

## SB 5323, to impose a statewide ban on plastic grocery bags and require an 8-cent fee for paper bags

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### Key findings

1. The Legislature is considering, SB 5323, to impose a statewide ban on plastic grocery bags and require an 8-cent fee for paper bags.
2. Most marine debris does not come from bags. In Puget Sound plastic bags account for only 4.4 percent of trash on beaches, about 10 percent of all plastic debris.
3. Additionally, most ocean pollution comes from other countries. The United States contributes less than one percent of the world's plastic pollution in the ocean.
4. Although the legislation claims reusable bags are “superior across most environmental performance metrics,” scientific analysis demonstrates reusable bags are significantly worse for the environment.
5. Replacing plastic bags with reusable polypropylene and cotton bags would likely increase both air and water pollution, according to independent life-cycle environmental analyses.
6. Even if consumers use replacement bags 370 times, they would still increase freshwater pollution, even if 70 percent of consumers use polypropylene bags and the remainder use cotton bags.
7. Cotton replacement bags, and especially organic cotton bags, cause the greatest environmental harm, particularly to water quality.

8. These environmental costs don't include the added environmental impact of washing reusable bags or of the additional plastic bags used to replace secondary uses, like trash liners and picking up after pets.

### Introduction

Following in the footsteps of cities like Seattle, Issaquah, and Tacoma, Washington state legislators are considering banning plastic grocery bags statewide. SB 5323 would impose a ban and require grocery stores to charge eight cents for a recycled paper bag.<sup>1</sup>

Advocates argue the ban would help the environment by reducing the amount of plastic in the ocean and protecting marine life. They also argue that plastic bags are difficult to recycle and often end up in landfills.

Independent research, however, finds many of those claims are exaggerated or false. Scientific analysis demonstrates that banning plastic bags would likely increase environmental harm. The Danish Ministry of Environment and Food completed an analysis of grocery bags in February of 2018, comparing the environmental effects of plastic bags to their likely alternatives, including cotton and reusable polypropylene bags.<sup>2</sup>

There are other concerns with reusable grocery bags, including higher cost, health concerns, and inconvenience. Those are all real costs and should be considered. This

1 SB 5323, “Reducing pollution from plastic bags by establishing minimum state standards for the use of bags at retail establishments,” Washington state legislature, introduced January 17, 2019, at <https://app.leg.wa.gov/bills/summary?BillNumber=5323&Year=2019&Initiative=false>

2 Ministry of Environment and Food Denmark, “Life Cycle Assessment of grocery carrier bags,” Environmental Project no. 1985, February 2018, at <https://www2.mst.dk/Udgiv/publications/2018/02/978-87-93614-73-4.pdf>

analysis, however, will focus on the potential environmental impacts of a ban.

The concern about plastic waste in the world's oceans is real. Plastic bags have an impact on the environment. Banning plastic bags, however, would encourage people to switch to alternatives that are more harmful than plastic bags and would likely increase the overall environmental footprint of grocery bags.

### **Washington state contributes very little to ocean plastic pollution**

In early 2016, a study claimed the amount of plastic in the world's oceans would be greater than the weight of fish by 2050.<sup>3</sup> Although some questioned the estimate,<sup>4</sup> there is no question the growing amount of plastic in the oceans poses a significant problem. Tracy Mincer, a microbiologist at the Woods Hole Oceanographic Institution, put it succinctly, noting, "Plastics in the ocean are the most abundant manmade debris found in the oceans, and it is bad. This debris adds up to a massive problem."<sup>5</sup>

The preamble of the legislation specifically acknowledges this concern, noting that reusable bags are superior to plastic bags with respect to "marine debris."

Unfortunately, a ban on plastic grocery bags, known as low-density polyethylene (LDPE) would not reduce the important sources of ocean plastic for a couple reasons.

First, only a small percentage of ocean plastic comes from grocery bags. Data collected from the Puget Sound using the Marine Debris Tracker app, show plastic bags

make up a small portion of marine debris.<sup>6</sup> In 2018, users reported 1,850 pieces of debris on Puget Sound shores. Plastic bags accounted for just 4.4 percent of the identified trash. Other types of plastic were far more prevalent. Plastic food wrappers represented 14.3 percent of all debris. The general category of "Plastic or foam" made up 21.7 percent of the logged items. Three percent of the items were straws. While it is possible that some of the items in the "plastic or foam" category are bits of plastic bags, it is unlikely plastic bags make up much of this category, since there is a specific reporting category for the bags.

National data for 2018 are similar. Of the more than 41,000 items logged into the Marine Debris Tracker app, plastic bags account for just 6.5 percent of marine debris. Plastic or foam accounts for 18.7 percent, and plastic food wrappers make up 18.5 percent.

Assuming the ban would be completely effective and that none of the plastic bags reported are the type of bag that would be exempt, including plastic bags for frozen foods or meat, the ban would only reduce about five percent of total debris, and less than 10 percent of the plastic debris found on Washington state beaches.

### **Most ocean plastic pollution comes from other countries**

The United States is responsible for an extremely small percentage of the plastic in the world's oceans. The primary cause of plastic pollution in the ocean is poor trash collection in some developing countries. Trash and roadside litter washes into the water and drifts into the ocean. As Tracy Mincer notes, "Some of these areas along the coastal areas, there is so much plastic you can't see the water. It is

3 Kaplan, Sarah, "By 2050, there will be more plastic than fish in the world's oceans, study says," *The Washington Post*, January 20, 2016, at [https://www.washingtonpost.com/news/morning-mix/wp/2016/01/20/by-2050-there-will-be-more-plastic-than-fish-in-the-worlds-oceans-study-says/?utm\\_term=.5b3382142310](https://www.washingtonpost.com/news/morning-mix/wp/2016/01/20/by-2050-there-will-be-more-plastic-than-fish-in-the-worlds-oceans-study-says/?utm_term=.5b3382142310)

4 Hornak, Leo, "Will there be more fish or plastic in the sea in 2050," BBC News, February 15, 2016, at <https://www.bbc.com/news/magazine-35562253>

5 Mincer, Tracy, "Plastic in the ocean," Woods Hole Oceanographic Institution, February 15, 2016, at <http://www.whoi.edu/visualWHOI/plastic-in-the-ocean>

6 The Marine Debris Tracker is a smartphone app developed in conjunction with the NOAA Marine Debris Program and the Southeast Atlantic Marine Debris Initiative at the University of Georgia. Marine Debris Tracker. Users can report debris by location and type. The data are publicly available and can be downloaded for any time period. "About," at <http://www.marinedebris.engr.uga.edu/about-2/>

just jugs, and bottles and other stuff floating in these areas.”<sup>7</sup>

A study published in *Science* magazine in 2015 demonstrates how significant a source of pollution these countries are.<sup>8</sup> China and Indonesia alone account for more than one-third of worldwide ocean plastic. The small island country of Sri Lanka contributes about five times as much plastic to the world’s oceans as the entire United States. Completely eliminating the U.S. contribution to plastic of all kinds, not just plastic bags, would reduce the amount of ocean plastic pollution by less than one percent.

Since plastic grocery bags account for about ten percent of that plastic pollution, a statewide ban would have a negligible impact on worldwide plastic. To be sure, the total amount is not zero, and some advocates of the ban argue that even if the U.S. contribution is small, it is worth taking steps to reduce even that small amount.

This is true only if banning the bags does not create offsetting environmental harm. Unfortunately, scientific assessment of the alternatives to plastic bags indicate there is a high environmental cost to switching to reusable grocery bags.

### **Environmental costs of alternatives to plastic bags**

Supporters of banning plastic bags argue that reusable bags, made with polypropylene or cotton, are better for the environment. SB 5323’s preamble claims, “alternatives to single-use plastic carryout bags are convenient, functional, widely available, and measure as superior across most environmental performance metrics.” To test this claim, several scientific organizations have completed

life-cycle analyses of the full environmental impact of plastic bags and their alternatives.

The Danish Ministry of Environment completed the most recent analysis, examining the life-cycle cost. Its report notes that life-cycle analysis is:

“...a standardized methodology that takes into account the potential environmental impacts associated with resources necessary to produce, use and dispose the product, and also the potential emissions that may occur during its disposal.”<sup>9</sup>

Using this analysis, we can compare LDPE plastic carryout bags to their most common alternatives, including paper bags, polypropylene bags, cotton bags, and organic cotton bags.

The comparison between paper and plastic bags is fairly straightforward since both bags are typically used once or twice. Although paper bags are more frequently recycled, plastic bags are more frequently reused, meaning both have uses after being used as a carryout bag.

Additionally, since plastic bags are often reused, if they were not available, some other bag – and the resources associated with that bag – would take its place.

The Danish study found unbleached paper bags generated fewer CO<sub>2</sub> emissions, but created 16.7 times as much air pollution in the form of particulate matter. Paper bags are also worse for water quality, creating 7.5 times as much “Marine eutrophication,” which is water pollution caused by excessive nutrient loading in the water that leads to reduced oxygen in the water.

NOAA notes that as a result of eutrophication, “Sixty-five percent of U.S. estuaries and coastal water bodies are moderately to severely degraded by excessive nutrient inputs, which lead to algal blooms and low-oxygen (hypoxic) waters that can

7 Mincer, Tracy, “Plastic in the ocean,” Woods Hole Oceanographic Institution, February 15, 2016, at <http://www.whoi.edu/visualWHOI/plastic-in-the-ocean>

8 Jenna R. Jambeck, Roland Geyer, Chris Wilcox, Theodore R. Siegler, Miriam Perryman, Anthony Andrady, Ramani Narayan, and Kara Lavender Law, “Plastic waste inputs from land into the ocean,” *Science* magazine, February 13, 2015, pages 768 – 771, at <http://science.sciencemag.org/content/347/6223/768>

9 Ministry of Environment and Food Denmark, “Life Cycle Assessment of grocery carrier bags,” Environmental Project no. 1985, February 2018, pages 13 and 14, at <https://www2.mst.dk/Udgiv/publications/2018/02/978-87-93614-73-4.pdf>

kill fish and seagrass and reduce essential fish habitats.<sup>10</sup>

The Danish study also notes that paper bags would have to be used more than 40 times to equal the freshwater eutrophication potential of plastic bags. Their data show that paper bags are significantly worse for water quality than plastic bags.

<b>Percentage of bags replacing plastic bags</b>			
Polypropylene	<b>70%</b>	<b>50%</b>	<b>30%</b>
Cotton	<b>30%</b>	<b>50%</b>	<b>70%</b>
<b>Times needed to reuse to break even environmentally</b>			
CO2	<b>21.7</b>	<b>30.6</b>	<b>39.4</b>
Particulate matter	<b>126</b>	<b>203.1</b>	<b>280.2</b>
Freshwater Eutroph	<b>371.7</b>	<b>600</b>	<b>828.3</b>
Marine Eutroph	<b>71.2</b>	<b>111.6</b>	<b>151.9</b>

To compare plastic bags to reusable cotton or polypropylene bags, the Danish study calculated how many times each bag would have to be reused to equal using plastic bags for that same period.

### Alternatives use more air and water resources

SB 5323 would require that reusable carryout bags, “have a minimum lifetime of one hundred twenty-five uses.” We can use that as a metric to see how the different types of bags compare. It should be noted, however, that just because a bag can be used that many times, it does not mean consumers will do so, and accurate data about how many times consumers ultimately reuse bags is scarce.

Polypropylene bags fare better than cotton when comparing the life-cycle costs of alternatives to plastic bags. To break even compared to plastic bags, polypropylene bags must be used 8.3 times to equal the same CO2 emissions, 10.4 times to equal the emission of particulate matter, about 30 times for freshwater eutrophication, and about 10.6 times for marine eutrophication. If a consumer used their polypropylene bag every week for eight months, they would break even

compared to plastic bags across all four of those environmental metrics.

Cotton bags, on the other hand, create significantly more environmental damage. For bags made using traditionally-grown cotton, a consumer would have to use the bag 53 times to equal the plastic bag in CO2 production. It would have to be used 396 times, however, to break even with regard to particulate matter air pollution. For water pollution, a cotton bag would have to be used 213 times to equal the level of marine eutrophication, and for freshwater eutrophication it would have to be used an astonishing 1,171 times, or once a week for more than 22 years.

Swapping plastic bags for cotton bags would dramatically increase environmental damage, both for air and water pollution.

Organic cotton bags are much worse and must be used 153 times to equal the comparable CO2 emissions, 1,145 times for particulate matter, 607 times for marine eutrophication, and 3,415 times for freshwater eutrophication. A consumer using an organic cotton bag every week for 65 years would still create more freshwater pollution than someone using LDPE plastic bags every week for that period.

### Switching to reusable bags increases environmental damage

These comparisons are useful to understand the relative impact of each option, but in the real world, consumers will choose a variety of alternatives. Using the data from the Danish study we calculated the necessary reuse rate for four different replacement scenarios. For example, if seventy percent of consumers switched to polypropylene bags, and the remaining 30 percent switched to cotton bags, they would have to be used on average 126 times to match plastic bags in the production of particulate matter air pollution. To match the performance of plastic bags with regard to freshwater eutrophication, they would have to be used an average of 372 times.

As the chart demonstrates, the higher percentage of cotton bags chosen by consumers, the greater the number of times

<sup>10</sup> National Oceanic and Atmospheric Administration (NOAA), “What is eutrophication,” June 28, 2018, at <https://oceanservice.noaa.gov/facts/eutrophication.html>

the bags must be reused on average to break even environmentally.

We also calculated one scenario using organic cotton bags. If consumers replace plastic bags with only 20 percent organic cotton bags, using polypropylene bags for the remainder, they would still have to use the bags 238 times on average to equal plastic bags with regard to particulate matter, and 707 times for freshwater eutrophication.

Replacing plastic bags with even a small percentage of organic cotton bags increases environmental damage significantly.

Switching from plastic bags to reusable bags is likely to increase air and water pollution. Even if a plastic bag ban would effectively eliminate the bags that end up as marine debris in Washington waters, the increased environmental impact from reusable bags would likely offset that benefit, harming the marine life advocates hope to protect.

### Critiques of the life-cycle analysis

Supporters of the bag ban have questioned these independent life-cycle analyses. One state representative claimed, “some of these studies were actually done by the plastics industry.”<sup>11</sup>

The Danish study, however, was conducted by the Danish government and reached conclusions similar to those of an earlier government study conducted by the U.K. Environment Agency.<sup>12</sup> Additionally, if the insinuation is that groups with a financial stake are compromised, the group with the greatest financial stake in the legislation is the grocers who are supporting the ban

because they will profit from selling the environmentally-harmful alternatives.

Some cite problems recycling plastic bags, with one ban supporter saying life-cycle “studies don’t take into effect ... how they affect our recycling stream.” The Danish study does consider how bags are disposed of.

The authors note that their assessment, “takes into account the potential environmental impacts associated with resources necessary to produce, use and dispose the product, and also the potential emissions that may occur during its disposal.” So, the analysis includes all aspects of the lifespan, from resources to disposal and even impacts after disposal.

Some highlight the fact that plastic bags get tangled in recycling equipment, and increase the maintenance required for those systems. This is true. I have seen this personally on a tour of a recycling center. What is not clear is how much cost this actually adds. There is no perfect solution and there will be additional costs with or without the ban, either to consumers who have to buy reusable bags, or to utility customers who pay a bit more to deal with the problems of recycling plastic bags.

### In response to ban, people buy substitute plastic bags

There are also issues that are not accounted for in life-cycle analysis. For example, although the analysis compares the use of plastic bags to reusable bags, it does not include the additional environmental impact of the bags used to replace the secondary use of plastic bags, such as trash liners or to pick up after pets.

A recent study examined how consumers reacted when California cities and counties imposed a ban on plastic bags. It found, “bag bans in California reduced plastic carryout bag usage by 40 million pounds per year, but that this reduction was offset by a 12-million-pound annual increase in trash bag sales.”<sup>13</sup>

11 Rep. Strom Peterson on TVW: “The Impact,” February 6, 2019, at <https://www.tvw.org/watch/?eventID=2019021017>

12 Environment Agency, United Kingdom, “Life cycle assessment of supermarket carrier bags: a review of the bags available in 2006,” February 2011, at [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/291023/scho0711buan-e-e.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/291023/scho0711buan-e-e.pdf)

13 Taylor, Rebecca, “Plastic bag bans can backfire if consumers just use other plastics instead,” The Conversation, March 14, 2019, at <http://theconversation.com/plastic-bag-bans-can-backfire-if-consumers-just-use-other-plastics-instead-110571>

Rather than simply replacing plastic bags with reusable grocery bags, consumers also purchased plastic bags to replace the secondary uses of the banned bags. This increases the environmental costs of banning plastic grocery bags.

The life-cycle analysis also does not include washing reusable bags to keep them clean and free from food-borne illness. Each wash increases the amount of water, detergent, and energy – and the environmental impact – during the lifespan of reusable bags.

### **Conclusion – Plastic bag bans have a high environmental cost**

The proposed ban on plastic grocery bags is inspired by a real concern about the growing amount of plastic in our oceans. The ban, however, is a particularly poor way to solve that problem, and would probably end up doing more environmental harm than good, even to marine life.

Even if the ban successfully eliminated Washington as a source of plastic bags reaching our water, it would only eliminate about 10 percent of the plastic pollution coming from the state. While not zero, that is inconsequential when combined with the reality that the United States as a whole contributes very little to worldwide ocean pollution.

Although the ban would do little to reduce the problem of ocean plastic, the alternatives to plastic bags would likely increase both air and water pollution, contributing to the greatest water quality problem facing marine life in U.S. waters.

Replacement bags would have to be used every week for many years before they would break even environmentally. It may be counterintuitive to argue that plastic bags are the best environmental choice, but the science consistently points in that direction, making the statewide ban a cure worse than the disease.

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