



China's Ban on Imported Used Plastics Is an Opportunity for Innovation

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Plastic waste has received a lot of attention recently for two reasons, starting with the environmental impact of plastics pollution. The magnitude of plastic waste showing up in oceans and waterways has accelerated in recent years, killing ocean life due to ingesting or getting caught in the plastics, showing up in our food chain and now being discovered as microplastics in typically plastic-free areas like the Arctic. This has led some cities, states and countries to ban certain plastics uses, from single-use bags to straws.

The second, perhaps less emotionally compelling, reason is that the recycling business is in crisis. Recycling is a commodity business and China has been the largest importer of recycled materials. While commodity prices for plastics had steadily fallen for years causing difficulties for the industry, China's severe restriction of the imports of recycled plastics substantially impacted the flow of these materials in the global market.

This ban has caused prices to plummet, leaving a significant hole in the market as there was no longer a destination for the volumes of plastics that had previously been "recycled" by consumers and companies across the US. What had been a revenue source for cities and towns

has now turned into a cost. This shift has caused cities around the country to begin to re-examine their role in recycling, deciding whether to restrict recycling some commodities or even canceling recycling programs altogether.

At the same time, the production of plastics, in particular single-use plastics, has been on the rise. From water bottles to product packaging, more and more plastics are being produced and used each year, which means more and more plastics will either end up in our landfills or waterways. More than half of the plastic ever made was produced in the past 15 years.

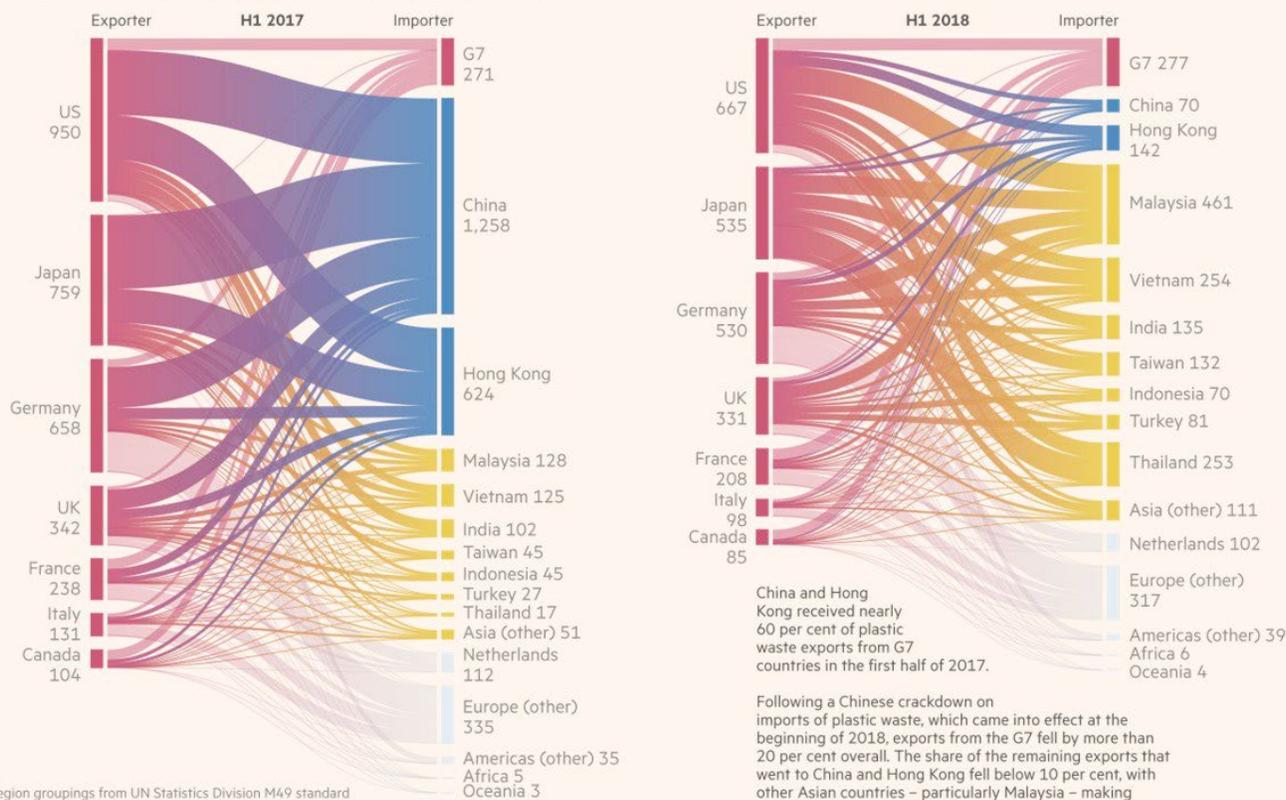
As many studies have shown, the benefits of reducing plastic waste both exceed the costs of recycling and limit the use of single use and other plastics to begin with, but the story is complicated.

People Support Recycling

Part of the reason we have recycling programs across the US to begin with is that people like to recycle. According to the [Carton Council](#), more than 90 percent of consumers support recycling and 70 percent believe it should be a priority. In a [poll conducted by the Pew Charitable Trusts](#), 70 percent of people say they are bothered

How the global river of plastic waste changed course in just 12 months

Exports of plastic waste, parings and scrap from G7 countries ('000 tonnes)



China and Hong Kong received nearly 60 per cent of plastic waste exports from G7 countries in the first half of 2017. Following a Chinese crackdown on imports of plastic waste, which came into effect at the beginning of 2018, exports from the G7 fell by more than 20 per cent overall. The share of the remaining exports that went to China and Hong Kong fell below 10 per cent, with other Asian countries – particularly Malaysia – making up much of the shortfall.

Visual journalism: David Blood, Liz Faunce, Andrew Rininsland

by people throwing away recyclables and nearly 70 percent say they are bothered by people putting the wrong things into recycling bins. However, only 30 percent of respondents said they had curbside recycling for all recyclables and another 40 percent have curbside pickup for some materials while other recyclables have to be dropped off at a center.

If people are so supportive of recycling, why has it been so difficult to increase the recycling rate and so hard now for local governments to maintain robust recycling programs?

The Landscape

The answer is economics and special interests. Being complicated by special interests is not unique to recycling, of course. Energy, water and environmental protection in general, as well as health care, all face similar problems – but in different ways. However, in almost all of these cases it is the underlying economics and our underpricing of long-term consequences that drive many of the problems.

In the case of recycling, it is the cost of putting trash into landfills that defines the market. Across much of the country, landfilling is substantially inexpensive compared to recycling and this sets the basic economics of the waste problem. There are exceptions to this, such as in New York City, where the high cost of landfilling has led to innovative programs to reduce the waste stream.

The reason the costs of landfilling typically are cheap is that the land, set away from major populated areas, often is cheap. It is equally important that while some long-term costs of maintaining a safe landfill are included in what cities pay, it is likely insufficient if waste managers accelerate the introduction of plastics and other toxic materials. Someone will have to pay for potential waste contamination and mitigation in the future, and is that a burden we really want to leave to our grandkids.

The Barriers

The politics of waste and disposal limit the ability of policymakers to require certain levels of long-term protections in landfills or to put a “price” on landfill disposal to reflect those costs. When commodity prices for recycled materials drop, recycling can’t compete with landfill disposal. There does not appear to be an immediate need to address the long-term risk as there was in the 1970’s with the onset of acid rain from the influx of sulfur dioxides. In that case the U.S. instituted a sulfur dioxide trading program where coal plants were given limits on the amount of sulfur dioxide they could emit, but instead of requiring all plants to just reduce, we allowed plants to buy and sell permits to emit, as long as the total amount continued to decline. This allowed plants that could reduce emissions cheaply to go below their limits and sell excess permits to plants that faced higher costs. The outcome was a significant reduction in acid rain and the program cost was significantly less than forcing plants to each reduce equally. This was a win-win for companies and for the environment - an elegant and innovative solution for the times.

Another major waste/recycling complication is the wide variety of types of plastics. There are more than seven types of plastics created for single-use products, some that are easily recycled (numbers 1 and 2) but many others that are not (numbers 3 through 7). When they are mixed into the same container, that makes it even more difficult for the waste processors to manage due to “contamination”. Technologies for separating types of plastics have become more sophisticated, using optical scanners and other devices, but the results have not offset costs. This problem only becomes exacerbated as more types of plastics enter the system.



China’s Ban Can Spur Innovation

We cannot continue to dramatically increase the use of single-use plastics if we have not developed methods to divert these plastics for re-use and prevent them from entering the broader environment. China has shown us that we cannot rely on exporting our recycled materials, as this is fraught with too much uncertainty due to foreign market fluctuations and policies. Much like the strength that the Oil Petroleum Exporting Countries (OPEC) wielded in oil markets from the 1970’s until the early 2000’s, China and other countries wield significant influence over the price and supply of recycled materials as they have been the primary users of these resource materials. OPEC lost much of its power because they increased prices by cutting supply, spurring technology innovation in both oil production and oil substitutes that reduced dependence on oil in the overall economy. Just ten years ago, if Iran had stopped an oil tanker in the Persian Gulf, oil prices would have soared past \$100/barrel. When it happened a few weeks ago, the market didn’t even notice. We need to use China’s ban on plastics to similarly spur innovation in the plastics market so that we don’t need to rely on exports in the future just as we rely less on OPEC today.

As with other key commodities, we need to hedge against uncertainty in dealing with waste by limiting our exposure to volatile markets and focus on how we can position plastic waste as a valuable resource, produce recycled products locally as a means to reduce exposure to these markets, reduce transport needs and create local economic activity and jobs. We also can’t depend on the goodwill of the public to recycle effectively. We need a focus on how to drive innovation to substantially change the economics and viability of recycling programs. The innovation we’ve seen from cellphones, computers and now battery technologies that power cars and airplanes did not happen magically. They happened with the help of government policy, government investment and innovative tax policies that generated significant numbers of jobs and contributed to economic growth. It is time to do the same for the waste and recycling sectors to tackle this swelling problem.

What Can We Do?

Congress has introduced a number of new bills focused on dealing with these problems under a general umbrella of a National Recycling Strategy. Some of the key elements that we have identified as essential to a path forward include the following:

- harmonization of standards for labeling plastics and the types of plastics that are recyclable, making the labelling simpler to understand;
- charge manufacturers and distributors for the production and/or use of single-use plastics and use that money to help fund recycling innovation programs;
- increase requirements for producer responsibility to recycle their products.

So where do we go with these proposals? What are some solutions we can explore?

1) Simplify recycling.

As this paper has outlined, there are too many types of plastics in our waste system. We support the proposal of standardization of labeling plastics and the kinds of plastics that are recyclable. This will make recycling easier to understand for consumers as well as allow for waste collectors and recyclers to streamline their recycling process, maximizing the commodity.

We have precedent for efficient and effective national standards that brought consistency to products and significantly improved efficiency. In the 1970s a number of states had different standards for appliance efficiency. States were looking for energy savings and were coming up with different standards and ways to rate and evaluate them. The National Association of Manufacturers went to the federal government and said it was going to be very difficult to meet different standards and needed some consistency. So together with the manufacturers, the federal government and some states agreed on a process for setting of codes and standards for appliances. Using refrigerators as an example we achieved bigger refrigerators, lower prices and substantially less energy use. We can do this for plastics as well.

2) Incentivize the reduction of plastics.

We need to increase the demand for recycled plastic as a material and we propose to do this with a producer plastic cap and trade program. Set up like California's greenhouse gas emission cap and trade program, companies could be given a cap on the amount of virgin plastics they can produce and use, which would decline over time. For example, a beverage company might be given an initial cap of a million bottles a year measured as an equivalent amount of virgin plastic. If they intend to continue to sell a million drinks, they would have to start including recycled materials in their bottles, buy recycled plastic credits from other companies or prove that they've recycled an equivalent number of bottles into an approved set of end-uses. This would provide incentives to innovate while reducing the amount of plastics entering the system. The proceeds from auction of supplementary permits would be used to fund R&D (see 4 below).

3) Encourage the creation and use of innovative packaging materials other than plastic.

We certainly need to reduce the amount of single-use plastics to prevent more from making it into the ocean and other places. Research shows that 56 percent of Americans say they want sustainable options for the product packaging they purchase and in a survey of Consolidated Container Company customers, 64 percent believed that consumers prefer recycled or bio-based resin packaging. New ideas for packaging are popping up almost daily. Lush Cosmetics packages shampoo and soap in reusable metal containers; Terracycle has recruited major companies into their Loop system, in which containers are designed to be re-used; and Craft beer producer Saltwater Brewery has created a packaging ring that is made of brewing spelt and can naturally decompose or be eaten by sea life should it reach the water systems. This can be encouraged by creating tax incentives for the use of innovative packaging – much like the production tax credit for wind and solar energy.

4) Fund technology for reuse of plastics.

Finally, it is critical to engage entrepreneurs to develop new ways to locally recycle and re-use plastics. We have a long history of successful R&D programs, many funded out of the Department of Energy. We have achieved significant efficiency gains and cost reductions for many technologies from refrigerators to solar panels. Let's apply this know-how to recycling by creating a dedicated program – with a focus on funding innovations in technology to re-use plastics locally and to drive down the cost of this transformation. Micro-manufacturing at the user level, locally or regionally, will keep the money, the waste and the jobs local. We know how to create and fund innovation. One example is Renewlogy, a new venture from Arizona State University's circular economy incubator. They process numbers 3 through 7 plastics, which used to be shipped to China or sent to landfill, into liquid fuels or repurposed materials. Entrepreneurs like this exist across the US and around the world, but they require resources to unleash their technologies and processes that can not only reshape our waste crisis but also act as new economic drivers that create jobs.

Plastic waste is a huge, complex, wicked problem - but if we unleash innovation we can solve it now.



About the author:

Mark Bernstein has 25 years of experience pioneering energy and sustainability solutions through robust analysis and innovative frameworks across academic, private, public and non-profit sectors. As the Rob and Melani Walton Chair for Sustainability Solutions, Mark leads an effort to make measurable impacts on sustainability and influence decisionmaking by utilizing the deep knowledge and experience resources across Arizona State University and drive collaborations and partnerships that will create global solutions. Mark brings to ASU a long history of research and analysis and a strong track record as an innovative leader in sustainability, research and strategic planning for energy, climate and the environment. He has held positions of influence with the White House, RAND Corporation, University of Southern California and University of Pennsylvania. Mark's project portfolio includes one of the first reports for the World Bank on the costs of reducing greenhouse gas emissions that helped set initial frameworks in use today, models of emissions trading and carbon sequestration that supported acid rain legislation in the Clean Air Act Amendments and California's ambitious greenhouse gas reduction goals, a report on the economic benefits of energy efficiency to the State of California that was instrumental in convincing the legislature to renew the energy efficiency benefits fund, and a report composed after Hurricane Katrina that set the bar for understanding the devastation in Mississippi and how to recover affordable housing in a meaningful way.

About the Rob and Melani Walton Sustainability Solutions Service:

The **Rob and Melani Walton Sustainability Solutions Service** at Arizona State University is the result of an investment by the Rob and Melani Walton Foundation to advance sustainability solutions locally and globally. The Rob and Melani Walton Sustainability Solutions Service engages diverse teams of faculty, students, entrepreneurs, researchers and innovators to collaborate and deliver sustainability solutions throughout the globe, to provide learning opportunities for future and current sustainability leaders, and to engage audiences of all ages to take action on and celebrate sustainability solutions. For more information visit sustainabilitysolutions.asu.edu.