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Reducing single-use plastic shopping bags in the USA

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ABSTRACT

In the USA, local governments have the primary responsibility to manage MSW. However, local governments lack the authority to explicitly shift costs or responsibility back onto the producer for specific problem wastes. A particularly problematic waste for local governments is the single-use plastic bag. In 2014, in the USA, 103.465 billion single-use plastic shopping bags were consumed. Because of their extremely low recyclability rate, plastic bags remain a significant source of land-based litter and marine debris and impair stormwater management systems. They also reduce the effectiveness of automated recycling systems. In response, local governments increasingly have adopted a variety of measures specifically intended to reduce the store-level consumption of single-use shopping bags in 5 major categories: bans, imposition of fees and taxes, establishing minimum product design of bags, requiring consumer education, and mandating retailer take-back programs. As of September 2017, there were 271 local governments in the USA with plastic bag ordinances covering 9.7% of the nation's population. The majority (95%) of the ordinances is a ban on single-use plastic bags; 56.9% of these bans also include a mandatory fee on paper and/or reusable bags. For the fee-based ordinances, the mode is $0.10 per bag; every tax/fee ordinance allows retailers to retain some or all the collected fee. As local governments continue to increase their actions on plastic bags, 11 states have enacted laws to prohibit local governments from regulating single-use plastic bags. Because of the success with single-use bags, local governments are also enacting similar ordinances on single-use expanded polystyrene consumer products and other single-use plastic products.

1. Introduction

In the USA, the federal government's role in municipal solid waste (MSW) management has been minimal; providing technical assistance and establishing minimum solid waste landfill criteria and regulating waste-to-energy facilities. State governments have a significantly broader role in planning and they generally establish the regulatory framework for MSW management, which typically includes the siting and permitting of solid waste management activities and facilities, establishing state-level recycling goals, imposing recycling requirements on businesses and institutions, and adopting state-level beverage container deposit/refund systems. It is local governments (e.g., counties, cities, towns, villages, and tribes) that have the primary responsibility for actually managing MSW.

Over the past decade, 33 states have enacted extended producer responsibility (EPR) laws to help shift the responsibility and costs away from local governments back onto the producers (Product Stewardship Institute, 2017). EPR laws have focused on electronic waste, mercury-containing products, rechargeable batteries, beverage containers, mattresses, carpet, packaging, and architectural paint. In addition to the cost-shifting goal of EPR, the goal is to encourage producers to internalize some of the end of life (EOL) costs of their product with the intent of encouraging the producer to redesign the product by reducing its mass and/or toxicity and/or improved recovery at the product's EOL (Lifset et al., 2013). EPR, however, is a state-level approach in the USA because local governments, unless specifically authorized by their state, lack the legal authority to adopt local-level EPR rules. Herein lies the conundrum, while the primary management responsibility of MSW resides with local governments, they lack the authority to enact EPR-based rules to reduce the quantity of MSW generated and disposed of within their jurisdiction. Local governments have, however, adopted a number of initiatives to decrease disposal of MSW including pay-as-you throw (unit-based pricing), curbside collection of trash and recycling, free recycling, single-sort recycling collection, education, community-based social marketing, organics collection, yard waste collection, and household hazardous waste collection. Although collectively these actions focus on increasing the capture of EOL materials through recycling, they do not explicitly focus on source reduction, which is essential to

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reduce local government costs and to foster sustainable materials management.

In spite of the limitations on local governments' authority to implement EPR, in the USA, local governments increasingly are adopting an effective alternative. Most states in the USA do not prohibit local governments from banning, restricting, or discouraging the sale or use of a consumer product provided the product is: (1) considered to be problematic as MSW because it is difficult to recycle, expensive to recycle, is not recycled, or has no or insufficient market value; (2) causes significant local environmental impact such as a significant source of litter during use, collection, processing, and proper or improper disposal or it impairs stormwater management; and (3) viable and environmentally preferred substitutes exist. A consumer product that meets these criteria is the single-use shopping bag, especially plastic bags.

As local governments seek to reduce the environmental costs and impacts of specific products through the levying of taxes or fees, use restrictions, or outright bans, 11 USA states have adopted laws to explicitly restrict the ability of local governments to control bag usage including Arizona, California, Florida, Idaho, Indiana, Iowa, Michigan, Minnesota, Missouri, Texas, and Wisconsin. There are also unintentional impacts from state-level restrictions on local government. For example, California state law originally preempted local governments from charging a fee for plastic bags at checkout but did not prohibit bans (Romer and Tamminen, 2014). This partial restriction resulted in the adoption of 110 local plastic bag bans in California often coupled with a fee on paper bags. These 110 local government ordinances covered 43% of California's population, which gave rise to a citizen-ballot initiative passed in November 2016 that adopted the first ever statewide law in the USA banning the distribution of plastic single-use shopping bags and levying a $0.10 fee on paper bags.

This article first provides background information on single-use paper and plastic shopping bags. Then, the paper examines the local environmental and EOL management problems caused by single-use shopping bags. It next discusses the various options available to local governments to reduce or eliminate the generation of single-use bags. Finally, the paper examines the various approaches undertaken by 271 local governments in the USA to eliminate or reduce the consumption of single-use bags.

2. Single use shopping bags

Thin-film, single-use shopping bags are ubiquitous throughout the world. They are inexpensive, have a high strength to weight ratio, are waterproof, and have a multitude of uses (Lewis et al., 2010). Their primary intended purpose, however, is utilitarian; to convey purchased materials from the point of sale to a destination. The average life-span of a single use plastic bag is only 12 min (NSW EPA, 2016). Since the 1980s, consumers have been habitualized into expecting free, single-use plastic shopping bags (Sharp et al., 2010). Grocery stores generally are the single largest supplier of thin-film single use bags. In Montgomery County, MD, grocery stores accounted for 70% of all bags provided, non-food retailers 12%, retail super centers 8%, restaurants 3%, unclassified stores were 7%, and wine and liquors stores were <1% (Montgomery County, 2016). In the USA, the mean grocery shopper trips per week is 1.6 (FMI, 2016).

Single-use plastics bags are primarily made from fossil fuels. High Density Polyethylene (HDPE, resin identification code #2) is the primary material for thin-film, single-use bags (e.g., singlet bags) used primarily at grocery stores, convenience stores, and takeout restaurants. Based on a survey by Verghese et al. (2006), single-use HDPE bags provided by grocery and department stores generally range from 0.7 to 1.75 mil in thickness and include handles. The inclusion of handles often differentiates shopping bags from other single use plastic bags such as those used to carry materials within a store to the cashier/checkout (e.g., barrier bags) including bags for produce, meat, fish, and bulk foods and for dry cleaning and product packaging. Low Density Polypropylene (LDPE, resin identification code #4) bags (e.g., boutique style bags) generally are imprinted bags with plastic or fiber handles and generally range from 2.25 to 3 mil in thickness and are provided by retailers selling higher value or specialty goods (Verghese et al., 2006). Paper bags are generally made of kraft paper, including post-consumer recycled paper, and generally weigh about 43 gm. Standard paper bags have 50% more carrying capacity than standard plastic shopping bags (Sapphos, 2010).

2.1. Per capita consumption of bags

Precise data on the per-capita consumption rate of bags are difficult to find in part because many businesses treat this data as proprietary information or simply do not track per-customer bag consumption. As shown in Table 1, a range of published per-capita consumption rates of bags exists for various reporting years prior to the implementation of a reduction-based ordinance; however, some sources have reported plastic bags only or separately or all single-use bags combined. (Note nearly all of data in the table below are estimated.) The variation in per-capita consumption of single-use bags is influenced by multiple factors at the point of sale. Based on a survey by Sapphos (2010) in Los Angeles County, CA, customers used more plastic single-use bags when they are available compared to paper bags. For example, at traditional grocery stores, customers used single-use plastic bags 96% of the time compared to 2% paper and 2% reusable (Sapphos, 2010). The authors also report different bag use data at non-traditional grocery stores (large specialty or "gourmet" stores) with a reputation for attracting shoppers with higher incomes. In those non-traditional stores, only 4% of the bags were plastic followed by 18% reusable and the highest amount being paper at 78% (Sapphos, 2010).

The US International Trade Commission (USITC, 2016) estimated the national annual per capita consumption of single-use plastic shopping bags in 2014 for the USA to be 319.5, which includes bags consumed at grocery, drug, convenience, department, specialty retail, discount stores, and restaurants. (The total USA consumption in 2014 was 103.465 billion plastic shopping bags.) In the USA, 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 (USITC, 2016). And, the future demand for plastic shopping bags is expected to continue to decline primarily because of increased use of reusable bags and the increased imposition of local bans, fees, and taxes (USITC, 2016).

2.2. EOL impacts from single use bags

2.2.1. Low recycling rates

Although the precise national recovery rate for single-use bags is not known, the recycling rate of plastic bags is very small. According to the US Environmental Protection Agency (US EPA, 2016), the 2014 EOL recovery rate for all (HDPE and LDPE combined) plastic bags, sacks, and wraps combined was 12.3%, which represents a decrease of 1.2% from 2013 (US EPA, 2015). Although the US EPA provides national annual data, their data is based on predictive modeling and not measurement through waste characterization studies and thus is known to significantly underestimate generation rates and overestimate recovery rates (Powell et al., 2016; Wagner and Raymond, 2015; Van Haaren et al., 2010). In addition to the inaccuracy of US EPA's data, the amalgamation of

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