastic and (3) designing for reuse and recycling, and then (4) closing the loop by maximizing recycling and, equally importantly, the use of recycled materials. By taking this approach, the world in 2040 could still meet the utility or function that plastics provide (e.g., in food service) while reducing waste and using 11% less virgin plastic in the system than today. This system change would require less government funding toward waste management and would benefit U.S. efforts to reduce greenhouse gas emissions associated with oil and gas extraction for virgin plastic production.

Reduction offers the biggest potential to reduce plastic waste and pollution

Eliminating low-utility avoidable plastic and switching to consumer reuse and refill systems and new delivery models could not only reduce as much as 30% of plastic waste generation in 20 years (by 2040), but is also the most attractive solution from environmental, economic, and social perspectives. Examples include eliminating the use of packaging for produce through the application of edible

coatings, bulk dispensers in stores and e-commerce solutions, such as reusable packaging that is returned to the retailer.[9]

In addition to less pollution, reduction approaches also provide net savings estimated at $70 billion globally over the 20 years due to lower government waste management spending needs, and from reduced costs of plastic production and waste management. Consumer reuse and refill systems and new delivery models can also create new, and local, business opportunities to provide these services, creating jobs in local communities.

Substituting plastic with sustainable and biodegradable materials like paper and other compostable materials represents another approach to reducing plastic production. As noted in *Breaking the Plastic Wave*:

> *Substitution could switch one-sixth of projected plastic waste generation by 2040. Ninety-five per cent of this potential substitution comes from six key product applications for which known material alternatives already exist at some level of scale: monomaterial films; other rigid monomaterial packaging; sachets and multilayer films; carrier bags; pots, tubs, and trays; and food service disposables. All substitutions need careful management at end of life and have varied environmental impacts. They create opportunities, risks, and trade-offs that must be carefully managed and assessed on a case-by-case basis. [Substituting plastic] has 1.7-2 times higher production costs than virgin plastic per metric ton of plastic utility, so substitutes were selected only when they replace plastic that cannot be reduced or mechanically recycled. The intervention plays an important role in minimizing ocean plastic pollution and could help reduce overall GHG [greenhouse gas] emissions.*

Systemic challenges in the recycling sector hinder recycling rates

Currently just 15% of global plastic waste is recycled, and the U.S. plastic recycling rate in 2018 was even lower at 4.5%.[10] One of the reasons for these low rates are the pressures faced by the plastic recycling sector at both the pre- and post-consumer stages.

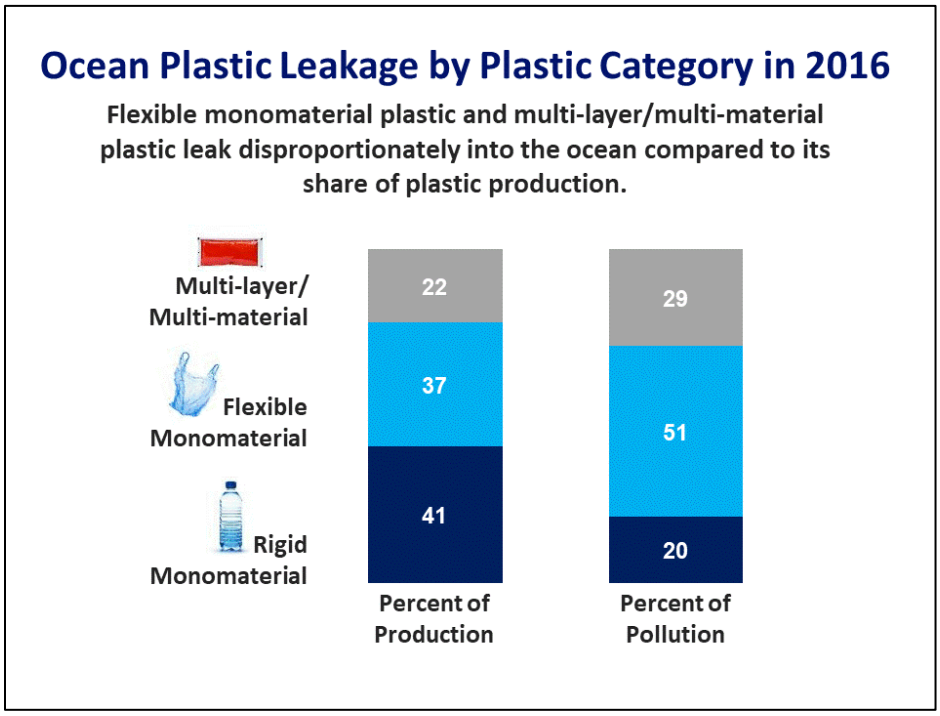
Collecting and sorting plastic waste for recycling is economically challenging. Plastic products come in many forms and are made from many different polymers and chemical formulations. Designers of plastic products generally do not consider the feasibility or ease of recycling of the products they design. Plastic's barrier properties make it attractive for food grade applications, as well as for holding liquids; however, these uses often result in plastic waste that is contaminated with the product it held, which can raise the cost of collecting, sorting, and cleaning prior to recycling.

Eighty percent of the plastic produced globally today is economically unrecyclable. The main technology that is currently at commercial scale is mechanical recycling, where collected and sorted plastic waste is

[9] The Ellen MacArthur Foundation, 2020. "Upstream Innovation: A guide to packaging solutions." Available at: https://plastics.ellenmacarthurfoundation.org/upstream.
[10] https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials

cleaned, chopped up, heated, and reformed into plastic pellets. Mechanical recycling is economically feasible only for half of the rigid monomaterial plastic (e.g., bottles). The remainder is either too costly to collect and sort, or too contaminated. Flexible monomaterial plastic (e.g., packaging wraps), can technically be mechanically recycled, but generates too low a value to be economical because waste plastic scrap is sold by mass and flexible plastic tends to be lightweight. Multilayer/multimaterial plastic cannot be mechanically recycled at all.

Because of the technological and economic challenges of collecting and recycling flexible monomaterial and multilayer/multimaterial plastic, these two plastic categories are leaked into the ocean disproportionately to their overall production. While flexible monomaterial is 37% of plastic production, it contributes 51% of the ocean plastic pollution from land.



Multi-layer/multi-material plastics include sachets, laminated paper and aluminum (e.g., cartons), sanitary products and diapers, and household goods. Flexible monomaterials include carrier bags and packaging and other plastic films. Rigid monomaterials include bottles, food service disposables, pots, tubs and trays, household goods and business-to-business packaging.

Additionally, there are significant hurdles around price and costs for mechanical recycling to compete and be profitable. Recycled plastic prices have been volatile as they are linked to the global commodity price for oil and often cannot compete with the price of virgin plastic.[11] This price disparity has limited investments in the collection and recycling infrastructure and capacity that could drive costs down. On the other hand, disposal via landfills and incineration has historically been cheaper than recycling,

[11] OECD, 2018. "Improving Plastics Management: Trends, policy responses, and the role of international co-operation and trade. OECD Environment Policy Paper No. 12." Available at: http://www.oecd.org/environment/waste/Policy-Highlights-Improving-Markets-for-Recycled-Plactics.pdf.

making these technologies a financially more attractive option for managing plastic waste. However, both of these disposal methods have had negative environmental impacts such as air pollution and greenhouse gas emissions. Further in some communities, landfills take up precious space.

Chemical recycling – chemical conversion of plastic waste back to plastic polymers – has been promoted as an emerging technology that could solve the feasibility issue with flexible or mixed plastics. Commercial scaling of this technology is still in the development stage and global capacity is at around 0.5 percent. Unfortunately, the adoption of new technologies generally takes several decades to reach widespread commercial scale. Our assessment showed that maximizing the scaling of chemical recycling at the highest historical rate for similar technologies would only lead to 6% of plastic being chemically recycled in 2040, assuming it can be made economically viable.[12]

Similar to mechanical recycling, chemical recycling will also have to compete with the price of virgin plastic and disposal costs. Collection and sorting costs would also be higher for flexible plastic for chemical recycling as they are much lighter in weight than rigid plastic. Chemical recycling also has associated greenhouse gas emissions that are 110% higher than mechanical recycling.

Investments in mechanical recycling could double recycling rates in the next 20 years and increase its profitability through incorporating "design for recycling" principles[13], at the product design stage (including shifting from flexible plastic to rigid plastic), improving sorting technology, and establishing recycling content targets, among other approaches. Each metric ton of mechanically recycled feedstock would offset about half of greenhouse gas emissions over virgin plastic feedstock.

Microplastics are an increasingly growing concern, especially for high-income countries

Although high-income countries like the U.S. have close to 100% access to waste management services, they have the highest per capita microplastic generation, more than triple that of middle- and low-income countries, due to high plastic consumption rates and the inherent difficulty in capturing microplastics before they enter the environment.

Among the four sources of microplastic we analyzed (for which sufficient global data were available), tire wear particles by far comprised the biggest component of microplastic pollution into the ocean, lakes, and rivers (70-80%). Pellets are the second largest component (18%), followed by microfibers from textiles and microplastic ingredients in personal care products. Similar to the trend seen for municipal plastic waste (macroplastic waste), microplastic pollution is expected to double by 2040, under a Business as Usual trajectory, adding 11 metric tons of plastic to the world's oceans.

Due to their small size, it is currently technologically and economically unfeasible to clean up microplastics once they enter the environment. The best approach at controlling this waste stream is to either remove them from products entirely or to capture/contain them at source or close to the source.

[12] The Pew Charitable Trusts and SYSTEMIQ. 2020. "Breaking the Plastic Wave: A Comprehensive Assessment of Pathways Towards Stopping Ocean Plastic Pollution", p. 78-84.
[13] For example: The Association of Plastic Recyclers' "APR Design Guide". Available at https://plasticsrecycling.org/apr-design-guide.

For example, microplastics could be removed from all personal care products, existing measures for plastic pellet management could be strengthened, and technological solutions for reducing microfiber pollution such as in-line filters in washing machines and improved textile design to reduce microfiber generation could be implemented. However, the technological gap for tire wear particles is large and existing solutions may only be able to reduce this type of pollution by 50% by 2040, mainly by increasing the use of alternate forms of transportation (like mass transit) and by driving less.

The U.S. contribution to plastic pollution does not stop at its borders

Plastic pollution is often seen as a problem of developing countries that do not have adequate waste management services. Plastic pollution in middle- and low-income countries is indeed higher than high-income countries and growing due to a confluence of rising income and per capita plastic waste generation, growing population, and the increasing gap between waste generation and waste management capacity. Although in the U.S. solid waste management services extend to nearly 100% of the population, the picture is more nuanced when it comes to the recycling of plastics and ocean pollution.

The U.S. is the highest plastic waste-generating country globally and has the highest per capita plastic waste generation in the world, more than four times that of middle- and low-income countries.[14] The U.S. is also the number two exporter of scrap plastic waste for recycling.[15] Collected plastic waste that is then exported has previously been considered managed waste; that is, it has not factored into a country's plastic pollution estimates. A recent study showed that the U.S. is in fact adding five times more plastic waste into the environment than previously estimated when domestic littering and mismanagement of the exported plastic waste are accounted for.[16] As a result, the U.S. could rank as high as the world's number three plastic polluter.

Unlike the U.S., middle- and low-income countries have a significant solid waste management services gap. About 2 million people globally lack waste collection and management services today and this would grow to 4 million people in 2040 if no significant investments are made. For a sense of the scale of the problem, it would take connecting to waste management services 500,000 people per day every day for the next 20 years to reach full waste management capacity.

Compounding this problem, the waste from countries like the U.S. is usually exported to middle- and low-income countries that lack sufficient infrastructure and capacity to handle their domestic waste. Waste collection and recycling in middle- and low-income countries relies on the informal waste sector, often working under poor sanitary conditions with low wages. Exported waste from the U.S. can add to global inequality and injustice. A substantial proportion of exported plastic waste can be made up of low-value (e.g., flexible), contaminated plastic waste that cannot be recycled economically and must be dumped or burned[17], causing land, water, and air pollution. Degradation of air quality around open

[14] Law, KL, Starr, N, Siegler, TR, Jambeck, JR, Mallos, NJ, and Leonard, GH. 2020. The United States' contribution of plastic waste to land and ocean. Science Advances, 6. DOI: 10.1126/sciadv.abd0288.
[15] Brooks, AL, Wang, S, and Jambeck, JR. 2018. The Chinese import ban and its impact on global plastic waste trade. Science Advances. 4. DOI: 10.1126/sciadv.aat0131.
[16] Law *et al.*, 2020.
[17] Law *et al.*, 2020.

burning or incineration sites can become severe, affecting human health. Dumped plastic in rivers can clog waterways and cause flooding.

Recommendations / Potential Policy Solutions

Based on data from our study, The Pew Charitable Trusts recommends that the U.S. adopt a system change strategy at the federal and state level, implementing solutions ambitiously and concurrently across the whole of the U.S. plastic production, consumption, and distribution infrastructure. The U.S. should further take on a global leadership role to demonstrate how it is possible to achieve an 80% reduction in plastic pollution by 2040. The solutions are often interconnected and focusing only on one or a subset of solutions could significantly reduce effectiveness of even those targeted. For example, increasing recycling rates without driving demand for recycled plastic or designing for recycling would not overcome the economic hurdle posed by cheaper virgin plastic and dampen actual incorporation of recycled plastic back into the economy.

Different combinations of solutions and system interventions could be prioritized based on the desired outcome, such as cost reduction, plastic pollution reduction, greenhouse gas emission reductions, implementation speed, technology readiness or feasibility, and the acceptable trade-offs. Despite the complexity of the plastic infrastructure system, we believe the criteria- and evidence-based approach used in Pew's assessment does offer policy options for consideration by this subcommittee.

Government procurement and policy can drive a reduction in plastic production and incentivize the switch to reuse and refill business models

Among the menu of solutions, reducing plastic production in the U.S. by eliminating unnecessary plastic use, expanding consumer choice around reuse, or developing new delivery models is the most attractive solution, taking into account environmental, economic, and social factors. It offers the biggest reduction in plastic pollution, often represents a net savings, and provides the highest mitigation opportunity for greenhouse gas emissions. The approaches below outline opportunities that Pew hopes will be explored in depth in the upcoming "Report on Minimizing the Creation of New Plastic Waste" called for in section 305 of The Save Our Seas 2.0 Act (S. 1982).

The power of government procurement policies could help drive the phaseout of single-use plastic items and a switch to reusable items. To incentivize the private sector, U.S. government agencies could provide grants or put in place preferential purchasing programs for businesses, especially small businesses, that switch from single-use plastic items to reusable or plastic-free biodegradable items or employ new delivery/refill models. Bag fees, bag bans and single-use item phase-outs (such as for expanded polystyrene containers, utensils and straws) have already been put in place in some jurisdictions (e.g., California, Connecticut, Maine, Hawaii[18]). Government agencies could likewise put in place de facto phase-outs or bans of the single-use plastic items and hard-to-recycle plastics they purchase directly. These government procurement policies could incentivize business opportunities around new delivery models that reduce plastic packaging and waste generation. Single-use plastic

[18] https://plasticpollutioncoalitionresources.org/resources/maps/, accessed 11 March 2021

items could also be phased out from federal lands, including national parks, or banned from particularly sensitive areas, such as designated wilderness areas or endangered species habitats.

Additionally, resources could be allocated to federal agencies, such as the Environmental Protection Agency (EPA), to conduct detailed environmental impact assessments of new plastic production facilities; reduce permits issued for production facilities overall to curb the growth in plastic production, a primary driver of the projected growth in plastic pollution; update pollution standards and regulations; and increase enforcement capacity related to air, terrestrial and aquatic pollution from plastic production facilities. These facilities are often co-located near fossil fuel infrastructure, adding to the pollution burden and health impacts on neighboring communities, and often disproportionately impact low-income and minority communities.[19] Phasing out subsidies to plastic production and instead redirecting those funds to green subsidies for refill and recycling technologies would also help shift the economic incentives towards circular economy production and consumption business models and create new business opportunities for local communities.

A robust domestic recycling program generates social and environmental benefits and economic activity

Based on technology maturity and costs, mechanical recycling will be the predominant recycling technology for the next two decades, treating over 95% of the plastic to be recycled. Over this time period mechanical recycling rates will need to double globally.

Many municipalities across the U.S. have cut their recycling programs and many recyclers have gone out of business since China enacted its waste import ban in 2018 as well as over the past year due to the COVID-19 pandemic. The low cost of oil has driven virgin plastic prices even lower, further pricing out recycled plastic feedstock.

Along with reduction strategies, doubling domestic recycling over the next 20 years could significantly reduce the U.S. contribution to the global plastic pollution problem and facilitate a circular economy approach to plastic production and consumption. Increasing recycling rates would also allow the U.S. to export less plastic waste, reduce the potential of inadvertently contributing to pollution and human health problems in other countries, and cause the U.S. to rely less on the international plastic recycling industry.

The amount of economically recyclable plastic will need to double over the next 20 years to achieve reductions in ocean plastic pollution. One approach is to make the cost of plastic recycling more economically competitive. Congress could invest in providing guidance and establishing standards on design for recycling and recycling labels that are harmonized with local systems and across jurisdictions, as well as easy to understand by consumers. Guidance could also be provided to shift away from low-value, economically unrecyclable plastic (flexible and multimaterial plastic) toward the use of mechanically recyclable plastics (rigid monomaterial plastic). Clearer standards and guidance coupled with programs to educate consumers about recycling programs in their communities could cut the costs

[19] D. Azoulay et al., "Plastic and Health: The Hidden Costs of a Plastic Planet" (Center for International Environmental Law, 2019). Available at https://www.ciel.org/reports/plastic-health-the-hidden-costs-of-a-plastic-planet-february-2019/.

associated with collecting and sorting plastic waste for recycling. Extended producer responsibility policies would further complement public participation by covering the costs of collection, recycling and disposal, as well as providing economic incentives to the private sector to increase the reusability and recyclability of products. We hope the recommendations above will inform the "Report on Eliminating Barriers to Increasing Collection of Recyclable Materials" that the EPA is preparing under the Save Our Seas Act 2.0.

Initiatives that drive up demand for recycled plastic are also crucial to grow the market for recycled plastics. National recycled content targets that are reviewed and ratcheted up periodically could signal that companies should invest in recycling infrastructure and programs, increasing capacity and bringing down costs.

Building a robust domestic recycling industry also presents a job creation opportunity, especially at the community level. Last year, Australia announced an A$190 million (US$130 million) investment in its Recycling Modernization Fund to strengthen its waste and recycling industry and to ban most waste export by 2024, with the potential to create as many as 10,000 jobs.[20] Creating a similar fund here in the U.S. could likewise lead to job creation, even more so than in Australia given the size of the domestic market and its plastic waste stream.

As noted in this subcommittee's House Report 116-100, state and local governments have asked for federal assistance to support recycling infrastructure. To that end, Congress could allocate funds to support municipalities in procuring and operating improved collection and sorting infrastructure and technology, developing separate recycling and compost collection programs at the household level, and providing more education and outreach to the public about recycling programs to increase participation and reduce loss due to contamination. The federal government could also provide support to state and local governments to implement collection incentives and funding mechanisms such as deposit return schemes or extended producer responsibility policies to fund and expand recycling programs.

Microplastics require more attention to understand their full scale, potential solutions, and impacts

There are significant uncertainties around identifying and measuring microplastics in the environment. This is due to not only the lack of standardized methods for collecting and analyzing microplastics in environmental samples like water and air, but also the lack of reliable information on how and where microplastics are used in products and how quickly and in what quantities they are generated in the environment from the breakdown of larger plastic items. For example, little is known about how plastic ingredients in paints may contribute to microplastic pollution, but there is evidence that this may be another important source.[21]

[20] https://www.weforum.org/agenda/2020/08/turning-trash-into-treasure-how-australia-plans-to-recycle-its-way-to-recovery-after-covid-19/, accessed 11 March 2021.

[21] Gaylarde CC, Neto JAB, da Fonseca EM. 2021. Paint fragments as polluting microplastics: A brief review. Mar Pollut Bull. 162:111847. doi: 10.1016/j.marpolbul.2020.111847.

Building on research by the European Chemicals Agency[22], there is currently proposed regulation in the European Union to phase out the use of microplastic ingredients in products that may enter the environment (covering a range of sources such as personal care products, detergents, paints, agricultural products, etc.), as well as proposed reporting requirements and a roadmap under development for policy measures to address microplastic emissions from tires, textiles and pellets. The U.S. would benefit from a similar research and reporting effort on microplastic uses and sources to assess rates of environmental pollution, as well as potential implications for air quality and human health to inform policy needs.

Under the Clean Water Act, the EPA could increase its regulation of plastic production, conversion and recycling facilities to target the sources of plastic pellet pollution. The EPA could also look into monitoring microfiber release by clothing manufacturers and investigate the potential efficacy of microfiber removal systems at textile and clothing production and recycling facilities. Finally, research needs to be conducted to develop standardized testing methods for tire wear rates, as well as textile shedding rates to inform the potential development of future standards for products.

Building on the Microbead Free Waters Act, the EPA could undertake an effort to compile a comprehensive inventory of microplastic ingredients added to both consumer and industrial products, such as detergents, paint, agricultural products, and industrial abrasives. Following the inventory, the EPA could establish sampling and monitoring protocols for the prevalent products, conduct environmental sampling to assess their extent, as well as impacts to people and nature.

Additional research is needed to understand impacts and track progress

A main reason that a comprehensive system-wide study on plastic pollution, like the one Pew conducted, had not been done previously is that the data are scarce, even for high-income countries like the U.S. Pew's assessment identified various data gaps that could benefit from additional research to improve future assessment of the effectiveness of proposed policies and monitoring of progress.

Funding could be allocated to the EPA in collaboration with the National Institute of Standards and Technology (NIST) to establish standard methods for measuring and monitoring plastic pollution, including microplastics, in our waterways and the ocean, as well as on land. This would allow us to track plastic pollution load in the environment and measure progress.

The upcoming Report on Minimizing the Creation of New Plastic Waste will include "an estimate of the current and projected United States production and consumption of plastics, by type of plastic, including consumer food products." We agree that these data are needed and can only be provided accurately by industry and the companies themselves. Ideally a disclosure and reporting system would be developed for annual reporting by companies of their full plastic usage, including in their operations and throughout their supply chain and covering both macro- and microplastics.

[22] European Chemicals Agency, 2019. "Annex to the Annex XV restriction report: Proposal for a restriction". Available at https://echa.europa.eu/registry-of-restriction-intentions/-/dislist/details/0b0236e18244cd73.

Better data are also needed on the environmental and economic impacts of plastic pollution on the environment and economy, the externalities and social costs, such as human health impacts and loss of ecosystem services, of plastic pollution. A comprehensive study by the EPA in collaboration with the National Academies of Sciences, Engineering and Medicine could contribute to understanding the full impacts of plastic pollution, inform trade-off discussions, and make better decisions about policy priorities.

Because scrap plastic is traded globally, a worldwide tracking system of exported plastic waste is needed to assess each country's contribution to the global ocean plastic pollution problem. And because the informal sector handles much of the imported waste, working conditions in this sector will need to be monitored to ensure that high-income countries are not exporting their pollution problems to middle- and low-income countries.

Investments into research and innovation to develop new materials, particularly for tires and food-grade packaging, as well as creative new business models that provide the utility that plastic delivers without generating plastic waste could be modeled after the National Science Foundation's engineering research centers or the Convergence Accelerator program. Establishing these types of programs or developing partnerships with them could examine and address the multiple dimensions to the plastic issue. Innovation will be a key ingredient to stopping plastic pollution within the next two to three decades.

If we are to successfully reduce plastic pollution, the U.S. and the world will need to adopt a system change approach, one that reduces avoidable plastic use, manages plastic waste and recaptures its value through a circular economy. On behalf of The Pew Charitable Trusts, thank you for the opportunity to present the findings from our comprehensive assessment on pathways toward stopping ocean plastic pollution.