

## PLASTIC WASTE: THE SEARCH FOR SUSTAINABLE SOLUTIONS



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In 2019, scientists testing rain-water samples in Colorado found micro-plastic fragments at Loch Vale, in the Rocky Mountains, at an altitude of 10,364 feet. Scientists believe that these micro-plastics could have been released from synthetic clothing through laundry drying vents, and from household items which degrade, such as tarps and packaging. The bits are picked up by the wind; they wash into lakes and rivers, are evaporated into the atmosphere, and then return with rain or snow. They can also be inhaled along with dust particles. Today, most plastic items are made from fossil fuel; they do not biodegrade and will last for centuries, simply getting smaller and more dangerous. The plastics which we discard are found everywhere: in the Arctic, in the oceans, wrapped around the necks and in the guts of sea creatures, and in the bodies of those of us who eat seafood and sea salt or drink beer. Toxic chemicals leaching from these plastics accumulate in the environment and in our bodies. Some studies show that plastic nanoparticles can be absorbed by lung tissue and could cause cancer.

Recycling as it is currently practiced, is not the Solution to Plastic Waste. Around 335 million metric tons of plastic were produced globally in 2016, roughly one-half of which was destined for single-use products. Unfortunately, 91% of all plastic which is produced yearly is not recycled, nor is much of it currently considered recyclable. For years China, which purchased our plastic waste until 2018, had in effect subsidized our recycling industry. They simply separated the items which were recyclable, i.e., #1PET and #2HDPE, then burned or threw away the rest. Today, it is cheaper to buy virgin plastic pellets made from fracked oil and gas, rather than to purchase recycled plastic. Each year hundreds of thousands of plastic pellets fall from their shipping containers, creating an additional biohazard. Unfortunately, the Clean Water Act has not yet been amended to cover this debris.

Only half of U.S. communities have curb-side pick-up for recycling. It is estimated that an investment of \$12 billion would be necessary to make recycling available to every American citizen. Further, single-use items which are not currently recyclable such as Molded plastic packaging and single portion pouches have taken over the packaging industry. So far researchers have reported positive results using plastic-eating enzymes to more expeditiously digest plastic bottles, and are working on developing hybrid enzymes to break down cotton-polyester clothing for recycling. It is feared however, that if advanced recycling technology was developed it would just encourage the production of more single-use plastics. An onslaught of even more plastic is inevitable, anyway. As of February 2020, three hundred forty-three new production plants or expansions were permitted or planned in the U.S. in the near future.

So where does our plastic waste go? Some ends up in undeveloped nations where it is illegally melted down to make cheap recycled plastic pellets. This process causes widespread pollution, harming both the

environment and the population. A great deal of our plastic waste is simply dumped and much of that ends up in our waterways. Each year citizens who volunteer with the Alliance for the Great Lakes remove 18 tons of mostly plastic waste from Great Lakes Beaches.

The plastics industry claims they have made our modern way of life possible. Plastic is relatively inexpensive, light weight, leak-proof and child resistant. It retards spoilage and reduces food waste. Plastic parts make automobiles and planes lighter and more fuel efficient. Some single use plastics are necessary e.g., syringes and other medical products - such waste, however, is recognized as biohazardous and disposal is regulated by law. In truth ALL plastic waste is Biohazardous if not properly disposed of, and is a proper subject for strict regulation.

It took legislation to ban one of the most flagrant examples of plastic overkill, plastic microbeads in personal care products, which rinsed off right into the water. Illinois was the first state to ban them; this led to a federal ban. Many other countries have similar bans.

Other attempts at regulation have had mixed results. In 2018 Chicago reported that the use of disposable bags had dropped by 48% during the first year that the disposable bag tax was in force. Eight states and hundreds of municipalities have banned or restricted single-use plastics, but another seventeen states have banned local restrictions on plastic products.

Some American cities especially in Florida and the Northeast incinerate their plastics along with other waste in so-called "Waste to Energy" programs. As these facilities age they emit greater amounts of toxic waste. Other municipalities such as Boise, Idaho separate those plastics which still have a market value; all other plastics are melted down into diesel fuel through a claimed less polluting process called pyrolysis. Seventynine percent of municipal solid waste incinerators operating in our country are located in communities of color and or low income.

Efforts to create a circular economy: Visionaries tell us that we need to evolve a circular economy where there is no waste; Products, components and materials would be designed for future re-use, repair, remanufacturing and (in the last resort) recycling. Efforts at re-use and remanufacturing have been occurring, but the circular economy is still a long way off.

For example, manufacturers like Patagonia and Nike have stepped up for years to accept and repurpose used products. Interface, Inc., has made recycled, replaceable rug and tile squares available for decades. A Chicago company, Dart, accepts and recycles cleaned Styrofoam food containers, and Styrofoam packing pieces. Adidas shoes uses recycled plastic in their products, while Method cleaning Products as well as Aveda Care products come in recycled containers.

Two companies have found a use for the plastics which would usually end up in landfills. TerraCycle, an American Company, accepts used disposable diapers; they sterilize and compost the inner cotton lining and turn the outer plastic shells into recycled plastic pellets. An Australian company Re>Pal, turns ten tons of mixed plastic waste each year, including packaging, into durable heavy-duty pallets.

Other companies have committed to using less plastic in their packaging and to reduce packaging itself. For example, Procter and Gamble produces a Tide Detergent Bar. Other companies have developed tooth paste tablets and capsules. Some grocery chains and department stores maintain water refill stations dispensing filtered and purified water at about \$.35/gallon for consumers who bring their own containers. During the January 2019 World Economic Meeting, a number of large manufacturing companies agreed to participate in a project called "Loop" in which they would sell products in re-usable containers, e.g. insulated steel jars of Haagen-Dazs Ice Cream which could be retrieved, cleaned and refilled by the company in much the same way that glass milk bottles were many years ago. Even Coca-Cola seems to be reconsidering its opposition to adding deposits to its bottles. Many re-use projects are still in the pilot stage, however. Only 3% of packaging is reusable today.

Fifty large companies were recently surveyed by As You Sow, a non-profit representing socially responsible stockholders. Nineteen of these companies pledged that by 2025 all of their packaging will be reusable, recyclable, or compostable. Many agreed to increase their use of recycled plastic. Very few companies, however, agree that they should contribute monetarily to pay for recapturing the items which they produce.

**Bio-Based Plastic** Some have turned to bio-based plastic as a possible solution to the plastic waste problem. One of these plastics, PLA (Polylactic Acid) is especially relevant to our topic. PLA is a bio-compatible polyester derived from renewable sources such as corn (majority source in US and Canada), tapioca roots, chips or starches and sugarcane. It is the least expensive of the bioplastics and most commonly used globally. The fact that PLA can degrade into innocuous lactic acid in the body makes it very useful for medical implants. PLA is also used as a feedstock material in desktop 3D printers as well as compost bags, food packaging, and disposable tableware.

PLA is not considered biodegradable according to American and European standards because it does not biodegrade outside of artificial composting conditions. A PLA cup may take more than a year to biodegrade in a backyard composting bin, and centuries in a landfill. PLA waste is considered contaminating if mixed into the ordinary plastic recycling stream and recyclable plastic is considered contaminating if mixed in with PLA waste.

The United States is the largest producer of PLA; Europe has been the largest market for it, largely due to restrictions which have been placed on fossil-based plastics in that area. However, in the absence of industrial composting facilities which accept bioplastics, many European nations have been incinerating PLA waste. In November, 2019 a Parisian firm, Citeo and Les Alchimistas, announced “encouraging results”: they had successfully demonstrated that it was possible to collect and mix up to 5% PLA (25g bottles without label, adhesive, ink, or cap) with other bio-waste without disturbing the quality of the compost. They hope to fine-tune these experiments (grinding the PLA, lengthening the period for composting) in an effort to mix greater quantities of PLA with bio-waste.

San Francisco has taken another approach to bio-plastics, which are considered compostable under the California Standard, a standard which actually favors bioplastics. San Francisco residents are mandated to separate their compostable waste, including bioplastic dinnerware into a separate receptacle which the municipality collects. As a result, San Franciscans actually compost more waste than they recycle. The city also monitors plastic recycling bins and fines those residents who contaminate recycling bins with garbage. The recycled plastic is as a result more acceptable to prospective purchasers. As of November 2019, San Franciscans were considering a ballot initiative to charge manufacturers one cent per plastic package. **Edible Single-Use Products** Recently, entrepreneurs have created edible cutlery, cups, straws and other products. Others have focused on making packaging waste less harmful to wildlife. For example, Saltwater Brewery in DelRay Beach, Florida has developed an edible six-pack ring made of the wheat and barley residue from the brewing process; the rings can be safely eaten by animals and marine life. In Bali, Avani Eco has developed a certified compostable plastic bag made of cassava root. Animals can eat the bag without harm. Each bag costs twice as much as a plastic bag. Virgin Megastore announced plans in March, 2019 to replace all of its plastic shopping bags in the UAE with the Bio-Casava bags.

**Conclusion** Plastic Waste has created an existential crisis which requires concerted action from all sectors: business, government and private citizens. Manufacturers need to contribute more to the costs of collecting and processing the waste which they are creating. Without the necessary infrastructure to collect and recycle or compost this waste it

will all be dumped or worse. We consumers should refuse to accept single-use plastic products which do not add to our quality of life, and we must demand transparency regarding our recycling; we have the right to know how many of the items claimed to be recyclable are actually recycled. Local governments must also recognize plastic waste as hazardous and adopt laws which penalize littering, dumping and other means of improper disposal. Finally, everyone must acknowledge that “cheap” oil and gas, which feed plastic

production, costs far too much in terms of environmental destruction and loss of quality of life. Now is the time to enact a Carbon Tax to recognize the true cost of our plastic lifestyle.

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