

Effectiveness of plastic regulation around the world

This report was compiled by the [Scientist Action and Advocacy Network](#) and summarizes evidence from academic and government-commissioned studies. For questions or comments, email info@scaan.net.

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Plastic pollution represents a critical threat to both marine wildlife that gets trapped or poisoned by ocean-borne litter, as well as the humans who eat seafood that has been contaminated by plastic microparticles.^{1,2} Abating the flow of lightweight plastics, such as plastic carrier bags, into the ocean is thus an urgent matter for policy intervention. Here, we summarize the impact of different policies around the world on reducing plastic usage. The evidence indicates that charging for plastic bags, via tax or fee, is most effective at curbing usage whereas "ban-only" legislation tends to have diminished results. Approximate conversions of other currencies to USD were made in March 2019.

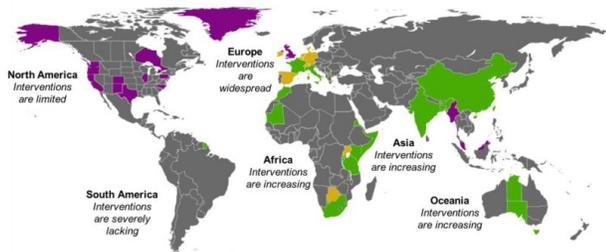


Figure 1: Global intervention status for lightweight plastic bags usage. Green: plastic bags banned, Yellow: taxes on some plastic bags, and Purple: partial tax or ban at the municipal or regional level.³

1 Successful global policies

Europe

- **England: 5 pence (0.07 USD) tax on plastic bags.** In 2015, England implemented a plastic bag tax on major businesses. The 7 main retail-

ers in England issued 83% fewer bags (over 6 billion fewer bags) after the tax was introduced (reported by the Department for Environment, Food and Rural Affairs).⁴ In an independent supermarket observation study conducted by Cardiff University,⁵ a 36% decrease in plastic bag use was observed after the tax was introduced.

- **Portugal: 0.10 Euro (0.11 USD) tax on plastic bags.** A Universidade Nova de Lisboa study⁶ examined the number of plastic bags carried by survey respondents at the same supermarket in Portugal before/during and 4 months after the implementation of a plastic bag tax in February 2015. They found a large (74%) reduction in plastic bag consumption, with a simultaneous (61%) increase of reusable plastic bags.
- **Wales: 5 pence fee (0.07 USD) on single-use bags.** A Cardiff University study examined the effect of a bag charge (plastic or paper),⁷ introduced in Wales in October 2011. 34% more respondents reported taking their own bag to the supermarket on their last shopping trip, and there was an increase in support for the charge. Additionally, the Welsh government estimates a greater than 70% reduction of single use bag usage across a variety of retail industries.⁸ The proportion of people using their own bags increased from 61% to 82%. Finally, as observed in other locales, support for the policy increased after it was implemented and people were acclimated, from 59% to 70%.
- **Ireland: 0.15 Euro (0.17 USD) tax on plastic bags.** A University College Dublin study⁹ examined the effect of a plastic bag tax introduced in March 2002. By questioning retailers, they es-

timated that plastic bag usage reduced by 94% following the introduction of the tax. Consumers generally responded positively to the tax.

- **Netherlands: Plastic bag ban.** In 2016, a ban on free plastic bags was enacted in the Netherlands. A year after the ban, a 71% decrease in plastic bag usage and 40% decrease in resulting litter was observed.¹⁰

Asia

- **China: 0.20-0.50 CNY (0.03-0.07 USD) fee on plastic bags.** A Beijing Normal University study¹¹ examined the effect of a mandatory plastic bag fee in supermarkets in China, introduced in 2008. They conducted two surveys, one before and one after the implementation of the fee. They found an overall reduction of 49% in self-reported new plastic bag consumption, and a 64% reduction of the number of new plastic bags used on the surveyed shopping trip.
- **Philippines: Plastic bag ban.** Local and national issues on solid waste management are characterized by issues of plastic litter in the Philippines. Plastic pollution exacerbated the results of floods in the Philippines because of drain blockages.¹² A variety of municipalities have implemented plastic bans and there was proposed federal legislation. One municipality, Muntinlupa, saw a 3% reduction in total daily waste collection (4 tons), and in Las Pinas, only 4% of their daily waste was plastic or styrofoam. Antipolo implemented a local ordinance banning the use of plastic bags in the commercial sector. Although data is missing for plastic usage pre-ban, over 90% of respondents indicated that they brought their own reusable grocery bags after the ban.¹³
- **Israel: 0.10 NIS (0.03 USD) tax on plastic bags.** On January 1st 2017, Israel introduced legislation that required large supermarket chains to charge customers at least 0.10 NIS for each plastic bag.¹⁴ This fee must be reported on their bill, and stores report their sales directly to the government. Proceeds from the tax go to the Ministry of Environmental Protection's Maintenance of Cleanliness Fund, funding air pollution reduction projects, raising awareness about the law, and helps manufacturers comply with the legislation. One year after the law's introduction, Israel saw an 80% reduction in overall plastic bag usage and has halved the number of plastic bags found at sea.
- **Malaysia: 0.06 USD tax on plastic bags.** In 2011, Malaysia implemented a tax on plastic bags

on Saturdays. This study suggests half of the population either used reusable bags or did not take a bag.¹⁵ The fee was given to charity or stayed in the stores for environmental conservation activities.

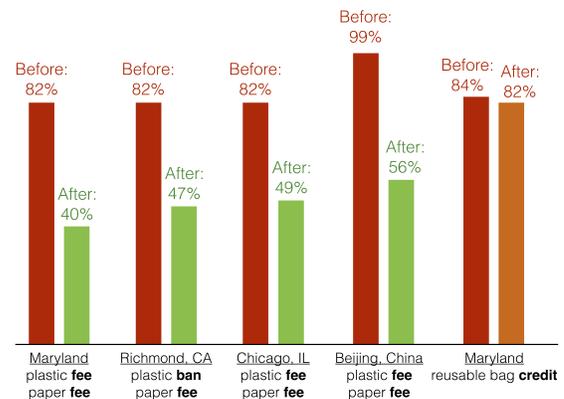


Figure 2: The percentage of customers using single-use bags drops in response to bans and fees, but not in response to reusable bag credits. Data reported in studies for the following locations: Maryland,¹⁶ Richmond,¹⁷ Chicago,¹⁸ and Beijing.¹¹

Africa, South America, and Oceania

- **South Africa: 0.46 Rand (0.05 USD) fee on plastic bags.** A plastic bag fee was introduced in May 2003. Corrected for the volume (value) of purchases, the plastic bag consumption at supermarket chains decreased by 90%.¹⁹ Following this period, the fee was reduced due to industry pressure, leading to a rebound in number of plastic bags issued, yielding an overall reduction of 44%.
- **Brazil: Replacing plastic bags with purchased compostable bags.** In 2008, the municipality of Belo Horizonte passed a law replacing plastic carrier bags with purchaseable compostable bags. 57% of interviewees reported using reusable bags rather than purchasing compostable bags, 10% bought smaller volumes of goods, and only 2.5% avoided shops that did not supply free bags.²⁰
- **Australia: Waste management and reduction strategies.** A survey of local efforts was performed across communities in Australia to assess efficacy of different waste management and reduction strategies, including outreach efforts, fines for littering/dumping, and bag bans.²¹ They suggest a combination of recycling, litter prevention and illegal dumping programs to be most effective.

North America

- **New England: Inter-state comparison of fees (0.05 USD) and bans by Ocean State Job Lot.** The retailer Ocean State Job Lot operates stores in several states and counties with plastic bag fees and bans.²² In stores where thin plastic bags were banned, 70% of customers used thicker plastic bags provided by the store (for free). In contrast, in stores where there was a fee for thin plastic bags, only 37% of customers used a plastic bag and 63% of customers used a reusable bag or no bag at all.
- **Washington, DC: 0.05 USD fee on paper and plastic bags.** 80% of residents reported using fewer bags each week (a decrease from approximately 10 bags per week to 4 bags per week in the average household) and more than 75% of businesses reported providing fewer bags to customers. Plastic bag litter decreased, with two-thirds of residents and businesses reporting seeing fewer plastic bags in the form of litter around the neighbourhood. Additionally, 53% of residents and 63% businesses expressed support for the ban.²³ The Alice Ferguson Foundation surveyed how common plastic bags were during Washington DC's annual clean up before and after the implementation of the fee and found that the number of plastic bags found at their annual clean-up dropped to nearly a quarter of their original levels.²⁴
- **Chicago, IL: 0.07 USD tax on plastic and paper bags.** A joint University of Chicago-New York University study¹⁸ reported that after implementation of a tax on plastic and paper bags, the number of plastic bags used at grocery stores decreased by over 40%. Furthermore, the number of customers bringing reusable bags increased 2.5 times, and the number of people who didn't use a bag nearly tripled.
- **Aspen, CO: Plastic bag ban and 0.20 USD fee on paper bags.** There has been a ban on plastic bags and a fee on paper bags since 2012.²⁵ In 2016, a supermarket study of around 1600 customers showed 15% of customers purchasing paper bags - all other customers used no bags or reusable bags. Since the ordinance came into effect, the highest average paper bag usage (annually) was 0.78 paper bags per \$100 of revenue.
- **Richmond, CA: Plastic bag ban and 0.05-0.10 USD fee on paper bags.** A University of California, Berkeley study looked at bag use before and after a plastic bag ban and a paper bag fee in Richmond, CA.¹⁷ Before the ordinance was implemented, 75% - 85% of customers used thin plastic bags. After, approximately 40% of customers used reusable bags at both national chain stores and discount chain stores. Approximately 40% of customers used paper bags at national chain stores (5 cent bag fee) and 10% used paper bags at discount chain stores (10 cent bag fee). The number of customers who did not use a bag jumped from 5% before the law to 20% at national chain stores and 40% at discount chain stores.
- **Santa Monica, CA: Plastic bag ban and 0.10 USD fee on paper bags.** A grocery store observation study found that before the ordinance, 69% of customers used plastic, which dropped to 0% after the ban.²⁶ Reusable bags more than quadrupled in use, and the number of people using no bag more than doubled.
- **San Jose, CA: Plastic bag ban and 0.10 USD fee on paper bags.** In under one year in San Jose, CA, a ban on thin plastic bags, coupled with a fee on paper bags reduced plastic bag litter in rivers to less than a third of the pre-ordinance levels.²⁷ Neighborhood litter from plastic bags dropped by more than two thirds. The prevalence of reusable bags increased from 4% to 62% post-ordinance and the prevalence of customers not using a bag increased from 19% to 43% post-ordinance.
- **Suffolk County, NY: 0.05 USD fee on plastic and paper bags.** In Suffolk county, a fee on plastic and paper bags was implemented in 2018.²⁸ After the fee was implemented, plastic bag usage decreased 82% (totalling 1.1 billion fewer plastic bags used in 2018) and paper bag usage decreased 79%. Grocery store observation studies showed that customers not using any bags or using reusable bags increased from 28% to 60%. Additionally, a 42% decrease in plastic bag litter and a 41% decrease in paper bag litter on shorelines was observed.
- **Montgomery County, MD: 0.05 USD fee on paper and single-use plastic bags.** After the fee was implemented, single-use bag use dropped by 42 percentage points (from 82% to 40%).¹⁶

2 Ineffective global policies

- **India: Ban on plastic bags.** Delhi raised the minimum thickness of bags and subsequently ordered a ban but it wasn't implemented thoroughly. This study suggests, where bans are not effectively enforced, information campaigns on environmental impact (contribution to the deadly Mumbai

Floods) and cashback/alternative schemes had an impact on plastic bag use.²⁹ Fees, dependent on amount, decreased plastic bag use by up to 10%. This combination of interventions decreased plastic bag usage from 80.8% to 57.1%. The study concludes that blanket bans are not the best policy for developing countries that lack enforcement capacity, and instead turn to fees, consumer awareness campaigns, and cashback plans.

- **Botswana: Plastic bag tax.** Botswana implemented a plastic bag levy that is proving ineffective, mostly due to the fact that consumers are willing to pay the tax to continue using plastic bags. The study suggests that the levy be increased and that the government must establish efficient collection methods to avoid the perception that the tax serves as revenue for retailers.³⁰
- **Westport, CT: Ban on plastic bags.** A check-out survey showed that in areas affected by the ban-only ordinance over 50% of customers used "reusable" bags (including thicker plastic bags), 45% of customers used paper bags, and 2% of customers carried out with no bag.³¹ The ban-only ordinance increased paper bag usage drastically (from virtually no usage to a prevalence of about 45%) relative to similar stores in areas that were unaffected by the ban-only ordinance.
- **Austin, TX: Plastic bag ban.** The 2014 ban succeeded in decreasing Austin's thin plastic bag waste in litter, at levels 25% of that in a nearby community without the same ordinance.³² However, retailers switched to thick, "reusable" plastic bags, not covered by the ban. The overall decrease in plastic litter was minor, largely driven by a five-fold increase in thick reusable plastic bags.
- **San Francisco, CA: Plastic bag ban.** In San Francisco, a ban on plastic bags (with no mandatory fee) was first implemented in 2007, only applying to large supermarkets and grocery stores with over \$2 million in annual sales.³³ The newsletter, Use-LessStuff conducted a survey on stores affected by this ban-only ordinance. Most retailers switched to offering paper bags, and retailers unaffected by the ban-only ordinance continued primarily offering plastic bags. Excessive use of paper bags was observed (with significant double bagging), and few customers brought their own reusable bags.
- **Montgomery County, MD: Resuable bag credit.** Giving a credit (reward) for bringing a reusable bag is ineffective. A 5 cent credit barely reduced single-use bag use in Montgomery County, MD (from 84% to 82%).¹⁶

3 Conclusion

Across multiple countries and continents, the common feature among effective plastic carrier bag regulations is a charge on the bag itself, via fee or tax. The fees in various implementations have ranged from the equivalent of 3 to 20 US cents,^{11,25} and can reduce the usage of these bags by half (Figure 2). Support for these policies tend to increase over time after implementation as people acclimate.^{8,34} Evidence also suggests that these behavior-changing policies increase consumers' support for other environmentally friendly policies,⁵ as well as their likelihood to make environmentally conscious product choices.³⁵

Plastic bag regulation is often ineffective when stores offer an alternative type of bag not explicitly prohibited by the regulation, such as paper bags or thick plastic bags that evade the regulation. This occurs most often with "ban-only" type legislation. Consumers will switch to using this alternative type of bag, failing to reduce overall single-use bag consumption. This occurred in Austin³² and San Francisco,³³ with thicker bags and paper bags, respectively. Other ineffective policies include a plastic bag ban implemented in Delhi, India²⁹ that failed because it was not effectively enforced, and a 5 cent credit to Maryland customers who brought reusable bags to the grocer, which resulted in no behavior change (Figure 2).¹⁶

Taken together, these studies in diverse locales amply demonstrate the power of charging for plastic on consumers' behavior. However, more work is needed to examine the effectiveness of these policies on the environment. A study on California's state-wide plastic ban and fee found policy "leakage" effects, namely an increase in purchases of unregulated small trash bags after implementation, though it still had a net impact of eliminating 28 million pounds of plastic from the waste stream.³⁶ As plastic regulation reaches new regions, we entreat researchers and governments to conduct thorough studies on the before and after effects of the policies on the local ecosystem, via litter analysis and other outcome measures. These studies are critical to quantifying the specific environmental impact of these regulations.

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