June 19, 2023

Comments on EPA's *Draft National Strategy to Prevent Plastic Pollution*

Submitted on behalf of:

Duke University | Environmental Law and Policy Clinic

Duke Cancer Institute

Duke University | Bass Connections

Department of Pharmacology & Cancer Biology
Duke University School of Medicine

Duke Law

Duke
Department of History

Duke University School of Medicine

Duke | Nicholas Institute for Energy, Environment & Sustainability
Fueling ambitions. Powering networks. Accelerating solutions.

Duke | Nicholas School of the Environment
Duke University Marine Lab

Center for Documentary Studies at Duke University

Duke Fuqua School of Business

Duke | Nicholas School of the Environment

Duke | Department of Art, Art History & Visual Studies

昆山杜克大学
Duke Kunshan University

Duke | Pratt School of Engineering

We, the Duke University Plastic Pollution Working Group, thank the EPA for this opportunity to provide comments and feedback on the *Draft National Strategy to Prevent Plastic Pollution* (EPA 530-R-23-006). We commend the Strategy's goal to eliminate the release of plastic waste from land-based sources into the environment by 2040,[1] and support the Strategy's emphasis on achieving this goal by:

1. **promoting a circular economy approach that aims to eliminate waste and rejects harmful practices of converting solid waste to fuel, fuel ingredients, or energy;**

2. **minimizing pollution from *all* stages of the plastic lifecycle;**

3. **including communities with environmental justice concerns; and**

4. **promoting solutions that yield benefits and minimize harm to overburdened communities.**

The Strategy's vision captures the direction the United States must take to confront the plastics crisis and develop lasting solutions. However, due to its voluntary nature, actually reaching the goal of eliminating the release of plastic waste to the environment hinges on three key factors:

First, the EPA must recognize where voluntary measures will not be enough and pursue binding strategies to compel action in those instances. For example, the EPA has existing authority to require removal of macro-plastics, micro-plastics and nano-plastics from water sources under the Clean Water Act and the Safe Drinking Water Act, but has yet to do so.

Second, support for stakeholders is needed. Ultimately, the Strategy's effectiveness will be determined by the ability of stakeholders to work collaboratively with EPA to implement it. For collaborations like ours to refine, expand, build upon, and better align efforts with the objectives set forth in the Strategy, support from the agency is needed. We encourage the EPA to provide the following types of support:

- identify funding opportunities both within and outside the agency that could be deployed to support research and community-led efforts that further the objectives of the Strategy;
- provide opportunities (meetings, workshops, conferences, etc.) for stakeholders to come together to foster new collaborations, learn from each other, and strengthen their support networks;
- provide platforms (e.g., webinars, web pages, etc.) for stakeholders to disseminate work, including model policies, educational materials, research results, and novel plastic reduction programming; and

[1] Relatedly, we also commend EPA's recent action withdrawing its proposal to exempt chemical processing facilities from Clean Air Act requirements and confirming their coverage by the Act's permitting requirements and emission standards.

- develop clear benchmarks with status updates for progress towards the goal of eliminating the release of plastic waste from land-based sources into the environment by 2040.

Third, the United States is one of only five countries that has not ratified the Basel Convention. While the Senate voted to ratify the Convention in 1992, the domestic statutory authority to implement it is lacking. The United States could develop this authority, but Congress must enact legislation to do so, e.g., by passing the Break Free from Plastic Pollution Act or amending the Resources Conservation and Recovery Act.

A multi-disciplinary approach is necessary to execute the Strategy and attain its articulated goals. The Duke University Plastic Pollution Working Group has adopted such a multi-disciplinary approach to collaboration and research to reduce and mitigate the harms from plastic waste, and we would be thrilled to collaborate with EPA on local and regional implementation in the Southeast and potentially beyond. Our working group is composed of more than 50 members from 12 Duke schools and academic units and is led by faculty and postdocs who collaborate with doctoral, professional degree, and undergraduate students to work on research, legal and policy analysis, and community outreach. Members represent a broad range of fields, including environmental toxicology, business, medicine, public policy, engineering, law, bioinformatics, marine conservation, environmental justice, history, chemistry, resource and environmental management, and the arts. Many of the Group's initiatives and research projects support EPA's Strategy, such as:

Policy & Advocacy

- The Duke Environmental Law and Policy Clinic engages in local and statewide plastic reduction policy efforts in partnership with several non-profit organizations, including Don't Waste Durham and the North Carolina Plastic Waste Reduction Network. Through these partnerships, we have a keen understanding of the political, legal, and policy landscape in the Southeast and the benefits and drawbacks of various interventions. The Clinic also has surveyed businesses, analyzed the factors to determine "recyclability," analyzed the costs of plastic pollution to local communities, and developed model ordinances and laws and policy toolkits for local actors to use in their work. *Connects to A1.1, A1.4, B1, B2.2, and C4*
- The Duke Environmental Law and Policy Clinic has conducted extensive research into the legal tools under the Clean Water Act to address stormwater sources of litter and is currently partnering with North Carolina Riverkeepers to collect data on litter in streams using in-stream trash capture devices. *Connects to C1.2, C2.1, C3.3*.
- The Nicholas Institute for Energy, Environment & Sustainability created and maintains a public inventory of plastics policy documents from all over the world, focusing on regional, national, and international levels (the Plastics Policy Inventory). This inventory includes a library of data regarding policy effectiveness, as well as a resource bank of other databases and publications that measure and track plastics policy, and is intended to serve as a resource for policy development. *Connects to A1.4, B1, C1.1*

- The Nicholas Institute and the Environmental Law and Policy Clinic have also received a small grant to develop a roadmap for assessing the social cost of plastics. This effort, the results of which will be made public, will identify cost categories, determine those for which cost estimates have already been developed, and identify priorities for those categories that lack data. We would be happy to connect with EPA to ensure our methods and results are relevant to its work for the Strategy. *Connects to B4.5*

Education & Outreach

- Our members have extensive experience in outreach, curriculum development, mentorship, and fostering external partnerships related to plastic waste. This includes a partnership with the Durham Public Schools through Duke's Health and Environment Scholars Program to study plastic pollution and civic action, a partnership with the Boys and Girls Clubs of the Coastal Plain with programming related to plastic pollution, and the development of marine debris curriculum resources and solutions for high school outreach programs. Because of our interdisciplinary nature, the Plastic Pollution Working Group can also work across disciplines to create education and outreach materials that target diverse audiences and communities (e.g., art installations to support educational models). *Connects to C4.1, C4.2, C4.3*

Bioengineering Plastic Waste

- As EPA has noted, current proposals to turn plastic waste to fuel using chemical or advanced recycling are imprudent as they pose significant sustainability challenges that must be overcome. However, a growing body of research indicates that microbial degradation of plastic could be optimized through bioengineering strategies. In particular, the integration of deep learning models to advance lead candidate protein structure modifications, unique combinations of microbial communities, or optimized nutrient growth conditions harbor significant potential. Further potential lies in the use of combined mechanical, chemical, and biological methods for transforming plastic into constituent byproducts to create a circular economy or novel products. While these technologies are promising, it is also important to assess the fate of plastic additive compounds, as well as the health and environmental impacts of such bioengineering processes. Unfortunately, there is limited funding available to develop these novel approaches, and the lack of funding impedes the necessary research. Further investment in research and development is needed to bring these game-changing technologies to bear on the plastic pollution problem and spur further innovation.

Environmental Engineering and Toxicology:

- Plastic pollution is a global challenge that requires problem-solving expertise and research from multiple disciplines. As such, Duke University researchers have formed interdisciplinary collaborations to investigate the impacts, toxicity, and fragmentation of plastic pollution.
- Plastics pose different levels of risk based on their various types and characteristics. Environmental Toxicologists at the Nicholas School of the Environment have conducted studies to better understand the risks and effects of plastics on various organisms.

These studies have focused on specific characteristics – e.g., types of polymers, sizes of micro- and nano-plastics, shapes of micro-plastics (e.g., fibers, fragments, films), and additives – as well as routes of exposure. Studies like these demonstrate how the characteristics of plastics throughout their lifecycle can affect organisms, from bioavailability to toxicity.

- Environmental chemists at the Nicholas School of the Environment and the Pratt School of Engineering have expertise in the analysis of organic compounds such as PFAS (per- and poly- fluoroalkyl substances), flame retardants, and disperse azobenzene dyes (colorants used exclusively in plastic textiles), among others. Their combined analytical capabilities have contributed research about exposure to known plastic additives and additive leaching behavior from microplastics.
- Environmental engineers within the Pratt School of Engineering have made incredible advances on the study of fragmentation of plastics into micro-plastics, as well as modeling micro- and nano-particle transport within the environment, and the leaching behavior of additives. *Connects to C5*

Overall, we are excited to see the release of this draft Strategy, as well as the earlier National Recycling Strategy, and look forward to the release of future strategies developed in accordance with the Save Our Seas Act 2.0. The United States is long overdue in prioritizing the elimination of pollution from plastics, and we welcome the opportunity for this Strategy to guide us in a collaborative, multidisciplinary effort to address the plastics crisis. We hope this overview of our research and initiatives provides helpful context for our comments on the *Draft Strategy* and the potential for future collaboration with the agency. Below we provide comments on certain tasks identified in the Strategy and respond to the specific questions posed for feedback.

Thank you for your consideration.

On behalf of the Duke University Plastic Pollution Working Group,

Michelle Nowlin, JD, MA, Clinical Professor of Law and Co-Director, Environmental Law and Policy Clinic
Nancy Lauer, PhD, Staff Scientist, Environmental Law and Policy Clinic
Jason Arnold, PhD, Assistant Research Professor in Molecular Genetics and Microbiology
Jason Somarelli, PhD, Assistant Professor in Medicine
Meagan Dunphy-Daly, PhD, Assistant Professor of the Practice, Marine Science and Conservation
Anna Lewis, Doctoral Candidate, Civil and Environmental Engineering
Melissa Chernick, M.S., Research Technician, Nicholas School of the Environment
Rachel Karasik, MEM, Senior Policy Associate, Nicholas Institute for Energy, Environment, and Sustainability

1. **Which actions are the most important and would have the greatest positive impact at the local, regional, national, and global levels?**

Local:
At the local level, efforts to facilitate waste diversion of some of the most common sources of plastic waste (e.g., single-use products and packaging) are needed. Such efforts could include regulations, incentives, and infrastructure to transition away from single-use products and towards existing and available alternatives – including reuse systems and compostable infrastructure. Likewise, support for reverse logistics to circulate reusable items and reduce carbon emissions is needed. Lastly, because solid waste management is handled at the municipal level, encouraging and incentivizing responsible end markets for plastic (as is done in Oregon's Recycling and Modernization Act) could help prevent our plastic waste from being exported to countries already burdened by pollution and that lack sufficient infrastructure to manage the waste.

Regional:
At the regional level, we support the same actions as mentioned above, and note that regions with concentrated industry and manufacturing plants will most directly benefit from and be affected by actions taken further upstream, such as production caps, chemical simplification, the removal of fossil fuel subsidies, or stricter permitting criteria for facilities. In addition, regions that include states that have adopted Extended Producer Responsibility schemes would benefit from regional coordination to facilitate industry compliance.

National:
Waste Reduction. On the national level, reducing pollution during production will likely have a greater positive impact than modifications to post-use materials. (For example, modifying manufacturing processes to reduce waste, and/or incentivizing the use of non-plastic alternatives in product production pipelines.) Through regulation, EPA could classify plastic pellets or plastic precursors like vinyl chloride as hazardous substances, which would secure more stringent oversight during manufacture and transport, and limit future tragedies such as the recent disaster in East Palestine, Ohio.

Definition of Recyclable. In addition, a more comprehensive and universally relevant definition of what is recyclable is needed - as EPA noted in C1.5 of its National Recycling Strategy. Lack of standardization for recyclable materials, plus consumer confusion about resin codes and the "chasing arrows" symbol on plastic items, prevents materials from being recovered properly. Moreover, many plastic and polystyrene materials are not, in fact, recyclable due to the lack of collection and processing operations or market factors that make the items too expensive to recover and recycle. The mere potential for an item to be recycled does not mean that it is, in fact, recyclable.

The definition offered by the Sustainable Packaging Coalition provides a starting point for a workable definition: a product is recyclable if "it can be collected, sorted, reprocessed and

ultimately reused in manufacturing or making another item." A universal definition also should make clear that market access is critical to the determination of whether an item is recyclable. As the Sustainable Packaging Coalition notes, there must be a "substantial likelihood" that, in the majority of communities in which the item is sold, the product is accepted by the local recycling program,[2] can be effectively sorted or separated from other materials, and can be reprocessed in order to make something new.

Chasing arrow resin codes mislead consumers about the recyclability of the product. Manufacturers could update the molds to eliminate this confusion. Alternatively, manufacturers could be required to place a stamp stating "Not Recyclable" on unsortable black or mixed plastic products that contaminate the recycling stream.

Use existing federal laws. Finally, there are federal authorities that can be acted on to address plastics across its lifecycle. For example, use of existing authority in the Clean Water Act (stormwater systems to remove macro-plastics from creeks and rivers, establishing water quality standards for discharges of micro- and nano- plastics) and the Safe Drinking Water Act (drinking water standards for micro- and nano- plastics, PFAS/PFOS) would force development of technology to remove those pollutants and better protect human health and the environment. Pursuant to the Food, Drugs and Cosmetics Act, the FDA could prohibit or limit the leaching of chemicals from food packaging; doing so could lead to reductions in packaging, removal of materials that are harmful to human health and the environment, and support for circular models. And, to better protect local authority, EPA could issue guidance under the Resources Conservation and Recovery Act (RCRA) clarifying that waste management happens at the local level and thus (1) RCRA does not preempt state and local government action to reduce waste at the source, and (2) local governments have authority to determine what waste reduction efforts would work best for their communities.

Global: At the global level, coordinated reduction of plastic use in manufacturing, along with optimization of manufacturing protocols to reduce waste, would have the most significant impact. Initiatives to prevent trash from entering waterways (ultimately reducing the accumulation of plastic waste in global water systems) also have an important role to play in addressing plastics. One idea is to work with manufacturers of laundry machine – in the U.S. and in other countries – to include microfilters that can catch micro-plastics shed from clothing prior to release into wastewater systems and waterways.

A ban on the export of plastic waste, through ratification of the Basel Convention, for example, could promote resource recovery domestically. Recovered materials could be exported as inputs for use in manufacturing or other industrial processes.

[2] The Federal Trade Commission (FTC) is aware of consumer concerns and, earlier this year, solicited public comment on the definition of "recyclable" and other topics in its Green Guides. The most recent update, in 2012, advised manufacturers to qualify their recycling claims if recycling facilities are not available to at least 60% of consumers or communities in which the product is sold.

Lastly, several of the changes suggested above for the local and regional levels in the U.S. could be implemented in communities across the globe to reduce the amount of plastic waste from entering national and global water sources.

Which actions can best protect human health and environmental quality?

The United Nations Environment Programme (UNEP) published a report on May 3, 2023 that revealed there are more than 13,000 chemicals associated with plastic and its production, approximately 3,200 of which have hazardous properties including carcinogenicity, mutagenicity, reproductive toxicity, endocrine disruption, and/or ecotoxicity to aquatic organisms. (i.e., would be classified as hazardous pursuant to RCRA). Exposure to these chemicals happens at all stages in the plastic lifecycle, from production to disposal, highlighting the importance of action A2 in protecting human and environmental health. Specifically, exposure to the chemicals in plastics can occur from 1) inhalation of air pollutants generated in the manufacturing process, 2) leaching of these chemicals into food and drink, and 3) ingestion or inhalation of micro- and nano-plastics (which contain the chemical additives).

During plastic production, inhalation of air pollutants associated with the manufacturing process is a real health concern. (EPA's recent decision to regulate emissions at chemical processing plants is a good example of the protections needed at plastic production facilities.) Many of these facilities (approximately 150 of them) are located the Gulf Coast region, particularly in an 85-mile stretch in Louisiana known as "Cancer Alley." This area is home to a historically Black community with some of the highest air pollution levels and cancer rates in the country. As demonstrated by Cancer Alley, fenceline and environmental justice communities will bear the greatest exposure from manufacturing plants, and we support the Strategy's goal to map and assess the environmental justice and public health impacts on these communities (A2.5).

The ability to reduce the risks posed by chemicals leached from plastics and chemicals in micro- and nano-plastics is hindered by the fact that the human health effects of plastic's chemical additives and pollutants are not fully known. Future research efforts should focus on 1) testing of micro- and nano-plastics in sources of drinking water and processed foods; 2) determining the cumulative impacts of complex mixtures of plastic monomers, polymers, and plastic additives; 3) understanding the effects of size, shape, and weathering of different polymers on toxicity; 4) quantifying fate and transport of plastics and their additives in the environment and within and between organ systems; 5) developing standardized assays to address the impacts of plastics and their additives with sufficient scientific rigor; 6) understanding the impacts of plastics and plastic additives across scales of biological organization (molecular and cellular to whole organism and population/ecosystem-level); and 7) better understanding and measuring cumulative risk and impact of either multiple pollutants or clustered industrial facilities within a given area. Despite these research gaps, it is important that we do not just sit back and wait for the science to emerge. One action that would proactively reduce exposure to these sources includes transitioning away from needless single-use plastic products and towards circular reuse systems that do not rely on plastic.

Additionally, actions that prevent macro- and micro-plastics from entering freshwater and marine ecosystems, such as those outlined in action C, will reduce exposures to micro- and nano-plastics and plastic additives. In these environments, weathering facilitates the breakdown of plastic into micro- and nano-plastics and promotes leaching of chemical additives, all of which can then be consumed by aquatic life and humans. For example, research conducted by members of Duke's Working Group documented that resident organisms, including invertebrates and fish, mistake plastic particles as food items and ingest various types, shapes, and sizes of micro- and nano-plastics. Exposure to these particles negatively affects body condition, organ pathology, among other effects, while the leached chemical additives can drastically alter processes such as reproduction and embryo development.

Which actions are most important to address environmental justice and climate impacts?

Although several members of our Group work and collaborate with environmental justice organizations and fenceline communities, we cannot – and do not purport to – speak for them in these comments. The best way to identify priorities for addressing environmental justice is to engage directly with disadvantaged and overburdened communities and invite their input. From our collective perspective, environmental justice concerns are implicated at every stage of the plastics life cycle, from cradle (oil and gas exploration) to grave (disposal).

That said, we offer three recommendations that could help environmental justice communities:

(1) Reducing plastic production and volumes of plastic waste are essential for protecting fenceline communities and mitigating climate and environmental justice impacts. Emissions from oil and gas production and refining, pollution from plastics manufacturing, pollution from landfills, and ingestion of plastics by aquatic organisms disproportionately burden these communities.

(2) Institutionalizing and expanding the use of existing tools, including EPA's EJ Screen, CEQ's CJEST, and CDC's social vulnerability index, would help determine social and environmental vulnerabilities and exposures and identify areas that will be harmed by the siting of industrial activity related to plastics (e.g., oil and gas extraction and refining, plastic production, recycling facilities, incinerators, etc).

(3) Banning the export of plastic waste and promoting responsible end markets for waste would confront the environmental injustice caused by the export of plastic waste from wealthy countries to poor countries that lack the infrastructure to properly manage the waste. Ratifying the Basel Convention could also help control, monitor, and track plastic waste exports.

To address the climate impacts, scaling reuse systems within and across cities and towns would have notable climate benefits, and, if designed intentionally, could ensure that the benefits of and access to reuse systems are available to the most marginalized communities.

What are the key steps and milestones necessary to successfully implement the actions in the draft strategy?

Development and implementation of micro- and nano-plastic detection/quantification methodologies that allow for unbiased analysis of environmental and clinical samples would be a critical step forward (currently methods available to detect and quantify these pollutants are highly biased, expensive, and challenging to standardize). Once these techniques exist, more concrete benchmarks can be introduced to track the success/failure of strategies to reduce pollution.

Dedicated funding is needed to implement many of these actions. Although remarkable in their scope and the resources provided, the BIL and IRA don't target funding to support plastic reduction goals. Additional funding could be secured through Extended Producer Responsibility requirements, which would more appropriately internalize the costs of plastic waste and pollution to those entities responsible for its creation. Otherwise, additional legislation or appropriations, modifications to annual proposed budgets, and modifications to existing funding programs (e.g., revolving funds through the Clean Water Act) would be necessary. Partnerships with foundations and businesses could also be possible. We do not know the universe of funding opportunities available but imagine there are many opportunities to leverage existing funding.

Given that the overall plastics recycling rate is so much lower than for other materials, it could make sense to set a separate recycling target for plastic, which would serve as a milestone.

2. What are the most important roles and/or actions for federal agencies to lead?

The government must lead by example and reduce waste generation in its own operations (as outlined in EO 14057). In addition, agencies should share with the public their actions and benefits as best practices for other institutions to replicate. EPA's proposal for government procurement policies (e.g., Strategy A.1.2) is an example of the leadership required, as are EPA's procurement guidelines and DOI's secretarial order to phase out single use plastics at national parks, visitor centers, and cultural institutions.

Federal research funding agencies – including USDA, NIH, and NSF – should consider providing increased funding support for research (clinical, agricultural, and environmental) that is focused on better understanding the impacts of micro- and nano- plastic pollutants on human health, environments, ecosystems, plant life and wildlife. Better understanding the impacts of plastics will better inform policy-makers and business leaders on the development of solutions.

Regulatory agencies will undoubtedly need to lead initiatives to provide financial incentives to manufacturers that work to reduce plastic waste, and to impose financial consequences on manufacturers that produce waste. For example, a sliding tax on companies producing plastic

waste (more production = higher tax) would provide funds for educational initiatives focused on single-use plastics and for research to better understand the implications of plastic pollution. Of course, this would require congressional authorization, but the agencies could lead these efforts.

Federal agencies can also provide assistance by creating circular models for reuse of materials and modeling their benefits (social, economic, and environmental). Federal agencies can also develop guidelines and best practices for protecting public health in the circulation and reuse of certain materials (e.g., reusable shopping bags, reusable takeout containers, refill and bulk purchase food items).

3. Is your organization willing to lead an action or collaborate with others to implement the actions? What factors would your organization consider when determining whether to lead an action?

As referenced in our cover letter, the Duke University Plastic Pollution Working Group is willing and well-equipped to lead actions and collaborate with others to implement the actions. Our multi-disciplinary expertise, which spans environmental toxicology, business, medicine, public policy, engineering, law, bioinformatics, marine conservation, environmental justice, history, chemistry, resource and environmental management, and the arts, complements the diverse set of goals outlined in EPA's Strategy. Our Group's current work supports the following actions:

Action	
A1.1	Identify single-use, unrecyclable, or frequently littered plastic products and identify alternative materials, products, or systems with fewer impacts on the environment.
A1.4	Identify effective policy tools and approaches to reduce production of single-use, unrecyclable, or frequently littered plastic products.
B1	Conduct a study of the effectiveness of existing public policies and incentives upon the reuse, collection, recycling, and conservation of materials.
B2.2	Research and identify obstacles to reuse and propose innovative, viable solutions.
B4.5	Assess the social costs of plastic waste (including litter cleanup) and how those costs could be reduced via reduction/prevention solutions.
C1.1	Conduct analyses on the cost, effectiveness, and equity of policies/programs addressing the problems of litter, illegal dumping, and unintentional spillage of trash, in particular in disadvantaged and vulnerable communities.
C1.2	Explore expanded use of Clean Water Act authorities to significantly reduce trash loadings into waterways.

C2.1	Identify and address potential barriers to installing and maintaining effective trash and micro/nanoplastic capture systems.
C3.3	Disseminate information on trash assessment protocols and the appropriate usage of these protocols.
C4.1	Develop messaging and educational materials about the nature and impacts of trash pollution and what targeted audiences can do to help address the problem.
C4.2	Research and disseminate information on successful outreach and education practices and programs to motivate positive behavior change.
C4.3	Conduct campaigns using known best practices to raise public awareness of the trash pollution problem and encourage behavior changes that reduce trash pollution.
C5	Increase and coordinate research on micro/nanoplastics in waterways and oceans.

Before deciding whether to lead an action, the Plastic Pollution Working Group would need clear guidance on 1) EPA's expectations from action leaders in terms of the time commitment, stakeholder and community engagement, and deliverables, and 2) what action leaders can expect from EPA in terms of support. The draft Strategy states "EPA intends to help facilitate the implementation of actions in the strategy and will provide routine status updates to interested stakeholders," but details on what this facilitation will look like are lacking. We encourage EPA to provide the following types of support:

- identify funding opportunities both within and outside the agency that could be deployed to support research and community-led efforts that further the objectives of the Strategy;
- provide opportunities (meetings, workshops, conferences, etc.) for stakeholders to come together to foster new collaborations, learn from each other, and strengthen their support networks;
- provide platforms (e.g., webinars, web pages, etc.) for stakeholders to disseminate work, including model policies, educational materials, research results, and novel plastic reduction programming; and
- develop clear benchmarks with status updates for the goal of eliminating the release of plastic waste from land-based sources into the environment by 2040.

4. What are potential unintended consequences of the proposed actions that could impact communities considered overburdened or vulnerable, such as shifts in production or management methods?

The politicization of *any* topic is a significant problem in the United States, and globally. As an example, use of masks to reduce the spread of COVID-19 and discussion of the impacts of gas stoves have turned deeply political. So far, addressing plastic pollution has benefitted from

bipartisan support and we hope this will continue. However, the plastics industry is already lobbying against initiatives to address plastic pollution and gaining access to decision making fora, including the INC negotiations. One of the industry's arguments is that upstream actions that cut plastic production may lead to a reduction in workforce and cause economic harm to communities. Our expectation is that any workforce reduction would be offset by increases in workers needed to support reuse and circularity. However, we lack sufficient information to verify or refute this argument and agree that it warrants consideration.

Similarly, manufacturers could move manufacturing plants to locations with more vulnerable communities, where they could acquire a less costly workforce. Developing a national strategy would reduce this potential, as would ratifying the Basel Convention and/or signing and ratifying the treaty to end plastic pollution that currently is being developed within the United Nations.

Many single-use plastics are being replaced with single-use alternatives, particularly compostables, even though most communities lack infrastructure and access to commercial composting facilities. Moreover, some of those "compostable" items contain additives that contaminate the compost and render it unfit for use in crop production and community gardens. Advancing replacements without understanding their full effects can lead to the creation of new problems.

5. What key metrics and indicators should EPA use to measure progress in reducing plastic and other waste in waterways and oceans?

Establishing a baseline of macro-plastics entering waterways and oceans is necessary to track changes to that baseline and evaluate the efficacy of plastic reduction policies and programs. Thanks to EPA's Escaped Trash Assessment Protocol (ETAP), developed by the Trash Free Waters Program in 2021, establishing this baseline is more feasible than ever. Prior to ETAP, there was no EPA-backed, standardized protocol for collecting and assessing litter data. Without a standardized protocol, researchers, community groups, and non-profits who saw value in collecting litter data were doing so using varying methods, making it difficult to compare or collate datasets. For instance, some collected data by weight while others collected data by number, and the categories in which litter data were sorted varied substantially. The development of ETAP allows for the systematic monitoring of plastic waste in waterways and the ability to compare these data across time and space.

Despite such promises, there are several steps EPA must take to effectively deploy ETAP to establish a comprehensive baseline of plastic and waste in waterways and track progress in reducing loadings. First, ETAP's protocol is relatively new and information about the protocol on EPA's website is sparse. As outlined in Action C3.3, we encourage a concerted effort to promote ETAP to Riverkeepers, environmental non-profits, state and local governments, and researchers through trainings, webinars, and case studies. Second, individuals, community groups, and non-profits have relied on citizen-science litter assessment tools, such as

CleanSwell, Debris Tracker, and Litterati, for years prior to ETAP's release. EPA must determine how ETAP can complement, as opposed to compete with, these citizen science tools. Finally, EPA must provide a centralized, publicly available platform (as suggested in C3.1), such as an ArcGIS Online WebApp or Dashboard, that tracks and visualizes data collected with the ETAP protocol. Such a platform would allow EPA and its partners to analyze spatial and temporal trends in macro-plastic pollution and measure progress towards the EPA's goal of eliminating the release of plastic waste from land-based sources into the environment by 2040.

While ETAP can be deployed to measure litter loadings in stream beds, we encourage EPA to also recognize ETAP's suitability for collecting data from in-stream trash capture devices, such as booms, "litter gitters," "Trash Trouts," and Bandalongs. Providing funding and training for local municipalities to purchase, install, and track data from in-stream litter traps is an excellent way to both reduce litter loadings in waterways and track progress on plastic pollution reduction efforts.

Finally, although ETAP is an important development in the monitoring of macro-plastics, we lack well-established and standardized detection/quantification methods for micro- and nano-plastics. Methodologies for isolating and detecting macro- and micro-plastics in environmental samples have greatly improved, but still require expensive instrumentation and rigorous contamination mitigation. Accessible and high throughput methods are crucial to monitoring plastic pollution mitigation progress. Reliable and high throughput methods for detecting nano-plastics in environmental matrices must be developed. Nano-plastics should be considered separately as they present different transport behavior and toxicity than larger plastic particles. Objectives described in the AMAP's 2021 Litter and Microplastics Monitoring Plan and GESAMP's 2019 Guidelines for the Monitoring and Assessment of Plastic Litter in the Ocean as well as NIST's Center for Marine Debris Research (CMDR), provide good examples of what we would like to accomplish.

That said, measuring the amount of plastic entering aquatic environments versus the amount being removed is challenging, especially because much of the plastic waste in waterways and oceans is the result of improper waste handling and illegal dumping. The recent use of AI-powered drones by non-profits and NASA Earthdata to create maps that help focus efforts has been a boon for research. However, these techniques are typically limited to surface water and larger size categories of plastics.

To measure the progress of plastic reduction in aquatic environments, standardized operating procedures (SOPs) for the detection and quantification of plastics from various environmental matrices is necessary. Considerable strides have been made recently in laboratory methodology to quantify micro-plastics in various environmental matrices, some of which has helped advance policies such as the one adopted in California (CA SWRCB 2021a, CA SWRCB 2021b) for the measurement of micro-plastics in drinking water. However, SOPs for other environmental matrices (e.g., biota, sediment) have not been developed due to their complexity. Additionally, nano-plastics pose a particularly difficult challenge as there are no consistent

techniques for their detection or quantification. This lack of consistency makes their removal from environmental matrices both difficult to do and to confirm.

6. **What criteria should processes other than mechanical recycling meet to be considered "recycling activities" (e.g., "plastics-to-plastics outputs are 'recycling' if the output is a product that could again be recycled into another product or to extent that it can achieve viable feedstock for new plastic materials")? How should health and environmental impacts be considered in these criteria?**

Many of the additives contained in plastics have serious health concerns. We generally think about these additives in new and in-use plastic products, but "legacy" additives should also be addressed. These additives can leach out under normal conditions all the way to thermal degradation processes. While these additives have various properties, they are often volatile and/or soluble in water. Research into the toxicity of these additives has yet to catch up to the sheer number of chemicals used in plastics.

Chemical (tertiary) recycling has gained traction in recent years. In chemical recycling, new chemicals are used to break down plastics (e.g., via "dissolution," "conversion," or "depolymerization") into secondary raw materials. While some champion "chemical recycling" as a way to produce raw materials as well as break down harder-to-recycle plastics, there are concerns about the development and use of these chemicals, many of which are identified as toxic. In addition, the chemical reactions involved in process may produce byproducts (e.g., volatile organic compounds) as well as hazardous waste. We share the concerns raised by lawmakers in their comments on EPA's *Draft Recycling Strategy* (e.g., https://www.booker.senate.gov/imo/media/doc/booker_huffman_lowenthal_lead_35_colleagues_in_letter_raising_concerns_over_climate__environmental_justice_risks_of_chemical_recycling_of_plastics1.pdf). As this is a relatively new industry that requires sizable energy inputs, and that poses significant threats of harm to already overburdened communities, we recommend caution in evaluating the industry's claims and support independent research in evaluating the technology's impacts.

Specific criteria to consider include the following:

- Does the process prevent a product from ending up as any kind of pollutant?
- Does the process emit GHGs from energy inputs or the breakdown of plastic inputs?
- Does the process release toxic chemicals?
- Does the process release chemicals with little available data on risk of exposure?
- Does a market exist for the secondary materials?
- Is it feasible to develop and enforce requirements for actual use of secondary materials?

- A definition of circularity that differentiates between plastic-to-plastic and plastic-to-energy may be needed.

7. Are there other actions that should be included in the Strategy?

Should EPA expand the scope of the strategy to include sea-based sources?

Marine debris and sea-based plastic pollution have the potential to influence human health through consumption of ocean-derived food, which is a dominant food source for much of the planet. However, EPA's authority over sea-based sources of plastic is limited. Based on our understanding of the evidence base, the sea-based sources are: (1) cargo ships; (2) cruise ships; (3) oil & gas platforms; (4) military operations; and (4) derelict fishing gear. Fishing gear is regulated by NMFS pursuant to the Magnuson-Stevens Fisheries Act; there is additional, albeit limited, authority under the Endangered Species Act and Marine Mammal Protection Act - but NMFS is the authorized agency in these statutes, too. NOAA's Marine Debris program and EPA's Trash Free Waters program have similar missions and methods and could work jointly in some watersheds. It may also be beneficial for EPA to work with NMFS on a joint strategy for recovery of abandoned fishing gear. We would support inclusion of sea-based sources in the strategy, as appropriate.

Should specific types of plastic products be targeted for reduction or reuse in this strategy?

As a starting point, focusing on single-use plastics (disposable devices, packaging, polystyrene), and other plastics that are identified as unnecessary through a collaborative process, is likely to have the broadest initial impact. Single-use items are the most common forms of plastic reported from road-side and river clean-ups. However, the national strategy should evolve and include mechanisms for adaptive management should other sources of plastic become dominant. For example, the OECD anticipates that plastic from other sources (e.g., clothing and textiles, construction, tires, etc.) will become increasingly significant sources of plastic in the future.

Recommended additional actions for the Strategy:

- Many communities - especially rural communities and low-wealth/disadvantaged communities - lack access to recycling facilities and proper waste collection. Consider recovery/diversion of recyclable materials at the point of disposal
- A barrier for circularity/reuse systems is the increasing consolidation/centralization of bottling plants. Bottled items like sodas are transported over longer distances for distribution, which increases expense/logistical hurdles for bottle returns. What can be done about this?
- Extended producer responsibility is essential - companies must be responsible for the waste they create - e.g., $$ for waste management, bottle deposits/returns, can EPA support standardization and harmonization for reuse across EPA regions.

- Research is needed to identify alternatives for single-use plastics and packaging, and the costs of those alternatives.
- Enforcement of label claims - e.g., create a “recyclable” definition that requires certification, similar to the USDA organic label. (Or, work with FDA on “adulteration” of food products (under the Food, Drug and Cosmetics Act, a product is considered “adulterated” if its label is misleading. Typically, that law has been enforced re: baseless/unsupported health claims (e.g., heart-healthy), but it could be enforced more broadly)
- Research into leaching of plastic additives/PS constituents from food packaging into food. Research could be done in conjunction with the FDA.

8. Do you have any additional information or recommendations for EPA regarding these or other proposed actions in the draft strategy?

Below are some additional comments that, while not responsive to the specific questions EPA has posed, provide feedback on specific tasks set forth in the Strategy.

B2: Develop or expand capacity to maximize the reuse of materials.
EPA should develop clear messaging and outreach to state and local public health agencies on best practices for safe reuse. For example, Before the pandemic, there was considerable progress across the country on plastic reduction and scaling reuse. When the pandemic hit, the plastics industry broadcast false information that reuse was unsafe. This message quickly undermined bulk and reuse operations around the country. The Environmental Law and Policy Clinic developed information to rebut the industry’s messaging (e.g., pointing out that the study they relied on was about bacteria, not viruses, and focused on a bag that was left on a bathroom floor!), which the Nicholas Institute published (Policy in the Pandemic series) but this got little attention - we were no match for the industry’s communication resources.

B3.2: Research the use and environmental impacts of certified compostable plastic products.
We support the focus on research surrounding the environmental implications of using “Certified Compostable” products, especially regarding release of micro- and nano- plastics and the use of PFAS in many of these products. This further highlights the need for better tools for detection and quantification of micro- and nano-plastics.

C: Prevent trash and micro- and nano- plastics from entering waters and remove “escaped” trash from the environment.
EPA states that it needs to understand the sources, pathways and sinks, but much of this information is already known. For example, the Environmental Law and Policy Clinic’s stream collection research and litter index documents that sources are mainly fast food/take-away shops; pathways are the stormwater delivery systems; and “sinks” are low-lying areas (“hot spots”) and obstructions in creeks (bends, dams, tree snags). Likewise, it is widely reported that plastic film, polystyrene, and plastic drink bottles are the largest items by number collected in stream clean-ups.

EPA could partner with one of the litter app developers (e.g., Litterati, Ocean Conservancy) to collect existing data, standardize collection metrics, and generate more citizen science, which supports Objective E in EPA's Recycling Strategy.

C.1.1: analysis of policies to prevent trash from getting into water.

Street sweeping, trash traps on storm drains, and mandatory covers on waste dumpsters (e.g., big containers on loading docks behind retail/grocery stores) have proven to be effective at preventing blow-off and keeping trash out of creeks/rivers. However, trash reduction - i.e., preventing the generation of trash - would be even better. The behavioral literature indicates that consumers are more responsive to policies that cost them money than policies that give them money, e.g., in the form of a credit. In terms of specific policies, this means that fees for take-out bags and containers and disposable bottles will be more effective than, e.g., credits for bringing one's own bag or even opt-in policies for take-out cutlery.

C1.2: Explore expanded use of CWA authorities to significantly reduce trash loadings into waterways.

Few communities use TMDLs to reduce trash in waterways, and that's likely because those states lack a specific water quality standard for trash and debris. EPA could support state rulemaking for specific water quality standards for trash/debris, or mandate assessment of trash loads in state triennial reviews, to facilitate use of TMDLs.

EPA could also develop a water quality standard under the Clean Water Act for micro- and nano-plastics, as doing so would require dischargers (including municipal wastewater plants) to develop technology to remove it from effluent prior to discharge into surface waters. Likewise, EPA could use its authority under the Safe Drinking Water Act to develop a maximum contaminant level for micro- and nano-plastics, which would require publicly owned treatment plants to screen out these materials from the water supply.

C2.1: Identify and address potential barriers to installing and maintaining effective trash and micro/nanoplastic capture systems

EPA could develop guidance that recognizes stormwater as a conduit for the delivery of trash/plastics to surface waters and provides specific recommendations for local government to reduce this source of debris - e.g., installation of trash traps in stormwater drains, and issuance of best practices for street sweeping (target areas where fast food outlets proliferate, regular sweeping schedule plus notices to move parked cars). One barrier local governments articulate for the installation of trash traps is concern about flooding. EPA could offer an innovation prize for the development of effective trash traps that reduce the potential for flooding.

Another barrier to installing micro/nanoplastic capture systems is the absence of EPA requirements to do so. In North Carolina, as well as many other states, the legislature prohibits the state environmental agency from adopting or imposing standards that are more stringent than minimum federal standards. Without that federal standard, the state DEQ is unable to place effluent discharge limits for micro- and nano-plastics. Several operators of wastewater

treatment facilities the Environmental Law and Policy Clinic contacted stated that without a mandate from EPA, they cannot (or perhaps are unwilling to incur the expense to) install technology to remove micro- and nano-plastics from their effluent discharge.

C3: Increase and improve measurement of trash loadings into waterways to inform management interventions.

EPA could partner with Waterkeeper Alliance/Riverkeepers, which is collecting this information across watersheds, and with Keep America Beautiful, whose affiliates frequently organize clean-ups around the country. Partnering with them to standardize data collection methods and metrics and publicly report the information could help establish priorities for targeted intervention (e.g., focus efforts on the biggest sources of litter); it would also promote citizen science efforts and better engage the public.

C5.3: Develop definitions for micro/nanoplastics and standardized methods for their collection, extraction, quantification, and characterization.

We agree that standardization in definition as well as standardization of method is important, but disagree that existing micro-plastics research methods are feasible for larger-scale detection and quantification methods. A full review on existing methods would be helpful.