# PLASTIC BAGS
## SHORT-TERM USES WITH LONG-TERM CONSEQUENCES

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**Introduction and Significance**

In the past three decades, plastic consumption has doubled.[1] While plastic replaces many metal parts to decrease the weight of goods, "over one-third of [all] plastics are for short-term usage and are discarded within one year of being manufactured."[2] These types of goods are typically made entirely out of plastic, which is cheap and highly malleable. Figure 1 highlights the tendency of items with the highest plastic content to have the shortest lifespan. Figure 1 also shows that, in larger items, plastic comprises only a minority of the total materials. This targeted materials approach increases manufacturing productivity and product lifespan by developing specialized functions for plastic.

Conversely, single-use plastic goods are made entirely out of plastic and serve no long-term use. According to a report by the Ecological Society of America, approximately one trillion plastic shopping bags are disposed into the environment annually.[3] This can result in the long-term presence of plastic bags in landfills, where they can remain for up to 1000 years.[4] While the effects on terrestrial animal and human populations can be harmful, marine habitats suffer directly as well. Millions of plastic bags migrate to the ocean from landfills and trash receptacles every year and comprise 50-80% of shoreline debris, which causes ecological damage to marine animal populations.[5] Plastic bags present an especially frequent health hazard to "marine animals that consume jellyfish or squid, as they resemble these prey species when floating in water columns."[6] The resulting consumption of plastic bags chokes or entangles predator marine animals and birds.[7]

**Collective Action Problem, Opportunity Cost, and Free Riding**

As consumption increases for each individual, so does the amount of plastic bags. The connection between consumer purchases and plastic bags can be explained by Garrett Hardin's concept of the "Tragedy of the Commons." This human consumption paradox results from the gridlock between an individual's desire to maximize his or her individual benefit and the collective health or sustainability of society (i.e. conservation of a natural

resource or environment).[8] Further exacerbating the problem, the behavior of a single individual does not severely impact total consumption patterns. This results in a higher individual cost to change behavior while the rest of the group still benefits from the same practices.[9]

For most environmental issues, collective action problems surface from widespread individual use of a product, material, or resource. In a strict economic sense, the individual cost associated with behavior change equals the amount of a good given up to consume another good.[10] Using the plastic bag issues as an example: a rational human being would be less likely to purchase reusable bags when the opportunity cost would be the unlimited amount of free plastic ones.

While opportunity costs dissuade individual behavior change, group action can result in a shift in population consumption. Mark Lubell "posits that people will participate in a collective endeavor when the expected value of participation is greater than the expected value of non-participation."[11] The Lubell model suggests that an individual will only change his or her behavior when the cost of not changing their behavior is economically inefficient. Furthermore, individual consumers can enjoy the benefits of the environmentally friendly behaviors of others without having to directly contribute to them. Alone, a single individual does not influence the global climate and "the rational citizen… [will] free ride on the efforts of others" to remedy environmental issues.[12] Without comprehensive behavior shifts, some consumers will continue to use plastic bags and to benefit from the decrease in waste provided by other consumers who forego this same option.

In order to eliminate the free riding strategy, local policies can decrease the opportunity cost of collaborating on environmental issues. Government mandated economic disincentives and restrictions affect consumer decisions by making environmentally damaging behaviors, such as using plastic bags, rationally adverse. Government disincentives increase the individual cost of contributing to a collective action problem, which shifts consumer behavior to a new equilibrium.



**Plastic Bag Waste**

In every collective action problem, a threshold point exists where consumer behavior changes as a result of an economic tradeoff. With plastic bags, the economic tradeoff results from the government mandated fee on single-use carryout bags. Through the enforcement of local legislation, Washington, D.C. and Hawaii prove the effectiveness of government intervention to reduce plastic bag waste.

In order to judge the success of either case study, recorded data and observational studies provide a more comprehensive picture of government effectiveness. Washington, D.C. keeps extensive records of plastic debris in waterways, which help define the impact of local regulation in this area. On the other hand, due to the relative infancy of its program, Hawaii's data is scarce and relatively untested. Most of the effectiveness of its Hawaii Plastic Bag Reduction Ordinance is based on preliminary testimony by a member of the Department of Environmental Management and interviews with customers about their behavior changes.

**Plastic Bag Opposition**

Although plastic has been mass-produced for around 60 years, its impact on the environment is still uncertain.[13] Due to consumers' dependence on plastic both as a product and as a device to carry purchases, single-use plastics are integrated into consumer behavior and product manufacturing. As annual consumption of plastic worldwide reaches 245 million tons, the production and consumption of plastic does not have a foreseeable end.[14]

While plastic waste presents a credible threat to the health of both human and animal populations, the response to this problem proceeds slowly. An essay by R.C. Thompson postulates that the quantity of plastic garbage in the environment "will continue to increase— unless we all change our practices."[15] Additionally, a Gallup poll suggests that American consumers seem generally unenthused about contributing to any direct environmental improvements, with only 34% of Americans[16] worrying about the global

environment.[17] While consumer accountability remains tentative, one fact remains certain: the continual disposal of plastic bags will affect the global ecosystem for hundreds of years to come.

**Plastic Bag Support**

As opposition to plastic bags begins to gain momentum, interest groups and select consumers both push against reducing plastic bag availability. Coalitions, such as the American Progressive Bag Alliance (APBA), organize groups of individuals to rally support for American plastic bag manufacturers. The APBA website posts blogs, contains links to Congressional Representatives' websites, and distributes product information stating that plastic bags are "the environmental choice."[18] Defending the "booming" plastic job market, the APBA website cites available recycling opportunities and advocates the energy saving properties of plastic bags.[19] The information provided on this site, however, is highly repetitive and has no scientific support. APBA cites a "recent national survey," which "shows that over 90% of Americans reuse their plastic bags."[20] There is no citation or information on how this "recent national survey" was taken, what population was polled, or the confidence level. Plastic bag support lacks reliable sources to confirm many of the arguments for plastic bag reuse and recycling.

Another plastic bag interest group, *Bag the Ban*, provides similarly faulty figures on their "Recycling" page. *Bag the Ban* uses statistics from the U.S. Environmental Protection Agency (EPA) to argue that plastic bag recycling has nearly doubled in the past nine years.[21] Figure 2 indicates this slight positive increase in plastic product recovery since 1990. Yet, the presence of this trend is dwarfed by the disproportionate increase in plastic generation over the last 45 years.

Critics of plastic bag bans also argue against the use of reusable bags due to some observed health consequences. According to a study funded by the American Chemistry Council, more than half of the 84 reusable bags tested from shoppers in California and Arizona contained some sort of "coliform bacteria, a category that includes *Escherichia coli*."[22] This finding suggests a consumer health risk to food-borne bacteria by not regularly washing reusable bags.[23]



Further exacerbating the problem, consumer awareness to these serious health risks is low, with 97 percent of those interviewed never having washed or bleached their reusable bags.[24] The presence of this public safety concern considerably impacts the local enactment of plastic bag bans. Local lawmakers will have to address these safety concerns by providing instructions on bags, educating the public, instructing consumers to separate their food, and making sure that consumers do not use these bags for other purposes.[25]

Yet, while plastic bag support suggests the high risk of food contamination in reusable bags, an additional report by San Francisco's Communicable Disease and Control Prevention division asserts that the "average healthy person is not going to get sick from the bacteria that were listed [in the study]" and that the failure to identify the type of *E. coli* in the bags is a "significant shortcoming" to the study.[26] This critique of the currently accepted alternative (i.e. reusable bags) could either be an attempt to encourage consumer doubt in the legislation or an effort to expose a serious public health concern.

**Plastic Bag Bans: Throughout the Nation**

Although California is a relative newcomer to plastic legislation, plastic bag bans and taxes are not widespread throughout the United States. The lack of legislation results from a variety of factors, including powerful special interest groups, low constituent approval, and misinformation about the negative consequences of plastic bags. At this point in time, Americans remain unflinching in their acceptance of plastic bags. Figure 4, from the National Conference of State Legislatures (NCSL), shows the handful of local governments that currently restrict the distribution of plastic bags.[27]

**Case Study: Washington, D.C**

In an effort to combat the negative impact of plastic in the environ-

ment, Washington, D.C. proposed and enacted local legislation that has decreased plastic bag waste. Formerly, the Anacostia River had been known for its "astronomical levels of trash," which gave it the unsavory title of the "dirtiest of all streams."[28] The Anacostia Watershed Society currently uses a trash trap to estimate the amount of plastic bag waste contained in the waterways.[29] Prior to local legislative efforts, plastic bag waste in eight tributary streams to the Anacostia River doubled from 2007-2008.[30]

The results of the data collected and further observations of river trash forced political action in Washington, D.C. On January 1, 2010, the Anacostia River Cleanup and Protection Act began charging 5 cents for each plastic or paper bag distributed.[31] In an effort to encourage business acceptance of this mandate, stores keep 1-2 cents of the fee and the remainder goes to the Anacostia River clean up.[32] As the first city in the nation to implement a fee on disposable plastic and paper bags, Washington, D.C. attempts to corral business, individual, and environmental interests into one piece of local legislation.[33]

According to the District of Columbia Department of the Environment's website, the goal of the law is "to change consumer behavior by encouraging District residents to use reusable bags."[34] Efforts to achieve this goal have resulted in a decrease in plastic bag use during the first years following the implementation of the bag tax. Similarly, as district businesses notice a reduction in plastic bag use, clean-up groups also observe less pollution in the surrounding waterways.[35] Figure 5 is a District Department of the Environment (DDOE) chart mapping the number of plastic bags over the months before and after the plastic bag tax. The downward trend in plastic bag pollution over a three-year period could mark the success of government efforts to shift consumer behavior.

The decrease in Figure 5 could also be a result of increased consumer accountability. On the DDOE website, there are links to a tip line to report any stores in violation of the Act as well as resources and information for residents about the progress of the bag tax and the benefit to the river. By



making the legislation readily available to local consumers, the DDOE increases the effectiveness of the bag tax by creating a well-informed public. In Washington, D.C., the combination of education and government mandated plastic mitigation contributes to the success of the Anacostia Act.

**Case Study: Hawaii**

As Washington, D.C. continues to combat plastic bag waste in its waterways, local legislation throughout Hawaii attempts to protect its most valuable natural resources. Hawaii's surrounding ocean suffers most significantly from plastic litter due to high winds and its over-accumulation in landfills.[36] The resulting plastic bag waste harms the native fauna of the islands, especially fishes, turtles, birds, and other animals that become entangled or choke on the plastic thinking it is food.[37] To address these waste management concerns, the Hawaii Plastic Bag Reduction Ordinance attempts to preserve the "health, safety, welfare and scenic natural beauty of the County of Hawai'i."[38]

The County of Hawaii's ordinance became law on January 17, 2013 with provisions that ensure all businesses charge a fee for any single-use plastic carryout bag.[39] Accordingly, the counties under the jurisdiction of the ordinance have one year to phase out single-use bags entirely, and as of January 17, 2014 plastic carryout bags are prohibited.[40] Taking plastic bag legislation a step farther, Hawaiian local legislatures also ban plastic and paper bags that are non-biodegradable or at less than 40 percent recycled.[41] Although lacking formal statewide legislation, the state of Hawaii benefits from its "de facto ban," which results from the collective actions of all the counties in the state to institute the same restrictive ordinance.[42]

With the use of consumer-based strategies, the ordinance provides an example of incremental implementation. Chris Chin-Chance of the Hawaii County Department of Environmental Management[43] spoke positively about business efforts saying that the Plastic Bag Reduction Ordinance (PBRO) does not specify a cost for plastic checkout bags but "most businesses have established rates that seem to have modified consumer behavior."[42]

Furthermore, the Department of Environmental Management is observing a "significant increase in the usage of reusable bags" through periodic "observational surveys of shoppers exiting selected businesses."[44]

Yet, there are significant limitations to the Hawaiian case study and even Mr. Chin-Chance does not know how the ban will affect plastic bag waste throughout the state. Unfortunately, the County of Hawaii Department of Environmental Management does not keep official figures on waste prevalence in waterways, which limits quantitative data.[45] However, research stipulates that every reusable bag has the potential to replace over 600 single-use plastic bags over its life time, which reduces litter and conserves natural resources.[46] Although suffering from statistical limitations, the Hawaiian case study still depicts the preliminary success of local environmental action.

**A Further Case Study: Los Angeles**

As of January 2014, Los Angeles has stopped the distribution of plastic bags. Large grocers and retailers in the City of Los Angeles currently "ban plastic carryout bags and require a $0.10 fee on each paper carryout bag requested" to help reduce waste and pollution.[47] In July 2014, the ordinance will further expand to small retailers.[48] In order to avoid any disproportionate effects of the law along income brackets, the ordinance will provide free reusable or recyclable bags to customers on the California Supplemental Food Program.[49]

In the City of Los Angeles alone, the estimated quantity of single-use plastic bags is 2,031,232,707 per year.[50] This quantity of waste increases air pollutant emissions from the manufacturing and delivery of plastic bags. Waste measurements in storm water collection systems indicate that single-use plastic and Styrofoam food containers comprise approximately 25% of the litter stream entering the Los Angeles River Watershed.[51] Similar to the prior two case studies, marine life is also severely impacted by this type of waste and in 2010 the Ocean Conservancy found that "14.6% of marine wildlife found entangled were entangled by plastic bags."[52] The removal of



single-use plastic carryout bags improves environmental quality by reducing the plastic debris entering the terrestrial and marine environments and habitats.[53]

In an effort to increase public awareness, Los Angeles also endorses an education campaign to promote the use of reusable bags and argue against continuing to increase plastic waste. The "Bring-Your-Own-Bag" Campaign in Los Angeles distributes reusable bags and teams up with celebrities and the California Grocers Association "to preserve our environment by bring our own bags to the market."[54] According to the Los Angeles Ordinance environmental impact report, reusable bags generate more pollution per bag production and transportation than plastic bags, but they can be used up to 100 times or more.[55] When compared relatively to plastic bags, the benefits of reusable bags to the environment significantly outweigh any associated negative externalities.

Since the enactment of the ordinance, the County of Los Angeles indicates a decline in single-use paper bags by approximately 121,000 per store.[56] The single-use carryout bag ordinance will not only reduce the amount of waste generated from these products but could also reduce air pollutant emissions from the manufacturing and delivery of single-use bags.[57] Combined, these benefits will contribute to a "beneficial cumulative impact to biological resources" throughout the Los Angeles region.[58]

**Plastic Waste Recovery and Regeneration: A Possible Solution?**

Plastic recovery and recycling could be better promoted in the United States to reduce the amount of single-use plastic waste. In his article on plastics in the environment, R.C. Thompson states that plastic debris is avoidable, but only if it is treated as integral to new production, rather than waste.[59] The current recovery of "bags, sacks, & wraps" in the United States is 9.4% and "overall recovery of plastics for recycling is relatively small."[60] Figure 3 shows the total amount of containers and packaging generated and discarded in municipal solid waste sites during 2009, as reported by the EPA. While total generation of plastic is relatively normal compared to

other materials, the total discarded plastic (the second pie chart in Figure 3) accounts for more than a quarter of total waste. Figure 3 shows that while plastics do not represent a majority of the total materials produced, they disproportionately dominate the waste spectrum.

**Environmental Problems as Collective Action Problems**

Without government regulations, profit-based individual behavior can lead to the depletion of available global resources. However, this conclusion does not assume total human apathy, but relies on a realistic depiction of profit-based behavior. Most people think that their actions will not have lasting effects on the physical state of the Earth or the health of entire animal populations. Yet, if everyone acts the same way, the resulting collective effect can greatly impact the environment, humanity, and natural resources.

All three case studies, Washington, D.C., Hawaii, and Los Angeles reveal the large impact of a small disincentive to modify consumer behavior. Through effective and informed local governance, entire communities, cities, or states can alleviate waste management and production issues by shifting to a more environmentally sustainable alternative. Although plastic bags are a relatively local concern, the incremental implementation of legislation to solve a problem may prove effective for other environmental issues.



**Appendix A**

Data Figures

Figure 1: Plastic Items and Their Estimated Lifespan[61]

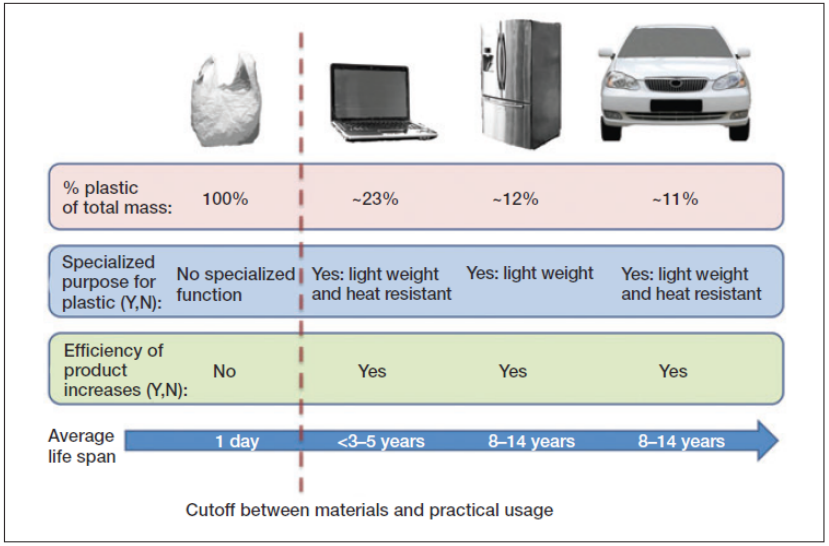



Figure 2: Plastics Generation and Recovery, 1960 to 2009[62]

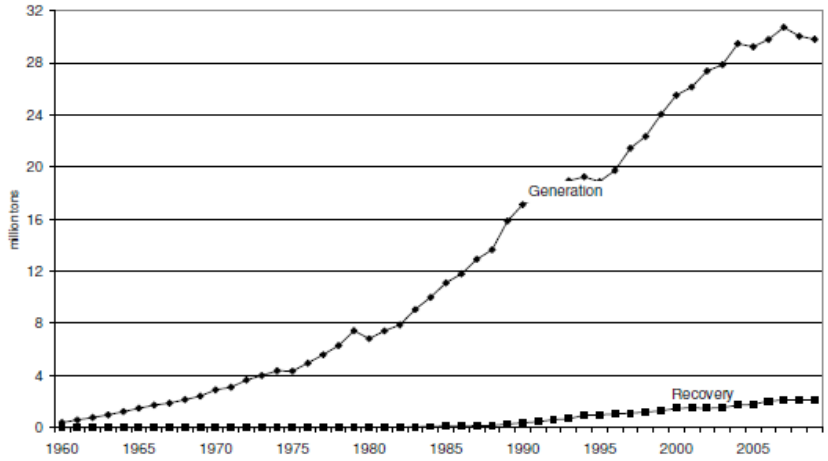


Figure 3: Containers and packaging generated and discarded in municipal solid waste, 2009 (In percent of total generation and discards)[63]

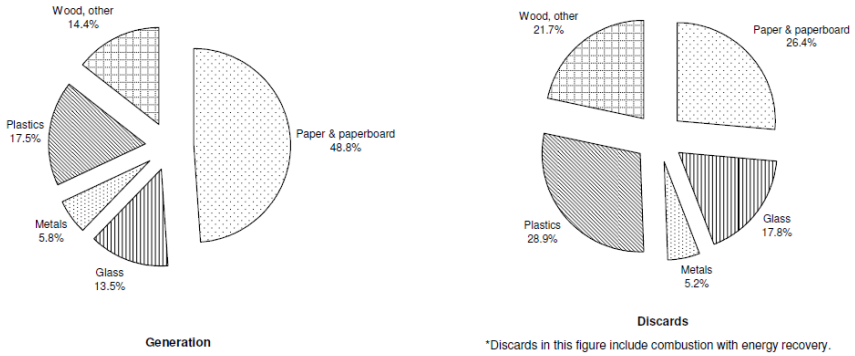



Figure 4: Enacted Plastic and Paper Bag Legislation in the United States

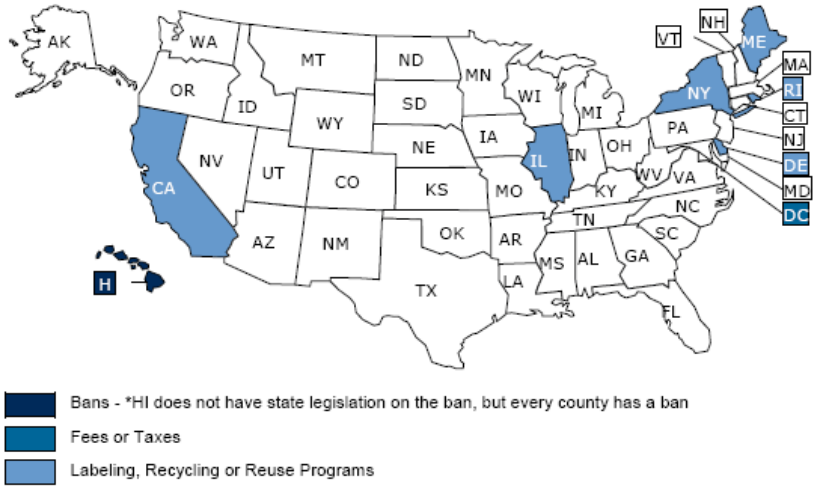
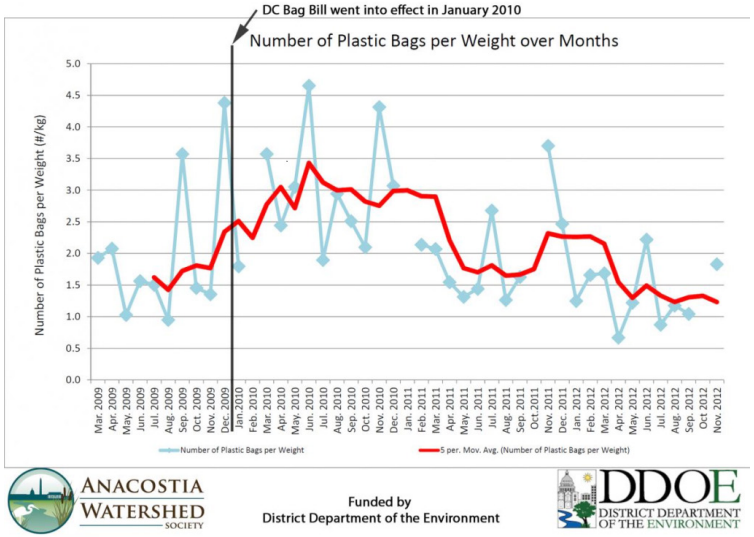





Figure 5: Trend in Plastic Bag Litter from March 2009 to November 2012




## Appendix B

*Questions and Answers from an Email Interview with Chris Chin-Chance, Recycling Coordinator for County of Hawaii Dept. of Environmental Management*

What has been the reaction of consumers (i.e. the public) to the Plastic Bag Reduction Ordinance?

> *I assume you mean after the law has been implemented, correct? There has been a mix of reactions to the Ordinance. Most consumers have adapted to the new law – they have either brought their own reusable bags, bought plastic bags (and/or paper bags if they are not free) at the checkout, some have switched to free paper bags*

*– while some have done without any bags when shopping. There was some vocal opposition to the law when it was nearing phase one implementation (no free plastic checkout bags) and for a period afterwards.*

Do you think that the Reduction Ordinance effectively targets consumer behavior and provides a high enough disincentive to switch users from plastic to reusable bags?

*The Plastic Bag Reduction Ordinance (PBRO) did not set the disincentive rate/cost for the purchase of plastic checkout bags; that was left entirely to the discretion of individual businesses. Most businesses have established rates that seem to have modified consumer behavior; this has been demonstrated in periodic before and after observational surveys of shoppers exiting selected businesses, which have shown a significant increase in the usage of reusable bags. Some businesses offer free paper bags and consumers have switched to those too. Without interview surveys of consumers it is impossible to definitively conclude that the reason for the switch was the disincentive rate and not some other factor.*

What has been your success in the County of Hawai'i since the Reduction Ordinance took effect in January of this year? As I've previously stated there has been a significant increase in the usage of reusable bags based on limited observational surveys done at some businesses. I don't have those figures with me at the moment but if you would like the survey summary results I could get them maybe in June.

Has there been a significant decrease in plastic waste? Or is there projected to be such a decrease? (Are businesses reporting a reduction in bag usage?)

*Single-use plastic checkout bags are such a tiny fraction of the total waste stream and we do not frequently conduct waste composition studies to determine if plastic waste has decreased so it would be difficult to measure any decrease. We do not survey businesses on their plastic bag usage.*

Considering the state-wide de facto ban on plastic bags, do you think that the state of Hawaii will soon enact legislation to ban plastic bags formally?

*I believe in the just concluded legislative session a proposal to have a statewide plastic bag fee to fund watershed protection (?) did not make it to law. Given that history I would hesitate to predict the success of a similar proposal in the upcoming session.*

Do you think advertisements encouraging people to "Bring Your Bags" and "Shop with Aloha" have increased consumer *awareness* (i.e. people are more likely to bring their own bags because they are constantly reminded)?

*Yes.*

**Notes**

1 Brett Scheffers and Thomas C Wanger. "Plastic: Matching Material with Usage." The Ecological Society of America: 151-152. doi:10.1890/11.WB.005., 151.

2 *Ibid*, 152.

3 Senior, Kathryn. "End in Sight for Plastic Bags," The Ecological Society of America, Vol. 6, No. 3, (2009): 119.

4 *Ibid*, 119.

5 Richard C. Thompson, Charles Moore, Frederick Saal and Shanna Swan. "Plastics, the Environment and Human Health," 2154.

6 Kathryn Senior. "End in Sight for Plastic Bags," 119.

7 *Ibid*, 119.

8 Thomas Robertson. The Malthusian Moment. New Jersey: Rutgers University Press, 2012, 154.

9 Mark Lubell, Sammy Zahran, and Arnold Vedlitz, "Collective Action and Citizen Responses to Global Warming," *Political Behavior*, Vol. 29, No. 3 (Sep., 2007), 391-413. doi. 10.1007/s11109-006-902, 392.

10 Grieco, Joseph M. *State Power and World Markets: The International Political* Economy. New York: W.W. Norton & Co., Inc., 2003, 349.



11 Mark Lubell, Sammy Zahran, and Arnold Vedlitz, "Collective Action and Citizen Responses to Global Warming," 392.

12 *Ibid*, 392.

13 Jefferson Hopewell, Robert Dvorak, Edward Kosior, "Plastics Recycling: Challenges and Opportunities," *Philosophical Transactions: biological Sciences*, Vol. 364, No. 1526, 2116.

14 Anthony L Andrady and Mike A. Neal. "Applications and Societal Benefits of Plastics," Philosophical Transactions: Biological Sciences, Vol.364, No.1526 (2009): 1977-1984. doi: 10.1 098/rstb.2008.0, 1977.

15 Richard C. Thompson, Charles Moore, Frederick Saal and Shanna Swan. "Plastics, the Environment and Human Health," 2155.

16 According to Gallup Polls, this poll was based on a random sample of 1,014 adults who own a telephone and has a 95% confidence level with only a 4% margin of error.

17 Lydia Saad, "Americans More Upbeat About Environmental Quality," *Gallup Politics*, gallup.com. 15 Mar. 2010. Web. Accessed on 10 May 2013. < http://www.gallup.com/poll/126620/Americans-Upbeat-Environmental-Quality.aspx>.

18 "Home Page," American Progressive Bag Alliance (APBA), plasticindustry.org. Web. Date Accessed 10 May 2013.

19 *Ibid*.

20 *Ibid*.

21 "Bag the Ban," Bag the Ban, bagtheban.com. Web. Date Accessed 10 May 2013. <http://www.bagtheban.com/learn-the-facts/recycling>

22 Wyckoff, Whitney Blair. (2010, June 25) "Bacteria May Grow in Reusable Bags, But Don't Fret," *National Public Radio*. http://www.npr.org/blogs/health/2010/06/25/128105740/plastics-industry-funded-study-finds-bacteria-in-reusable-grocery-bags

23 Harrison, Jeff. (2010, June 24). "Reusable Grocery Bags Contaminated With E. Coli, Other Bacteria," *University of Arizona News*. http://uanews.org/story/reusable-grocery-bags-contaminated-e-coli-other-bacteria.

24 *Ibid*.

25 *Ibid*.

26 Wyckoff, Whitney Blair. (2010, June 25) "Bacteria May Grow in Reusable Bags, But Don't Fret," *National Public Radio*. http://www.npr.org/blogs/health/2010/06/25/128105740/plastics-industry-funded-study-finds-bacteria-in-reusable-grocery-bags

27 "State Plastic and Paper Bag Legislation: Fees, Taxes, and Bans; Recycling and Reuse," *National Conference of State Legislatures*.(2014, February). http://www.ncsl.org/research/environment-and-natural-resources/plastic-bag-legislation.aspx.

28 Bradley Kennedy, "The DC Bag Fee is Cleaning up the Anacostia River," 25 Feb. 2013. Web. Date Accessed 11 May 2013. <http://www.anacostiaws.org/news/blog/dc-bag-fee-cleaning-anacostia-river>





29 *Ibid*.

30 *Ibid*.

31 "Skip the Bag, Save the River." *The District of Colombia*, District Department of the Environment. Web. Date Accessed 11 May 2013. <http://green.dc.gov/bags>.

32 "Skip the Bag, Save the River." *The District of Colombia*, District Department of the Environment. Web. Date Accessed 11 May 2013. <http://green.dc.gov/bags>.

33 "Protect the Anacostia River Cleanup Fund." Web. Date Accessed 11 May 2013. <http://www.trashfreeanacostia.com/>.

34 *Ibid*.

35 "Skip the Bag, Save the River." *The District of Colombia*, District Department of the Environment. Web. Date Accessed 11 May 2013. <http://green.dc.gov/bags>.

36 *Ibid*.

37 "County of Hawai'I Plastic Bag Reduction Ordinance," *County of Hawai'I Department of environmental Management: Solid Waste Division & Recycling Section*. Web. Date Accessed 11 May 2013. <http://www.hawaiizerowaste.org/reuse/plastic-bag-reduction-ordinance/#.UY6J4Wcf-yw>

38 Ordinance No. 12.1. *County of Hawai'I, State of Hawai'i*. Bill No. 17, Draft 2. 1.

39 "County of Hawai'I Plastic Bag Reduction Ordinance," *County of Hawai'I Department of environmental Management: Solid Waste Division & Recycling Section*. Web. Date Accessed 11 May 2013. <http://www.hawaiizerowaste.org/reuse/plastic-bag-reduction-ordinance/#.UY6J4Wcf-yw>

40 *Ibid*.

41 *Ibid*.

42 "State Plastic and Paper Bag Legislation: Fees, Taxes, and Bans; Recycling and Reuse," *National Conference of State Legislatures*, ncsl.org. March 2013. Web. Date Accessed 11 May 2013. <http://www.ncsl.org/issues-research/env-res/plastic-bag-legislation.aspx>.

43 Chris Chin-Chance, Email Interview, 24 May 2013.

44 *Ibid*.

45 *Ibid*.

46 *Ibid*.

47 "FAQ: Single-Use Carryout Bag Ordinance," *City of Los Angeles: Bureau of Sanitation*. http://www.lacitysan.org/pdf/2013/FAQ-Reusable_Bag_Program.pdf.



48 *Ibid*.

49 *Ibid*.

50 *Ibid*, 19.

51 "Single-Use Carryout Bag Ordinance," *City of Los Angeles: Bureau of Sanitation*. (2013, May). Final Environmental Impact Report. http://www.lacitysan.org/pdf/2013/CF-11-1531_FEIR.pdf., 34.

52 *Ibid*, 35.

53 *Ibid*, 38.

54 "City Officials Launch Bring Your Own Bag Campaign," *City of Los Angeles: Bureau of Sanitation*. (2013, November 18). Press Release. http://www.lacitysan.org/pdf/BYOBNewsRelease.pdf.

55 *Ibid*, 19.

56 "Single-Use Carryout Bag Ordinance," *City of Los Angeles: Bureau of Sanitation*. (2013, May). Final Environmental Impact Report. http://www.lacitysan.org/pdf/2013/CF-11-1531_FEIR.pdf., 27.

57 *Ibid*, 28.

58 *Ibid*, 39.

59 R.C. Thompson, C.J. Moore, F.S. Vom Saal, S.H. Swan, "Plastics, the Environment and Human Health: Current Consensus and Future Trends," *Philosophical Transactions: Biological Sciences*, Vol. 364,

No. 1526, (Jul., 2009), 2153-2166. 2159.

60 *Ibid*, 53-4.

61 Ibid, 152.

62 "Municipal Solid Waste in the United States: 2009 Facts and Figures," *United States Environmental Protection Agency,* December 2010*,* 55.

63 *Ibid*, 100.



**Bibliography**

Andrady, A. L and M.A. Neal. "Applications and Societal Benefits of Plastics," *Philosophical Transactions: Biological Sciences*, Vol.364, No.1526 (2009): 1977-1984. doi: 10.1 098/rstb.2008.0, 1977.

"Bag the Ban," Bag the Ban, bagtheban.com. Accessed from http://www.bagtheban.com/learn-the-facts/recycling.

Chin-Chance, Chris. Email Interview, 24 May 2013.

"City Officials Launch Bring Your Own Bag Campaign," *City of Los Angeles: Bureau of Sanitation.* (2013, November 18). Press Release. http://www.lacitysan.org/pdf/BYOBNewsRelease.pdf.

"County of Hawai'I Plastic Bag Reduction Ordinance," *County of Hawai'I Department of Environmental Management: Solid Waste Division & Recycling Section*. Retrieved from http://www.hawaiizerowaste.org/reuse/plastic-bag-reduction-ordinance/#.UY6J4Wcf-yw.

"FAQ: Single-Use Carryout Bag Ordinance," *City of Los Angeles: Bureau of Sanitation*. http://www.lacitysan.org/pdf/2013/FAQ-Reusable_Bag_Program.pdf.

Harrison, Jeff. (2010, June 24). "Reusable Grocery Bags Contaminated With E. Coli, Other Bacteria," *University of Arizona News*. http://uanews.org/story/reusable-grocery-bags-contaminated-e-coli-other-bacteria.

"Home Page," American Progressive Bag Alliance (APBA), plasticindustry.org.

Hopewell, J., R. Dvorak, and E. Kosior, "Plastics Recycling: Challenges and Opportunities," *Philosophical Transactions: Biological Sciences*, Vol. 364, No.1526.

Kennedy, Bradley, "The DC Bag Fee is Cleaning up the Anacostia River," 25 Feb. 2013. Retrieved from http://www.anacostiaws.org/news/blog/dc-bag-fee-cleaning-anacostia-river.

Lubell, M., S. Zahran, and A. Vedlitz, "Collective Action and Citizen Responses to Global Warming," *Political Behavior*, Vol. 29, No. 3 (Sep., 2007), 391-413. doi. 10.1007/s11109-006-902, 392.

"Municipal Solid Waste in the United States: 2009 Facts and Figures," *United States Environmental Protection Agency*, December 2010. 55.

Ordinance No. 12.1. County of Hawai'I, State of Hawai'i. Bill No. 17, Draft 2. 1.

"Protect the Anacostia River Cleanup Fund." http://www.trashfreeanacostia.com.

Robertson, Thomas. *The Malthusian Moment*. New Jersey: Rutgers University Press, 2012.

Saad, Lydia, "Americans More Upbeat About Environmental Quality," *Gallup Politics*, gallup.com. 15 Mar. 2010. Accessed on 10 May 2013. Retrieved from http://www.gallup.com/poll/126620/Americans-Upbeat-Environmental-Quality.aspx.

Scheffers, B. and T.C. Wanger. "Plastic: Matching Material with Usage." *The*



*Ecological Society of America*: 151-152. doi:10.1890/11.WB.005., 151. Senior, Kathryn. "End in Sight for Plastic Bags," *The Ecological Society of America*, Vol. 6, No. 3, (2009): 119.

"Single-Use Carryout Bag Ordinance," City of Los Angeles: Bureau of Sanitation. (2013, May). Final Environmental Impact Report. http://www.lacitysan.org/pdf/2013/CF-11-1531_FEIR.pdf.

"Skip the Bag, Save the River." *The District of Colombia, District Department of the Environment*. http://green.dc.gov/bags.

"State Plastic and Paper Bag Legislation: Fees, Taxes, and Bans; Recycling and Reuse," *National Conference of State Legislatures*, ncsl.org. February 2014. Retrieved from http://www.ncsl.org/issues-research/env-res/plastic-bag-legislation.aspx.

Thompson, R. C., C. Moore, F. Saal and S.Swan. "Plastics, the Environment and Human Health," *Philosophical Transactions: Biological Sciences*, Vol. 364, No. 1526, (Plastics, the Environment and Human Health, 2009): 2153-2166. doi:10.1098/rstb.2009, 2154.

Wyckoff, Whitney Blair. (2010, June 25) "Bacteria May Grow in Reusable Bags, But Don't Fret," *National Public Radio*. http://www.npr.org/blogs/health/2010/06/25/128105740/plastics-industry-funded-study-finds-bacteria-in-reusable-grocery-bags.