Policy options to reduce public consumption of disposable shopping bags

Prepared for:
Heather Trim
Green Bag Campaign

Prepared by:
Gabriela Carvalho and Seth Geiser
University of Washington
Evans School of Public Affairs

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**Executive Summary**

This is the final of three memos that discusses policy options to reduce the volume of disposable shopping bags entering the waste stream. In the first memo, we analyzed the nature of the disposable bag problem and its political, economic and social contexts. The second memo presented the policy goals related to the disposable bag problem and possible policy responses. In this final memo, we synthesize the content from the first two memos and evaluate the trade-offs associated with each policy option.

**Problem:** The true costs of disposable bag manufacturing, use and disposal are not fully accounted for in the disposable bag market, leading to the general public shouldering a disproportionate burden compared to other participants in the disposable bag market. In this current model, consumers do not currently have any incentive to reduce the number of disposable bags requested at the grocery store.

**Trade-Offs:** Six policy options are presented in this memo: the status quo for comparison purposes, a public education campaign, a $0.20 fee on plastic bags, a $0.20 fee on plastic and paper bags, a ban on plastic bags and a ban on plastic and paper bags. Each option was evaluated by environmental, economic and social indicators and all data used relates to the usage rates and impacts for the City of Seattle.

- **Environmental Impacts:** A ban on all disposable bags would produce the greatest reduction in negative environmental impacts in greenhouse gas emissions, water consumption, litter and tons of residential waste, while a fee on all disposable bags achieved second place in all categories.
- **Economic Impacts:** The ban on all disposable bags has the least negative economic impact to consumers. A fee on all bags has the lowest aggregate cost to all participants of the disposable bag market, but consumers would shoulder the burden of these costs.
- **Social Impacts:** The ban on plastic bags and the ban on all bags achieved the highest alignment with current waste management legislation. The status quo and education policy options have the most favorable impacts for low-income shoppers and the greatest level of public support. A fee or a ban on all bags would achieve the greatest change to consumer behavior.

**Recommendation:** Advocate for a ban on the provision of paper and plastic disposable bags at grocery, drug and convenience stores in Seattle. With this policy, we recommend the implementation of an educational campaign to increase the level of public support and a separate fund to support the provision of reusable bags and replacement bin liners for low-income Seattleites.
The Disposable Shopping Bag Problem

Billions of disposable plastic and paper shopping bags are used in the United States each year and these bags ultimately end up in the recycling bin, are littered on our nation’s streets, or are packed in a landfill. The ubiquity of disposable bags in our society has created economic and environmental problems that have sparked governments to develop policies aimed at reducing the volume of disposable shopping bags entering the waste stream.

The true costs of the bag industry on society are not fully accounted for in the costs of production, sale, use and disposal of disposable bags. In the end, taxpayers shoulder the costs of environmental pollution created by the manufacture and transportation of disposable bags, and the future costs associated with cleaning up litter and diminished landfill space.

While recycling disposable bags is a common strategy to reduce waste, recycling plastic and paper bags is expensive and polluting, and often the market for recycled materials is not lucrative enough to cover the cost of recycling processes. Policies aimed at promoting recycling generally do not reduce the quantity of bags consumed.

Recently, some governments have attended to the market failure created by the disposable bag market by instituting policy interventions that address the full costs of disposable bags. The policies that governments have implemented include bag fees, bag bans, and voluntary measures that increase consumer costs or eliminate the supply of bags to ultimately reduce the volume of disposable grocery bags entering the waste stream. These policies are rooted in waste management best practices that prioritize waste reduction as the most effective waste management strategy.

Locally, the cities of Seattle and Edmonds have proposed two strategies to address the disposable bag problem. In Seattle, the City Council passed an ordinance mandating a 20-cent fee to consumers per disposable shopping bag. Opponents of the ordinance gathered enough signatures to put a referendum for the bag fee on the August 2009 ballot for voters to determine the fate of the fee. The City of Edmonds recently directed city staff to analyze the impacts and feasibility of a disposable plastic bag ban. These local activities heighten the awareness and urgency to identify a viable disposable bag policy.

In general, the consumer culture and the bag industry are content with the status quo. In order to change retailer and consumer habits, policy makers are challenged with developing a policy that both reduces the costs and maximizes the benefits to society.

Policy Goals

Policy makers should incorporate the following three overarching goals in the development and evaluation of policy options:

1. Reduce environmental pollutants
2. Minimize negative economic impacts
3. Minimize negative social impacts

These goals align with the “triple bottom line” approach of evaluating the sustainability of a policy.

Reduce environmental pollutants: Pollution created during the manufacture, transport and disposal of disposable bags negatively impacts human health and ecological systems. The costs associated with mitigating environmental harm are a major contributor to the deficit...
between the costs and benefits of the disposable bag market. Policy options will be evaluated on the following areas of environmental impact:

- Greenhouse gas emissions – the amount of carbon dioxide equivalent that is generated by the production and transport of plastic and paper disposable bags in terms of per capita bag consumption. It is important to note that greenhouse gas emissions that result from the disposal of plastic and paper bags is not included in this indicator because emissions vary by disposal methods.
- Water use – the amount of water required to produce disposable plastic and paper bags in terms of per capita bag consumption.
- Litter – the amount of disposable bag litter in Washington State.
- Landfill space – the tonnage of disposable paper and plastic bags in Seattle residential waste.

Minimize negative economic impact: Given that producers and consumers are generally resistant to change, policy adoption will be more likely if policy makers can minimize the negative economic impact to disposable bag market participants. Policy options will be evaluated on the costs and benefits of implementing and sustaining the policies to government, retailers, producers, and consumers. Costs and benefits to consumers include out of pocket costs such as for replacements for disposable bags.

Minimize negative social impact: Policy options will be evaluated on how the policy impacts the following social indicators:

- Alignment with current waste management legislation goals and priorities – In Seattle, this would be how the policy aligns with Washington State’s waste management priorities and the City of Seattle’s Zero Waste Strategy.
- Impact to Low Income – the extent to which the policy supports consumers who may disproportionately suffer hardship as a result of the policy.
- Level of public support – the extent to which the general public would support the policy.
- Changes consumer behavior – the extent to which the policy changes current consumer behavior.

Policy Options
We were asked to evaluate the cost and benefit tradeoffs associated with disposable bag fees and disposable bag bans. Upon reviewing the literature, we decided to include an evaluation of a public education and the status quo. Most of the comparative legislation that addresses the disposable bag problem focuses solely on reducing the number of plastic bags used. Because the City of Seattle’s legislation uniquely includes both disposable plastic and paper bags, we have evaluated policy options that address combinations of disposable plastic and paper bags in order to assess how the inclusion of paper bags impacts policy goals.

Each policy option that we have evaluated has the intent to change consumer behavior toward reducing the number of disposable bags that each consumer uses. For the purposes of this analysis, the term “bag consumption” means the number of bags used by the average Seattleite in one year.

The policy options described below target grocery, drug and convenience stores in Seattle. Retail stores such as clothing or department stores would be excluded.

Status Quo: Government takes no action on the issue of disposable bags, and bags continue to be provided to customers at no upfront cost. The price paid for disposable shopping bags is
passed onto consumers through the increased costs of goods in the store. Since bags appear to be free, consumers do not have an incentive to reduce the number of shopping bags consumed at each store visit. Current rate of bag consumption remains at 511 plastic bags and 119 paper bags per Seattle resident per year.8

Education: A public education program targeted specifically at consumers of disposable bags aims to reduce the quantity of disposable bags demanded. This program would educate the public about the full costs of disposable bags and distribute and promote the use of reusable bags. Components of this policy option include:

- development and airing of public service announcements
- distribution of posters and signs for grocery, drug, and convenience store check-out stands
- development, production and distribution of an educational mailer to all public utilities customers
- partnership development with local schools, churches, and community organizations to extend education to hard to reach groups

Implementation of this policy option would require a new full-time city employee within the public utilities department to manage and implement the program in addition to funding to support the development, production and distribution of educational materials.

Fee - Plastic Bags: The government levies a fee on the consumption of a plastic disposable bag and uses the revenue generated to balance the true social and environmental costs and benefits of the disposable bag market. Retailers would charge customers a $0.20 fee for each disposable plastic bag provided. Seventy-five percent of the revenue generated by the fee would be used to support solid waste prevention and recycling programs. Twenty-five percent of the revenue generated would be kept by store owners to cover administrative costs. Small stores with less than $1 million per year in revenues will be required to collect the fee, but may keep all of the revenue to offset their costs. The City would provide stores with signs to educate shoppers about the policy.

Two new positions within the City would be required to implement this policy, a tax auditor and a program administrator. Both of these positions would enforce compliance.

Fee – Plastic and Paper Bags: The government levies a fee on the consumption of disposable plastic and paper bags. This policy option has the same characteristics as the “Fee-Plastic Bags” option above with the addition of revenue being generated by the fee collected for paper bags. The costs to implement this option would be the same as the fee for plastic bags.

Ban - Plastic Bags: The government enforces a plastic bag ban to eliminate plastic bag distribution and consumption. This policy would prohibit retailers from providing disposable plastic bags to consumers. Violation of the ban would result in fines being levied on offending retailers. Retailers could still provide disposable paper bags, but would be encouraged to provide or sell reusable or compostable plastic bags to customers. The City would provide stores with signs to educate shoppers about the policy.

Implementation of this policy would require two full-time city employees to monitor and enforce the policy.

Ban – Plastic and Paper Bags: The government enforces a ban to eliminate disposable bag consumption. This policy would prohibit retailers from providing any sort of disposable bag to
consumers, whether it be paper or plastic. Retailers would be required to provide or sell reusable bags to customers. The costs to implement this option would be the same as the ban on plastic bags.

Options not analyzed: Initially, we evaluated two additional policy options that address disposable bags: voluntary economic incentives and enhanced recycling. Our research found that neither of these options would directly impact consumer behavior, so we have excluded these options from our analysis.

- **Voluntary Economic Incentives:** Our research found that policies that provide retailers with an economic incentive to reduce the number of bags given to customers did not give consumers a direct incentive to alter their behavior\(^9\) and often resulted in minimal participation from retailers.\(^10\)
- **Enhanced Recycling:** Policies that provide economic incentives to increase the rates of recycling of disposable bags tend to be successful at diverting waste away from the landfill. While recycling has an important role in mitigating the effect of current waste, the practice does not alter consumption behaviors.

Evaluation of Policy Options

Each policy option has been evaluated on the environmental, economic and social indicators described above. For a summary of how each option fared on these indicators, please see Appendix I: Evaluation Matrix.

Environmental Impacts

The values for environmental impacts were based on the projected consumption rates of plastic and paper bags under each policy option (See Appendix III: Projected Consumption Rates, for more detail). We found that the negative environmental impacts of paper and plastic bags vary by bag type and by environmental indicator.

**Greenhouse gas emissions:** Figure 1, below, shows the expected rates of greenhouse gas emissions per capita for projected rates of bag consumption by the average Seattle resident in one year. Since these policies are aimed at reducing consumption, we evaluated the emissions produced up to the point of consumption.

![Figure 1: Greenhouse gas emissions expected from each policy option](image-url)
Under the status quo the average plastic bag consumption in Seattle contributes greater greenhouse gas emissions than average paper bag consumption. The policy option that attains the greatest reduction in greenhouse gas emissions compared to status quo is the ban on all disposable bags.

**Water consumption:** Figure 2 shows the gallons of water needed to produce the disposable plastic and paper bags used by the average Seattle shopper in one year. The water used during the manufacturing of disposable bags must be treated prior to being released back into the environment and the waste water releases excessive nitrogen into the soil and surface water leading to an imbalance in aquatic systems.\(^ {11}\) Since this imbalance in aquatic systems is difficult to measure, the number of gallons consumed is used as an indicator of water pollution in this analysis.

The production of paper bags consumes far more water than the production of plastic bags, thus any policy focused on reducing even a small volume of paper bags will attain significant results. Figure 2 illustrates that the ban on all disposable bags exhibits the greatest reduction in water consumption and therefore on water pollution as well.

**Litter:** Figure 3 illustrates the expected pounds of litter per interstate mile per year that would be made up of disposable paper and plastic bags in the State of Washington. These projected rates are made with the assumption that the litter along interstate roads throughout the State of Washington are comparable to litter found in the City of Seattle and that changes to policies in the City of Seattle will affect the amount of litter found per interstate mile in the city.
Since plastic bags are light weight and consumed in large volumes, they make up the majority of disposable bag litter currently found on Washington State interstate roads. A littered paper bag will decompose within six months on average whereas a plastic bag generally remains in the litter stream for over five years.\(^\text{12}\) While it may seem that paper bags are less harmful to the environment because they decompose faster, paper bags produce the same amount of greenhouse gases during decomposition as during production.\(^\text{13}\) Thus, when it comes to litter, neither paper bags nor plastic bags are a good alternative. A ban on all disposable bags would attain the greatest reduction in litter in Washington.

**Landfill space:** Figure 4, below, illustrates how each policy option impacts the volume in tons of City of Seattle residential waste comprised on disposable plastic or paper bags.

Under that status quo, paper bags make up almost all of the residential bag waste due to their relatively greater weight. Since consumers tend to reuse disposable bags as bin liners in their waste baskets, many disposable bags do end up as residential waste sent to the landfill. The
The graph above illustrates the reductions of only disposable bags for each policy option and does not factor in the increased tonnage of residential waste made up of replacement bin liners.

In summary, the greatest reduction in environmental impact occurs in the options which address both paper and plastic bags.

- The ban on all disposable bag option would produce the greatest reduction in negative environmental impacts in greenhouse gas emissions, water consumption, litter and tons of residential waste.
- A fee on all disposable bags comes in second with sharp reductions in all categories, though not to the degree of the full ban.
- Both the fee and ban on plastic bags only reduce total greenhouse gas emissions and litter, but have little impact on water consumption or waste tonnage as there would still be substantial demand for paper bags.
- The education only policy option has almost no impact under any environmental indicator compared to the status quo.

On environmental impact alone, a ban on all disposable bags is the best option as it would produce a reduction of more than 90 percent on all four environmental indicators.

**Economic Impacts**

The economic impact of each policy option was measured for four groups: consumers, producers, retailers, and government. Figure 5 below shows how each option impacts the financial condition of each of these participants in the disposable bag market in Seattle. For a description of the types of costs and benefits illustrated in Figure 5, see Appendix II: Evaluation Matrix Key and Notes.

As illustrated in Figure 5, the costs of the disposable bag market are passed onto consumers even in the status quo. While the perception is that disposable grocery bags are free to consumers, the truth is that the costs that retailers pay for bags are hidden in the prices of other goods purchased at a store. Because there are so many goods for sale and so many customers, this cost is a miniscule amount of each purchase but is a large sum in aggregate.
Figure 5 illustrates that the ban of all disposable bags has the least negative economic impact to consumers. A fee on plastic bags is less cost effective than a fee on all bags because shoppers would begin paying 20-cents per plastic bag and the per unit costs to retailers of expensive paper bags would continue to be passed onto consumers through increased store prices.

Figure 6, below, shows the aggregate of the costs and benefits of each policy option.

As illustrated in this graph, the fee on all bags has the lowest aggregate cost of all the options; however, Figure 5 indicates that consumers would shoulder the entire burden of these costs.

**Social Impacts**

Each policy option was evaluated against four social indicators: the alignment of the policy with current waste management legislation, the impact of the policy on low-income populations, the level of public support, and the extent to which the policy changes consumer behavior.

**Alignment with current waste management legislation:** The State of Washington has established waste management priorities in its Revised Code of Washington, code number 70.95.010, which states that, “Waste reduction must become a fundamental strategy of solid waste management. It is therefore necessary to change manufacturing and purchasing practices and waste generation behaviors to reduce the amount of waste that becomes a governmental responsibility.” Similarly, the City of Seattle adopted a Zero Waste Strategy in 2007 that will guide the City’s efforts “to increase recycling, reduce trash and upgrade Seattle’s transfer stations.”

We evaluated how each of the policy options aligned with the City and State’s waste management legislations. The ban on plastic bags and the ban on all bags received high alignment ratings whereas the fee on plastic bags and fee on all bags received medium ratings and the education and status quo options received low ratings.

**Impact to low-income:** Under the status quo, a shopper is not limited in the number of shopping bags he or she can consume. Low-income individuals are currently able to take advantage of the opportunity to consume and reuse as many bags as they choose. If a bag fee or ban is
instituted, then a low-income shopper will be disproportionately burdened because the relative cost of replacement products, such as bin liners, will be higher. For this reason, the status quo and education policy options have the most favorable impacts for low-income shoppers.

**Level of public support:** A public opinion survey of 400 Seattle city residents found that in general consumers are mostly in favor of the education policy option over bag fees or bans. Seventy percent of respondents were in favor of education, whereas only 41 percent were in favor of a fee on plastic bags, 35 percent were in favor of a fee on all bags and only 32 percent were in favor of a ban on all bags.16

A focus group survey of Seattle retailers found that retailers are in favor of efforts that would encourage stores to voluntarily reduce their use of disposable plastic and paper shopping bags and with the use of city money for advertising and public education for promoting the use of reusable shopping bags. Fewer than half of retailers agreed that plastic bags should be banned.17 Thus, the education and status quo policy options received the highest ratings in the area of level of public support.

**Changes to consumer behavior:** The most effective method to achieve a long-term reduction in disposable bag consumption is to change consumer behavior away from disposable bags towards reusable bags. Table 1 below illustrates the expected change of consumer behavior towards reusable bags for each policy option.

| Table 1: Expected Rates of Change in Consumer Behavior |
|---------------------------------|-----------------|-----------------|-----------------|
|                                 | Plastic to Reusable | Paper to Reusable | Level of change compared to Status Quo |
| Status Quo                      | 0%               | 0%               | Reference group |
| Education                       | 5%               | 5%               | Low             |
| Fee- plastic only               | 37%              | 10%              | Medium          |
| Fee - all bags                  | 52%              | 52%              | High            |
| Ban - plastic only              | 40%              | 10%              | Medium          |
| Ban - all bags                  | >60%             | >60%             | High            |

The two options that would achieve the greatest change to consumer behavior are a fee on all bags and a ban on all bags.

**Summary of Trade Offs**

**Status Quo:** The status quo is clearly not an advisable policy option given the goals outlined in this analysis. Externalities involved in the current system will continue to go unaddressed with the burden continuing to fall on governmental entities and the public in the way of environmental degradation and clean-up costs.

**Education:** Although this is the only option which has a majority of public support, an education program would have little noticeable effect on consumer behavior with little environmental benefit as a result. This option does have minimal impact on the current economic situation and should only be advocated if political feasibility and cost are of greatest importance. An education program may be of benefit in conjunction with options that do affect consumer behavior. But for the purposes of this analysis, the education program is not the preferred option.
Fee - Plastic Bags: A fee on plastic bags is expected to reduce greenhouse gas emissions and litter by approximately 50 percent, and achieve a minuscule reduction in water use and tonnage of landfill space. This option would have the highest economic burden on consumers. While we would expect that disposable bag consumers will switch from plastic to paper bags, research has found that the threat of a bag fee in combination with reusable bag adoption, overall paper bag consumption would reduce by 10 percent. A fee on only plastic bags would have significant negative impacts on low-income shoppers while attaining only modest rates of alignment with waste management legislation, change in consumer behavior and level of public support.

Fee – Plastic and Paper Bags: A fee on both plastic and paper bags would achieve the second most favorable gains in environmental impacts and cost the least out of all policy options in total aggregate costs for consumers, producers, retailers and government. This option would have the most detrimental impact to low-income populations and receive a very low level of public support compared to other options. While this is the option that the City of Seattle has opted for, it is not the preferred option with respect to the goals laid out in this analysis.

Ban – Plastic Bags: A ban on plastic bags would achieve fewer gains in environmental indicators than the fee on all bags. While a ban on plastic bags would achieve an improvement in consumer costs over the fee on all bags, the total aggregate costs for participants in the bag market are greater than in the fee on all bags. In terms of social indicators, this option has a high alignment with current waste management legislation and a medium impact with respect to level of change to consumer behavior and negative impact to low-income populations. While this is the policy option that is currently being explored by the City of Edmonds, this option is not the most favorable option with respect to the goals laid out in this analysis.

Ban – Plastic and Paper: A ban on both plastic and paper disposable bags exhibits the most favorable environmental impacts and the most favorable economic costs to consumers. Similarly, the ban on all bags creates the largest change in consumer behavior and has the highest alignment with current waste management legislation. This policy option does have the least favorable ratings in the level of consumer support. In consideration of all criteria, the ban on all bags is the most favorable policy option.

Recommendation
As a result of our analysis, we recommend advocacy for a full ban on both paper and plastic disposable bags for the following reasons:

- A ban on all bags would have the greatest impact on changing consumer behavior, which is a primary goal of this policy. As a result of this policy, an estimated 90 percent of disposable bag users will switch to reusable bags or settle for no bag.
- The full ban provides for the greatest environmental benefit in all four environmental criteria categories. By reducing the pollution and waste of disposable bag use, fewer externalities will be put upon the public in the way of environmental degradation.
- Of the options considered, the full ban is the least cost option to consumers. Reduction cost to consumers will have a positive effect on consumer use behavior and this could be a point that is mentioned in educational materials promoting the new policy.
- The full ban is highly aligned with state and local waste reduction goals while having manageable risk to social equity concerns.
- The weak public support for the ban is comparable to any change from status quo.
To mitigate the drawbacks of this policy option, we additionally recommend that you advocate that provisions of reusable bags and free bin liners for low-income shoppers be enacted in tandem with the ban to address costs to low-income consumers and to address public support of the policy. Additionally, the city should engage in a public outreach campaign to increase awareness of the disposable bag problem and the merits of the bag ban policy.
## Appendix I: Evaluation Matrix

<table>
<thead>
<tr>
<th>Goals</th>
<th>Objectives</th>
<th>Status Quo</th>
<th>Education</th>
<th>Fee on Plastic Bags</th>
<th>Fee on All Bags</th>
<th>Ban Plastic Bags</th>
<th>Ban All Bags</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Environmental Impact</strong></td>
<td>Per capita lbs. of CO₂ equivalent</td>
<td>49.79</td>
<td>47.30</td>
<td>27.40</td>
<td>17.11</td>
<td>19.49</td>
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<tr>
<td></td>
<td>Per capita gallons of water (production)</td>
<td>53.27</td>
<td>50.61</td>
<td>43.84</td>
<td>17.84</td>
<td>41.97</td>
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<td></td>
<td>Miles of WA interstate per year littered with disposable bags</td>
<td>109.11</td>
<td>103.66</td>
<td>60.37</td>
<td>38.19</td>
<td>43.17</td>
<td>10.91</td>
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<tr>
<td></td>
<td>Tons of Seattle residential waste comprised of bags</td>
<td>2743</td>
<td>2606</td>
<td>2392</td>
<td>960</td>
<td>2357</td>
<td>274</td>
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<td><strong>Economic Impact</strong></td>
<td>Cost to Government (in thousands)</td>
<td>-$39,553</td>
<td>-$41,677</td>
<td>$190,117</td>
<td>$228,237</td>
<td>-$30,877</td>
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<td>Cost to Retailers (in thousands)</td>
<td>$4,066</td>
<td>$3,455</td>
<td>$231,386</td>
<td>$268,210</td>
<td>$3,266</td>
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<td>Cost to Producers (in thousands)</td>
<td>$92,001</td>
<td>$88,188</td>
<td>$84,120</td>
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<td>Cost to Consumer (in thousands)</td>
<td>-$416,854</td>
<td>-$399,958</td>
<td>-$778,253</td>
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<td><strong>Social Impact</strong></td>
<td>Alignment with Current Waste Reduction Legislation</td>
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<td>Low</td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
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<td></td>
<td>Level of Change to Consumer Behavior</td>
<td>None</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td>Medium</td>
<td>High</td>
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<td></td>
<td>Level of Public Support</td>
<td>Unknown</td>
<td>70%</td>
<td>41%</td>
<td>35%</td>
<td>30%</td>
<td>&lt;30%</td>
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<td></td>
<td>Impact to Low-Income</td>
<td>None</td>
<td>None</td>
<td>High</td>
<td>High</td>
<td>Medium</td>
<td>Medium</td>
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</table>
Appendix II: Evaluation Matrix Key and Notes

Environmental Impact

- **Greenhouse Gas Emissions**: Number of pounds per capita of carbon dioxide equivalent created by the manufacture and transportation of disposable bags consumed in one year by the average Seattle resident.
  - Emissions were calculated from the following values: Plastic bags produce 3097 tons of carbon dioxide equivalent per 100 million bags. Paper bags produce 7621 tons of carbon dioxide equivalent per 100 million bags.\(^{19}\) These values were then calculated for each option based on the projected bag consumption rates of each option as shown in Appendix III.
  - Values do not include greenhouse gas emissions that are produced after a shopper receives a bag from a store, for example, emissions resulting from waste disposal processes.
  - Values are based on greenhouse gas emissions for bags that are consumed in Australia. Actual greenhouse gas emissions resulting from the manufacture and transportation of bags consumed in Seattle are likely to differ, however the overall ratios of change between each option should remain comparable even with different values of emissions.
- **Water Consumption**: Number of gallons of water needed to manufacture the number of bags consumed per capita per year by the average Seattle resident.
  - Gallons were calculated from the following values: Plastic bags consume 5527 cubic meters of water to produce 100 million bags. Paper bags consume 145,729 cubic meters of water to produce 100 million bags.\(^{20}\) These values were then calculated for each option based on the projected bag consumption rates of each option as shown in Appendix III. It is unknown whether these values are based on producing paper bags from virgin pulp, or from recycled material.
- **Litter**: Number of miles of disposable bags that are littered with disposable bags Washington State interstate roads.
  - Miles were calculated from the following values: 2372 pounds of litter per mile of Interstate road per year. 2.9% of total litter is made up of plastic bags. 1.7% of total litter is made up of paper bags.\(^{21}\) These values were then calculated for each option based on the projected bag consumption rates of each option as shown in Appendix III.
- **Landfill space**: Number of tons of Seattle residential waste comprised of disposable paper and plastic bags
  - Tons were calculated from the following values: 140 tons of plastic bags found in residential waste. 2603 tons of paper bags in residential waste.\(^ {22}\) These values were then calculated for each option based on the projected bag consumption rates of each option as shown in Appendix III.

Economic Impact

- **Cost to Government**: includes costs for administration, inspection, enforcement, program outreach, bag transfer and disposal, litter control and potential bag fee revenue
- **Cost to Retailers**: includes bag purchase cost, bag revenue, alternative product sales, administration, employee training and potential bag fee revenue
- **Cost to Producers**: includes revenue from paper and plastic production and bag manufacturing
- **Cost to Consumers**: includes bag costs, alternative product costs, recycling, disposal, and potential bag fee costs
- **Note**: Costs for status quo, education, fee - plastic bags, fee – plastic and paper bags, ban – plastic bags, were obtained from Seattle Public Utilities. “Alternatives to Disposable Shopping Bags and Food Service Items”. Prepared by Herrera Environmental Consultants. January 29, 2008. Appendix J. The economic impact for the ban on all bags was derived from a synthesis of estimates for the ban – plastic bags and fee - paper and plastic bags.
Appendix II: Evaluation Matrix Key and Notes (cont.)

Social Impact

- Alignment with Current Waste Reduction Legislation
  - High – Fully meets intent of RCW 70.95.010 and Seattle’s Zero Waste Strategy
  - Medium – Mostly meets intent of RCW 70.95.010 and Seattle’s Zero Waste Strategy
  - Low – Partially meets intent of RCW 70.95.010 and Seattle’s Zero Waste Strategy
  - None – Does not meet intent of RCW 70.95.010 and Seattle’s Zero Waste Strategy

- Level of Change to Consumer Behavior
  - High – Greater than 50% of consumers switch to reusable bags
  - Medium – Between 10 and 50% of consumers switch to reusable bags
  - Low – Less than 10% of consumers switch to reusable bags
  - None – No change to consumer behavior

- Level of Public Support
  - High – High potential to cause hardship for economically disadvantaged groups
  - Medium – Medium potential to cause hardship for economically disadvantaged groups
  - Low - Low potential to cause hardship for economically disadvantaged groups
  - None – Not anticipated to cause hardship for economically disadvantaged groups beyond the status quo

- Impact to Low Income
  - High – High potential to cause hardship for economically disadvantaged groups
  - Medium – Medium potential to cause hardship for economically disadvantaged groups
  - Low - Low potential to cause hardship for economically disadvantaged groups
  - None – Not anticipated to cause hardship for economically disadvantaged groups beyond the status quo
## Appendix III: Projected Consumption Rates

<table>
<thead>
<tr>
<th></th>
<th>Expected reduction rates for bags consumed</th>
<th>Expected number of bags consumed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Plastic Bags</td>
<td>Paper Bags</td>
</tr>
<tr>
<td>Status Quo</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Education</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Fee - Plastic Bags</td>
<td>65%</td>
<td>10%</td>
</tr>
<tr>
<td>Fee - Paper and Plastic Bags</td>
<td>65%</td>
<td>65%</td>
</tr>
<tr>
<td>Ban - Plastic Bags</td>
<td>90%</td>
<td>10%</td>
</tr>
<tr>
<td>Ban - Paper and Plastic Bags</td>
<td>90%</td>
<td>90%</td>
</tr>
</tbody>
</table>

Note: the expected number of bags consumed presented in this table are based on the related reduction rates in the table. The reduction rates for status quo, education, fee-plastic bags, fee – paper and plastic bags, and ban – plastic bags are conservative and have been derived from the Herrera Environmental Consultants’ report for Seattle Public Utilities, titled “Alternatives to Disposable Shopping Bags and Food Service Items Volume II Appendix J”. The reduction rates for ban-paper and plastic bags were derived from the assumption that the reduction rates for paper bags under a ban would mirror the reduction rates for plastic bags under the ban – plastic bags.
Works Cited


10. Ibid, pg. 37.


17. Ibid. Pg 83.

18. Ibid. Pg 90.


20. Ibid.
