

Municipal Approaches to Reduce Single-Use Consumer Products in Maine

by Travis Wagner

Maine's solid waste management hierarchy prioritizes reduction and reuse over recycling. While most municipalities in Maine have focused on increasing recycling, they have undertaken minimal efforts to specifically foster source reduction and reuse. In this paper, Travis Wagner examines the approaches adopted in Maine by the state and by municipalities to reduce the consumption of single-use consumer products including bans, fees, consumer education, choice architecture, and retail take back.

INTRODUCTION

In 1989, Maine adopted a goal of 50 percent diversion (recycling) for municipal solid waste (MSW) to be achieved by 2009. To help achieve this goal, Maine also adopted its waste management hierarchy (38 MRSA §2101), which prioritizes source reduction followed by reuse, recycling, and composting, which all are preferred over disposal.¹ Nonetheless, the state has never been able to meet the 50 percent goal (Isenhour et al. 2016) and has yet to meet a 40 percent diversion rate. Maine's approach to MSW management is to rely on its municipalities to provide services (38 MRSA §1305). This responsibility often includes some or all of the costs of managing MSW generated within a jurisdiction, which can be a significant component of a municipality's budget (Criner 1991). To reduce costs and foster environmentally sound management, municipalities have adopted a number of initiatives including pay as you throw, curbside collection of trash and recycling, free recycling, education, organics collection, and yard waste collection. These initiatives focus on increasing diversion primarily through increased recycling and composting, but do not explicitly seek to increase reduction or reuse.

Maine has been a pioneer in adopting product stewardship and extended producer responsibility (EPR) laws, which are designed to shift some of the economic burden away from municipalities while promoting environmentally sound management at end of life (EOL). Whereas EPR identifies EOL management as the primary responsibility of producers, product steward-

ship promotes the sharing of responsibility among various stakeholders (designers, producers, sellers, users) involved throughout the life cycle of a product (Nicol and Thompson 2007). Maine's EPR and product stewardship laws have focused on a shared-responsibility approach (Wagner 2009). These shared-responsibility laws have covered mercury automobile switches, compact fluorescent lamps, electronics, cell phones, wall-mounted mercury thermostats, architectural paint, and beverage containers. Maine's shared-responsibility approach can foster source reduction while improving EOL management while shifting some economic obligations away from municipalities. The state's focus on shared responsibility has resulted in a significant shift in costs away from municipalities while recovering hazardous materials that otherwise would have been buried or burned (Wagner 2009). However, the enactment of shared responsibility is available only at the state level as Maine's municipalities, like most municipalities in the United States, do not have the requisite legal authority to adopt explicit EPR or product stewardship ordinances. Although limited in the ability to legislate source reduction or reuse, most municipalities have options for certain consumer products. Such products are problematic as MSW because they are generated constantly and in significant volumes, are difficult or too expensive to recycle, cause local environmental problems, and are replaceable by less problematic products. Two consumer products that municipalities have focused on are single-use shopping bags and single-use expanded polystyrene (EPS) food service items.

This article provides background information on the consumption of and problems caused by single-use shopping bags and single-use EPS food service items. I also discuss the various approaches undertaken by the state and municipalities in Maine to reduce consumption and to increase recovery through recycling.

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MUNICIPAL ROLE IN SUSTAINABLE MATERIALS MANAGEMENT

An important question in sustainable materials management is, To what degree are local governments able to engage in significant policy making regarding source reduction and reuse—reduced consumption—of specific consumer products within their jurisdiction? The answer varies by state. The superiority of the federal government over states, and by extension, local governments, is contained in the US Constitution. The ability of state governments to ban or restrict products resides in the Commerce Clause of the US Constitution (Article I, Section 8, Clause 3). This clause expressly grants Congress the power to regulate interstate commerce. As noted by Hodge and Scanlon et al. (2014), the dormant Commerce Clause, which is the negative converse of the Commerce Clause, prohibits regulations that improperly burden or discriminate against interstate commerce. For example, a regulation that favors in-state (or local) interests over out-of-state interests would restrict articles of commerce and thus violate the Commerce Clause unless explicitly authorized by Congress. Under intra-state preemption, individual states establish the degree to which local governments are able to engage in such policy making within their jurisdiction (Diller 2007). Provided states allow localities to restrict or ban specific products, and the ban or restriction does not favor or

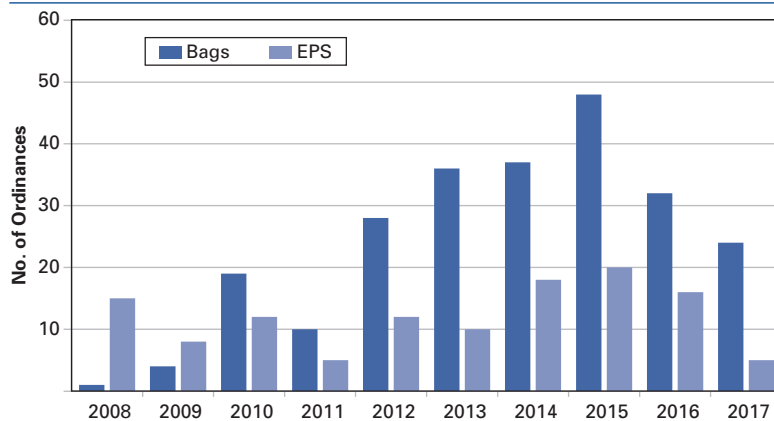
discriminate against out-of-state or nonlocal interests, the bans or restrictions are generally acceptable (Hodge and Scanlon 2014).

Because municipalities exist as a subordinate unit of a state, their authority is limited. States can allow municipalities to enact ordinances of purely municipal-level concern, known as *municipal home rule* (Vanlandingham 1968). Home rule is the permanent degree of autonomy and law-making ability for municipal governments within their own legal framework (Diller 2007). As noted by Vanlandingham (1968), municipal home rule does not provide blanket autonomy for municipal governments; states expressly limit or prohibit municipal authority in certain matters including municipal boundaries, criminal codes, education, and taxation. Municipal home rule can be conferred through the legislature or through the state constitution. In Maine, Article VIII-A, Section 1, of the state constitution was amended by ballot in 1969 with the Maine Municipal Home Rule Referendum, which added municipal home rule.

Due primarily to public health and safety concerns, the United States has a history of local-level product restrictions or bans. Local gun restrictions in the United States existed in the nineteenth century (Blocher 2013). More recently, in one of the first local-level product restrictions for public health reasons, New York City restricted the use of lead-based paint in 1959 (Hodge and Scanlon 2014). Other examples of public health-related bans and restrictions include smoking restrictions in restaurants and other public places (1977, Berkeley, California) and bans on aerial application of certain herbicides (1979, Mendocino County, California), the sale of genetically modified crops and seeds (2004, Arcata, California), partially hydrogenated oils (2007, Montgomery County, Maryland), and toys in fast-food children's meals (2010, Santa Clara County, California). There have been fewer local restrictions or bans on products based on their adverse impact to the environment.

The converse of broad home rule is express preemption, where states specifically prohibit or restrict certain municipal actions. As local governments seek to reduce costs and environmental impacts of specific products through levying fees, restrictions, or bans, some states have adopted laws to explicitly restrict the ability of local governments to act. For example, 43 states have some level of preemption regarding local government's authority to control pesticides, including 29 states that explicitly prohibit stricter regulation at the local level

FIGURE 1: Local US Ordinances Covering Single-Use Bags and EPS Food Service Items, Tracked by Effective Date, 2008–2017*



* Figure depicts ordinances by their effective date as opposed to their adoption date.

(Beyond Pesticides 2010). In response to the growing number of local governments seeking to reduce the consumption of single-use shopping bags and EPS food service items, there has been an increase in state express preemption laws including in Arizona, Florida, Idaho, Indiana, Michigan, Texas, and Wisconsin. There are also partial preemptions. For example, a 2006 California state law, which expired in 2014, preempted local governments from levying a fee for plastic bags at checkout, but did not prohibit them from banning plastic bags or levying fees on paper shopping bags. Maine has not enacted an express preemption law that would affect local government actions in reducing consumption of shopping bags or EPS products.

In spite of the rise in express preemption laws, local governments are implementing ordinances focused on reducing the consumption of single-use shopping bags and single-use EPS food service items. As shown in Figure 1, as of January 2017, there were 242 local ordinances in the United States that focus on single-use shopping bags (affecting 11.7 percent of the US population) and 148 local ordinances that ban EPS food service items (affecting 6.8 percent of the US population).

SINGLE-USE SHOPPING BAGS

Thin-film, single-use plastic shopping bags are ubiquitous because of their low cost, high strength-to-weight ratio, and convenience (Lewis, Verghese, and Fitzpatrick 2010). They have a short utility, however,

as the estimated mean life span of a single-use bag is 12 minutes (NSWEPA 2016). Shopping bags are also an important way to advertise (Prendergast, Ng, and Lee 2001). Single-use plastic bags are commonly used at grocery, general merchandise, convenience, liquor, hardware, and home improvement stores, pharmacies, restaurants, and dry cleaners. High-density polypropylene (HDPE #2) is the primary material for thin-film, single-use bags, which generally are 2.4 mils or less in thickness and include handles and weigh 7.5–12.6 grams. Handles differentiate shopping bags from other single-use plastic bags used for dry cleaning, home-delivered newspapers, and produce bags, which

are designed to carry produce, meat, fish, and bulk foods to the checkout. Low-density polypropylene (LDPE #4) bags, generally imprinted and with handles, are provided by retailers selling higher-value or specialty goods. These bags are thicker, weighing 27.5–42.5 grams, and usually more expensive for the retailer. Paper bags are made of kraft paper and weigh about 55 grams. Standard paper bags have 50 percent more carrying capacity than standard carryout plastic bags (Sapphos 2010). For the retailer, paper bags cost significantly more than plastic bags. For example, the average per bag cost for HDPE plastic in October 2016 was approximately \$0.035 compared to paper at \$0.19.

A major problem with single-use plastic bags is the low recycling rate. An accurate, precise national recycling rate is not readily available. According to the US Environmental Protection Agency (USEPA 2016), the 2014 EOL recovery rate for all (HDPE and LDPE) plastic bags, sacks, and wraps combined was 12.3 percent, which represents a decrease of 1.2 percent from 2013 (USEPA 2015). Although the USEPA provides national annual data, their MSW data are based on predictive modeling and are not measured, making the information prone to errors. For example, in 2014, based on models, the USEPA estimated the content of metal in MSW was 57 percent higher than 19 state-level waste characterization studies (Wagner and Raymond 2015). USEPA data, which are cited often and used as a surrogate for missing state or municipal-level data, are known to underestimate generation rates and overestimate recovery rates

(Chowdhury 2009; Van Haaren, Themelis, and Goldstein 2010). Setting aside uncertainties in the USEPA data, the amalgamation of bags and sacks with film and wraps furthers the difficulty in identifying an accurate national recycling rate specifically for plastic bags. There is no current accurate state-level recycling rate for plastic or paper shopping bags in Maine. Based on limited state-level waste characterization studies, the recycling rate for plastic shopping bags in 2009 was 1.5 percent in Illinois (IDCEO 2009) and 3 percent in California (<http://www.calrecycle.ca.gov/plastics/AtStore/AnnualRate/2009Rate.htm>). For paper bags and sacks, the USEPA (2015) estimated the 2009 (most recent data available) national recycling rate at 49.4 percent.

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There are numerous reasons for the low recycling rate for plastic bags. First, for stores that collect bags, although large or chain stores may have sufficient volume for recycling, small- or medium-sized stores and independent stores may have insufficient volume (MSPO 2010). Second, household-generated plastic bags not collected at specific drop-off locations must be segregated at the curb or at a material recovery facility (MRF) to maximize their economic value. However, plastic bags are not easily segregated at MRFs and become snagged or trapped in automated sorting equipment, reducing the effectiveness of the equipment and causing breakdowns (Brendle Group 2012; Staley 2014). Third, the driver in recycling is the net economic value of plastic bags taking into account the costs of collecting, segregating, recovering, baling, and transporting the bags compared to revenue from their sale. High separation and processing costs limit their economic viability for the recycled commodity market. For example, the average cost to process a ton of recyclables (i.e., all materials combined) at ecomaine is \$65 (Lisa Wolff, personal communication, November 23, 2016). While most Maine municipalities discourage or do not accept plastic bags for recycling, when they are received at an MRF,

the bags are often included with #3–#7 commingled plastics—the lowest-grade plastic—which has minimal positive or even negative value. At ecomaine, which serves a third of Maine’s population, segregated and baled mixed #3–#7 plastics were sold at a price of \$0–\$10 per ton since the first market downturn in 2009. A more aggressive market downturn in 2016, however, has resulted in a cost of up to \$60 per ton to ecomaine for selling these mixed plastics for recycling. Because of the problems single-use plastic bags cause in the sorting equipment, and to align with a movement by member communities to adopt shopping bag ordinances, ecomaine began phasing out acceptance of single-use plastic bags in October 2016 (Wolff, personal communication, November 9, 2016).

The converse of the recycling rate is the discard rate. The vast majority of plastic shopping bags are discarded, intentionally or unintentionally, which is a problem because they then contribute to litter and subsequently marine litter. (For a discussion of the impacts of plastic litter in the marine environment, see Dye 2014.) Because their aerodynamic and ballooning features allow them to become airborne, plastic bags escape easily. Escaped plastic bags often are the number one litter issue at landfills (Brendle Group 2012; FDEP 2010). Portable litter fences are typically installed near the working face of landfills to trap blowing litter, but they need to be cleaned daily to remove trapped litter to reduce wind damage to the fences (Christensen 2011; Martel and Helm 2004). Litter cleanup can be a significant expense for local and state government. Based on a study of litter generated from recycling collection in Portland, Maine, the estimated cost to collect each piece of litter ranged from \$0.17 to \$0.79 (Wagner and Broaddus 2016). In San Francisco, the cost to clean up each littered plastic bag was estimated at \$0.052 (Burnett 2013; Pender 2005).

Paper bags (about 2.4 ounces) weigh substantially more than plastic bags (about 0.24 ounce), which makes the transportation costs and associated generation of greenhouse gasses much higher for paper compared to plastic bags. Furthermore, the environmental impacts from the manufacture, use, and post-EOL management of paper bags is significantly higher than HDPE and LDPE plastic bags and is exacerbated by the limitations on reusing paper bags (UK Environmental Agency 2011). Thus, while paper bags have a significantly higher recycling rate and are compostable, they cost more for retailers; cost more to collect, haul, and recycle; and

their overall environmental impacts are greater than those of plastic bags. Consequently, merely substituting paper bags for plastic bags will result in a net increase in retailer and municipal costs and a net increase in environmental impacts.

Consumption of Single-Use Shopping Bags

Data on the estimated per capita consumption rate of shopping bags are sparse partly because many businesses treat this data as confidential or do not track bag consumption per customer. Grocery stores are the largest provider of single-use bags, as grocery shoppers make 1.6 trips per week in the United States (FMI 2016). The US International Trade Commission (USITC 2016) estimated the national annual per capita consumption of single-use plastic shopping bags in 2015 to be 319.5. This figure includes shopping bags consumed at grocery, drug, convenience, department,

specialty retail, discount stores, and restaurants. The USITC report notes that since 2009, there has been a 6.8 percent increase in consumption of plastic bags although the annual per capita consumption rate has steadily decreased since 2010. As observed by USITC (2016), the demand for plastic shopping bags is expected to continue to decline primarily because of the increased use of reusable bags and the increased imposition of bans and fees.

Seven municipalities in the United States have estimated (for varying years) the annual per capita consumption of plastic shopping bags before adopting an ordinance (see Table 1). Based on a two-year study conducted in Tucson, Arizona, retailers reported the mean number of plastic shopping bags provided per shopper per transaction was 2.61 (<https://www.tucsonaz.gov/es/tucson-plastic-bag-ordinance>). The Tucson study only included retailers classified as chains with two or more locations within the city limits, with over 10,000 square feet of space dedicated to retail and 25 percent of retail sales dedicated to food products.

Using the USITC's mean per capita-based consumption rate of 319.5 and the 2015 US Census estimated state population of 1,329,328, I conservatively estimated total plastic shopping bag distribution in Maine in 2015 at 424.7 million (see Table 2).² This is a conservative estimate because it does not include bag consumption by the approximately 34 million tourists who visited in 2015 (DPA 2016). For single-use paper shopping bags, the Maine Merchants Association conservatively estimated Maine's annual per capita consumption between 1989 and 1990 to be 122 (MWMA 1991). Although plastic bags are more commonly distributed by retailers, the precise ratio of plastic to paper in Maine is not known. For paper bags, using the 122 per capita figure, consumption for 2015 was estimated at 162 million (consumption by tourists was not

TABLE 1: Municipal-Level, Annual per Capita Consumption Rates of Shopping Bags

Annual per capita consumption	Municipality	Coverage	Source
335	Austin, TX	Plastic bags only	Waters 2015
342	Boulder, CO	Plastic and paper bags	Brendle Group 2012
398	Aspen, CO	Plastic and paper bags	Brendle Group 2012
471	Evanston, IL	428 plastic bags + 43 paper	Evanston 2011
552	Santa Monica, CA	Plastic bags only	R3 2010
600	Los Angeles County, CA	Plastic bags only	LA County 2007
630	Seattle, WA	511 plastic bags + 119 paper	HEC 2008

TABLE 2: Estimated Consumption of Single-Use Shopping Bags in Maine, 2015

	Plastic	Paper	Total
Annual per capita mean	319.5	122.0	441.5
Annual per household mean (2.34)	747.6	285.5	1,033
Annual total consumption state*	424,720,000	162,440,000	586,898,000

*Figures were rounded.

included). Thus, the estimated total consumption of single-use shopping bags in Maine in 2015 was 586.9 million equaling a per capita consumption of 441.5 bags, or 1,033 single-use shopping bags per average household of 2.3 persons in 2015 according to the US Census (2016).

Reducing Single-Use Shopping Bags in Maine

Since 1989, the legislature has proposed 13 bills aimed at reducing the use of single-use shopping bags in Maine. These bills have resulted in three laws, one joint resolution, and a creation of a working group in Maine. In 1989, legislators proposed LD 1102, which required retail establishments to use only paper shopping bags at the point of sale unless the customer specifically requested plastic bags. The bill also prohibited the use of plastic bags unless there was a minimum 50 percent recycling rate for the bags and the bags were constructed of only one type of plastic and identified as such. The bill did not pass, but it was incorporated into LD 1431 (An Act to Promote Reduction, Recycling and Integrated Management of Solid Waste and Sound Environmental Regulation), which was passed and became law (PL 1989). Starting on January 1, 1990, the law required retailers to provide only paper shopping bags at the point of sale unless the customer specifically requested plastic bags. The mandatory recycling rate contained in LD 1102 was removed. This law was based on default-choice architecture (see Thaler and Sunstein 2008), which seeks to alter consumer behavior, without banning certain behaviors, by encouraging a preferential selection. The law was successful in reducing the consumption of plastic bags. However, based on a survey by the Maine Merchants Association, while the law resulted in a decrease of 267 million plastic bags, there was a corresponding increase of 254 million paper bags consumed (MWMA 1991). The state estimated the recycling rate for plastic bags in 1989–1990 was 18 percent. The result of the law was an unintended, significant cost increase to retailers because of the higher price of paper bags coupled with the increased demand for them.

In 1991, the legislature repealed the “paper default choice” law with the enactment of LD 116 (38 MRS §1608). This law allowed retailers to distribute plastic shopping bags at the point of retail sale if they provided a receptacle for collecting used plastic bags within 20 feet of the main entrance to the store and ensured that collected plastic bags were recycled. This retailer take-back program was designed to promote

recycling rather than source reduction. Interestingly, this practice may inadvertently increase consumption through the moral-licensing effect (Catlin and Wang 2013), thus undermining source reduction. Although the law remains in effect, there is no statewide data on the recycling rate of plastic bags collected through Maine’s retailer take-back program.

In 1993, the legislature (LD 963) proposed a \$0.20 fee on all paper and plastic grocery bags. Retailers would keep \$0.10 of the fee with the other \$0.10 going to fund a voucher program for reusable bags and the Office of Waste Reduction and Recycling within the Maine Waste Management Agency. This bill did not pass.

In 2009, LD 367 proposed a \$0.10 fee on all plastic shopping bags with the funds earmarked for the Waste Reduction and Recycling Loan Fund. The bill was replaced by a resolve (Resolve, to Convene a Work Group to Design and Implement a Statewide Disposable Checkout Bag Reduction Campaign, with Benchmarks), which was passed. The work group was to report by January 15, 2010, on approaches to reduce the distribution of disposable checkout bags. The goal was to reduce consumption of single-use shopping bags by 33 percent by 2013. The work group’s report proposed a statewide education campaign. This Got Your Bags? education program was a partnership between Maine retailers, the State Planning Office, and the Natural Resources Council of Maine, but the program became dormant by 2012 (MacDonald 2010). Also in 2009, LD 622 proposed that retailers with 30,000 square feet of retail floor space must distribute free cloth reusable bags at least twice a year. This bill did not pass.

In 2011, LD 745 proposed an income tax credit up to \$75,000 to retailers that provided compensation to customers for the use of reusable bags, but it was not passed. In 2013, LD 1292 proposed a \$0.10 fee on single-use plastic shopping bags, which did not pass. In 2015, LD 325 and LD 396 both proposed a \$0.05 fee on single-use plastic shopping bags, and LD 680 proposed a \$0.05 fee on plastic and paper single-use shopping bags. Neither LD 396 nor LD 680 passed. LD 325 was amended to ban single-use plastic shopping bags effective 2020, but it also did not pass. Finally, LD 590, an emergency bill was proposed in April 2015 to exempt any single-use bag fee from state sales tax. Although only Portland was affected, Maine’s Revenue Forecasting Committee had budgeted \$70,000 in revenue over the two-year budget cycle. This, in part, led to a veto of the bill by the governor, but the veto was

TABLE 3: Overview of Approaches to Reduce Consumption of Single-Use Shopping Bags

Approach	Overview	Benefits	Negatives
Ban	Full Ban: Retailers prohibited from providing single-use shopping bags. Targeted Ban: Retailers prohibited from providing specific types of shopping bags (i.e., plastic).	Most effective approach to reduce consumption and litter Easy to enforce	With targeted ban, increased consumption of nonbanned bag likely, which increases retailer costs Eliminates consumer choice Politically least popular
Fee	Levies visible and separate per bag fee on single-use paper or plastic bags, or reusable bags.	Reduces consumption and litter Fees kept by retailers can compensate for compliance costs Relatively easy to enforce	Increased initial cost to consumer (purchase of reusable bags) or subsequent costs (purchase of single-use bags from retailer) Increased administrative cost at the regulator and retailer levels Retains consumer choice Politically less popular
Specified bag design	Specification of minimum thickness, minimum post-consumer recycled content, use of sustainability harvested fibers, must be compostable, or include pro-environmental message.	Can reduce upstream environmental impacts Can increase composting opportunity at EOL	Difficult to enforce; Response can be offering thicker plastic bags for free Increased costs to retailers depending on bag cost Does not reduce consumption or increase recycling
Consumer education	Educate consumers on how to reduce consumption or increase recycling	Low or no cost to consumers Imposes no restrictions on consumers	Difficult to enforce Education is expensive to implement and maintain Not likely to have appreciable impact on consumption or recycling If retailer required, costs apply
Mandated retailer take back	Requires retailers to provide for convenient options for consumers to return used plastic bags for recycling.	Relies on voluntary actions of consumer to return bags Low or no direct cost to consumers	Easy to enforce if only containers need to be provided Could increase consumption of bags due to moral-licensing effect Increased cost to retailers to collect, store, ship, and recycle

overridden and the bill became law on June 9, 2015.

Municipal Approaches to Reducing Single-Use Shopping Bags

In the United States, 242 local governments, covering more than 37 million people, have adopted ordinances designed to reduce the consumption of single-use shopping bags.³ These ordinances have used a variety of approaches (Table 3). As of January 2017, the focus of the 242 ordinances is categorized as follows:

- 95 percent of all ordinances banned plastic bags
- 57.6 percent of ordinances banning plastic bags also included a fee on paper bags
- 5 percent of all ordinances levied a fee on all single-use bags
- \$0.10 per bag for paper and plastic bags was the most common fee in all the ordinances levying a bag fee

As Table 4 illustrates, seven municipalities in Maine, covering 11 percent of the state's population, have adopted single-use bag ordinances. There are two common approaches: (1) the Portland model, no ban, but a mandatory \$0.05 fee on all single-use bags and (2) the York model, a ban only on single-use plastic bags with no fee and no restrictions on paper bags. The Portland model has been adopted by Topsham, South Portland, Falmouth, and Freeport. The ordinances in Portland, South Portland, and Topsham are similar and focus on any store where food represents at least 2 percent of the gross sales, which includes grocery and convenience stores and pharmacies, but restaurants are exempt. Falmouth adopted a more

TABLE 4: Approaches to Reduce or Eliminate Single-Use (SU) Shopping Bags in Maine

Municipality	Approach	Overview	Effective date
Portland	No ban, mandatory fee on all SU bags	\$0.05 fee for all SU bags at stores where food constitutes at least 2 percent of gross sales. (Dry cleaners, restaurants, and farmers markets exempt.)	April 15, 2015
South Portland	No ban, mandatory fee on all SU bags	\$0.05 fee for all SU bags at stores where food constitutes at least 2 percent of gross sales. (Dry cleaners, restaurants, and farmers markets exempt.)	March 1, 2016
York	Partial ban, plastic bags only	Bans distribution of SU plastic bags at all retail establishments. Plastic bags without handles (e.g., dry cleaning, newspapers, meat, seafood, bulk foods, and produce) excluded. Nonprofit and religious organizations not considered retail establishment. No restriction on paper bags.	March 3, 2016
Freeport	No ban, mandatory fee on all SU bags	\$0.05 fee for all SU bags at stores where food constitutes at least 2 percent of gross sales. (Restaurants are exempt and reusable bags as defined exempt.)	September 12, 2016
Kennebunk	Partial ban, plastic bags only	Bans distribution of SU plastic bags at all retail establishments. Plastic bags without handles (e.g., dry cleaning, newspapers, meat, seafood, bulk foods, and produce) are excluded. Nonprofit and religious organizations not considered retail establishment. No restriction on paper bags.	October 14, 2016
Topsham	No ban, mandatory fee on all SU bags	\$0.05 fee for all SU bags at stores where food constitutes at least 2 percent of gross sales. (Dry cleaners, restaurants, and used bags distributed by antique and secondhand stores are exempt.)	May 7, 2017

narrow definition of retail establishments by using a minimum floor area of 10,000 square feet regardless of food sales, thus including department stores, office supply stores, and pharmacies, but exempting horticultural nurseries. The York model has been adopted by Kennebunk, which banned plastic shopping bags, but did not restrict the distribution of paper bags or reusable plastic bags. Both towns define a reusable bag as any bag with handles made to withstand repeated uses, which can be cleaned and disinfected. If made of plastic, the bag must be at least 3 mils thick. In contrast, Topsham adopted a stricter requirement that reusable plastic bags must be at least 4 mils thick.

Falmouth has collected data on single-use shopping bags distributed at the six stores covered by its ordinance. Based on the data collected during the first six months of the program, a total of \$35,134.30 was collected by the stores in mandatory bag fees, which equates to 702,686 bags or 1,405,372 per year (Kimberly Darling, personal communication, January 5, 2017), which corresponds to an annual per capita consumption rate of 117.2. In Falmouth, the two stand-alone grocery stores accounted for 70.6 percent of all shopping bags distributed during the first six months, while the third largest distributor of shopping bags was a combined department and grocery store, which distributed 24.6 percent. The remaining three retailers, a pharmacy, an office supply store, and a secondhand store, collectively

accounted for the remaining 4.8 percent of shopping bags distributed. Although these six stores represent the majority of retail transactions in Falmouth, they represent less than 5 percent of retailers. Thus, the rate of 117.2 bags per person per year slightly underestimates the actual consumption rate. Using the national estimated annual per consumption rate of 441.5 bags for comparison, Falmouth's data clearly indicate that the distribution of bags has decreased following the implementation of its fee.

While neither Portland nor South Portland have collected any postordinance data the use of reusable bags at the Portland Hannaford store increased from around 15 percent before Portland's ordinance to more than 80 percent immediately after. However, these results are not representative because Hannaford gave away more than 140,000 reusable shopping bags two weeks before the ordinance and conducted community outreach targeting low-income people and immigrants (Eric Bloom, personal communication, December 8, 2016).

Based on experiences in Maine and in other communities around the country, one of the likely impacts of the York model is the unintended increase in consumption of single-use paper bags. If consumption of single-use paper bags correspondingly increases, the cost to retailers increases due to higher purchase costs. At the wholesale level, paper bags cost about 440 percent more than plastic bags. Costs also can increase for the

municipality because the increased weight of paper bags affects the cost of collecting and processing recyclables, which are charged on a per ton basis. For recycling, these increased costs can be offset by revenues from sold materials. Based on USEPA's (2015) data, about 50 percent of paper bags will be recycled, meaning 50 percent will be disposed of as trash, which costs municipalities more than recycling. The life-cycle environmental impacts of single-use paper bags are significantly greater than for single-use HDPE and LDPE plastic bags. The York model does have benefits, however. If the goal is to eliminate single-use plastic bags from the waste stream, bans are generally the most effective. In addition, retailers that no longer offer plastic bags also no longer have to comply with the provisions of the retailer take-back program. Avoiding this requirement reduces the administrative, labor, and waste management costs of an in-store recycling program specifically for bags.

EXPANDED POLYSTYRENE FOOD SERVICE ITEMS

Polystyrene (resin identification code #6) is a polymer made from the monomer styrene, which can be in a solid or foamed form. Expanded polystyrene (EPS), also known under its trade name, Styrofoam, has a bead-like form and is used for take-out food and beverage items including cups, bowls, plates, platters, clam-shell hinged-containers, and cafeteria trays. Extruded polystyrene is a smoother material used primarily for packaging such as trays for meat, poultry, fish, deli products, produce, bakery items and egg cartons. Molded polystyrene is used in the food and beverage industry to produce a variety of products including lids for disposable cups, disposable cups, cutlery, and containers for salad bars, produce, and dairy products.

The recycling rate for EPS is low. In California in 2001, the recycling rate of EPS food service items packaging was 0.2 percent (IWMB 2004). The recycling rate for EPS is so low because of the products' weight, segregation challenges, low market value, and contamination issues. EPS is extremely lightweight, which means its transportation costs are comparatively high. It is inefficient to transport it without significantly compacting it, which requires additional equipment and labor.⁴ Because EPS breaks easily into tiny pieces, it cannot be collected effectively and then segregated in a single-stream collection system. Furthermore, the postconsumer market is low for EPS because when EPS is

recycled, the recycled material is lower quality than the original, and EPS food and beverage containers are often contaminated with food.

Like single-use plastic bags, EPS can be blown away by wind as it is being collected or transported and becomes litter. Since EPS breaks into smaller pieces easily but does not biodegrade, it is even more of a problem as litter. EPS is extremely buoyant, easily moving from land to surface water, through stormwater drains, and into marine environments. EPS was a significant component of trash collected in stormwater drains in San Jose, California, ranging from 7.8 percent to 10.8 percent of trash (Romanow 2012).

Consumption of EPS Food Service Items

There are few estimates of total or per capita consumption of single-use EPS food service items. Based on industry-provided data for 2004 and 2008, the mean annual consumption of selected EPS food service items was approximately 58 billion units or 193.2 items per person per year (Keybridge Research 2009). Annual mean per capita consumption rates, which also incorporate California state-level data, allow for the estimated per person annual consumption of each EPS category: cups (110.6), plates, bowls, and platters (36.5), clamshells (36.5), and trays (9.8). Using these data, the total and annual per capita consumption of each category of EPS food service items can be estimated for Maine using 2015 state population data (Table 5). This is a conservative estimate because it does not include consumption from the additional 34 million tourist visitations in 2015 (DPA 2016).

Reducing EPS Food Service Items in Maine

In 1987, Maine banned the distribution of food and beverages in EPS containers at state and political subdivision facilities and functions starting on January 1, 1990 (LD 2178), which is the strongest state-level action in the United States.⁵ The ban included schools that are not satellite schools served by a central kitchen, but it did not apply to food-delivery programs for seniors (e.g., Meals on Wheels) served by a central kitchen. In 1989, legislators proposed LD 1307 to ban retail use of EPS, but it did not pass. In 1993, the legislature passed LD 1067, which amended 38 MRS §1651, and allowed EPS food service items at state facilities provided the facility had an EPS-recycling program. In 1997, LD 1019 amended 38 MRS §1652 and allowed schools to request a three-year waiver from the EPS ban

TABLE 5: Estimated Consumption of Selected EPS Food Service Items in Maine in 2015

	Cups	Plates, bowls and platters	Clamshells	Trays	Total
Annual per capita mean	110.6	36.5	36.5	9.8	193.4
Annual per household mean (2.34)	258.9	86.5	85.3	22.8	452.5
Annual total consumption state*	146,943,000	48,515,000	48,439,000	12,971,000	256,868,000

*Figures were rounded.

based on demonstrated financial hardship. No school district has formally requested a waiver from the EPS food service ban (Kevin Martin, personal communication, December 27, 2016). Finally, in 2015, LD 468 proposed another statewide ban on the sale or distribution of EPS food service items, but it did not pass.

Municipal Approaches to Reducing EPS Food Service Items

As of January 2017, there were 148 local-level ordinances in the United States designed to reduce the consumption of EPS food service items. All the EPS ordinances in the United States are variations of bans because it is not feasible to expect customers to bring their own containers (or not use one at all). Table 6 categorizes these bans as narrow, limited, full, and expanded bans.

Of the 148 local ordinances in the United States that have adopted bans

- 5.4 percent are narrow bans in which EPS is restricted primarily at governmental facilities and public areas,
- 81.1 percent are limited bans that include a ban on EPS food service items at restaurants and retailers selling prepared food,
- 2.7 percent are full bans that include polystyrene food packages (i.e., egg cartons and produce, meat, fish trays), and
- 10.8 percent are expanded bans that include the retail sale of EPS food service items, sale and use of disposable polystyrene coolers, or any food service items made of polystyrene or polyvinyl chloride.

Six municipalities in Maine, covering 11 percent of the state's population, are reducing consumption of EPS through bans (Table 7). Freeport enacted the first

TABLE 6: Summary of Approaches to Reduce Consumption of Single-Use EPS Food Service Items

Ban type	Overview
Narrow ban	Applies only to local government buildings, facilities, or events or use or sale on public property such as parks and beaches.
Limited ban	Applies to EPS containers provided by retailers that sell or provide food including restaurants, grocery stores, and food trucks. Bans in this category can include EPS containers for take-out food and EPS containers for leftovers.
Full ban	Includes the items in a limited ban and also polystyrene packaging for meat, poultry, fish, produce, deli, and bakery products, and egg containers.
Expanded ban	Includes the items in both full and limited bans and can also include a ban on retail sale of new EPS food service items; disposable EPS coolers; use or selling of plastic utensils, cup lids, and straws; and selling polystyrene foam "peanut" packing material.

municipal-level ban on EPS food service items in Maine in 1990 (it was also one of the first in the country). The Portland School District banned the use of EPS trays in 2012.

CONCLUSION

Maine municipalities are adopting ordinances to address consumer products that cause economic challenges as MSW because of limited recyclability, costs of litter clean up, and costs related to protecting and cleaning stormwater management systems. Because municipalities are not able to shift their MSW costs back to the producers through an EPR scheme, their only option has been to encourage or require source reduction through bans and fees. As noted by Rogoff

TABLE 7: Approaches in Maine to Reduce EPS Food Service Items

Municipality	Approach	Overview	Effective date
Freeport	Full ban	Food service items and polystyrene packaging at grocery stores (e.g., egg cartons and meat trays)	January 1, 1990
Portland	Limited ban	Prepared food and beverages including from food trucks	April 15, 2015
South Portland	Limited ban	Prepared food and beverages including from food trucks	March 1, 2016
Brunswick	Limited ban	Prepared food and beverages	October 1, 2016
Saco	Full ban	Food service items and polystyrene packaging at grocery stores (e.g., egg cartons and meat trays)	October 19, 2016
Topsham	Full ban	Food service items and polystyrene packaging at grocery stores (e.g., egg cartons, meat trays, and bakery products)	May 7, 2017

and Ross (2016), the removal of difficult-to-recycle items has the added benefit of reducing a municipality's overall recycling costs because of increased sorting efficiency and of increasing the value of the end product because of reduced contamination.

Maine has enacted laws to reduce consumption of single-use plastic shopping bags and EPS food service items. The state's attempt to make paper shopping bags the default consumer choice resulted in a dramatic increase in consumption of paper bags, which increased costs to retailers and was quickly repealed. The shift to paper bags also increases the overall environmental impact and municipalities' MSW costs. State law then established a retailer take-back program and required retailers that distribute plastic bags to offer postconsumer recycling. This law, however, does not foster source reduction. In fact, research has shown that offering recycling near consumption can actually increase consumption through moral licensure. There are now seven Maine municipalities with local ordinances that either ban plastic shopping bags or mandate a fee for all single-use shopping bags.

For EPS food service items, Maine has adopted the most stringent statewide restriction on their use at state and local government and quasigovernment facilities and functions. Six municipalities have adopted local ordinances incorporating bans; three municipalities banned the use of EPS food service items at retail establishments, and three municipalities also banned the use of polystyrene packaging at grocery stores.

Given the precedent the ordinances have set for reducing consumption of products that are not readily recycled and cause local environmental impacts, the obvious question is, what other similar consumer products are ripe for local control? Local governments outside

of Maine have enacted bans on disposable EPS coolers, foam packaging peanuts, and nonrecycled plastic utensils. While all of these restrictions or bans are based on the lack of recycling for the products, France recently enacted a ban on plastic single-use bags and plastic utensils as a component of its climate action plan. This action signals a new critical assessment of the type of materials used for disposable consumer products given increased concern for reducing carbon emissions. 

ENDNOTES

- Also in 1989, Maine enacted a statewide ban (38 MRSA §1652, sub-§1-A) on the use of plastic beverage stirrers at food servicers at state and political subdivision facilities or functions.
- A survey conducted by the Maine Merchants Association estimated the annual per capita consumption of plastic shopping bags in 1989 and 1990 to be 268.8. According to the Maine Waste Management Agency (1991: 3), this figure should be viewed as conservative with a "healthy margin of error."
- In November 2016, California became the first state to adopt a statewide law banning the distribution of plastic single-use shopping bags and levying a \$0.10 fee on paper bags.
- Report of the Majority of the Green Packaging Working Group Recommending a Ban on the Sale of Polystyrene Foam Food Packaging in Portland, 2013. From meeting agenda for the City of Portland, Transportation, Sustainability, and Energy Committee, March 13, 2014. <http://www.portlandmaine.gov/AgendaCenter/ViewFile/Agenda/03192014-272?packet=true>
- Political subdivisions are defined in 14 MRSA §8102 to include any local government (city, town, plantation, or county) and any officially authorized water district, sanitary district, hospital district, school district, or airport authority.

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