

D I A L O G U E

# SINGLE-USE PLASTICS AND THE PANDEMIC

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## SUMMARY

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The COVID-19 pandemic is testing the balance between sustainability and human safety on a global scale. After more than six years of momentum for banning a variety of single-use plastic types, the pandemic brought many of these achievements to a standstill. On December 15, 2020, the Environmental Law Institute hosted a panel of experts that explored the pandemic's repercussions for overconsumption of single-use plastics. Below, we present a transcript of the discussion, which has been edited for style, clarity, and space considerations.

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**Chandler Randol** is Manager of Educational Programs at the Environmental Law Institute.

**Martin Bourque** (moderator) is Executive Director of the Ecology Center in Berkeley.

**Nicole E. Bothwell** is an Associate with Squire Patton Boggs LLP.

**Nick Mallos** is Senior Director of the Trash Free Seas Program at Ocean Conservancy.

**Rachel A. Meidl** is a Fellow in Energy and Environment at the Baker Institute for Public Policy at Rice University.

**Chandler Randol:** I would like to briefly introduce today's panel. Martin Bourque is a renowned recycling industry expert who has led the Berkeley Ecology Center since 2000. Under his leadership, the Ecology Center operates the nation's first and longest-running curbside recycling program, and pioneers zero-waste policy solutions at the local level.

Nicole Bothwell is an associate in the Environmental, Safety & Health Practice Group at Squire Patton Boggs. She has experience with numerous federal environmental statutes, including the Clean Air Act (CAA)<sup>1</sup>; the Clean Water Act (CWA)<sup>2</sup>; the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)<sup>3</sup>; as well as various other state and federal regulations.

Nick Mallos is senior director of the Trash Free Seas program at Ocean Conservancy. Nick oversees the Conservancy's work on marine debris, which includes the annual International Coastal Cleanup, its international plastics initiative, and the Global Ghost Gear Initiative.

Rachel Meidl is a fellow in energy and environment at Rice University's Baker Institute. She was previously appointed deputy associate administrator for the Pipeline and Hazardous Materials Safety Administration, an agency of the U.S. Department of Transportation, and prior to that was the director of regulatory and technical affairs at the American Chemistry Council in Washington, D.C.

With that, I will turn things over to our moderator, Martin Bourque.

**Martin Bourque:** It's a great pleasure to be with you today on such a timely and important issue. The Ecology Center is a 50-year-old, community-based nonprofit organization, started in the run-up to the first Earth Day. Since our beginnings, we've worked on local issues that have global impact or relevance. One of the very first programs that was started by community members in and around the Ecology Center was a curbside recycling program. It was the first in the nation. It came out of Earth Day in the early days of the environmental movement in the early 1970s.

At that time, Richard Nixon was president. Under President Nixon, there was tremendous pressure from residents across the globe and across the country. They passed the National Environmental Policy Act (NEPA)<sup>4</sup>, the CWA, the CAA, the Endangered Species Act (ESA)<sup>5</sup>, and probably 100 other really important pieces of legislation. We're celebrating our 50th anniversary at a time when all of those things have been under severe attack for the past four years certainly, and really since Ronald Reagan became president.

In that context, we started to think about the plastics movement, and what I would call the fastest moving and

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1. 42 U.S.C. §§7401-7671q, ELR STAT. CAA §§101-618.  
2. 33 U.S.C. §§1251-1387, ELR STAT. FWPCA §§101-607.  
3. 42 U.S.C. §§9601-9675, ELR STAT. CERCLA §§101-405.

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4. 42 U.S.C. §§4321-4370h, ELR STAT. NEPA §§2-209.  
5. 16 U.S.C. §§1531-1544, ELR STAT. ESA §§2-18.

most successful environmental movement that I've been a part of in my career. Certainly, it has come to public awareness and has seen much dramatic action to try to clean up a global problem. With limited success to date, I would say the problem is growing and not shrinking, as we'll hear today. But in terms of people understanding what the problem is and how we can begin to address it, it's moved much faster than anything that I've worked on.

We have an amazing panel today that will cover some of the ins and outs of the different aspects of that. Within the context of this mass movement on multiple levels, we've got environmental organizations really highlighting the issue, pressuring for change, and providing solutions. We've got everybody through the production chain paying much more attention to the issue and the problems that have been created by the use of plastic, particularly plastic packaging and disposable plastics.

People are looking at it from all different angles. We'll hear about marine plastic today, but we'll also cover health impacts, environmental degradation, and ecosystem impacts. There's a whole range of environmental problems that have arisen and become particularly acute. It started maybe a decade ago with some awareness that there was a plastic gyre, a floating mass or an island of plastic. It turned out to be a big stew of plastic in the middle of the ocean.

The Pacific gyre was the first one that was really documented, but now we know that they're in all the oceans and major waterways and water bodies. We saw the focus shifting to a consideration of where it is all coming from. The focus was on Asian countries. Basically, the narrative said, these countries don't clean up their own mess. Then, we found out, guess what, we're exporting millions of tons of plastic to these countries through recycling programs. Some of that is getting recycled, and much of it is getting dumped or burned and is contributing to those problems in other countries. Then finally, it was a question of who owns this stuff? Where is it coming from? It comes back to a number of major brands that we can identify by the labeling, whether it's bottlers or other fast-food snack packages or other sources.

That has led us to a place where we can really start to ask, what are the solutions? In February 2020, Sen. Tom Udall (D-N.M.) and Rep. Alan Lowenthal (D-Cal.) introduced the Break Free From Plastic Pollution Act.<sup>6</sup> It was a comprehensive, integrated approach to reducing plastic and plastic pollution. It covered plastic bag bans, a national bottle deposit system, holding companies responsible for their waste, investment in recycling systems, and a moratorium on new plastic packaging infrastructure in the petrochemical industry. It was a broad and sweeping approach.

Many of those ideas that were put together in that initial legislation are being considered at the state level as well. In the 30 years that I've been involved in recycling, I haven't seen anything like this that addresses the full spectrum of any material, much less plastic and the fossil fuel indus-

try, introduced into legislation. It's going from zero to 60; we've really seen a lot of movement.

Shortly after that bill was introduced, the pandemic hit. The restrictions on people's movement, and the stay-at-home orders, and mask use and personal protective equipment (PPE) use skyrocketed. As a recycler, we had just passed in Berkeley the nation's first Single Use Foodware and Litter Reduction Act.<sup>7</sup> It was a policy at the local level designed to reduce plastic foodware, which was clogging up our recycling system and had no markets or destination.

We had been working on cleaning up recycling not just locally but nationally, as recyclers are facing market collapses and rejection of export recycling to China and other Asian countries. We're trying to clean up recycling, which had gotten very dirty with this idea to just throw everything in the blue bin and it'll be taken care of from there. But it wasn't really being taken care of.

We were trying to clean those streams up so that they could be better recycled here in the United States. But the pandemic really put the brakes on those efforts. We'll hear a bit about the impacts of that on the environment. But many efforts to reduce single-use disposable plastics were put on hold by the pandemic. States that had plastic bag bans put those bans on hold.

In California, we have a disposable bag reduction ordinance.<sup>8</sup> It banned single-use disposable bags and required paper bags. You have to pay for them. The goal overall is to reduce the number of single-use carryout bags. That order was put on hold. The message came out from the plastics industry that plastics were safer than other materials and that we needed more plastic in order to keep ourselves safe from the pandemic. This has largely been debunked. Many people feel it was a very opportunistic and egregious move to try and sell more plastic packaging.

At the same time, PPE really ramped up—screens, masks, gloves, aprons. None of it is recyclable. Most of it, I would say, is being handled properly, but a good portion of it is ending up in our streets, in our creeks, in our rivers, and in our oceans. We'll hear more about that too.

As the vaccines are rolled out, hopefully we can see some light at the end of the tunnel, but at the same time, things did get much, much worse across the country through the holidays. Where is this all going to go? On the one hand, we have this major movement and pressure to try to address plastic pollution. And then, on the other hand, we have a resurgence in the use of disposables.

With that, I'd like to turn it over to our first speaker, Nicole.

**Nicole Bothwell:** Today, I am going to talk about the legal landscape for plastics use, disposal, and recycling. There's a lot to cover there, but I'm going to go over how plastics

6. H.R. 5845, 116th Cong. (2020).

7. City of Berkeley, *Berkeley Single Use Foodware and Litter Reduction Ordinance*, [https://www.cityofberkeley.info/Public\\_Works/Zero\\_Waste/Berkeley\\_Single\\_Use\\_Foodware\\_and\\_Litter\\_Reduction\\_Ordinance.aspx](https://www.cityofberkeley.info/Public_Works/Zero_Waste/Berkeley_Single_Use_Foodware_and_Litter_Reduction_Ordinance.aspx) (last visited Feb. 9, 2021).

8. CalRecycle, *Single-Use Carryout Bag Ban (SB 270)*, <https://www.calrecycle.ca.gov/plastics/carryoutbags> (last updated June 23, 2020).

issues are currently regulated in the United States, including some pending bills, emerging trends, and the impact of the pandemic, as well as the outlook for plastics issues going forward.

Currently, plastics issues are primarily governed by state and local laws and regulations rather than federal law. However, there are a few federal laws that do implicate plastics issues. For example, the Resource Conservation and Recovery Act (RCRA),<sup>9</sup> which is administered by the U.S. Environmental Protection Agency (EPA), includes language about resource conservation and recovery, although it's primarily directed at solid waste disposal and hazardous waste management. But it is interesting to note that EPA cited to RCRA in its recently proposed draft National Recycling Strategy,<sup>10</sup> which is something I'll come back to.

Another thing to keep in mind is that the Food and Drug Administration regulates indirect food additives and sets purity standards for food-contact articles. This can be implicated if manufacturers are going to be increasingly required to include recycled material in their packaging. We'll have to meet these purity standards, which can be more of a concern using recycled material, which comes with contamination issues.

As I said, most of the regulation of plastics issues does not come at the federal level. It comes at the state level. And the state laws can generally be divided into two categories: laws that are aimed at reducing the use of disposable plastic products, and laws that are aimed at increasing recycling of these products. As Martin mentioned, there is an increasing movement toward this type of law at the state level. Many of them are aimed at things like single-use plastic straws, plastic stirrers, plastic carryout bags, and plastic packaging of that sort.

Recently, California passed a law prohibiting hotels from providing toiletries in small plastic bottles.<sup>11</sup> That's something we might expect to see other states follow. One thing that is important to pay attention to with these state laws is the fact that each state defines how broadly or how narrowly these laws apply. So, it's important to look at the definitions.

For example, Maine considers food establishments to include food manufacturers and processors, as well as places like restaurants and grocery stores.<sup>12</sup> That's a very broad application. Other states, like New York, only apply their laws to grocery stores and restaurants.<sup>13</sup> It's more what you would expect to be a food service provider. A lot of states will treat facilities, such as nursing homes or hospitals, very differently too. That's something to pay attention to when determining the scope of these laws.

The second category of laws that I mentioned are those that are aimed at increasing recycling of plastic prod-

ucts. Those are largely known as "bottle bills." Those are the programs where, when you buy a beverage, you pay a deposit. Then, if you bring the empty container back to a redemption center, you get your deposit back. Those have been around for quite a while. As Martin mentioned, there is a piece of legislation that would impose a national bottle bill program.<sup>14</sup> Right now, only about 10 states have those bottle bills in place and they all apply differently. So, a national bottle bill would provide some clarity and stability as far as how manufacturers should comply with those requirements.

One trend we're seeing in state law is an increasing focus on recycled content mandates. This seems to go hand-in-hand with the increasing awareness of the fact that a lot of these recyclable plastics are not actually being recycled at a very high rate. I think that for a long time people—myself included—thought that if they were putting plastics into the recycle bin, if they were rinsing them out, everything was good. They were getting recycled and it was kind of a low-impact option. But come to find out the majority of plastic products are not being recycled. I believe in 2018, EPA reported that only 30% of polyethylene terephthalate (PET) plastic was being recycled.<sup>15</sup> That's one of the most recyclable plastics out there. There's a lot of infrastructure for recycling that type of plastic. Yet the majority of it is not actually being recycled.

One way to address that is by mandating minimum recycled content requirements for plastic packaging. California recently passed a law mandating minimum recycled content requirements for plastic beverage containers.<sup>16</sup> It's a tiered program, so starting in 2022, beverage containers will be required to contain 15% recycled material. That's going to increase to 50% by 2030.

Similar bills are pending in New Jersey and New York.<sup>17</sup> There was a similar bill pending in Maine that didn't go anywhere.<sup>18</sup> It's interesting to note that a similar bill was passed by both houses of the Washington State Legislature, but it was vetoed by the governor in April.<sup>19</sup> He specifically cited budgetary restrictions caused by the pandemic. That's something we might expect to see resurface once some of the impacts of the pandemic pass.

On the federal level there has been a lot of movement and action toward legislation to address the plastic pollution problem. The Break Free From Plastic Pollution Act that was mentioned was introduced in 2020. It would impose a nationwide container deposit system. It would extend producer responsibility nationwide for packaging.

That brings up the extended producer responsibility principle, which is a buzz phrase right now. It's being talked about a lot. The idea there is to shift the burden back on to

9. 42 U.S.C. §§6901-6992k, ELR STAT. RCRA §§1001-11011.

10. U.S. EPA, NATIONAL RECYCLING STRATEGY (Draft Oct. 5, 2020), [https://www.epa.gov/sites/production/files/2020-10/documents/draft\\_national\\_recycling\\_strategy\\_0.pdf](https://www.epa.gov/sites/production/files/2020-10/documents/draft_national_recycling_strategy_0.pdf).

11. CAL. PUB. RES. CODE §42372 (2019).

12. ME. REV. STAT. ANN. tit. 38, §1572 (2019).

13. N.Y. ENV'T CONSERV. LAW §27-3003 (McKinney 2020).

14. See H.R. 5845, *supra* note 6.

15. U.S. EPA, *Plastics: Material-Specific Data*, <https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/plastics-material-specific-data> (last updated Jan. 5, 2021).

16. Assemb. B. 793, ch. 115 (Cal. 2020).

17. S.B. 2515, 219th Leg., Reg. Sess. (N.J. 2020); Assmb. B. 8664, 2019 Leg., Reg. Sess. (N.Y. 2019).

18. H.P. 88, 129th Leg., Reg. Sess. (Me. 2019).

19. H.B. 2722, 66th Leg., Reg. Sess. (Wash. 2020).

manufacturers and require them to take responsibility for their products through the entire life cycle of the products to ensure that they are recycled or disposed of responsibly. The bill would target expanded polystyrene food packaging, Styrofoam, single-use plastic bags, and similar items.

The RECYCLE Act<sup>20</sup> that was introduced in 2019 is focused on increasing awareness and education. It would authorize EPA to develop some guidelines to increase participation in recycling and reduce contamination.

I previously mentioned EPA's draft National Recycling Strategy. That was introduced in October 2020. The Agency set forth some goals—reducing contamination, increasing recycling efficiency, and improving markets for recycled feedstock. The document is largely preliminary. It talks about improving understanding, stakeholder meetings, and feedback, but there's not a lot in the way of specific proposals, and certainly no proposed regulations. That's something to watch as it develops.

The draft strategy does note the impact of the pandemic on the composition of recycled materials. It acknowledges that there's been less office waste—so less paper—and more plastic waste—PPE and plastic packaging—as a result of the pandemic.

Finally, what is the outlook for 2021? We certainly expect to see continued action and movement behind this plastics pollution issue. There have recently been a number of actions proposed by a group of environmental organizations called the Presidential Plastics Action Plan. They proposed eight categories of action.<sup>21</sup> One thing that's interesting is that the group specifically stated that these are actions that can be taken via executive action alone and don't require congressional approval. That could be a trend as well, to push toward approaches to addressing plastic pollution other than legislation, as a lot of those measures haven't gotten very far.

The U.S. Plastics Pact was a recently formed coalition that includes both environmental organizations and members of the industry. It has some very ambitious targets looking at increasing the recycled content for plastic packaging.<sup>22</sup>

It's going to be really interesting to watch and see what develops over 2021 and where things stand once the impact of the pandemic passes a bit.

**Nick Mallos:** I have had the great fortune and misfortune to work on plastic pollution in our oceans for the past decade at Ocean Conservancy, but we do a variety of other work on things like Arctic oil and gas, ocean planning, ocean acidification, sustainable fisheries, and so on. The ocean really is our client, and we have been advocating for national-level policies for almost five decades.

My colleagues are obviously the legal experts here. I appreciate having their deep dive on many of the relevant

policies and pieces of legislation that are out there. I'm going to talk about the ocean environmental context and what we actually know right now about plastics, PPE, the pandemic, and what that looks like moving forward for the health of our ocean, as well as how this fits into the broader context on the issue of plastics that Martin touched on at the start.

When we think about the pandemic and PPE, we know that the scale of this material is huge. Scientists have estimated that about 200 billion items of PPE are being used monthly during the global pandemic.<sup>23</sup> Obviously, first and foremost, human health is of paramount concern during this unprecedented time. But we do know that almost all of that PPE is largely unrecyclable. It is made of plastic and, for a variety of reasons, including the human health virus exposures, we know it is not recyclable.

Something else for us to seriously think about is that the future projections of PPE growth around the world is quite extraordinary.<sup>24</sup> We're going to see massive growth over the next five years with unprecedented consumption and use of PPE. So, this portion of the waste stream that has been generated as a result of the pandemic is not going away. Obviously, as I said, PPE provides a critical service for protecting humans against the virus. But we do know that it is finding its way into the environment. We know that even a small fraction of those 200 billion items finds its way into the environment; and that is a very large number.

I live in Portland, Oregon, which for the most part is a relatively clean area. It's been astounding for me, as I am sure for most of you wherever you live around the world, to see more and more masks and occasional gloves littering the sidewalk and littering the street. We do know that this is not being properly managed and that we are seeing a fraction of this waste stream escaping into our environment.

Ocean Conservancy's annual International Coastal Cleanup this year, while data are very, very preliminary, really underscores this. This is in more than 90 countries around the world. Again, we are still amassing the data, but we expect this number, unfortunately, to be much larger. We've already seen more than 70,000 items of PPE being documented on beaches and waterways around the world. We are seeing firsthand the downstream effects of this fraction of the waste stream as a result of the pandemic.

When it comes to environmental risk, we do know that these items pose many of the same challenges that other traditional plastic products in the environment pose. Masks and the elastic bands that are on those masks certainly are an entanglement threat. Plastics in general, as they are in the waterways, as they are out in the ocean over time, fragment. They turn into smaller and smaller fragments and

20. S. 2941, 116th Cong. (2019).

21. PRESIDENTIAL PLASTICS ACTION PLAN (2020), available at <https://www.nrdc.org/sites/default/files/presidential-plastics-action-plan.pdf>.

22. U.S. Plastics Pact, *Let's Take Action*, <https://usplasticspact.org/take-action/> (last visited Feb. 9, 2021).

23. Joana C. Prata et al., *COVID-19 Pandemic Repercussions on the Use and Management of Plastics*, 54 ENV'T SCI. TECH. 7760 (2020), available at <https://pubs.acs.org/doi/pdf/10.1021/acs.est.0c02178>.

24. News Release, PR Newswire, World Personal Protective Equipment (PPE) Market Growth, Trends and Forecasts—Market Forecast to Grow at a CAGR of 7.8% During 2020-2025, PR Newswire (June 9, 2020), <https://www.prnewswire.com/news-releases/world-personal-protective-equipment-ppe-market-growth-trends-and-forecasts---market-forecast-to-grow-at-a-cagr-of-7-8-during-2020-2025--301072706.html>.

fibers that can then be taken up by a diverse array of the marine food chain, including many of the species of fish and shellfish that humans consume.

We know at the global level that the pathway of contamination is quite determined. Data suggest that we are going to see an increase in this form of plastic pollution as consumption of PPE increases over the coming years. But I think it's really important to distinguish between PPE and the broader issue of what is being consumed and what is being disposed of with respect to plastics and then plastic pollution.

Yes, PPE is an increased portion of the waste stream. We're generating more waste from it. But again, that is delivering a very, very valuable service. Yes, in many places we can use reusable masks and we would encourage everyone to do that when appropriate, but again, PPE is a responsible and needed use of plastics.

What has also increased during the pandemic, and again this is exacerbating an issue that has been around for decades, is the consumption of single-use disposables—the focus of today's conversation. What we have seen since the start of the pandemic with increased delivery services and increased takeout is an increase in many disposable products. These are not new issues. This is unfortunately a very long-standing issue that has been plaguing waterways, beaches, and communities around the world. But the pandemic really has underscored the severity of this issue and is going to increase this issue in the near term.

These are not new products that are being consumed and disposed of. Back to that International Coastal Cleanup data, these are the same items we find in the millions every single year on beaches and waterways around the world in just a single-day effort. Millions of these takeaway containers, bottles, and bags that have been littering beaches and waterways for decades are the same products that are being consumed at an accelerated rate as a result of the pandemic.

It's important to again distinguish when we are talking about plastics and the pandemic between that fine line of what is a good and appropriate use of plastics and the value they derive—like PPE—in delivering first responders, frontline workers, and medical workers that protection, and reevaluating what fractions of the plastics packaging world or the disposable plastics world we really need to narrow down, and thinking about those aggressive policies that can phase them out, manage them, and push for better recycling. Because, as Martin said, this issue is not new. This is an issue that has been around for decades.

We know from an article published several months ago in *Science* by a consortium of scientists from around the world, including my colleagues and I,<sup>25</sup> that even with all of the current reduction commitments that have been pledged by corporations, governments, and individuals around the world, based on consumption, based on production and growth, over the next 10 years, we are still looking at a

cargo ship's worth of plastics entering our aquatic environment every single day by 2030.

So, the pandemic is putting the spotlight on this issue in many ways, but this trajectory and this issue is one that has lingered for years, and is really hitting ahead and coming to a bottleneck where we need to overhaul the comprehensive policies that are going to address this issue at every point in the plastic pollution pipeline.

When we think about where responsibility rests, it is true that in many places around the world where waste collection and recycling does not exist, we do see large amounts of plastics entering the aquatic environment.

But where does that really start? Where does responsibility start? New research published just a few weeks ago by Dr. Kara Lavender Law,<sup>26</sup> and I was fortunate to be an author along with some of my colleagues on this work, really highlighted the renewed role of the United States in addressing the issue of plastic pollution globally. When we factor in those export numbers, the fact that for decades we have been sending the majority of our plastic waste overseas and combining that with litter and illegal dumping here in the country, the United States actually moves very quickly up the list to as high as third in terms of the largest contributors of ocean plastics globally.

While we're talking today about single-use plastics in the time of the pandemic, we can't overlook the systemic issue of plastic pollution and the role of the United States. We need to not just support waste efforts around the world, but really reevaluate our plastic footprint here at home, and think about the overhauling policies we need to get a handle on this issue. To not only reduce our footprint here, but now, from this research, we know that by reducing our footprint here we are also reducing the burden on many, many developing economies around the world.

Lastly, what can we do? I think there's a lot here. My colleagues have shared a lot of the political landscape that I look forward to delving into in the question-and-answer portion, but also we do all have a role. One thing that I have found encouraging to a certain extent, is that although in the early days of the pandemic we saw this run to halt plastic bag bans and to put in place policies that might send us down a pathway toward increasing the use of plastics in perpetuity, what we saw after several months of that initial shock factor was a renewed focus on the issue of disposable plastics globally. We're seeing new stories covering this issue every day. We're seeing renewed political conversations and policy conversations at the state and federal levels.

Nicole referenced the New Jersey legislation, the strongest legislation in the country, banning the most problematic and unnecessary single-use plastics. California is putting in place aggressive recycled content standards that are going to pull those materials through the market, and yet at the federal level, there is a real effort to hone in on

25. Stephanie B. Borrelle et al., *Predicted Growth in Plastic Waste Exceeds Efforts to Mitigate Plastic Pollution*, 369 *SCIENCE* 1515 (2020), available at <https://science.sciencemag.org/content/369/6510/1515>.

26. Kara Lavender Law et al., *The United States' Contribution of Plastic Waste to Land and Ocean*, 6 *SCI. ADVANCES* eabd0288 (2020), available at <https://advances.sciencemag.org/content/6/44/eabd0288>.

things like the Break Free From Plastic Pollution Act and other policies that phase out unnecessary materials and put in place the structures to manage the remainder of the waste stream.

I think we are actually at a point in the pandemic where we have seen a spotlight on this issue, perhaps even finer than it was previously. We are at that bottleneck again where policies are going to move. And I think we are at the point where the world has said that this irresponsible, unnecessary use of plastics needs to stop. We need to focus on managing the responsible use of this material and derive the value from it in many other ways we know exist.

Ocean Conservancy has been looking at its programs over the past year. Our International Coastal Cleanup looks very different this year for obvious reasons. We are encouraging everyone to go out and clean up in a variety of ways, whether that is as an individual wearing PPE or a reusable mask, and going out and doing your small part to clean up where it's safe.

That is the reason we are able to have those data on PPE and to begin to think about what this means for the environment and the ocean, and to take time to reevaluate our individual waste footprints within our homes, think about what changes we can make in our daily lives to reduce that disposable plastic use, and recognize that each of those individual actions really rolls up to a global collective impact.

Then, finally, all of us can use our voice. We do know there are more and more policies being presented. So, reach out to your local elected officials, reach out to your respective congressional representatives, and encourage them to prioritize policy on the issue of plastic waste and packaging so that we reduce the burden on communities and the environment around the world.

**Rachel Meidl:** This is really an important issue. It's a timely issue. It's only going to grow in the future, especially with the new administration. I work at the Baker Institute for Public Policy. We are a nonprofit, nonpartisan think-tank. Our programs cover a wide array of domestic and foreign policy issues.

My issue areas are pretty broad. I cover a lot of hazardous waste management issues and issues relating to international policy and law and trade. I do life-cycle management work on different things, but I'm very much interested in the work of plastics and some of the advanced technologies that we are seeing today.

I want to come at this from a fairly high level and talk about sustainability because I think this is the backbone to what our policies are founded upon and where we need to be if we want to get to a circular economy, which I'll talk about in a moment. I want to elucidate on what this is and what it means.

The whole idea is about systems-level thinking. Most people define "sustainability" as having this environmental focus solely on preserving future generations and attaining this homeostasis within the environment. That is a part of it, but it's more complex than that. It is really about an equilibrium between all sorts of factors; it's a sys-

tems-level philosophy. It includes all of the social aspects and the economic aspects. Included in all of this are sub-domains and geopolitics and cultural and sociotechnical issues and so on. Thus, it's an assessment and an equilibrium of all the social, economic, and environmental factors that equals sustainability.

It has to be assessed from a life-cycle perspective. That's important when we talk about policy solutions and things that really do have a lasting effect in looking at what the impacts are from the point of generation to final disposal and end-of-life management. It's about quantifying and understanding what the risks are across the life cycle, and what the trade offs and unintended consequences are. As our economy globalizes and we have this rising middle class across the world and more than a billion emerging markets, it's really important to account for all of these aspects.

The pandemic impacts are extensive, as the other panelists have mentioned. We're still trying to understand what it means and how it's going to play out in the coming decades or longer. But what we do know is that it has tested our resiliency and highlighted our lack of preparation and adaptability. In doing so, it has exposed vulnerabilities in our system. It's revealed a number of shortfalls in our domestic production of critical goods. It has uncovered reliance on offshore supply chains and accentuated our dependence on foreign markets for end-of-life management of waste.

Because of our long-term reliance on foreign markets, we really lost the incentive to innovate, to find more practical, higher-quality solutions for things like plastics. And the pandemic, and China's import ban on a lot of the plastics and materials that were being exported from developed economies and imported into China, also raised the stakes for sustainability. It's kind of become a dress rehearsal for the whole sustainability agenda, forcing companies and governments to see how they can tackle an expanding array of challenges.

Even prior to COVID-19, there were existing obstacles that were barriers to advancing waste and recycling. All the signs were there. The pandemic is just another reminder of how complex and entangled our supply chains are. We've been operating off of linear business models that are centered around exports and decades of dependence on offshore supply chains and markets for critical materials and end-of-life management of these products.

There's been turbulent commodity markets. The low cost of oil and natural gas really makes the cost of virgin materials much cheaper to produce, which makes it hard for recyclers to compete. There's been subsidies for virgin materials and cheap landfill rates and so forth. This creates a market in which manufacturers really can't compete and they favor virgin materials. Meanwhile, we've had increasing waste volumes year to year—about a 4% to 5% increase.<sup>27</sup>

27. World Bank, *What a Waste 2.0*, [https://datatopics.worldbank.org/what-a-waste/trends\\_in\\_solid\\_waste\\_management.html](https://datatopics.worldbank.org/what-a-waste/trends_in_solid_waste_management.html) (last visited Mar. 1, 2021).

Also, funding for public works, sanitation, and waste management are not keeping pace with the generation rates of wastes. We have domestic recycling technologies and infrastructure that are only making modest improvements to the developments that are needed to manage the overflow of waste. We have high levels of contamination and complexity of polymers that make it very, very difficult if not impossible to manage these wastes at their end of life.

Then, of course, I mentioned China's restrictions that were absolutely burdensome for many businesses around the world. But now that we're in this global pandemic, it is really exacerbating the waste crisis. It's pushing our decades-long business models of exports and other strategies and our consumer behaviors of recycling. Assuming that our recycling materials are actually being recycled at the end of their life, it's really pushing these deficiencies up to the forefront.

I mentioned that our current business models operate on a linear economy where we take materials, we make them, we use them, and then we dispose of them. But this model is no longer fit for our purposes and is now being challenged given consumer preferences and a greater focus on sustainability. We'll likely see, as I mentioned, a greater push for this in the incoming administration with the focus on the clean energy revolution and environmental justice.

When we talk about sustainability, it's become widely popular to discuss it in terms of the circular economy. This is what we're trying to gravitate toward where we can take plastics, reengineer the polymers at the end of their life, and reinsert them back into the economy for a second or third and ideally an infinite life. This whole framework is restorative and regenerative. It's designed to eliminate wastes through the superior design of materials. It builds end-of-life thinking into upfront research and development (R&D) and innovation.

It's certainly not a perfect model. There's a lot of different interpretations around the world on what a circular economy is. But it is a great framework to begin thinking about how we can become more sustainable and how to tackle the ever-increasing issues of waste in our environment.

Right now, we're all familiar with these plastic statistics on generation and how waste is managed at the end of its life: very low recycling rates and high landfill rates and so on in the United States and abroad. Nick mentioned the new figures that were published several weeks ago. These figures are sobering. We really need to approach this pandemic with renewed interest in resiliency and an opportunity to build more robust supply chains, reshore a lot of our operations, and invest in domestic infrastructure in waste management.

While this whole crisis has exposed weaknesses in all of our existing operations, especially in the recycling and waste management front, it opens the door for a lot of investment opportunities for innovative reengineering and advanced recycling, for companies to create redundancies in their supply chains and minimize the complexity of their supply chains, and to become more transparent and socially and environmentally conscious.

When we talk about transitioning to a more resource-efficient and circular future, it has broad linkages to international trade. There is an interconnectedness of our global economy. Our supply chains are inextricably linked, which is why decisions at the local level and the regional level also have to keep in mind what's happening globally. That's systems-level thinking.

The pandemic has illustrated just how intertwined and enmeshed we are. If we want a more circular and sustainable future, we have to be cognizant of the bigger picture. The depth and the breadth of this current global crisis is a reminder to us that we need transformational change if we want to meet the global climate targets and the United Nations Sustainable Development Goals. If we want to reduce the amount of plastic waste that's entering our environments, we have to understand that there are global solutions. We have to look at this globally, but also keep in mind that it has to be tailored to local and regional conditions.

**Martin Bourque:** We've got a number of great questions queuing up. But following up on the circular economy discussion, this is a major shift in thinking in the way that we approach not only waste and disposal but production, and linking those two and taking that linear model and reconnecting it. The critique of it has been in the simplistic perspective of looking at it. What it can turn into, in a sort of lowest common denominator, is "let's recycle everything."

As a recycler, we know that's just not realistic or true. There have been so many years of education by major brands, the American Chemistry Council, and others saying that all plastic is recyclable. We know that's certainly not true for a number of reasons. I want to pose it back to the panelists and see what your thoughts are.

This is a major shift. I'm seeing it not just in the philosophical or academic or environmental spaces, but I'm seeing it discussed seriously in government, discussed seriously in the Plastics Pact and the corporate sector. I'm curious, as the ground shifts from linear to circular, but is slow to gain traction, what do you see as the impacts or potential for that as we move through? With PPE being very linear right now, how do you see the fundamental shift playing out in the coming years?

**Rachel Meidl:** I can start on that since I brought up the issue of a circular economy. This is something that's been gaining traction for many years. Since the late 1970s, we've been talking of a circular economy, and sustainability even longer than that. But some of the issues with this is that, in a circular economy, there's no one definition for what it is and how it's implemented. If you look at different countries, there are different motivations and origins and prioritization.

For example, Germany is really focused on resource efficiency and a top-down materials management strategy.<sup>28</sup>

28. PAWAŁ KAŹMIERCZYK ET AL., MORE FROM LESS—MATERIAL RESOURCE EFFICIENCY IN EUROPE (2016), available at <https://www.eea.europa.eu/publications/more-from-less>.

And China was initially focused on end-of-pipe and waste management.<sup>29</sup> It's from a waste management perspective and not so much from innovation, and materials, and business models like we see in the Netherlands.<sup>30</sup> But I love the framework for a circular economy because, theoretically, I think it can take us where we need to go where we can reduce our stressors on primary production and make a dent in the waste crisis issue. I might hold a minority opinion on this one, but I think something we have to be careful with is that it's not a one-size-fits-all framework.

There's a lot of tailoring that has to be done. And when you increase the efficiency and production for things, sometimes you have to be mindful that you're not offsetting some of the environmental gains and that you balance that with the economics and the social aspects. I think, on the social aspects of that, one of the challenges is, are we being Organisation for Economic Co-Operation and Development (OECD)-centric by expecting developing economies to align with the same consumption cycles, zero-waste goals, and circular economy principles of the Western world?

I think that perspective is diametrically opposed in developing economies that are focused on sustaining their basic needs. They're not really yet receptive to that whole rhetoric on waste reduction, prevention, and elimination. I think we have to be careful of that and understand that not all solutions that we see as solutions in OECD countries are transferrable to other nations. Developing nations want their chance to consume. They have their own consumer preferences, and I think we have to understand that.

In devising solutions, it's important for us to recognize the role of the informal sector, for example, and find a way for them to generate social and economic benefits for their local communities. Also being mindful of protecting their right to economic prosperity because there is a place for the informal sector in the world of a circular economy. There are more than 11 million people working in the informal sector.<sup>31</sup> In a lot of countries, they're doing a great job at circularity by collecting and managing the waste, far better than some other countries around the world.

**Martin Bourque:** Thanks for bringing that international perspective and the differences between economies. A circular economy in one place is totally different than in another. In many developing nations, as you mentioned, the informal sector is doing what waste management systems looked like prior to World War II in the United States and going back many years where you had people coming through neighborhoods and collecting things of value. Glass jars would never just be crushed and turned

into asphalt. They would be used many times over. There were people coming through and getting old rags. Those went into various industries, including the paper industry. There were people who came through for bones even, and food for animals, and there were circular economies in rural areas.

With regards to PPE, the circular economy is also about how big is the circle. As a recycler, we're not just trying to recycle 100% of everything. That is a fool's errand and folly. How do we shrink that circle so that we get the benefit from a robust and dynamic economy that supports people in the ways that you're talking about both in developed nations and in developing nations without causing all of the harm that we've learned through the 20th century in developed nations? Are there ways that we can leapfrog some of that and maybe pull back older things around reuse or reduction in production? I would like to know if you see any hope for that with PPE? I pose that to our other panelists.

**Nick Mallos:** I'll look to others to speak specifically to PPE. I wanted to add one thing, Rachel. I do think it's also important that, with respect to imposing developed economies' zero-waste strategies, it's easy to think about it as binary. But I would also say there are a lot of places around the world in developing economies where they are far ahead of the United States and other developed economies in putting in place zero-waste strategies. It's not that they're consuming less, they've just been pretty thoughtful about the systems they put into play so that they can extract the value at every point of the waste stream and eliminate those problematic products.

I know there is no malintent there, Rachel. I think sometimes it's easier to think of it as a binary issue. But in many places around the world, developing economies are actually farther ahead than many developed economies in terms of innovative zero-waste and other strategies. I just wanted to add that to the conversation.

**Rachel Meidl:** When you look at things like e-waste and textiles and other things, some countries are far better at reuse and creating their own secondhand economies—much better than we are in the United States.

Going back to plastics and looking at developing economies and emerging markets, in 2016, the informal waste sector collected more than 27 million metric tons of plastic waste.<sup>32</sup> So, that prevented it from going to landfills and eventually the ocean. That means that more than one-half of all the plastic material collected for recycling globally is carried out by the informal sector. That's almost 60%. So, I agree with you.

But my point is that we have a tendency in OECD economies to assume that we're going to take the lead and

29. ELLEN MACARTHUR FOUNDATION, *TOWARDS THE CIRCULAR ECONOMY* (2013), <https://www.ellenmacarthurfoundation.org/assets/downloads/publications/Ellen-MacArthur-Foundation-Towards-the-Circular-Economy-vol.1.pdf>.

30. A CIRCULAR ECONOMY IN THE NETHERLANDS BY 2050 (2016), <https://www.government.nl/documents/policy-notes/2016/09/14/a-circular-economy-in-the-netherlands-by-2050>.

31. Prevented Ocean Plastic, *The Informal Waste Economy: At the Front Lines of Ocean Plastic Prevention*, <https://www.preventedoceanplastic.com/the-informal-waste-economy/> (last visited Mar. 1, 2021).

32. PEW CHARITABLE TRUSTS, SYSTEMIQ, *BREAKING THE PLASTIC WAVE* (2020), [https://www.pewtrusts.org/-/media/assets/2020/07/breakingtheplasticwave\\_report.pdf](https://www.pewtrusts.org/-/media/assets/2020/07/breakingtheplasticwave_report.pdf).

create this overarching framework, but that doesn't necessarily play out in practical reality and it shouldn't.

**Martin Bourque:** Let's shift to policy because there's so much on the table now. There's a distinction at the macro level between voluntary goal-setting and the announcements that some of the major brands have made, particularly the bottlers, through the global audit of material being collected at shoreline cleanups; it's clear that the bottlers are the worst culprits at least on the shoreline. It's important to know that many PET bottles, the clear plastic bottles, sink. So, if they don't have their lids on or some air inside them, then they are going to the bottom of the ocean. We haven't even seen the full scope of that problem yet, but we've got bottlers making major commitments and joining things like the Plastics Pact.

Yet, as a recycler—we heard this 30 years ago in California—we went from a refillable bottle system to a much more linear recycling system through our bottle deposit program in California. I want to ask Nicole what she thinks about this mandatory minimum content approach or mandatory bottle deposit systems that the bottlers have fought across the nation. Only 10 states have been successful in getting deposit systems.

They're the only system we know about that actually captures the bottles back and yet, on the voluntary side, they're saying they want to get all this stuff back and be 100% recyclable. But then they fight bottle bills that are the only ways that seem reasonable to expect that we're going to capture those things. What are your thoughts in the broader scheme of mandatory, voluntary, or can industry lead? Do we need regulations? Are both minimum content and deposit systems necessary, or one or the other?

**Nicole Bothwell:** That goes hand-in-hand with something that Rachel was talking about, which is the markets for virgin material versus recycled material, and the fact that it's just a lot cheaper to buy virgin materials at this point than it is to buy recycled materials.

I do think that the mandatory recycled content laws can provide a needed regulatory push to require industry to buy recycled materials to stabilize that demand a little bit. That's really the most direct way to affect those market forces. And I'm not sure that it will be accomplished otherwise.

As you say, there is a lot of talk out there from groups about voluntary initiatives. But whether or not those actually translate to action as far as buying recycled material is another story. I think those mandates are something that can push the market in that direction.

The bottle bill also could be effective. As you say, that is one of the only ways that's been proven to actually get these materials back into the recycle stream. As I mentioned, it would provide a bit more stability and clarity for manufacturers. Currently, manufacturers are trying to comply with 10 different bottle bills. Of course, they want to sell their products throughout the whole United States and all these laws apply a little bit differently as far as labeling and the requirements. So, that can be a challenge to comply with.

It could actually simplify things for manufacturers to comply with a national law as well as increase overall recycling rates for those products.

**Martin Bourque:** Thanks for that perspective. There's a question here around chemical recycling and so-called advanced recycling. Chemical recycling is the idea of taking collected plastics and putting them through various and sundry chemical processes to try to capture or recreate the original resin. In the manufacturing process, there's tons of additives and sometimes multiple types of plastics and/or other materials. They get combined into the packaging. The idea is to try to extract out those resins in a form that is identical to the original virgin fossil fuel-based plastics.

From our perspective as mechanical recyclers, we're just collecting that stuff and then it basically gets washed, chipped and melted, and then reused in its altered state. A lot of these so-called advanced processes have been around for decades. There's nothing new about them. They haven't penciled out in the past. There are some real dangers with them; the easiest thing to do with them is to turn them into very low-grade and polluting fuels.

There's plastics-to-energy and plastics-to-road technologies. At the highest end of that spectrum you can get more circularity where, if you got say a green plastic bottle, you could actually get the dyes out of that and have it clear again. That would be great, but it's very expensive. It hasn't really, throughout the decades, come to scale.

There's a lot of talk about it now and yet, as recyclers who've been around a long time, we've seen a lot of things come and go. We've heard this whole chemical recycling spiel in the past. We don't have a lot of confidence that it's actually going to result in a significant or fundamental change. And it brings with it some real risks of false narratives about how it's going to solve everything and we're back into rainbows and unicorns in recycling. It could also actually create harm in terms of going into some real polluting technologies or having some nasty side effects.

I want to know what the panelists think about chemical recycling and the new focus and attention on it. Do you think it will pan out? What are your hopes and concerns?

**Rachel Meidl:** I guess there's a lot to learn and understand yet with chemical recycling. There are a lot of different technologies with that—pyrolysis, gasification, hydrolysis, methanolysis, and so on. But what we do know is that, even with investments in advanced robotics, enhanced optic recognition technologies, and artificial intelligence to improve our conventional and mechanical processes, there are fundamental limitations that inhibit the traditional system from recovering all of the polymer families that are out there, especially with all the additives and low-quality, mixed polymers. There's a lot of work that needs to be done on standardization of polymers to prevent that from happening in the first place.

But globally, we generate more than 400 million tons of plastic annually and, as I mentioned, with a 4% to 5% increase every year. Our conventional processes are not

equipped to manage all of those. One benefit of chemical recycling is that it has very little degradation. It produces virgin-grade materials that maintain its quality and value without the downcycling that may occur with traditional mechanical recycling. When quality degrades the downcycling, that means that most of that plastic will eventually end up in a landfill or incinerated.

I think all recycling methods have a role to play in reducing plastic waste in the future and achieving some of the sustainability goals that we're trying to go after. But we need more investments in general in waste recovery and definitely in advanced recycling frameworks and technologies to deal with all of the waste that we can't manage right now.

Martin, you mentioned chemical recycling. It has been around for a really long time to turn plastics into fuel, but what is new is this growing market and demand for high-quality plastic recyclates. That is due to higher targets for recycling plastic and packaging products and a heightened sense of corporate responsibility. And we mentioned China's import ban and COVID-19.

That said, I do understand the public's and policymakers' concerns regarding chemical recycling. Emerging technologies in this sense are not well understood by regulators, the public, and decisionmakers. There needs to be a common language around what chemical recycling is that differentiates it from waste-to-energy and plastics-to-fuel, because that's really not what it is from a technical and scientific standpoint.

There are fundamental elements of advanced recycling that we need to understand and communicate for a successful uptake. We need to understand what the risks are from environmental and economic and social standpoints, where those risks are, and how we lower those risks to drive investments. There's a whole host of things that we need to understand.

I understand the concerns that we want to avoid waste-to-fuel lock-ins. But the European Union recently put legislation into place that looked at advanced chemical recycling and inserted it into their legislation.<sup>33</sup> It has to be reprocessed into new materials and it can't be used as fuel.

There are pathways that we can tailor to pursue this. But as with any technology, it's important to understand their technological and economic availability to retain value within current and future markets. We have to understand what all those trade offs are.

I do want to mention that Chevron Phillips Chemical recently traded the first commercial-scale production of polyethylene using advanced recycling technology.<sup>34</sup> This is a significant achievement in creating circular polymers.

33. Resolution of 10 February 2021 on the New Circular Economy Action Plan (2020/2077(INI)), EUR. PARL. DOC. P9\_TA-PROV(2021)0040 (2021), [https://www.europarl.europa.eu/doceo/document/TA-9-2021-0040\\_EN.html](https://www.europarl.europa.eu/doceo/document/TA-9-2021-0040_EN.html).

34. Press Release, Chevron Phillips Chemical, Chevron Phillips Chemical Successfully Completes First U.S. Commercial Scale Production of Circular Polyethylene From Recycled Mixed-Waste Plastics (Oct. 8, 2020), <https://www.cpcchem.com/media-events/news/press-release/chevron-phillips-chemical-successfully-completes-first-us>.

But fundamentally, with all the various forms of advanced chemical recycling, there's a lot to understand. We do need investments to look at that in order to scale it and understand where all the risks and trade offs are.

**Martin Bourque:** Nicole, I'd love to hear your perspectives on this. And particularly, with the amount of investment that's needed, who should pay? I know this issue has come up a lot. It's in the participant questions here. Is this something that taxpayers and the government should pay for? I know it's been suggested to include funding through the RECYCLE Act and other national legislation. What are your thoughts?

**Nicole Bothwell:** I agree with a lot of what Rachel said. It's something that does deserve more investment in order to more fully understand the implications of advanced recycling. Since there is increasing focus on plastic pollution and plastic issues, now could be a time when national legislation that includes money dedicated to investigating in these new technologies could be something that would have national support. I think one of the most important aspects of the advanced recycling issue that we mentioned is to really fully understand what are going to be the other consequences.

As far as what other environmental impacts are going to be, we know that in every chemical and industrial process there are going to be all kinds of environmental impacts other than just the primary product that's being produced. We need to understand the full picture of advanced recycling. I think it's something that deserves to be studied. It could be a great opportunity. But we need to understand the full picture and how that's going to be regulated and how that's going to be addressed going forward to make sure that it's a net positive, in that we're not taking two steps forward and then three steps back as far as the environmental impacts.

Probably the most likely scenario is a combination of government investment and investment from the private sector to get that moving forward. I'm hopeful that it's something that will turn out to be a useful part of the overall solution to addressing the plastics issue. I think it's important not to pin our hopes on one thing. It's probably going to be a combination of all these different strategies that's going to work together the best.

**Martin Bourque:** Going back some years in thinking about the origins of this movement and modern recycling as an industry, I think back to the Keep America Beautiful campaign's "Crying Indian" ad that people of my generation certainly remember as being formative. It was focused on the individual responsibility of being litterbugs and dumping the garbage that the industry has created for us in the natural environment. It's something that's still very much discussed.

Who is responsible for this? Is this something the industry needs to take responsibility for? Is all the trash in our neighborhoods around fast food stores the result of the fast food stores or is that the result of litterbugs in the

neighborhood? That debate is still very much at play when we're talking about including hundreds of millions of dollars in some of these federal proposals for technology to try to clean up the mess being put out by manufacturers of disposable products and ending up in our waterways and oceans.

As an organization that focuses so much on doing cleanups, we do them here in Berkeley. We have a litter hotspot because of our location in the bay. We end up cleaning up not only our own waste as a result, but that from the whole Bay Area and what comes in the Golden Gate. We do it three or four times a year over and over again. At what point is it not our responsibility and somebody else's? I wanted to pose that to you, Nick. On the cleanup side, whose job is this?

**Nick Mallos:** It's a great point, Martin. I would agree that to clean up in perpetuity is not the solution. I think if we actually look at some of the new science that I referenced that has emerged, what that's trying to show is that there is no single solution. I think everyone on this panel knows that. Most people know that it has to start with source reduction. If we're actually going to bend the curve and get a handle on this issue, we need to significantly reduce the sheer amount of disposable plastics that is being produced, upwards of 25% to 40% depending on the economy.

In the United States, the largest producer of plastic waste globally, we really need to get a handle on reducing that generation. At the same time, management is a critical piece. We're going to have to make sure that the systems are in place to manage those remaining higher-valued quality materials that are in the system.

There was an interesting study published this week that looked at recycling companies across the country, really outside of the number ones and twos, and nothing can really be recycled widespread across the country.<sup>35</sup>

That is a failure when we think about circular design, that the design of these products is not matching the back ends. We have to absolutely look at the front-end design as it does or does not mesh with the back end.

I'm not a technical expert on chemical recycling, but I do think, when we talk about a really capital-intensive technology to deal with that lower-value, hard-to-recycle disposable material, does that make sense economically, and from a source-reduction, sustainable circular economy arch?

I think those two pieces—the source reduction and reducing the sheer amount of disposable material—need to be managed in the first place. Ensuring materials that are in the system and delivering this high-value utility to society can be managed properly whether that's through composting, recycling, and in the worst cases landfill.

Then, finally, there is going to be a sustained need for cleanup. The science shows that even if we do those other

things perfectly, we're still going to need to clean up the remaining plastics that are finding their way into the environment. When we look at cleanup, it's really twofold. Obviously, the manpower, the volunteer effort that's out there, is an extraordinary effort. But it's not the responsibility of citizens alone.

So, how do we better institutionalize cleanups? Look at where funds come from to make that part of the municipal budget. Look at things like extended producer responsibility and fractions of the private sector covering some of those costs.

Finally, I don't think we can overlook the role that waterway infrastructure has. We've seen some really amazing trash traps and water wheels that prevent that material from entering the coastal environment; cleanup almost becomes impossible once it's out in the open ocean. That's not talking about large, capital-intensive, million-dollar water wheels necessarily. In some places, that may be fine. Right now, we're fortunate to be working with a partner in Vietnam on a very locally appropriate, low-cost solution that is highly effective at taking plastics out of riverways.

It's a long way to say, Martin, that cleanup is going to be a part of the equation for a long time. It can't just be a once-a-year volunteer type of cleanup. It has to be institutionalized in a certain way. It has to be a shared responsibility from individuals, government, and the private sector alike in terms of footing the bill for that.

**Martin Bourque:** I want to move to the hierarchy of reduce, reuse, recycle. We've heard a bit about the reduction part of it. You can have a circular economy that doesn't reduce anything and it just keeps growing. That is what the fossil fuel industry and the petrochemical industry have been working toward. They're driving plastics as a backup plan to reduction in fossil fuel use overall.

When you have cheaper oil, in the negatives now, where people for a minute there were getting paid to take it, it's hard to compete with a recycled product that may be contaminated with or blended with other things and not performing the same way in the manufacturing process. But we really have to get to that place where it's reduced first, reused, and as a last resort recycled.

For us, as recyclers, a zero-waste organization, our goal is that nothing goes to a landfill. We want a truly circular economy. But for some of these things, like the numbers three through seven plastics, for which the non-bottle plastics really don't have markets, there isn't really any place where we can sell them. We'd much rather have them in a landfill in California where we know where they are, and that they're contained, and that they're being managed well with the best management practices that we can expect in the current context.

But that drives us to reduce those things and to get rid of that stuff. That brings us into a reuse space. Somebody asked a question about Loop and the scalability of reusables. Here in Berkeley, we piloted a reusable cup program called Vessel. There's a reusable takeout and delivery service in the Bay Area called Dispatch Goods.

35. See also GREENPEACE, CIRCULAR CLAIMS FALL FLAT: COMPREHENSIVE U.S. SURVEY OF PLASTICS RECYCLABILITY (2020), <https://www.greenpeace.org/usa/wp-content/uploads/2020/02/Greenpeace-Report-Circular-Claims-Fall-Flat.pdf>.

This is a very emergent space. It could be a reuse economy and service-based economy that really takes off in certain arenas. Either geographically in areas where you could get those kinds of densities or nexuses, or at the national level through brands adopting it through programs like Loop. I would like your thoughts on reuse.

**Rachel Meidl:** I think reuse is a part of that whole waste hierarchy at the top to eliminate, reduce, and reuse. It's a step in the right direction. Any time we can cut down on primary production, that's a great move.

But even if we do reuse, eventually those things are going to have an end of life. So, it's important, going back to a circular economy and sustainability, to go back to R&D in the innovation stage and design for circularity so that we can infinitely reuse something and not just for a shortened period of time. Along with that, to develop recycling and treatment markets because the pandemic and years of exporting have really caused an underdevelopment in the recycling and waste management infrastructure domestically.

I think it's one tool in the overall toolbox on how to get to sustainability in the plastics arena, but it's going to come down also to collection. It doesn't matter what type of technology we use—whether it's chemical recycling or mechanical recycling, and what kind of strategies we take. The fundamental problem is that we have deficiencies in our collection system. We need to improve the economics of waste collection and then work toward reducing

problematic and unnecessary single-use plastics. Again, designing for circularity and bringing the consumer into this, and creating educational and outreach strategies to increase some of their knowledge around what recycling is and what circularity is.

**Nicole Bothwell:** I love the idea of focusing on reuse. I think, as you say, it's such an important piece of the overall picture.

As far as from a legal perspective, this is something I see as being probably more efficiently regulated on a local level at least as a start rather than on a national level. These types of programs really should be tailored to the communities. It will work a lot better if they can be regulated on a smaller level and fit the needs of the community to the needs of the program, and have needed regulations work in that framework. Kind of a pilot program in different communities before moving on to a larger scale. But I love the idea of reuse. I hope those types of programs take off more.

**Martin Bourque:** We're certainly in that space of trying to test it out in the communities where there is some appetite for it. We've got the Single Use Foodware and Litter Reduction Act in Berkeley on pause because of the impact on restaurants. We are moving forward with that, but it's not being heavily enforced. Then, also piloting some of these reuse programs and seeing how you can get that nexus of reduction policy combined with new services in the marketplace.