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Megan Manning
Arizona State University Sandra Day O'Connor College of Law

Stephanie Deskins
Arizona State University Sandra Day O'Connor College of Law

ARTICLE

MAKING IT USABLE AGAIN: REVIVING THE NATION'S DOMESTIC RECYCLING INDUSTRY

*MEGAN MANNING & STEPHANIE DESKINS**

* Both authors are Sustainability Law Student Research Fellows within the Program on Law and Sustainability at Arizona State University's Sandra Day O'Connor College of Law. This Article was researched and written under the supervision and guidance of Professor Troy A. Rule as part of the Sandra Day O'Connor College of Law's Sustainability Law Research Fellowships initiative. The authors wish to thank other Fellows within the initiative for their invaluable input on early stages of this Article.

INTRODUCTION

Blue recycling bins situated throughout the Memphis International Airport collect travelers' recyclable bottles and paper each day. The airport's janitorial staff then empties the bins, sending all of their contents to a local landfill.[1] As deceptive and troubling as this practice of landfilling recyclables may seem, it is now commonplace throughout the coun-

[1] *See* Michael Corkery, *As Costs Skyrocket, More U.S. Cities Stop Recycling*, N.Y. TIMES (Mar. 16, 2019), https://www.nytimes.com/2019/03/16/business/local-recycling-costs.html.

try. Philadelphia sends half of its collected recyclables to an incinerator.[2] Even Oregon, a state often revered for its sustainability practices, has been increasingly shipping its recyclables to the dump.[3] For decades, communities across the United States had saved money by sending much of their recyclable material to China for sorting and processing rather than recycling it domestically.[4] However, that arrangement abruptly ended when China recently placed stringent restrictions on its importation of recyclable waste as part of broader revisions to the country's own environmental policy plan.[5] This sudden change by a single foreign government has quickly created a recycling crisis in the US, where communities have long lacked the infrastructure necessary to recycle their own trash.

In the face of these new challenges, today's US has a unique opportunity to finally develop its own modern, sustainable recycling system. The nation's current domestic recycling system accounts for over 750,000 stable jobs, $35 billion in wages, and almost $7 billion in tax revenue.[6] Despite the important role recycling plays in the US economy, the stateside processing of many types of recyclables has long been viewed as costly and unjustifiable.[7] For instance, Prince George's County, Maryland generated nearly $1 million in annual revenues by selling its recyclables to China before the country imposed its importation restrictions; now the county must spend $3 million a year on alternative means of disposing of its recyclables.[8] And Stamford, Connecticut earned $95,000 through its recycling program in 2017, only to be set back $700,000 in 2018 in efforts to dispose of the waste they could no longer recycle.[9] Such new costs and declining revenues are beginning to put upward pressure on retail waste disposal prices and could ultimately

[2] Hundreds of municipalities in the US have cancelled all or part of their recycling programs in response to China's restrictions. *Id*.

[3] *See* Livia Albeck-Ripka, *Your Recycling Gets Recycled, Right? Maybe, or Maybe Not*, N.Y. TIMES (May 29, 2018), https://www.nytimes.com/2018/05/29/climate/recycling-landfills-plastic-papers.html?rref=collection%2Fbyline%2Flivia-albeck-ripka&module=inline.

[4] *See generally* Colin Parts, *Waste Not Want Not: Chinese Recyclable Waste Restrictions, Their Global Impact, and Potential U.S. Responses*, 20 CHI. J.INT'L L. 291 (2019).

[5] *See* Mingjie Hoemmen, *Vertical and Horizontal Modes of Injustice in Air Pollution: A Comparison of Law and Society in China and the U.S.,* 59 NAT. RESOURCES J. 347, 361-364 (2019).

[6] Along with the financial benefits, recycling is also environmentally beneficial. *See* Waste360 Staff, *China's Recycling Regulations: How American Cities Can Benefit*, WASTE 360 (Sep. 26, 2018), https://www.waste360.com/legislation-regulation/china-s-recycling-regulations-how-american-cities-can-benefit.

[7] *See* Corkery, supra note 1.

[8] In addition to Maryland, Bakersfield in California transitioned from receiving $65 per ton of recyclables to owing $25 per ton of recycling since China implemented its export restrictions. *See* Edward Humes, *The US Recycling System Is Garbage*, SIERRA (Jun. 26, 2019), https://www.sierraclub.org/sierra/2019-4-july-august/feature/us-recycling-system-garbage.

[9] *See* Humes, *supra* note 6.

have significant, adverse effects on the nation's broader economy.[10] The increased landfilling of recyclables occurring because of these shifts is also imposing significant environmental costs that could be eliminated if adequate domestic recycling infrastructure were in place.

This Article describes the major shortcomings of existing US federal, state, and local laws related to the recycling of solid waste; explains why these deficiencies are more costly to the US today than ever before; and identifies a set of specific policy strategies capable of supporting the development of a modernized, efficient, and profitable domestic recycling system. The Article ultimately recommends a multi-faceted approach to improving the nation's domestic recycling programs that could ultimately usher in a new era of sustainable and cost-justifiable US recycling.

Section I of this Article describes the history and development of US recycling programs, outlining how the nation became highly dependent on China to process much of its recyclable solid waste and how new Chinese solid waste importation restrictions have created solid waste disposal crises across the US. Section II highlights how major gaps and deficiencies in existing US recycling policies have hindered the development of adequate domestic recycling infrastructures and systems. Section III examines various policies and actions that private companies, municipalities, states, and the federal government are now considering or employing in efforts to address the nation's recycling crisis. Section IV then proposes several specific strategies capable of finally promoting the development of a cost-effective and sustainable domestic recycling system.

I A HISTORY OF EXPORTING TRASH

For most of the past century, the US has been a prolific producer of trash. Dubbed by some as the planet's biggest "throwaway society" because of its notoriously consumptive and wasteful culture, the US has had widespread recycling programs for less than 50 years.[11] Even during this period, the nation's recycling programs have often relied on exporta-

[10] The relief China provided was short lived, and now the US is suffering from the financial ramifications. Some question whether or not China's restrictions should be challenged within the World Trade Organization. *See* Colin Parts, *supra* note 4 at 305.

[11] The author concludes, "in a world of finite resources it makes no sense to act as if they were infinite. It is simply beyond common sense to throw valuable materials into landfills." *See* Brett Godush, *The Hidden Value of a Dime: How A Federal Bottle Bill Can Benefit the Country*, 25 VT. L. REV. 855, 857 (2001) citing Anthony R. DePaolo, *Plastics Recycling Legislation: Not Just the Same Old Garbage*, 22 B.C. ENVTL. AFF. L. REV. 873, 874-75 (1995) ("Recycling efforts started in cities and college campuses in response to the proliferation of the 'throwaway society.'").

tion to dispose of much of the country's recyclable material, leading to remarkably little domestic investment in recycling infrastructure.

A. THE DEVELOPMENT OF DOMESTIC RECYCLING IN THE 20TH CENTURY

US waste management policies have evolved across multiple stages over the past century.[12] During World War II, concerns about resource scarcity compelled the federal government to implement large-scale waste recovery programs aimed at promoting, reusing, and reducing waste.[13] Government propaganda posters distributed in the 1940s encouraged Americans to recycle tin, scrap, paper, and rubber.[14] However, after the war ended, interest in recycling quickly waned and the country embraced its "throwaway" culture more strongly than ever.[15]

It took 30 years after the end of World War II for the US government to finally begin implementing permanent domestic recycling policies.[16] In the 1970s, the impetus for embracing recycling policies was not a war effort but growing concerns about the nation's ballooning waste problem. Still, even in those early years of US waste management policy, it was evident that recycling strategies and alternative means of reducing landfill waste were often in tension with one another. Overflowing landfills led to the opening of the country's first recycling mill in Pennsylvania in 1972, followed by the introduction of curbside recycling programs in a small number of communities a year later.[17] However, many other communities turned to waste incineration—an antiquated and less environmentally friendly form of waste disposal—that first became widespread in the 1960s as a means of avoiding landfill-related health

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[12] *See* Crystal Ward Kent, *Could Opportunity Rise From The Chinese Recycling Crisis?*, WASTE ADVANTAGE (Jan. 1, 2019), https://wasteadvantagemag.com/could-opportunity-rise-from-the-chinese-recycling-crisis/ ("The U.S. was once a 'make it work,' kind of place where nothing was wasted and everything was used until used up. However, post-World War II affluence led to a gradual degrading of this mindset").

[13] *See* Godush, *supra* note 11 at 857.

[14] *See* Karen Fishman, *Scrap for Victory!*, Library of Congress (Jan. 15, 2015), https://blogs.loc.gov/now-see-hear/2015/01/scrap-for-victory/ ("During World War II scrap drives were a popular way for everyone to contribute to the war effort. By recycling unused or unwanted metal for example, the government could build ships, airplanes and other equipment needed to fight the war").

[15] *See* Godush, *supra* note 11 at 857.

[16] *See* Anthony R. DePaolo, *Plastics Recycling Legislation: Not Just the Same Old Garbage*, 22 B.C. ENVTL. AFF. L. REV. 873, 874-76 (1995).

[17] Around this time, Woodbury, New Jersey became the first city to mandate recycling, and curbside recycling began to gain momentum throughout the US. *See* Rick Leblanc, *Recycling Progress in the US,* THE BALANCE SMALL BUS. (June 25, 2019), https://www.thebalancesmb.com/recycling-progress-in-the-u-s-2878054.

hazards.[18] Indeed, the 1970s saw a resurgence of waste incineration in response to the implementation of state and federal waste disposal regulations that were difficult for localities to meet.[19] During this period when recycling strategies were still in their embryonic stages, burning waste was an appealing alternative to the mounting challenges of diminishing landfill space and tightening regulations.[20] Waste-to-energy facilities were also first seriously explored during this age, promising to use heat from trash incineration to produce energy but also generating their own environmental and health risks.[21]

Because of decades of minimal investment in solid waste recycling infrastructure in the US, environmentally hazardous strategies such as incineration and landfills are often viewed as the most economical short-term solutions to the waste crisis.[22] Although incinerating trash does reduce its physical footprint, it can also release harmful toxins into the air. For instance, some experts believe that the burning of plastic waste at an incineration plant is contributing to a dioxins fog, which is in turn increasing asthma and cancer cases in Chester, Pennsylvania, where rates of these illnesses are higher than those in the rest of the state.[23] Environmental injustices often accompany such toxic air pollution from incineration plants because these plants commonly reside in low-income, minority communities.[24]

Although incinerating trash releases carbon monoxide, nitrogen oxide, mercury, lead, and other harmful emissions into the atmosphere, dumping solid waste into landfills instead is often not much better because it generates its own environmental and health hazards.[25] For instance, reliance on landfills to dispose of solid waste generates significant emissions of methane, which is a far more potent greenhouse

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[18] *See* Ana Isabel Baptista and Kumar Kartik Amarnath, *Garbage, Power, and Environmental Justice: The Clean Power Plan Rule*, 41 WM. & MARY ENVTL. L. POL'Y REV. 403, 404 (2017).

[19] California passed the state's first major recycling bill where all cities and counties had to divert 50% of waste from landfills by recycling or composting by 2000. *See* Kaylee Beam, *China is refusing most U.S. recyclables. That may mean higher trash bills in the Coachella Valley*, THE DESERT SUN (Aug. 11, 2019), https://www.desertsun.com/story/news/environment/2019/08/11/palm-springs-coachella-valley-china-recycling-markets-education-trash-bills/1751480001/.

[20] *See* Baptista and Amarnath, *supra* note 14 at 404.

[21] Alana Semuels, *Is This the End of Recycling?*, THE ATLANTIC (Atlantic Media Company, Mar. 6, 2019), https://www.theatlantic.com/technology/archive/2019/03/china-has-stopped-accepting-our-trash/584131/.

[22] Oliver Milman, *Since China's Ban, Recycling in The US Has Gone Up In Flames,* WIRED (Feb. 27, 2019), https://www.wired.com/story/since-chinas-ban-recycling-in-the-us-has-gone-up-in-flames/.

[23] *Id.*

[24] *Id*.

[25] *See* Thomas F. Irwin, *Slowing the Rush to Burn: The Need To Revise Federal Municipal Solid Waste Policy To Prioritize Recycling Over Incineration*, 19 VT. L. REV. 891, 893 (1995).

gas than carbon dioxide.[26] In fact, decomposing organic waste in landfills is the third largest source of methane in the US.[27] Landfilling waste also allows non-biodegradable plastics to break down into microbeads and enter water systems, infecting water and seafood.[28]

Despite these dangers, some argue that landfills still offer the most practical solution for waste problems in the US. In an infamous *New York Times* article, John Tierney wrote that "Recycling is Garbage" and "the simplest and cheapest option is usually to bury garbage in an environmentally safe landfill."[29] According to Tierney, "all the trash generated by Americans for the next 1,000 years would fit on one-tenth of 1% of the land available for grazing."[30] However, the US started exporting waste partly due to decreasing landfill space.[31]

B. CHINA'S PRIOR ROLE IN US RECYCLING

Although the 1970s brought some notable advancements in America's fledgling recycling system, the country's growing reliance on the exportation of recyclable waste to China in the decades that followed ultimately slowed that progress. As China rapidly industrialized in the late 20th century, its demand for raw materials soared. Across the Pacific, the US had an excess supply of materials in the form of reusable waste, and China became increasingly willing to take it. Soon a recyclables trading system emerged that sent millions of tons of American waste to China for processing, and then back to the US as recycled goods.[32] Because this system made it more economical for US communities to export their recyclables across the Pacific than to process them

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[26] *See* Steven Ferrey, *Converting Brownfield Environmental Negatives into Energy* Positives, 34 B.C. ENVTL. AFF. L. REV. 417, 429 ("While both carbon dioxide and methane contribute to global warming, methane has twenty-one times the global warming potential of carbon dioxide").

[27] *See* Semuels, *supra* note 21.

[28] *See* Charles Grosenick, *The Price of Plastic*, 42-SPG ADMIN. & REG. L. NEWS 34, 34 (2017).

[29] Despite America's best intentions by shipping over 100 million tons of waste to China to avoid American landfills, a significant amount of its waste ended up in the oceans. *See* J. Frank Bullitt, *Recycling: America's False Religion*, ISSUES & INSIGHTS (2019), https://issuesinsights.com/2019/06/05/recycling-americas-false-religion/.

[30] *Id*.

[31] Congress enacted the Resource Conservation and Recovery Act in 1976 because of issues from landfilling and the lack of disposal space. *See* Jennifer R. Kitt, *Waste Exports to the Developing World: A Global Response*, 7 GEO. INT'L ENVTL. L. REV. 485, 490 (1995).

[32] *See* Leslie Hook and John Reed, *Why The World's Recycling System Stopped Working*, FIN. TIMES (Oct. 24, 2018), https://www.ft.com/content/360e2524-d71a-11e8-a854-33d6f82e62f8.

domestically,[33] exportation became a critical aspect of the nation's waste management strategy.[34]

Unfortunately, America's reliance on waste exportation to China over the past couple of decades has greatly hindered the development of recycling infrastructure. Because they no longer domestically processed most of their recyclable waste, many municipalities and waste management companies across the US began implementing "single-stream" recycling—programs under which all recyclables are placed into a single bin and collected together rather than being sorted into different bins based on recyclable material types.[35] Such single-stream recycling is a relatively inexpensive and easy waste collection method, but it also mixes recyclable materials in ways that often contaminate them with food or moisture and thereby make them much more costly to reuse.[36] Fortunately for the US, for decades, China was willing to employ its cheap labor to sort through America's contaminated trash. So single-stream recycling was generally an adequate approach.[37]

China's willingness to sort through the world's contaminated waste ultimately enabled that country to grow into a waste importing superpower, and the US became one of its key suppliers.[38] China was collecting roughly 66% of the world's global plastic waste as of 2016, with the US alone contributing close to 1.5 million tons of plastic in that year.[39] China was also collecting more than half of the world's paper scrap, including over 13 million tons per year from the US.[40] And because of all of the contamination contained within that recyclable scrap, China

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[33] *See* Parts, *supra* note 4 at 303 ("It is generally cheaper to transport scrap from Los Angeles across the Pacific Ocean rather than ship it overland to a mill in Pennsylvania or Virginia").

[34] *See* Kent, *supra* note 12.

[35] *See* Humes, *supra* note 6.

[36] For a discussion about some issues associated with contamination, *see generally Pollution Prevention and Rethinking "Waste"*, 49 ENVTL. L. REP. NEWS & ANALYSIS 10515 (2019).

[37] *Id*.

[38] *See* Tribune News Service, *US cities scramble to rewrite rules on recycling after China restricts foreign garbage*, S. CHINA MORNING POST (July 3, 2018) https://www.scmp.com/news/china/policies-politics/article/2153628/us-cities-scramble-rewrite-rules-recycling-after-china ("Recyclable scrap has been the United States' biggest export to China by volume and was valued at 5.6 billion.").

[39] *See* Jeff Spross, *America Has A Recycling Problem. Here's How to Solve It.* THE WEEK (Feb. 11, 2019), https://theweek.com/articles/819488/america-recycling-problem-heres-how-solve; Tribune News Service, *supra* note 38; Kimiko de Freytas-Tamura, *Plastics Pile Up as China Refuses to Take the West's Recycling*, N.Y. TIMES (Jan. 11, 2018), https://www.nytimes.com/2018/01/11/world/china-recyclables-ban.html?module=inline.

[40] Waste is America's sixth largest export to China. *Id.*

was also importing 500 pounds of non-reusable trash per ton of recyclables.[41]

The US recycling industry's heavy reliance on China over the past few decades helped to keep Americans' recycling costs relatively low, but it also led to inadequate waste management policies and insufficient US investment in recycling technologies and infrastructure.[42] The nation has long been relying primarily on landfills and incineration to deal with the waste it could not export overseas.[43] These decades of underinvestment and outdated policies have ultimately turned today's domestic recycling into an economically unappealing business,[44] even though the recycling industry is expected to add up to $850 billion by 2025 to the global GDP.[45] Under these current conditions, most waste management companies tend to profit more by disposing of recyclables in landfills than in recycling them. [46] Recycling programs also increasingly involve elevated financial risks in the US because of increased volatility in the costs and market pricing associated with them.[47] And since waste disposable within the US often involves private, profit-driven companies, these risks and elevated costs have deterred many waste management companies from heavily investing in recycling on their own.[48] This dearth of investment in domestic recycling has ultimately slowed innovation and further perpetuated widespread reliance on incineration and landfills.[49]

C. CHINA'S "GREEN FENCE" AND "NATIONAL SWORD" POLICIES

Several major deficiencies in US recycling policy have become increasingly evident in recent years as China has stopped importing as much American trash. In particular, the Chinese government in recent

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[41] *See* Ted Oberg, *Houston among cities seeing recycling costs going up,* ABC 13 (Dec. 12, 2018), https://abc13.com/finance/13-investigates-earth-friendly-recycling-becoming-more-costly/4888172/.

[42] *See generally* Jennifer R. Kitt, *Waste Exports to the Developing World: A Global Response*, 7 GEO. INT'L ENVTL. L. REV. 483 (1995) ("Rich countries are sending their garbage to poor, developing countries. The motivation is money: rich countries want to save it and poor countries want to earn it. . .. The industrialized world should be responsible for managing its own wastes").

[43] *See* Baptista and Amarnath, *supra* note 14 at 404.

[44] *See* Spross, *supra* note 39.

[45] *See* Irma S. Russell, *The Green Economy: Strategic Planning for A Future?,* 86 UMKC L. REV. 913, 925 (2018).

[46] *See* Adele Peters, *All the Ways Recycling Is Broken and How to Fix Them,* FAST COMPANY (Apr. 4, 2019) https://www.fastcompany.com/90321566/all-the-ways-recycling-is-broken-and-how-to-fix-them.

[47] *See* Erin Biba, *Everything Americans Think They Know About Recycling Is Probably Wrong,* NBC NEWS (Apr. 14, 2019), https://www.nbcnews.com/think/opinion/everything-americans-think-they-know-about-recycling-probably-wrong-ncna994261.

[48] *See* Spross, *supra* note 39.

[49] *Id*.

years has actively fought against what it calls "yang laji" (foreign garbage), targeting illegal waste trading and contaminated recyclables in an effort to address environmental concerns and streamline China's domestic recycling industry.[50] These policies have greatly reduced the volume of waste importation into China—a change that continues to affect the US today.

The "Green Fence," implemented in 2013, was China's first major policy change restricting the importation of waste. The campaign was primarily aimed at temporarily reducing the importation of plastic waste.[51] China's open-arms acceptance of plastic waste over previous decades had kick-started a major challenge: massive quantities of imported plastic waste were beginning to build up within China.[52] For ten months, China's Green Fence policies limited the amount of contaminated garbage China was willing to accept.[53] Unprepared for such a sudden change, many communities throughout the US were focused to respond to Green Fence by temporarily sending much of their recyclable waste to landfills and other countries.[54]

Four years later, in 2017, China made permanent many aspects of its formerly temporary Green Fence policies. Among other things, China indefinitely banned the importation of nonindustrial public waste, restricted impurity levels for certain types of waste to 0.5%, and began refusing to accept 24 types of previously accepted materials. [55] Because the use of single-stream collection in the US causes contamination levels for its recyclable waste to far exceed China's new allowances, the US has been increasingly unable to find foreign takers for its recyclable waste and unable to economically process that waste at home.[56]

In addition to China's domestic environmental protection concerns, the country's recent frustrations over US trade policies have further damaged recycling-related commerce between the two countries. Among

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[50] *See* Waste360, *supra* note 6.

[51] *See* Amy L. Brooks, Shunli Wang & Jenna R. Jambeck, *The Chinese import ban and its impact on global plastic waste trade*, SCI. ADVANCES (Jun. 20, 2018), https://advances.sciencemag.org/content/4/6/eaat0131.

[52] *See* Parts, *supra* note 4 at 298 ("Among other environmental problems the country was confronting, there were mountains of trash slowly accumulating across the country").

[53] *See* Ying Xia, *China's Environmental Campaign: How China's "War on Pollution" is Transforming the International Trade in Waste*, 51 N.Y.Y. J. Int'l L. & Pol. 1101, 1164-65 (2019).

[54] *See Id.* at 1165 ("Similar to what happened during Operation Green Fence, without an international consensus on the control of waste trade, China's foreign waste ban has redirected waste shipments to countries that have not restricted the trade. News reports show that major waste exporting countries have once again turned to countries in Southeast Asia, the Middle East, and Africa").

[55] *See* Waste360, *supra* note 6, Albeck-Ripka, *supra* note 3.

[56] For a detailed explanation of the Basel Convention which governs international waste exportation and importation, *see* Eric V. Hull, *Poisoning the Poor for Profit: The Injustice of Exporting Electronic Waste to Developing Countries*, 21 DUKE ENVTL. L. & POL'Y F. 1, 15-18 (2010).

other things, the Trump Administration's imposing of tariffs on Chinese steel and aluminum appeared to have heightened tensions between the countries.[57] These hefty tariffs may have influenced China's decisions to impose new waste importation restrictions, including the country's 2019 and 2020 bans on importation of plastics, stainless steel, metal scrap, and insulated wire.[58]

In recent years, private and public waste management entities within the US have responded to the challenges emanating from China's new importation policies in various ways. Some have tried exporting their garbage to other Asian countries with cheap labor that were willing to sort through Americans' contaminated waste,[59] such as Vietnam, Malaysia, Thailand, and India.[60] Unfortunately, other developed countries across the world also grappling with China's policy changes have inundated these alternative countries with waste as well, prompting them to enact their own waste importation restrictions.[61] India and Thailand have adopted China's 0.5% contamination limit, making them non-viable alternative destinations for America's single-stream recyclable trash.[62] Facing fewer and fewer exportation options, the US continues to struggle to find ways to actually recycle its recyclable waste.

II. Current Challenges Plaguing the Domestic Recycling System

The US recycling crisis initially emerged and continues today because the nation has relied too long on exporting waste to China and has thus become incapable of processing its own recyclable trash. Referencing China's increasing waste restrictions, the president of the US Association of Plastic Recyclers recently quipped that "[China] has given [the US] the opportunity to begin inventing in the infrastructure we need" to domestically process the nation's own waste.[63] Of course, the first step toward building cost-effective and sustainable recycling infrastructure in the US is to critically assess the nation's existing recycling policy landscape.[64] As the following subsections describe, US policies presently fail

[57] *See* Kent, *supra* note 12.

[58] *See* Waste360, *supra* note 6.

[59] *See* Parts, *supra* note 4 at 303.

[60] *Id.* at 303, 304.

[61] *Id.* at 304.

[62] *See* Corkery, *supra* note 1.

[63] *See* Biba, *supra* note 36.

[64] *See generally* W. Kip Viscusi, Joel Huber, & Jason Bell, *Lessons from Ten Years of Household Recycling in the United States*, 48 ELR 10377 (2018).

to adequately support both major components of a healthy recycling system: collection and processing.

A. NO NATIONAL PLAN

The US presently lacks a cohesive national policy plan to address its recycling problems. States and localities handle their waste differently, and there is no uniform labeling system for recyclables. This lack of uniformity and coordination is among the major obstacles to building a cost-effective and sustainable domestic recycling system.

1. A Patchwork of State and Local Laws

Because cities across the US have long been collecting solid waste at the local level and then exporting it at the national level, the nation's municipalities have adopted inconsistent waste practices that often work against each other in ways that hinder domestic recycling.[65] Some US cities today are investing money in innovative recycling technologies, while others are completely shutting down their recycling programs.[66] Other cities still collect recycling but do not actually recycle the waste.[67] These variations in city and state waste management policies often confuse citizens and complicate efforts toward greater national-level coordination.

Because of the absence of a robust federal recycling policy structure in the US, an inefficient patchwork of incentives and regulations currently exists among states and cities across the country.[68] For instance, the US has struggled to implement a cohesive strategy to address its growing plastic waste crisis. Worldwide, more than 400 tons of plastic was manufactured in 2015.[69] Almost 80% ended up in a landfill, 12% was incinerated, and only 9% was recycled.[70] These numbers are partly a result of communities across America implementing conflicting and non-uniform plastic policies. Some cities have banned certain plastic products while other states refuse to allow their cities to implement bans.[71] Those

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[65] *Id.*

[66] California has successfully implemented single-use plastic bans, but there are ten states with preemption laws that do not allow plastic bag bans. *See* Sarah J. Morath, *Our Plastic Problem*, 33 NAT'L RES. & ENV'T 45, 46 (2019).

[67] *See* Corkery, *supra* note 1.

[68] For a discussion of microbead patchwork state laws that lead to federal action, *see* Ethan D. King, *State Preemption and Single Use Plastics: Is National Intervention Necessary?*, 20 SUSTAINABLE DEV. L. & POL'Y 31, 31 (2019).

[69] *See* Morath, *supra* note 66 at 45.

[70] *Id*.

[71] *Id.* at 47.

who cannot ban plastic, but also do not want to invest in recycling, choose to ultimately incinerate the plastic or throw it in a landfill. Landfills continue to be the easiest avenue for disposing of plastic, despite the harm they bring. All of these various policies create a patchwork that the federal government struggles to compensate for.

On the other hand, the federal government's existing forays into recycling policy have often been passive and deferential in ways that have limited their effectiveness.[72] Much of US federal waste policy takes this arms-length approach, which allows states and cities to largely pursue their own policy strategies and promotes minimal coordination across jurisdictions. Although many aspects of recycling need to be handled at the local level, certain other aspects are difficult to manage effectively without federal oversight.[73]

2. Inconsistent Labeling

One of the most problematic consequences of the nation's heavy reliance on municipality-level recycling policy is the lack of a standardized labeling system for collecting recyclable retail products. Existing recycling symbols in the US are often difficult for customers to understand and do not align with the collection policies of municipalities. This lack of coordination breeds confusion: 94% of Americans claim to recycle but 26% of them are uncertain about the recyclability of certain materials.[74] This uncertainty is costly because a single incorrectly recycled item can contaminate an entire bin of recyclable materials.

B. SPOTTY ACCESS TO COLLECTION SERVICES

Because existing recycling collection resources throughout much of the US are woefully inadequate, improving waste collection methods is another critical step towards improving the US recycling system.[75] For

[72] For example, Congress enacted the Save Our Seas Act in 2018. The Act only gave the Marine Debris Program the power to work with other agencies and organizations to target marine debris at home and abroad. The Act itself never took direct action for limiting debris like plastic. *See* Save Our Seas Act of 2018. Pub. L. No. 115-265, 132 Stat. 3742 (2018).

[73] Authority for more possible federal regulation of recycling stems from the Commerce Clause, the Resource Conservation and Recovery Act, and the Environmental Protection Agency. *See generally* Christina M. Everling, *Chasing Results from the Chasing Arrows: Strategies for the United States to Stop Wasting Time and Resources When it Comes to Recycling*, 52 J. MARSHALL L. REV. 147 (2018).

[74] *See* Semuels, *supra* note 21.

[75] Ninety percent of Americans believe that recycling collection sites should be more conveniently located. Sixty-five percent of Americans agree that they would likely not recycle if it is inconvenient. *See* Leblanc, *supra* note 17.

starters, many Americans do not have reasonable access to recycling. From 2015 to 2019 alone, more than 40% of recycling centers closed.[76] In part because of these trends, about 40% of households in the US currently do not even have access to recycling at home.[77] Put differently, about 34 million rural homes and 16 million apartments in the US presently have no means of recycling their waste.[78]

The US also has demographic and geographic characteristics that can significantly complicate recyclable waste collection. Major disparities in access presently exist between rural and urban communities, and between impoverished and wealthy ones. Most cities do not have recycling centers and thus transport their recycling waste elsewhere; rural communities often cannot afford those transportation costs and are thus more likely to send their waste directly to landfills.[79] Many rural areas also lack the population density needed for economical investment in recycling trucks and bins.[80] Municipalities with low median income levels are also less likely to separate collected recyclables because residents are less willing or able to bear the accompanying costs of that service.[81] Addressing these and other waste collection challenges will be a crucial step toward developing sustainable and efficient domestic recycling policies that consider environmental justice.[82]

C. DEFICIENCIES IN THE RECYCLING PROCESS

In addition to improving its recyclable waste collection capabilities, the US needs to invest heavily in the development of new infrastructure capable of domestically processing most of the nation's recyclable waste. Processing problems begin with the consumer and continue with processing centers. The country's longstanding heavy reliance on waste exportation has led to minimal investments in recycling infrastructure over the past few decades. Improving consumer education and investing in new processing plants to affordably sort through and recycle the nation's waste will be crucial to overcoming the convenience of landfills and incineration.[83]

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[76] *See* Beam, *supra* note 19.

[77] *See* Peters, *supra* note 46.

[78] *Id.*

[79] *See* Albeck-Ripka, *supra* note 3.

[80] Trucks cost approximately $300,000 each. *See* Peters, *supra* note 46.

[81] *See* Semuels, *supra* note 21.

[82] *See generally* John C. Dernbach et. al., *Sustainability as a Means of Improving Environmental Justice*, 19 J. ENVTL. & SUSTAINABILITY L. 1 (2012).

[83] *See* Parts, *supra* note 4 at 294.

1. Consumers' Role in Processing Recyclables

At least some of America's challenges in developing an effective recyclables processing system stem from confusion among citizens regarding how to properly recycle. Decades of public "reduce, reuse, recycle" campaigns have transformed many Americans into "aspirational" recyclers.[84] Aspirational recyclers hope that an item is recyclable and thus throw it into the recycling bin, ultimately contributing to the bin's contamination.[85] Contaminated recycling supplies that have unrecyclable materials mixed into them are often prohibitively expensive to sort using existing technologies. Sadly, such contamination problems have led some cities to send collected recycling directly to landfills rather than advise citizens to stop putting the wrong materials into their recycling bins.[86]

Reducing trash contamination levels through education and other efforts is crucial to the success of domestic recycling in the US. As of 2014, 80% of American communities were using single-stream recycling collection, meaning that all recyclable material is being collected in a single bin.[87] Such predominant use of the single-stream model makes it very difficult to decrease contamination levels in supplies of recyclable material. For instance, it is possible to increase the amount of recycled glass from 40% to 90% by collecting it separately from other materials rather than through single-stream collection.[88] So long as different recycling materials are collected together, the US will have to use workers or sophisticated equipment to separate garbage and examine waste quality before it can be processed here or exported elsewhere. And although material recovery facilities increasingly have automated sorting capabilities, human labor[89] is still typically required for a portion of the sorting.[90] In short, until most American recyclables are no longer contaminated, it will be more economical to use other means of disposal.

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[84] *See* Biba, *supra* note 36.

[85] *See* Albeck-Ripka, *supra* note 3.

[86] *Id.*

[87] *See* Nicole Javorsky, *How American Recycling Is Changing After China's National Sword*, BLOOMBERG CITYLAB (Apr. 1, 2019), https://www.citylab.com/environment/2019/04/recycling-waste-management-us-china-national-sword-change/584665/.

[88] *See* Mitch Jacoby, *Why Glass Recycling In The US Is Broken*, C & EN (Feb. 11, 2019) https://cen.acs.org/materials/inorganic-chemistry/glass-recycling-US-broken/97/i6.

[89] For a discussion about the role of waste pickers within the larger labor market, *see* Supriya Routh, *Embedding Work in Nature: The Anthropocene and Legal Imagination of Work as Human Activity*, 40 COMP. LAB. L. & POL'Y J. 29, 45-47 (2018).

[90] *See* Beam, *supra* note 19.

2. Infrastructure's Role in Processing Recyclables

Another barrier separating the US from an effective domestic recycling policy is the nation's lack of recyclables processing centers. Even though American cities generate enormous quantities of potentially recyclable waste every week, many have nowhere to send it for processing. It is predicted that China's new restrictions on waste importation will allow 37 million tons of waste to accumulate in the US by 2030 alone.[91] Some cities have responded to China's actions by merely holding onto waste materials in hopes that a cost-effective means of processing it will emerge or China will reconsider its current restrictive policies.[92] However, policymakers in states such as California are fearful of storing hazardous materials that could fuel wildfires, and officials in some other states are doubtful that affordable recycling pathways will appear for many types of recycling materials anytime in the near future.[93]

To attract large amounts of private investment into recycling collection and processing infrastructure, the US will also need to strengthen its recycled materials markets. Presently, acquiring and producing new materials often costs less than producing recycled secondary materials.[94] Until there is sufficient market demand for recyclable materials and the prices of such materials are competitive with those of virgin materials, the nation's recycling industry is likely to continue to languish.

The economic realities of domestic recycling have long created additional obstacles to the expansion of domestic recycling infrastructure.[95] Recycling is a "loss leader" and generally has been regarded as an expensive extra service that companies reluctantly bundle with other waste services to win bids with municipalities.[96] Because recycling services are largely managed by private industry in the US, their availability is closely tied to their profitability.[97] As described above, until recently the

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[91] *See* Tribune News Service, *supra* note 38.

[92] *See* Albeck-Ripka, *supra* note 3.

[93] *Id.*

[94] *See* Semuels, *supra* note 21. In the words of one author, "Every time you rinse a jug or a can or a jar in your kitchen, you are in some small way competing with oil drillers, cotton pickers, miners, and lumberjacks all over the world because you too are creating a commodity." *See* Henry Grabar, *Recycling Isn't About the Planet. Its's About Profit.* SLATE (Apr. 5, 2019) https://slate.com/business/2019/04/recycling-dead-planet-profit-americans-commodities-china.html.

[95] Private processing plants are heavily dependent on profits and are not always welcomed by their communities, like landfills. *See generally* Gary Abraham, *Concepts of Community in Environmental Disputes: Farmersville and Western New York's Garbage Wars,* 7 BUFF. ENVTL. L.J. 51 (2000).

[96] The loss recycling companies are facing due to rising costs no longer make even bundling recycling services feasible for many. *See* Corkery, *supra* note 1.

[97] One factor contributing to recycling profitability is whether or not recycled materials are cheaper than virgin materials. *See* Spross, *supra* note 39.

US exported much of its recyclable waste to China instead of developing more costly domestic facilities to process it.[98] If China were to reopen itself to imported recyclable waste or if other countries began filling that role, building expensive domestic processing plants today could ultimately feel like a poor investment.

In summary, the US recycling system in its current state is wholly incapable of recycling its own waste in the face of China's new waste importation restrictions. Accordingly, aggressive and innovative new policies are needed to develop a profitable and efficient domestic recycling industry capable of sustainably processing the nation's own trash.[99]

III. EXISTING POLICY RESPONSES TO THE RECYCLING CRISIS

In recent years, responses to the global recycling crisis have varied greatly across different levels of government within the US and across various countries abroad. Some governments have attempted to influence consumer behavior through educational campaigns,[100] bottle bills,[101] surcharges,[102] and mandated recycling in an attempt to place greater responsibility on the consumer.[103] Others have enacted outright bans on certain plastics.[104] With China no longer accepting trash, some advocates have even begun pushing for a new comprehensive federal recycling plan capable of finally modernizing the country's recycling system.[105] The

[98] Exporting waste allowed cities and private companies to heavily rely on single-stream recycling, instead of sorting recyclables into categories. *See* Humes, *supra* note 6.

[99] *See generally* Douglas L. Tooley, *Singapore's Environmental Management System: Strengths and Weaknesses and Recommendations for the Years Ahead*, 23 WM. & MARY ENVTL. L. & POL'Y REV. 169, 245 (1998).

[100] *See generally* John Dernbach, *Next Generation Recycling and Waste Reduction: Building on the Success of Pennsylvania's 1988 Legislation*, 21 WIDENER L.J. 285, 314 (2012) ("DEP should make education about recycling and waste reduction a priority").

[101] *See generally* Christina M. Everling, *Chasing Results from the Chasing Arrows: Strategies for the United States to Stop Wasting Time and Resources When it Comes to Recycling*, 52 J. Marshall L. Rev. 147, 168-71 (2018).

[102] *See* Andrew J. Berge, *Michigan's Waste Problems: How Expansion of the Bottle Bill and Other Options Could Help Michigan Defeat the Dormant Commerce Clause and Out-of-State Waste*, 23 T.M. COOLEY L. REV. 303, 329 (2006) (citing John F. Katers & Dawn M. Walczak, *Analysis of Wisconsin Municipal Solid Waste Landfilling Trends and the Impact of Recycling Fee Increases on the Amount of Imported Waste*, 6 (2005)).

[103] *See generally* Nicholas M. Vaz, *Are You Gonna Eat That?: A New Wave of Mandatory Recycling has Massachusetts and Other New England States Paving the Way Toward Feasible Food Waste Diversion and a New Player in Alternative Energy*, 27 VILL. ENVTL. L.J. 193, 198 (2015).

[104] *See* Abigail Hogan and Alexander Steinbach, *A Polymer Problem: How Plastic Production and Consumption is Polluting our Oceans*, GEO. ENVTL. L. REV. ONLINE (2019).

[105] *See generally* Everling, *supra* note 101 at 150 ("[T]he United States needs to implement national recycling policies to catch up with the progress of other developed nations").

following are brief descriptions of some of these new recycling policy efforts.

A. CONSUMER-FOCUSED POLICIES AND PROGRAMS

Targeting the actions of consumers is one strategy some governments are using to improve recycling rates and reduce the volume of new landfill waste. National and subnational governments across the world have developed policies that educate, incentivize, and even punish residents all in attempts to promote better recycling practices among their citizens.

1. Educational Campaigns

Numerous municipalities have implemented educational campaigns aimed at reshaping the recycling norms of their residents. The goal of these campaigns is to increase applicable knowledge in hopes of ultimately changing behavior.[106] For instance, Palm Springs, California has developed brochures and utilizes "oops" stickers designed to let residents know when their recyclable trash was contaminated.[107] By notifying residents when they place inappropriate items in their trash bins, Palm Springs hopes to eventually curb contamination rates.[108] Washington, D.C. has also trialed a curbside feedback program that provided one recycling truck route with tags informing residents on whether they were recycling correctly.[109] Another route was not given tags.[110] Impressively, the garbage of residents on the route that received feedback exhibited a nearly 20% decrease in contamination.[111] As trials like this one suggest, tag programs and similar initiatives can do much to shape consumers' behavior by helping consumers better understand how their individual choices create environmental harms and what they can do to mitigate those harms.[112]

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[106] *See* Ann E. Carlson, *Recycling Norms*, 89 CAL. L. REV. 1231, 1254, 1269 (2001) ("Informational campaigns can increase knowledge and signal the importance of desired behavior. . .. A change in law or architecture, for example, could end up affecting social norms or vice versa").

[107] *See* Beam, *supra* note 19.

[108] *Id.*

[109] *See* Javorsky, *supra* note 87.

[110] *Id.*

[111] *Id*.

[112] *See* Katrina Fischer Kuh, *Personal Environmental Information: The Promise and Perils of the Emerging Capacity to Identify Individual Environmental Harms*, 65 VAND. L. REV. 1565 (2012).

2. Bottle Bills

Some states have sought to increase recycling through bottle deposit bills, which incentivize people to recycle bottles and cans in return for cash. At least six states are presently contemplating joining the list of ten states that already provide refundable container deposits for single-use beverage containers.[113] Bottle bills are incredibly effective at increasing recycling rates: the states that offer refunds have recycling rates of roughly 98%, compared to just 33% for states without bottle bills.[114]

Governments in other parts of the world are similarly utilizing bottle deposit programs.[115] Norway charges a refundable deposit on all single-use beverage containers,[116] and in 2016 Norway had a total return rate of nearly 92%.[117] Germany's national bottle bill, enacted in 2003, has likewise led to recycling rates of more than 98% in that country.[118]

Concededly, if more governments in the US were to adopt bottle bills, there could be some losers. Many Americans rely on bottle deposit rebates as either a total or supplemental form of income.[119] "Canners" are individuals who collect empty cans and bottles from the trash and take them to redemption centers.[120] If bottle bills were to result in very high redemption rates, rebates could become unsustainable overtime. The legislature could address this concern by requiring a 10-cent deposit for an item and only an 8-cent return. Bottle bills could be successful in spite of these challenges, as long as they capture enough revenue to fund all program operating costs.

Bottle bills often encounter political opposition and have thus been most successful to date when implemented at the state or local level.[121] Industry stakeholders have defeated more than 2,000 bottle bills in the US in the last 25 years.[122] Despite this, some still argue bottle bills are

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[113] *See* Humes, *supra* note 6.

[114] *Id.*, *See* Jacoby, *supra* note 88.

[115] *See* Spross, *supra* note 39.

[116] *See Norway*, Bottle Bill Resource Guide (Jan. 13, 2020), http://www.bottlebill.org/index.php/current-and-proposed-laws/worldwide/norway.

[117] *Id*.

[118] *See* Matt Wilkins, *More Recycling Won't Solve Plastic Pollution*, SCI. AM. (July 6, 2018), https://blogs.scientificamerican.com/observations/more-recycling-wont-solve-plastic-pollution/.

[119] Canning is a common form of income for homeless people. *See* Francesca Berardi, *Meet the street nun helping people make a living from New York's cans,* THE GUARDIAN (Mar. 1, 2019), https://www.theguardian.com/us-news/2019/mar/01/new-york-city-canning-bottles-street-nun.

[120] It is estimated that up to 8,000 citizens support themselves through canning in New York City alone. *Id.*

[121] Because bottle bills have historically been so successful, they should remain a viable option that some states or municipalities may be able to successfully pursue.

[122] *See* Godush, *supra* note 11.

the best way to boost recycling, as states with bottle bills have the highest recycling rates in the nation.[123]

3. Plastic Bag Charges

Charging consumers for using plastic bags is another approach some jurisdictions have used to reduce plastic waste and generate revenue to support recycling efforts.[124] In 2015, the United Kingdom enacted a charge on all single-use plastic bags causing an 80% decrease in use.[125] Ireland's per bag fee reduced the total average number of bags per person a year to 14 from 328.[126]

In the US, however, some states and localities have faced strong opposition when attempting to adopt plastic bag tax initiatives. For instance, state preemptive laws in Arizona prevented a local nickel-a-bag tax in that state.[127] Per-bag charges or taxes have been met with similar challenges from industry stakeholders in other states.[128] Some opponents of these charges have asserted that charging consumers for plastic bags may disproportionately impact low-income individuals in ways that contravene other important public policy goals.[129] Fortunately, there are usually means of addressing these concerns. Minneapolis recently enacted a per bag charge that creates exceptions for low-income individuals receiving certain benefits, like food stamps.[130] Per bag fees may encourage

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[123] The six states are Arkansas, Florida, Illinois, New Jersey, Tennessee, and West Virginia. *See* Humes, *supra* note 6.

[124] *See* Bridget M. Warner, *Sacking the Culture of Convenience: Regulating Plastic Shopping Bags to Prevent Further Environmental Harm*, 40 U. MEM. L. REV. 645, 667 (2010) ("A consumer-paid fee on plastic bags is a powerful tool for changing consumer behavior in the checkout lane. The fee is not an absolute for each trip to the store; rather, the decision is up to the consumer: pay the fee for each bag used, bring sustainable reusable bags when shopping, or do not use a bag. Providing these choices will put an end to the mindless consumption of plastic carryout bags and will raise public awareness about the role individual choices collectively play with regard to litter and waste management").

[125] *See* Grosenick, *supra* note 28 at 35.

[126] *Id.*

[127] *See* Kate Juon, *Infrastructure in the Context of Human Development: Recycling as a Nation*, 18 SUSTAINABLE DEV. L. & POL'Y 16, 16 (2018).

[128] In Denton, Texas, the city attempted to regulate fracking but was ultimately preempted by state law when the Texas legislature enacted its own fracking legislation. This highlights a difficult part of creating change within cities. For change to occur at the local level, cities must have the resources to overcome interest groups as well as not be preempted by state laws that may affect plastic and waste regulation. Garrett Mize, *Big Cities in a Bigger State: A Review of Home Rule in Texas and the Cities that Push the Boundaries of Local Control*, 57 S. TEX. L. REV. 311, 340 (2016).

[129] *See* Matt Sepic, *Nickel per simple-use store bag approved by Minneapolis City Council*, MPR NEWS (NOV. 22, 2019), https://www.mprnews.org/story/2019/11/22/fees-for-singleuse-store-bag-on-way-to-minneapolis-city-council-approval.

[130] *Id.*

consumers to invest in reusable bag options, but any such legislation should only do so in a manner that respects individual dignity.[131]

4. Recycling Mandates

A few cities have even sought to improve consumer recycling practices by imposing penalties on citizens who fail to recycle correctly.[132] In Cleveland, Reno, Newton, and Marin County in California, residents receive warnings and fines for incorrect recycling.[133] Other cities such as Seattle have enacted mandatory recycling policies.[134] In 2006, Seattle targeted declining recycling rates by requiring businesses to sort paper, cardboard, and yard waste, and households to sort basic recyclables.[135] By punishing their residents, cities hope to encourage proper recycling and ultimately decrease contamination.

Some states have similarly mandated recycling and are fining consumers for incorrect recycling under increasingly stringent state recycling laws.[136] In Washington, it is unlawful to place cans, glass bottles, or cardboard in landfills.[137] Wisconsin, New Jersey, North Carolina, Pennsylvania, Massachusetts, Connecticut, and California also have mandatory laws for recycling plastic bottles.[138] Naturally, the provisions in these laws vary significantly from state to state. Connecticut law explicitly mandates exactly how residents must sort through their trash.[139] Legislation in some other states, such as Montana, consists merely of suggestions on how citizens should recycle.[140] Such variations in laws

[131] For a discussion about California's plan to avoid financial burdens on lower income citizens and concerns about reusable bag cleanliness, *see* Qiying Zhu, *The California Plastic Bag Ban: Where Do We Go from Here?,* 5 ARIZ. J. ENVTL. L. & POL'Y 1053 (2015) at 1056.

[132] Recognizing that sorting through contaminated garbage is expensive, these cities are using fines and other financial penalties to pass along those extra costs to the citizens creating them. *See* Jeremy Berke, *The American recycling system is on the verge of breaking down, and it could mean higher costs for homeowners*, BUS. INSIDER (May 14, 2018), https://www.businessinsider.com/recycling-system-is-breaking-down-2018-5.

[133] *See* Humes, *supra* note 6.

[134] *See* Mandatory Plastic Recycling, The Association of Plastic Recyclers, https://plasticsrecycling.org/resources/state-recycling/mandatory-plastic-recycling-legislation.

[135] *Id.*

[136] *See* Viscusi, *supra* note 64 at 10379.

[137] *See* Grabar, *supra* note 94.

[138] *See Mandatory Plastic Recycling*, THE ASS'N OF PLASTIC RECYCLERS, https://plasticsrecycling.org/resources/state-recycling/mandatory-plastic-recycling-legislation.

[139] *See* Viscusi, *supra* note 64 at 10379.

[140] *See* Viscusi, *supra* note 64 at 10379 ("Montana's goal law states, 'It is the goal of the state to reduce, through source reduction, reuse, recycling, and composting, the amount of solid waste that is generated by households, businesses, and governments and that is either disposed of in landfills or burned in an incinerator.'").

across states and localities may cause problems for visitors and new residents, especially if there are monetary penalties.

Internationally, South Korea has found considerable success with its mandatory recycling program.[141] South Korea successfully incorporated recycling into its citizens' daily lives through its Wastes Control Act enacted in 1986, which emphasizes a "shared responsibility" approach to waste management.[142] South Korea has a polluter-pay system under which citizens pay for the waste they create.[143] South Korea also adopted a national bin system with easy color-coded bins for different types of recyclables.[144]

Unfortunately, instituting a similar polluter-pay system would likely not be a feasible option for the United States.[145] The stringency of South Korea's system is inherently inconsistent with the predominant norms in American culture,[146] where laws that intrude into one's behaviors within their home often provoke opposition.[147] South Korea also has vastly different logistical and transportation concerns than the US, where the costs of processing recyclables can vary substantially across different regions of the country.[148]

B. RESTRICTIONS ON SINGLE-USE MATERIALS

At the municipality level, cities are also trying to impose restrictions on certain types of single-use materials as an additional means of reducing solid waste. Palm Springs is considering limiting local vendors to two specific types of plastic, which forces them to rethink how they package their products.[149] The city is focusing on recyclable plastics used for water bottles, soft drinks, condiment containers, milk jugs,

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[141] Juon, *supra* note 127 at 16.

[142] Through the Wastes Control Act, recycling in South Korea has increased from 10% to 80%. *Id.*

[143] In 2013, citizens were also required to pay for their food waste which has led to a 10% reduction of food waste in Seoul. *Id.*

[144] Spross, *supra* note 39.

[145] The average American citizen creates almost five pounds of waste each day. Citizens below the poverty line are already struggling to afford surcharges imposed by municipalities to process waste in light of China's restrictions and could likely not afford any additional surcharges. Semuels, *supra* note 21.

[146] Juon, *supra* note 127 at 16.

[147] Katrina Fischer Kuh, *When Government Intrudes: Regulating Individual Behaviors That Harm the Environment*, 61 DUKE L.J. 1111, 1169 (2012).

[148] *See* Albeck-Ripka, *supra* note 3.

[149] *See* Beam, *supra* note 19.

shampoo bottles, and cleaning supplies.[150] Other cities have banned plastic bags or at least tax them.

Some states have responded to the growing waste crisis by enacting legislation that progressively phases out or completely bans the use of certain types of difficult-to-recycle materials. California passed the California Circular Economy and Plastic Pollution Reduction Act[151] which aims to decrease single-use packaging by 75% while increasing the use of compostable materials for single-use products.[152]

Single-use plastics are also increasingly facing bans overseas.[153] Nearly 60 countries have enacted some form of plastic bag legislation.[154] Developing countries often ban plastic bags, as they do not have sufficient waste collection or disposal systems.[155] In 2016, France became the first nation to enact a large-scale plastics ban by banning single-use plastic cups, plates, and cutlery, taking effect in 2020.[156] China saved 1.6 million tons of oil in the first year after it enacted its plastic bag ban.[157] India has also enacted a plastic bag ban that will take effect by 2022, though its implementation and enforcement has not been consistent.[158]

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[150] Polyethylene terephthalate is a recyclable plastic often used for soda bottles. Milk containers are made of high-density polyethylene. Both types of polyethylene are useful because they can be recycled into non-single use plastic objects such as traffic cones, shower stalls, automotive parts, and much more. *See* Heather P. Behnke, Kathleen M. Bennett, & Amy L. Du Vall, *Recycling: Anything but Garbage*, 5 BUFF. ENVT'L. L.J. 101, 110 (1997).

[151] *See* Beam, *supra* note 19.

[152] The California Supreme Court upheld the right of California cities to implement bag bans without environmental impact research. *See* Scott Rodd, *Banning the Bans: State and Local Officials Clash Over Plastic Bags*, PEW (Jan. 29, 2018), https://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2018/01/29/banning-the-bans-state-and-local-officials-clash-over-plastic-bags.

[153] Countries that have banned plastic bags, taken regulatory action, or passed plastic bag legislation according to the author include China, Canada, Chile, Mexico, Australia, India, some European countries and some East African countries. *See* Hannah M. Diaz, *Plastic: Breaking Down the Unbreakable*, 19 FLA. COASTAL L. REV. 85, 96 (2018).

[154] For a complete list of countries that have enacted legislation concerning banning plastic bags and the year of that country's legislation enactment, *see Which Countries Have Banned Plastic Bags?*, WORLDATLAS, https://www.worldatlas.com/articles/which-countries-have-banned-plastic-bags.html (last visited Feb. 8, 2020).

[155] Bangladesh was the first country to ban plastic bags in 2002. *See* Morath, *supra* note 66, at 47.

[156] France's ban was part of its Energy Transition for Green Growth Act, which also banned plastic bags in an effort to promote a circular economy. *See generally* James McAuley, *France Becomes the First Country to Ban Plastic Plates and Cutlery*, WASH. POST (Sept. 19, 2016).

[157] China enacted the ban to combat "white pollution," which describes Styrofoam packaging and plastic bags. China banned the production of bags less than 0.025mm thick and disallowed grocery stores from giving free bags to consumers. *See* Jonathan Watts, *China plastic bag ban 'has saved 1.6 tonnes of oil'*, THE GUARDIAN (May 22, 2009) https://www.theguardian.com/environment/2009/may/22/china-plastic-bags-ban-success (last visited Feb. 8, 2020).

[158] While Indian officials have fined some businesses who continue to use plastic bags, there is generally no follow through or recheck with an offending business. Additionally, political parties use a variety of plastics in their advertisements and administrative officials have not been successful in enforcing restrictions on political parties. Nearly every state in India has seen problems with

Because of their propensity to constrain consumer choice, proposed bans or restrictions on single-use plastics can be contentious in some jurisdictions.[159] In fact, legislatures in at least 17 states have enacted a "ban on bans," preempting their cities from banning plastic bags.[160] Some argue that innovative environmental protections are the product of local cities, and bans would harm innovation.[161] Groups such as the American Progressive Bag Alliance, a division of the Plastics Industry Association, have supported legislation[162] that attempts to prohibit cities from passing legislation to ban bags, even in populous states like California.[163]

A federal bill aimed at banning certain single-use plastics would likely be met with opposition similar to that faced by various state bans in the past. Like bottle bills and bag taxes, a federal single-use plastic ban carries federalism challenges despite its potential to greatly decrease plastic waste.[164] While the Supremacy Clause of the Constitution would allow a federal bill banning single-use plastics to take priority over states' preemption laws that ban bans, such federal legislation is unlikely to pass in the current political gridlock.

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enforcement of their plastic ban. *See* Athar Parvaiz, *Why India Passed One of the World's Toughest Anti-Plastic Laws: Does It Stand a Chance?*, HUFFPOST (July 3, 2018) https://www.huffpost.com/entry/single-use-plastic-ban-india_n_5b3a09b6e4b0f3c221a28a07 (last visited Feb. 9, 2020).

[159] For example, the city of Bisbee, Arizona enacted a plastic bag ban in 2012 that was later repealed when the State of Arizona threatened to otherwise withhold nearly $2 million in state aid. *See* Rodd, *supra* note 152.

[160] For a detailed list of which states have a state-wide ban, state-wide preemption laws, and pending preemption legislation, *see* Sarah Gibbens, *see The Complicated Landscape of Plastic Bans in the U.S.*, NAT'L GEOGRAPHIC (Aug. 15, 2019) https://www.nationalgeographic.com/environment/2019/08/map-shows-the-complicated-landscape-of-plastic-bans/#close (last visited Feb. 10, 2020).

[161] *See generally* Sarah Fox, *Home Rule in an Era of Local Environmental Innovation*, 44 ECOLOGY L.Q. 575 (2017).

[162] The Plastic Industry Association has not disclosed specific amounts or sources of its funding. However, it spent $320,000 from January to September in 2019 on federal lobbying. *See* Samantha Maldonado, Bruce Ritchie & Debra Kahn, *Plastic Bags Have Lobbyists. And They're Still Winning*, POLITICO (Jan. 13, 2020) https://www.politico.com/states/new-york/albany/story/2020/01/13/plastic-bags-have-lobbyists-and-theyre-still-winning-1248888 (last visited Feb. 11, 2020).

[163] In California, the American Progressive Bag Alliance invested over $3 million to try to defeat California's plastic bag ban, bags which generate $100-$150 million-a-year in business. *See* Jeff Guo, *A Plastic Bag Lobby Exists, and it's Surprisingly Tough,* WASH. POST (Mar. 3, 2015) https://www.washingtonpost.com/blogs/govbeat/wp/2015/03/03/a-plastic-bag-lobby-exists-and-its-surprisingly-tough/ (last visited Feb. 8, 2020).

[164] The California Coastal Commission picked up around 65,000 bags on its annual cleanup day along beaches and rivers in 2010 before California enacted a statewide ban in 2014. In 2016, the same annual cleanup day picked up only about 24,000 bags. *See* Rodd, *supra* note 152.

C. Expanding and Improving Domestic Processing Systems

Because relying on China to take America's recyclable trash is no longer a viable option, municipalities and states are increasingly reevaluating their own recyclables processing capabilities. Some localities, realizing they are unable to domestically process all of the materials they previously collected, are opting to limit which items they continue to collect. Other localities are addressing these challenges by placing larger burdens on consumers through utilization of multi-stream recycling. Meanwhile, both the private and public sector are investing heavily in new technologies and new services to expand the country's recycling capabilities.

1. Limiting the Types of Recyclables Collected

Some cities have responded to the recent recycling crisis by instructing citizens to not recycle every type of recyclable material. Strictly reducing which items a city wants to recycle allows for easier recycling and less contamination. It also focuses a city's investment in fewer material markets which helps keep those specific materials out of landfills and incinerators. The city of Marysville, Michigan cut eight of eleven recyclable material categories from its collection efforts.[165] In doing so, the city is focusing its resources on recycling plastic, which is arguably one of the most important materials to keep out of landfills. Palm Springs, California is contemplating collecting only bottles and cans in order to easily transition from single-stream recycling to a multi-stream bin.[166] This would decrease contamination and allow for the collected items to actually be recycled rather than ruined by organic waste and other non-recyclables.

Reducing the number of items collected can help keep recycling programs afloat. Fewer recycling varieties means less overall waste that has to be sorted through. It may allow cities to capitalize on specific recyclable materials. It will also ultimately channel all other materials directly into landfills or incinerators. In a country like America, buying and consuming is a sign of wealth and prosperity. If Americans are not able to

[165] Marysville, Michigan is no longer accepting newspaper, glass jars, paperboard, and more. Residents can only recycle plastics #1-#8, tin, aluminum, and bundled corrugated cardboard. *See* Jim Bloch, *Marysville's New Refuse Collection Contract Reflects Global Recycling Crisis,* THE VOICE (Mar. 20, 2019). https://www.voicenews.com/news/marysville-s-new-refuse-collection-contract-reflects-global-recycling-crisis/article_1aead1c8-4b48-11e9-8544-fb5d53b8c64f.html (last visited Feb. 8, 2020).

[166] Palm Springs found that most of the waste generated downtown was not recyclable, besides cans and bottles. *See* Beam, *supra* note 19.

consume less, recycling less types of materials will not fully target the ever-growing waste problem this country is facing.[167] It could also force cities to decide on which materials are worth recycling. If there is a lack of diversity in the materials different cities are focusing on processing, then the secondary materials market will be flooded by certain types of recycled materials and deficient in others.

2. Adopting Multi-Stream Recycling

Another potential means of improving the nation's recycling system could be to invest in multi-stream recycling capabilities.[168] This approach has taken hold in Berkeley, California, which has developed a two-compartment curbside bin that separates paper from other recyclables.[169] This method of separating out paper helps keep paper free of moisture or food contamination that could otherwise make it un-recyclable. The ability to keep recyclables as separate as possible could decrease the amount of labor needed to sort through the materials before the repurposing process.

Although multi-stream recycling could help address many of America's waste problems, it also creates its own logistical and financial challenges. Not every community in the country is well suited to transition to multi-stream recycling in the short run. Large cities and small rural farming communities tend to have somewhat different types of trash and disparate amounts of available financial resources, which can impact how successful multi-stream recycling might be across various localities. Multi-stream recycling not only requires new recycling bins; it may also change how collected recycling is transported. To separately collect a range of different materials, cities may need more trucks and workers. Transportation and labor constraints are already an obstacle in rural and low-income communities, and multi-stream recycling would only exacerbate those challenges.

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[167] *See generally* Bradley A. Harsch, *Consumerism and Environmental Policy: Moving Past Consumer Culture*, 26 ECOLOGY L.Q. 543 (1999).

[168] "Multi-stream recycling refers to the process of separating recyclables by material type prior to collection. These recycled materials are then kept separate throughout the whole of the recycling process. This type of recycling may also be known as source-separated recycling, dual stream recycling, or sorted stream recycling." *See Which is best for me - Single-Stream Recycling vs. Multi-Stream Recycling?,* GLASDON, https://us.glasdon.com/faq/benefits-of-single-stream-vs-multi-stream-recycling (last visited Feb. 27, 2020).

[169] Berkeley's recyclables are some of the cleanest and most coveted in the business, according to Martin Bourque, the executive director of Ecology Center which manages the private, domestic curbside recycling program in Berkeley. *See* Humes, *supra* note 6.

3. Promoting Investment in Recycling Technologies and Infrastructure

Yet another potential means of addressing the recycling crisis is through policies that promote greater private investment in recycling-related technological innovation. Numerous companies throughout today's US are investing in and opening new recyclables processing facilities. They are also developing new technologies to sort materials and to help offset the high levels of contamination that result from single-stream collection methods. A few companies are even offering consumers new, more sustainable choices for recycling-related services and products.

Some private companies are responding to the recent changes in US recycling markets by opening new domestic processing plants.[170] Interestingly, a fraction of these new plants are backed by overseas investors.[171] Nine Dragons, a Chinese manufacturer, has already purchased at least two recycling plants in the US and plans to invest more than $300 million into the facilities.[172] However, some communities do not want the congestion and pollution associated with new facilities.[173]

Private companies are also developing new recycling processing technologies, including innovative new machines for sorting waste.[174] In some cases, these robotic sorting machines can work twice as fast as their human counterparts.[175] Recology, one of the most advanced recycling plants on the West Coast, sorts through more than 750 tons of waste a day with the aid of new technology.[176] This new technology not

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[170] Carbonlite Industries, a main recycler in the United States, processes over 4 billion plastic bottles a year, has two operational plants with two more on the way, enabling the company to process more than 10 billion bottles each year. *See* Humes, *supra* note 6.

[171] Investment and construction of new recycling facilities are needed to expand domestic capabilities, but they are only part of a larger solution. *See* Spross, *supra* note 39.

[172] Nine Dragons is China's leading producer of cardboard and paper. *See* Hook and Reed, *supra* note 32.

[173] Residents opposed a new recycling plant because of the potential air pollution and because the plant only transferred existing jobs; it did not create any new jobs. *See* Derrick Blakley, *New Recycling Plant Not Welcomed By Some Residents*, CBS Chi. (July 9, 2018). https://chicago.cbslocal.com/2018/07/30/907427-recycling-plant-protested-residents/.

[174] New sorting technology helps reduce processing costs by increasing sorting efficiency. Some machines that use optical recognition technology can sort out cardboard boxes, regardless of whether they have retained their original shape. Other machines use optical recognition technology, or various magnets, air blasts to help sort items of various weights. There are even some machines that can open bags of waste. *See* Spross, *supra* note 39.

[175] *See* Lori Ioannou and Magdalena Petrova, *America Is Drowning In Garbage. Now Robots Are Being Put on Duty to Help Solve the Recycling Crisis*, CNBC (July 27, 2019), https://www.cnbc.com/2019/07/26/meet-the-robots-being-used-to-help-solve-americas-recycling-crisis.html.

[176] *See* Hook and Reed, *supra* note 32.

only reduces costs; it also reduces risks of injury or death to the human workforce.[177]

Additionally, a few US companies are offering innovative new recycling-related retail services. One such service is "Loop," where items are delivered to consumers in reusable containers.[178] Another service, Recycled City, based in Phoenix, Arizona, provides a weekly pickup service for composting.[179] Of course, services like Loop and Recycled City may not be accessible to all.[180] And like any new strategy, these services and business models are also generally unproven and are likely to encounter logistical difficulties as they expand.

4. Banning the Exportation of Recyclables

Refusing to export waste and forcing cities and towns to deal with their own garbage is one other strategy that some countries are using to incentivize investments in their own recycling systems. Australia has moved to ban exportation of recyclables and has heavily focused on recycling innovations.[181] Prime Minister Scott Morrison has emphasized that Australia's waste is Australia's responsibility.[182] The country recognizes the need to reduce the overall quantity of materials that need be recycled, but has also extensively focused on developing new innovations to deal with waste.[183]

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[177] *See* Ioannou and Petrova, *supra* note 175.

[178] Once the consumer has finished an item, they return the container and it is refilled instead of going into a landfill. *See* Spross, *supra* note 39.

[179] *See generally* RECYCLED CITY: FARMLAND FOR THE FUTURE (Jan. 13, 2020), https://www.recycledcity.com.

[180] These services are likely not accessible to lower income communities due to their higher enrollment costs and continued monthly subscription costs. These new services are generally only available in limited geographic markets and may offer only limited and pricier items.

[181] Australia is moving to eventually ban the exportation of any recyclable material to increase domestic processing of materials and keep waste from ending up in the ocean. *See* Livia Albeck-Ripka, *Recycling is in Crisis. Could These Innovations be the Answer?,* N.Y. TIMES (Aug. 12, 2019), https://www.nytimes.com/2019/08/12/world/australia/recycling-plastic-trash.html.

[182] *See* Australian Associate Press, *Australia will ban export of recyclable waste 'as soon as practicable', PM vows*, THE GUARDIAN (Aug. 9, 2019), https://www.theguardian.com/environment/2019/aug/09/australia-to-ban-export-of-recyclable-waste-as-soon-as-practicable-pm-vows.

[183] Australia is home to the first road paved with Reconophalt, a mixture of asphalt and recycled materials. They have sought to decentralize recycling and reduce the initial costs associated with creating large reclamation and processing centers by building smaller portable recycling centers. Additionally, Australian companies like Closed Loop recycle around 7 million coffee cups a year and turn them into sturdy materials that can be used to create other products like benches, hangers, or planter boxes. Australia utilizes detritus processing facilities where the trash collected by street sweepers is separated into organic and nonorganic materials then used for various projects or sold to other facilities. Each detritus processing facility prevents up to 21,000 tons of waste from ending up in landfills each year. The Australian Council of Recycling has acknowledged the importance of a "National Waste Policy." *See* Albeck-Ripka, *supra* note 181.

Unfortunately, totally banning the exportation of recyclable solid waste is not a viable option for today's US. Although the US should continue to push for the development of more domestic processing capabilities and should consider the ethical repercussions of exporting waste, an outright recyclables exportation ban in the short run would likely have severe adverse effects on the nation's economy. Australia, as an island nation, faces different logistical transportation challenges than those of the US. For example, if a facility in Vancouver, Canada developed a method to recycle and process a material that no facility in the Pacific Northwest could, it might be more economically feasible to send waste across the border to that facility. Because the US shares lengthy land borders with two nations, an outright ban on waste exportation would likely not be successful.

D. LEVERAGING THE RESOURCES OF PRIVATE INDUSTRY TO IMPROVE RECYCLING

Although America's private sector has played an important role in improving the recycling industry, more private investment is necessary if the US is to succeed in building an adequate domestic recycling system. It is important to implement policies that force producers to accept responsibility[184] while continuing to encourage voluntary environmental governance[185] to improve domestic recycling.

1. Expanding Producer Responsibility

Requiring manufacturers to bear more responsibility for the disposability of their products is a potentially powerful means of encouraging sustainable manufacturing practices and thereby reducing waste. The European Union instituted an Extended Producer Responsibility program in 1994 based on this type of strategy.[186] The program essentially seeks to reduce the amount of product packaging waste and to increase the amount of product packaging that is recycled.[187] The 25-year-old pro-

[184] For a detailed discussion concerning extended producer responsibility, *see generally* Nicole C. Kibert, *Extended Producer Responsibility: A Tool for Achieving Sustainable Development*, 19 J. LAND USE & ENVTL. L. 503 (2004).

[185] For a detailed discussion concerning private environmental governance, *see generally* Nicole Michael P. Vandenbergh, *Private Environmental Governance*, 99 CORNELL L. REV. 129 (2013).

[186] *See* Humes, *supra* note 6.

[187] Objectives of an extended producer responsibility program include creating a sustainable production and consumption policy, incentivizing ecodesign, reducing landfilling and developing recycling and recovery channels, and fully internalizing environmental costs. *See Extended Producer Responsibility: Getting it Right*, WASTE MGMT. WORLD, https://waste-management-world.com/a/extended-producer-responsibility-getting-it-right 2015-04-17.

gram, which collects roughly $3.5 billion in fees each year from manufacturers,[188] has been successful at helping 65% of packaging to be recycled within the European Union.[189]

Imposing additional responsibilities on manufacturers in the US has historically been a difficult task. Keep America Beautiful, a non-profit formed by beverage companies in the 1950s, was specifically designed to place recycling responsibility on the public rather than on manufacturers.[190] Over the years, the non-profit has actively opposed bottle bills and other legislation that would increase manufacturer waste management responsibility.[191] Accordingly, Keep America Beautiful has been described as "the first corporate greenwashing front"—a stakeholder group aimed at shifting waste-related concerns away from responsible manufacturer practices and onto the general public.[192] While any successful recycling strategy requires cooperation and commitment from both manufacturers and consumers, nonprofits like Keep America Beautiful make it difficult to adopt any future federal US legislation that imposes an extended producer responsibility. However, some states have shown that it is possible to overcome these inherent difficulties. Washington state is pushing Plastic Packaging Stewardship legislation that regulates American waste and its effect on polluting other countries. The goal is to force American manufacturers to become responsible for the materials they put out into the world.[193]

2. Encouraging Voluntary Corporate Action

Governments can also potentially leverage the power of private industry to improve recycling and reduce waste by finding ways to reward and encourage voluntary corporate commitments related to waste reduction. Several notable companies are already making efforts to address environmental issues on their own—a trend known as private environmental governance—in ways that help to reduce solid waste and en-

[188] The EU's Extended Producer Responsibility program encourages manufacturers to utilize sustainable packaging and charges manufacturers annual fees. *See* Humes, *supra* note 6.

[189] *Id*.

[190] Keep America Beautiful teamed up with the Ad Council and produced campaigns such as the "Crying Indian" in the 1970s and recently the "I Want to Be Recycled" campaign. *See* Wilkins, *supra* note 118.

[191] *See generally* Christina M. Everling, *Chasing Results from the Chasing Arrows: Strategies for the United States to Stop Wasting Time and Resources When it Comes to Recycling*, 52 J. MARSHALL L. REV. 147 (2018).

[192] *See* Wilkins, *supra* note 118.

[193] *See* Jan Dell, *157,000 Shipping Containers of U.S. Plastic Waste Exported to Countries with Poor Waste Management in 2018*, PLASTIC POLLUTION COALITION (Mar. 6, 2019). https://www.plasticpollutioncoalition.org/blog/2019/3/6/157000-shipping-containers-of-us-plastic-waste-exported-to-countries-with-poor-waste-management-in-2018.

courage recycling.[194] For instance, Starbucks has pledged to stop using disposable straws.[195] Disney has also announced its plans to stop using plastic straws and stirrers on its properties.[196]

Of course, a major disadvantage of private environmental governance is that it is voluntary and generally unenforceable.[197] For example, if a company publicly pledges to reduce plastic consumption by 50% over the next five years, the company is not necessarily bound by its publicized commitment. The consequences of failing to meet its goal are minimal and mostly involve poor publicity.[198] Finding ways for companies to make binding voluntary commitments like these could unleash greater benefits from these approaches.

IV. STRATEGIES FOR IMPROVING THE US RECYCLING SYSTEM

Although governments across the US have already adopted a wide range of recycling-related policies, more cost-effective, coordinated, and aggressive approaches will be needed for the country to finally develop a sustainable and adequate domestic recycling system. Such policies must not only significantly reduce the amount of solid waste—especially plastics—Americans generate each day; they must also substantially increase the nation's capacity to affordably process recyclables.

As the following materials describe, one means of furthering these goals would be to impose a new federal tax on single-use plastics. The revenue generated from the tax could fund tax credits and grant programs to encourage businesses and localities to develop recycling technologies and build domestic recycling infrastructure.[199] A new plastic tax would discourage manufacturers from recklessly producing single-use plastic items, and such tax credit and grant programs would increase the demand for recycled materials and spur the development of more domestic recycling infrastructure. These changes, together with the nationwide adoption of a new, uniform, color-coded label and bin system to support greater use of multi-stream collection methods, could do much to improve recycling throughout the US.

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[194] *See generally* Michael P. Vandenbergh, *The Emergence of Private Environmental Governance,* 44 ENVTL. L. REP. NEWS & ANALYSIS 10125 (2014).

[195] *See* Christiana Caron, *Starbucks to Stop Using Disposable Plastic Straws by 2020*, NY TIMES (July 9, 2018), https://www.nytimes.com/2018/07/09/business/starbucks-plastic-straws.html.

[196] *See* Lindsey Ellefson, *Disney is the latest company doing away with plastic straws,* CNN (Aug. 1, 2018), https://www.cnn.com/2018/07/26/us/disney-plastic-straws-trnd/index.html.

[197] *See* Morath, *supra* note 66 at 48.

[198] *Id.*

[199] For a historical look at environmental taxes, *see generally* Mona L. Hymel, *Environmental Tax Policy in the United States: A "Bit" of History*, 3 ARIZ. J. ENVTL. L. & POL'Y 157 (2013).

A. CONFRONTING THE RECYCLING INDUSTRY'S EXTERNALITY PROBLEMS

Many of the challenges facing the US recycling system are attributable to various positive and negative externality problems.[200] Positive externality problems often hinder recycling-related activities because many of the benefits associated with those activities accrue to others.[201] Negative externality problems likewise discourage optimal levels of recycling because many of the environmental, health, and other costs associated with landfilling and trash incineration are not borne by those engaged in these activities.[202] Without government intervention to correct these market failures, sub-optimally low levels of recycling tend to result.[203]

1. Positive Externalities and Recycling

There are many positive externality problems associated with the US recycling system that are likely to result in sub-optimal levels of recycling activity without government intervention.[204] Even non-recyclers benefit when someone recycles materials that would have otherwise ended up in landfills and threatened to contaminate drinking water sources or cause other environmental harms. Recyclers also increase market supplies of recycled materials, leading to lower market prices that benefit many who are not involved in the recycling activity. And recycling activities spare manufacturers from having to use as many virgin materials, thereby preserving more natural resources. Recycling can even generate general economic growth: recycling in the US accounts for 757,000 jobs, $36.6 billion in wages, and $6.7 billion in tax revenue.[205] Unfortunately, recyclers do not capture many of these broader social benefits when they engage in recycling activities, leading to sub-optimally low levels of recycling.

The most straightforward means of addressing recycling-related positive externality problems are policies that enable recyclers to capture more of the broader social benefits of their recycling activities. Pigouvian subsidies, whether in the form of tax credits, grants, or other programs, have long been viewed as optimal solutions to positive exter-

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[200] *See* Troy A. Rule, SOLAR, WIND AND LAND: CONFLICTS IN RENEWABLE ENERGY DEVELOPMENT 3-8 (2014).

[201] *See* Donald J. Boudreaux &Roger Meiners, *Externality: Origins and Classifications*, 59 NAT. RESOURCES J. 1, 1 (2019).

[202] *Id.*

[203] *See* Rule, *supra* note 205 at 3.

[204] *Id*.

[205] *See* Waste360, *supra* note 6.

nality problems because of their capacity to help actors directly internalize the external benefits of their actions.[206] As described in the materials below, if structured properly, such subsidies could potentially promote more optimal levels of private recycling activity.

2. Negative Externalities and Recycling

Recycling may also be framed as suffering from negative externality problems because those who dispose of recyclable waste in landfills or incinerators often do not bear all of the costs of those actions, leading to excessive reliance on those activities.[207] Many municipalities charge a flat rate to all residents for solid waste disposal services regardless of whether the residents use recycling bins or dispose of even recyclable wastes in trash bins instead.[208] However, the environmental and health costs of landfilling or burning those wastes are often significantly higher. And disposing of recyclable waste, rather than recycling it, also requires that more trees be harvested, more minerals be mined, and potentially more energy be expended to generate additional virgin materials. Often, those who burn or landfill recyclable waste do not bear many of these broader societal costs of their actions, leading to excessive landfilling and incineration.

Pigouvian taxes have long been viewed as the classic means of correcting negative externality problems because of their capacity to require actors to internalize the costs of their actions and thereby lead to more optimal levels of the taxed activity.[209] Pigouvian taxes are often viewed as preferable to command-and-control regulation because they spare policymakers from having to estimate both the net social costs and the net social benefits of the taxed action.[210] When calibrated properly, they can deter actors from excessively engaging in activities that harm others and have an ancillary benefit of generating government revenue.[211]

In light of the externality problems affecting US recycling markets and the lack of adequate government intervention to address them, it is hardly surprising that the US has long underinvested in its recycling in-

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[206] *See* Lily L. Batchelder et. al., *Efficiency and Tax Incentives: The Case for Refundable Tax Credits*, 59 STAN. L. REV. 23, 44 (2006).

[207] *See* Rule, *supra* note 205 at 6.

[208] *See Solid Waste Rates*, CITY OF PHOENIX, https://www.phoenix.gov/publicworks/garbage/terms (last visited Mar. 19, 2020).

[209] When an actor engages in an action that benefits themselves but harms others without being held liable for those harms, actors may engage in excessive amounts of that activity. *See* Jonathan S. Masur, Eric A. Posner, *Toward A Pigouvian State*, 164 U. PA. L. REV. 93, 100 (2015).

[210] Under command-and-control regulation, policymakers consider both costs and benefits. However, Pigouvian taxes only requirepolicy makers to consider costs. *Id*. at 95.

[211] *Id*. at 100.

frastructure. Fortunately, there are policy strategies, including tax and subsidy programs like those described below, capable of reversing these challenges and putting the US on a course toward a more optimal level of recycling activity.

B. INCENTIVIZING HIGHER LEVELS OF RECYCLING PARTICIPATION

New federal taxes on single-use plastics, federal tax credits for certain recycling-related investments, and grant programs for recycling-related research could help to address many of the externality problems currently plaguing recycling markets. As described in the following paragraphs, if structured appropriately, such policies could greatly accelerate the nation's development of an effective and sustainable domestic recycling system.

1. A Federal Plastic Tax

To help address the negative externality problems associated with those types of plastics that are difficult or costly to recycle, Congress could consider taxing manufacturers who produce items with such plastics on a dollars-per-ton basis.[212] The amount of this tax could vary depending on the type of plastic, creating additional incentives for manufacturers to avoid the most unrecyclable plastics types. For instance, items made with relatively easy-to-recycle plastics such as Plastic #1 (typically found in water bottles), Plastic #2 (typically found in milk jugs), or Plastic #5 (found in various food containers such as ketchup bottles) could be taxed at $2.00 per ton.[213] In contrast, items made with Plastics #3, #4, #6, and #7, which are generally not as easily recyclable and impose comparatively greater costs on society, could be taxed at $4.00 per ton.[214] Ideally, such differential plastic taxes would apply only to nondurable goods, which primarily consist of single-use items, and would apply to imports as well as domestically-produced products.

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[212] A Pigouvian tax imposes a tax on a party equal to the harm they create and impose on others. *See generally* Masur and Posner, *supra* note 214.

[213] These numbers are provided solely for illustration purposes and may well be far too low to have their intended effects. For instance, in 2017 Coca-Cola used 3 million tons of plastic. *See Coca-Cola reveals how much plastic it uses*, BBC NEWS, (Mar. 14, 2019), https://www.bbc.com/news/newsbeat-47569233. Even if all the plastic Coca-Cola used was plastic #1, #2, or #5, the company would owe just $6 million in plastic taxes based on a $2-per-ton rate.

[214] *See What numbers of plastic are safe for water bottles? The Numbers Behind Water Bottles*, THE BERKEY https://theberkey.com/blogs/water-filter/what-numbers-of-plastic-for-water-bottles-are-safe-for-you-the-numbers-behind-plastic-bottles.

2. Federal Tax Credits

The federal government could help to mitigate the positive externality problems associated with recycling and encourage greater private investment in certain recycling-related activities by introducing new tax credit programs.[215] Federal income tax credits allow taxpayers to qualify for reductions in their tax liability by claiming credits for particular types of expenditures.[216] Congress could enact legislation offering such credits for qualifying investments in new recyclables processing facilities and infrastructure development, uses of recycled materials in domestically manufactured products, and other recycling-related expenditures. Similar to other investment tax credit programs, the credits claimable under such legislation could be made proportionate to the size of the taxpayer's qualifying investment.[217]

Congress has successfully used tax credit programs in the past to promote greater private investment in important sustainability technologies. For instance, Internal Revenue Code Section 48C allows for businesses to claim a 30% tax credit for qualified investments in solar technology.[218] A tax credit is also available for purchases of qualifying energy-efficiency building upgrades or products such as air conditioning units or LED lighting.[219] These tax credit programs address positive externality problems by effectively subsidizing targeted activities. This enables actors to internalize more of the social benefits of their actions. Tax credits have proven highly effective in the context of renewable energy and could have positive effects for the domestic recycling industry as well.[220]

3. Federal Research and Development Grants

Creating new recycling-focused federal grant programs could also potentially accelerate domestic recycling-related research and develop-

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[215] *See* Batchelder et. al., *supra* note 211 at 44.

[216] Tax credits may be either refundable or nonrefundable. Refundable tax credits allow taxpayers to receive a refund even if they owe less. Conversely, nonrefundable tax credits only allow a taxpayer to receive a refund for no more than the amount they owe. *See Credits and Deductions for Individuals*, IRS, https://www.irs.gov/credits-deductions-for-individuals (last visited Mar. 19, 2020).

[217] *See* 26 U.S.C. § 48C (2020).

[218] *Id*.

[219] *Id*.

[220] The solar industry has seen an average annual growth rate of 48% in the last decade. The Solar Investment Tax Credit has helped increase the national solar capacity to nearly 78 gigawatts, enough energy to power 14.5 million homes. See *Solar* Industry Data: *Solar* Industry Breaks 20 GW Barrier — Grows 34% Over 2013, SOLAR ENERGY INDUS. ASS'N, http://www.seia.org/research-resources/solar-industry-data (last visited Mar. 19, 2020).

ment in the US. One advantage of grant programs is that they provide immediate funding for targeted activities rather than requiring taxpayers to wait to claim tax credits.[221] Even non-taxpaying entities such as municipalities and state governments could potentially be eligible for such grants. In addition to funding research, these grants could support a wide range of important activities and investments, such as educational campaigns, new municipally-owned recycling plants and sorting equipment, or new city-owned bins in public places to help facilitate multi-stream recycling.

The US federal government has enacted grant programs on many occasions to encourage states, local governments, and private entities to invest in various types of environmentally-focused activities.[222] For example, the US Department of Energy has previously awarded $25 million to support the development of geothermal wells[223] and millions more in federal grants have been awarded in the past to promote wetlands conservation.[224] Like tax credits, federal grants for qualifying recycling investments are subsidies that help recipients internalize more of the social benefits of their actions, which promotes higher levels of private investment in US recycling.[225]

C. IMPROVING THE LABELING AND COLLECTION OF RECYCLABLES

The federal government could further accelerate the development of an effective domestic recycling system through improvements to the labeling and collection process for recyclable materials. The US currently recycles just 34%of its municipal solid waste, even though the EPA estimates that 75% of that waste could be recycled.[226] A uniform, nationwide, color-coded labeling and bin system that clearly indicates to consumers how to recycle various items could help to improve those numbers. The nation's recycling rate would also improve if municipalities narrowly limited the universe of materials collected and processed, and adopted multi-stream collection practices focused solely on the items they opted to collect.

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[221] *See* Nancy E. Shurtz, *Eco-Friendly Building from the Ground Up: Environmental Initiatives and the Case of Portland, Oregon*, 27 J. ENVTL. L. & LITIG. 237, 337 (2012).

[222] For a list of current federal grants, *see* Grants.gov, https://www.grants.gov/web/grants/search-grants.html (last visited Mar. 19, 2020).

[223] *See Geothermal Wells of Opportunity*, GRANTS, https://www.grants.gov/web/grants/view-opportunity.html?oppId=324194 (last visited Mar. 19, 2020).

[224] *See* National Coastal Wetlands Conservation Grant Program, U.S. FISH & WILDLIFE SERV., https://www.fws.gov/coastal/CoastalGrants/ (last visited Mar. 19, 2020).

[225] *See* Batchelder et. al., *supra* note 211 at 44.

[226] *See* Biba, *supra* note 36.

1. Creating a Clear and Uniform Recyclables Labeling System

Adopting a uniform, national, color-coded recyclables labeling and bin system would do much to increase the volume and quality of domestic recycling activities in the US.[227] Although instituting a nationwide color-coded label system would be costly, the long-term potential rewards of doing so seem likely to exceed those costs. Recycle Across America states that standardized labels are the "#1 solution for the environment today."[228] The recycling numbers currently found on most recyclables confuse consumers, contribute to America's contamination problem, and do not correlate to municipalities' processing capabilities.[229] New labels on waste items could clearly indicate to the consumer how they should be recycled, by matching the label color to a corresponding colored waste bin.[230] A similar system exists in South Korea.[231] Standardized color-coded labels could improve recycling 50-400%, help reduce bin contamination, and decrease sorting expenses.[232]

A new color-coded labeling and bin system would also reduce confusion and support the tailoring of recycling strategies to local and regional needs. The widespread contamination of recyclable materials today results in part because of confusion resulting from differences among cities with regard to which recyclables they will accept,[233] because municipalities vary widely in their approaches to that question.[234] If nationwide color-coded labeling and bins were in place, municipalities would be freer to tailor their use of colored bins to collect only those recyclable items they can most affordably and easily process.[235]

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[227] Over a quarter of Americans are unsure whether an item can be recycled. *See* Leblanc, *supra* note 17.

[228] *See The Solution and About Us*, RECYCLE ACROSS AM. (Jan. 13, 2020), https://www.recycleacrossamerica.org/the-solution-about-us.

[229] *See* Natalie Rademacher, *When in doubt, throw it out.' A struggling market spurs drive for better recycling*, TWIN CITIES (Dec. 8, 2019), https://www.twincities.com/2019/12/08/when-in-doubt-throw-it-out-amid-struggling-recycling-market-the-narrative-is-changing/.

[230] For example, every purple bin in the nation could be designated for glass items, every red bin in the nation could be designated for aluminum items, etc. Other main recyclables include cardboard, paper, plastic #1, and plastic #2.

[231] *See* Spross, *supra* note 39.

[232] *Id.*

[233] Color-coded labels could also reduce contamination, and therefore reduce associated sorting costs. The average truckload of recyclable materials headed to a recovery facility is 25% contaminated with non-recyclable goods. In order to clean out the contaminated quarter of materials, facilities rely on expensive human labor, equipment, and slowing conveyor belts, all of which further increase the cost of recycling. *See* Maddie Stone, *Recycling is Broken*, GIZMODO (Mar. 5, 2019) https://earther.gizmodo.com/recycling-is-broken-1833063010.

[234] *See* Biba, *supra* note 36.

[235] Transient cities, like Washington, D.C., have different lists of acceptable recyclables than neighboring counties and cities, creating confusion. *See* Juon, *supra* note 127 at 16.

In Congress, Representative Betty McCollum has been attempting to help address this issue by advocating for funding to expedite the standardization of recycling labels.[236] McCollum specifically pushed for such funding in a 2020 appropriations bill, arguing it would be a cost-effective means of improving recycling rates nationwide and decrease contamination. However, such standardization has faced some pushback from private industry because it would require countless manufacturers and companies to add new labels their packaging.

2. Simplifying the Universe of Recycled Materials

At the local level, many municipalities and waste management companies could increase the efficiency of their recycling systems by more narrowly limiting which recyclables they collect and process. Many municipalities and waste management companies are willing to recycle only those items for which the monetary costs of recycling are less than those of placing the item in a landfill.[237] As China's actions have made it difficult for many municipalities to find processing facilities for certain recyclables in recent years, some have responded by storing those items.[238] Others, such as the City of Deltona, Florida have terminated recycling programs all together.[239] An arguably more sensible approach is to impose stricter strategic limits on which recyclable items are accepted. For instance, to preserve the financial viability of its recycling program, Marysville, Michigan recently limited its collection to three out of 11 categories of recyclable items.[240]

Limiting the scope of acceptable recyclable materials not only reduces recycling costs; it can also improve recycling rates by reducing contamination. Some localities continue to accept items that they cannot process because they are concerned that consumers will not restart recycling those items in the future.[241] However, this is a costly mistake that allows consumers to dispose of additional nonrecyclable items, which increases sorting costs and can send entire loads of materials to landfills.

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[236] *See* Natalie Parletta, *Historic U.S. Bill To Clean Up Recycling at the Bin and Save Billions*, FORBES (May 23, 2019), https://www.forbes.com/sites/natalieparletta/2019/05/23/historic-u-s-bill-to-clean-up-recycling-at-the-bin-and-save-billions/#281eba7c55a9.

[237] *See* Sarah Gonzalez, *China's New Recycling Policy Could Give U.S. an Opportunity to Rethink Its Process,* NPR (Aug. 1, 2019), https://www.npr.org/2019/08/01/747368598/chinas-new-recycling-policy-could-give-u-s-an-opportunity-to-rethink-its-process.

[238] *See* Albeck-Ripka, *supra* note 3.

[239] *See* Javorsky, *supra* note 87.

[240] *Id*.

[241] *See* Albeck-Ripka, *supra* note 3.

Some materials are more financially viable[242] for cities to recycle than others.[243] Because of this, cities with limited recycling capabilities should focus on the most economically feasible recyclables as they develop the means to expand their recycling capabilities.

3. Implementing Multi-Stream Collection

The widespread adoption of multi-stream recycling practices that make use of a uniform labeling system like that just described could be one additional way to meaningfully increase recycling in the US. The contamination rates of collected recyclable materials are quite high in the US because Americans typically place all types of recyclables in a single bin.[244] Reducing contamination can greatly reduce processing costs by shifting much of the sorting and preparation of such materials onto consumers. If the US were to adopt a uniform national color-coded label and bin system as described above, consumers would be more informed regarding which types of recyclable items were accepted in any given context allowing for an easier transition to multi-stream collection.

Ideally, businesses and governments that manage public spaces would use multi-stream recycling with bins for every color and residents would use at least a dual-bin recycling approach.[245] As of 2014, roughly 80% of American communities used single-stream collecting methods for recyclable materials—a dramatic increase from 2005, when just 29% of US recyclables were collected with single-stream systems.[246] Single-stream recycling, through which all recyclables are placed into a single bin and picked up by one truck, is typically less expensive than multi-stream recycling but is considerably more inefficient.[247] Switching to multi-stream recycling could be a costly investment for some municipalities. Despite these costs, multi-stream recycling is a necessary step for reforming the recycling system.

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[242] Glass can be infinitely recycled with no loss in quality. For every six metric tons of recycled glass used by manufacturers in the place of virgin glass, roughly one metric ton of CO_2 emissions are cut. However, if a locality lacks the ability to process glass items, the transportation costs associated with glass can be heavy. While localities should prioritize recycling glass, they should not do so unless it is financially feasible. *See* Jacoby, *supra* note 88.

[243] Some items that require higher amounts of energy to recycle increase processing costs. *See Recycling Issues*, ZERO WASTE AM., http://www.zerowasteamerica.org/RecyclingIssues.htm.

[244] Berkeley's residential bins have a compartment for paper and a compartment for other recyclables. *See* Ioannou and Petrova, *supra* note 175.

[245] Despite many localities' recycling programs discontinuing due to costs, Berkeley's dual-stream recycling program has flourished. *See* Humes, *supra* note 6.

[246] *See* Javorsky, *supra* note 87.

[247] In communities with single-stream recycling, approximately 40% of glass is processed into new materials. *See* Humes, *supra* note 6.

V. CONCLUSION

After decades of exporting most of its recyclables to China, the US now has a reason and opportunity to develop its own cost-effective and modern domestic recycling system. Although there are significant obstacles to creating an effective domestic recycling industry in the US, through proactive and innovate policymaking, the emergence of such an industry is possible. If America were to create greater labeling uniformity across states and localities, provide better signaling and education to consumers, and promote far more private investment in recycling research and infrastructure development, the US could finally advance its recycling system into the 21st century.

The fact that domestic recycling of solid waste is often more expensive than landfill disposal or incineration is due partly to negative and positive externality problems affecting these activities. Governments could significantly mitigate those problems through appropriate tax and subsidy policies. Taxes on single-use and difficult-to-recycle plastics could help to reduce negative externality problems associated with these materials. Conversely, tax credits and grant programs for recycling research and recycling infrastructure development could address positive externality problems hindering the advancement of these activities.

Instituting multi-stream recycling and nationwide, uniform, color-coded labeling and bin systems could further improve recycling practices by better educating citizens and thereby reducing contamination problems. Hopefully, through coordinated and concerted policy efforts focused on these strategies, the US will finally establish a sustainable and cost-effective recycling system capable of benefiting generations of future Americans.