Rolling Back the Plastic Tide: Specific Strategies and Systemic Solutions to Reduce North Carolina's Plastic Dependency

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Introduction

Plastic is ubiquitous: it seals our food, is woven into our clothing, drifts through our oceans, and drifts through our bodies. It offers utmost convenience, and thus is desperately relied upon. Of course, the world was not always this way: the rise of the plastic industry, fueled by the oil and gas industry, only began in earnest during World War II.[1] Our increasing use of plastic was paired with a growing understanding of the drawbacks of plastic waste, though, and by the 1960s and 70s, local governments and organizations were raising alarms.[1] The plastic industry responded with a guilt-free solution: recycling. Now, as the public is becoming increasingly aware of recycling's failures and plastic's extensive harm, the global community is struggling to ease its plastic dependency. This essay reviews the damage that plastic inflicts and suggests policies and practices to reduce North Carolina's dependency on plastic.

Problems of Plastic

Manufacturing

Plastic consists mainly of processed oil or natural gas, and fossil fuel extraction is where plastic-related problems begin. Oil and natural gas extraction sites release toxic chemicals into the air, water, and soil, and communities near drilling sites suffer higher rates of cancer and decreased agricultural productivity.[2, 3] Furthermore, the Center for International Environmental Law estimates that plastic-related fossil fuel extraction alone causes nearly 120 million metric tons of CO2 equivalent (120 Mt of CO2e) greenhouse gas emissions annually.[4]

After fossil fuels are extracted, they must be processed into plastic. Like fossil fuel extraction, plastic manufacturing causes significant greenhouse gas emissions: approximately 200 Mt of CO2e were emitted globally in 2015 to produce ethylene alone.[4] Plastic factories also pose dangers to workers. Exposed to high levels of harsh chemicals, factory workers suffer from elevated rates of a range of serious health issues.[5, 6] The environmental and human health issues caused by plastic manufacturing affect North Carolina directly, as the state hosts plastic manufacturing plants that employ over 200,000 employees.[7]

Use

Like plastic manufacturing, plastic use causes significant environmental and health issues. Researchers have found that many, if not all, plastics leach toxic chemicals as they degrade. Health risks of continued bisphenol A (BPA) exposure, a plastic component often used in beverage bottles, include a weakened immune system, cognitive impairment, and reproductive disruptions.[8] Many BPA-free plastics leach toxic chemicals under common stressors (microwaving, dishwashing, sunlight) as well.[9] BPA alternatives commonly used in food packaging often have estrogenic activity, meaning that they may cause reproductive harm and other health problems.[9, 10]

Plastics not used for food storage are often even more dangerous. Polyvinyl chloride (PVC), a plastic polymer often used in construction, is carcinogenic.[11] Polyurethane, a polymer used in furniture and other consumer products, is also considered extremely hazardous.[11]

Disposal

In 2017, the US alone collected 32 Mt of plastic waste.[12] While the COVID-19-induced economic slowdown has caused a decrease in overall waste production, single-use plastic waste

has grown.[13] Once collected, plastic waste is disposed of through recycling, combustion (incinerating), or landfill disposal, while a third of global plastic waste is not collected at all.[14]

The Environmental Protection Agency reported that in 2017, Americans recycled only 8.4% of their plastic waste.[12] Because China no longer accepts most recycling, counties across the US, including several counties in NC, have been forced to shrink or cancel their recycling programs.[15] Moreover, plastic recycling has proven difficult and expensive.[16] Plastic combustion contributes to greenhouse gas emissions even when facilities recover some of the energy.[4] Combustion also produces harmful air pollution, causing higher mortality rates and higher rates of certain diseases in communities near incinerators.[17] Disposal via landfill, which is how the majority of American plastic waste is disposed, can lead to toxic chemical leaching[18] and low levels of greenhouse gas emissions.[4]

Mismanaged plastic causes even more problems than municipally-disposed plastic. Plastic that is littered usually washes into the ocean, with an estimated 8 Mt of plastic entering the ocean each year.[19] Ocean plastic pollution poses a serious threat to marine animals, who ingest or become tangled in plastic. Sea turtles, including NC's endangered loggerhead turtle, are among the most vulnerable species to marine debris.[20]

Plastic floating through the ocean eventually degrades into microplastic, which causes other problems to marine life. Pollutants stick to microplastics in a process known as sorbtion, and over time, pollutants accumulate.[21] Microplastics eaten by herbivorous fish are eaten by larger fish, leading to biomagnification (increased prevalence higher on the food chain) of microplastics and the toxic substances that they sorb.[21] This poses a danger to humans who eat

fish, although the extent of health issues that microplastics cause are unknown. Microplastics have also been found in salt and drinking water.[22]

Ocean plastic pollution is also a threat to NC's economy. In NC, 5,443 metric tons of beach litter were collected between 1986 and 2016, and the majority was plastic.[23] Such plastic pollution threatens the tourism and fishing industries.[23]

Strategies to Decrease Plastic Use

Because plastics have become nearly essential to modern life, limiting plastic use will take time and won't be easy. To be as efficient as possible in reducing plastic dependency in NC, a strategic approach that addresses specific issues as well as systemic issues of plastic dependency will be necessary.

Specific Strategies

Currently, NC does not have any statewide anti-plastic legislation. In 2009, a plastic bag ban was passed for six coastal counties,[24] but the ban was repealed in 2017.[25] In 2019, Durham County proposed a 10¢ carryout bag tax, which would include plastic and non-plastic bags.[26] Durham County has also decided to stop buying single-serve plastic water bottles at county-sponsored events.[27]

Outside of NC, eight states have banned plastic bags, and hundreds of local plastic bag bans or taxes have been implemented.[28] Other statewide or local single-use plastic bans include bans on plastic cutlery, straws, single-serve water bottles, and certain food containers.[29] Balloon releases have also been banned in several states.[29] Furthermore, a nationwide ban on plastic microbeads was implemented in 2017.[30]

Many of these laws have helped to reduce plastic waste across America. Plastic bag legislation is an especially promising approach for NC because of its success in other states. Bans, taxes, and buybacks have all been implemented in the US, but carryout bag taxes, or a plastic bag ban paired with a paper bag tax, are most effective in changing consumer behavior: on average, American disposable bag taxes decrease bag use by half.[31] Such taxes target loss aversion, a consumer's tendency to prioritize minimizing losses.[32] Furthermore, carryout bag taxes reinforce pro-environmental behaviors and shift norms.[32] If implemented in NC, stores would no longer default to providing bags. Instead, the customer would have to request and then pay a tax on bags. This approach led to a 28 million pound net annual decrease in plastic waste in California.[31]

How could this approach succeed at a statewide level when it failed in NC coastal communities just three years ago? According to behavioral scientists, a well-generated environmental law balances inconvenience and monetary costs with environmental and other benefits.[33] The Outer Banks ban was repealed because of ostensible economic harm to local businesses,[25] but in reality, the Outer Banks community supported the ban: after speaking with retailers, the Outer Banks Chamber of Commerce wrote to NC legislature, "Being in tune with their community and environment... is more important to [our retailers]. In addition, the minimal amount of money they would save on not purchasing paper bags will not have any impact on their hiring of additional employees." [34]

Besides plastic packaging, plastic-containing textiles also represents a large sector of plastic use.[35] To reduce plastic production from plastic-containing textiles, a double tax could be implemented, which would tax textiles with high plastic content more aggressively than textiles

with lower plastic content. This double tax is modeled after the UK's sugar tax, which encouraged the beverage industry to reformulate their recipes to contain less sugar.[32] The UK tax has been successful in lowering sugar consumption, and is not as regressive as a single tax.[32] A double tax on items with plastic-containing textile in NC could similarly influence producers who want to avoid their products being taxed at the higher rate.

Systemic Solutions

Systemic solutions address the broad reliance on single-use plastics in our society. They will require even more public engagement and will reap longer term, not necessarily short term, results. Systemic solutions paired with specific strategies will decrease waste in NC most effectively.

Circular economy approaches, which are being implemented in the European Union and China, are a promising start to mitigating the harm caused by plastic. According to a World Economic Forum report, the goal of circular economies is to "increase prosperity, while reducing demands on finite raw materials and minimizing negative externalities." [14] In terms of plastic packaging, a circular economy limits production of new plastic by collecting and recycling as much packaging as possible, while also promoting reusable packaging.[14] Comprehensive recycling reform would decrease the need for producing virgin plastic; to limit the need for recycling, extended producer responsibility schemes could be introduced.[14]

An extended producer responsibility initiative to reduce plastic bottle waste could be implemented with local outreach to grocery stores. Certain brands of liquid products could be bottled in reusable containers, and consumers could choose between refillable and nonrefillable options. The refillable option would be cheaper than non-refillable alternatives and nearly as

convenient (when customers arrive at the store, they could drop off empty bottles and pick up refilled ones) to target loss aversion and limit perceived costs. These strategies have proven more effective in changing behavior mediated by split-second decisions than educating consumers about environmental impacts alone.[32]

Several reusable plastic packaging programs have already been implemented in NC: GreenToGo is a subscription-based takeout container program[36] and Fillaree is a soap company.[37] Both are based in Durham and focus on green-messaging, but to reach wide audiences across NC, businesses should consider messaging towards non-environmental interests (affordability, quality) that often take priority over sustainability.[32]

Lastly, a circular economy-related approach that could be implemented locally would focus on farmers' markets and local produce. Programming to encourage the growth of local farms and markets has potential to decrease plastic packaging consumption, and farmers' markets are already on the rise.[38] Buying local, seasonal produce means that produce doesn't need plastic packaging to stay fresh, and it's usually cheaper.[39, 40] Shopping local also encourages consumers to make their own food, which decreases plastic packaging consumption that accompanies buying processed foods. Community programs to establish and expand farmers' markets must educate consumers and increase the ease of buying local produce. Paired with elementary school curriculum that focuses on local farming and farmers' markets, these programs could shift community norms.

Conclusion

Disincentivizing plastic use in NC will require both specific strategies and systemic solutions, plus enthusiastic community participation. Anti-plastic campaigns that focus on

environmental messaging have reaped success in liberal states, but NC will have to tailor its message to liberals and conservatives alike. Targeting values shared by all North Carolinians, such as pride in the state and in the strength of local communities, will be essential as North Carolina rolls back the plastic tide.

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