Alternatives to Disposable Shopping Bags and Food Service Items Volume I

Prepared for

Seattle Public Utilities

January 2008

Executive Summary

Summary of Conclusions and Recommendations

This report provides the City of Seattle with relevant information to inform policies being developed for disposable shopping bags, and expanded polystyrene foam (EPS) and other plastic disposable "to-go" food service items. The report concludes that actions taken within the spectrum of strategies presented will likely reduce environmentally adverse and socially undesirable implications of disposable plastics. Conclusions and recommendations include:

- The use of reusable bags instead of disposable shopping bags of all kinds provides substantial environmental benefits, and reduces unintended environmental impacts, including litter.

- All education on disposable shopping bag use should emphasize that no bag or an existing reusable bag is the preferred option, followed by a new reusable bag used for as long as possible, and finally recyclable plastic and paper bags reused often and then deposited in curbside or in-store recycling facilities.

- An Advance Recovery Fee (ARF) on all disposable shopping bags provides the most environmental gains (except for litter), and provides for much higher overall economic gains when compared to all strategies. With an ARF on all bags, consumers experience slightly less costs than with a plastic only ARF (due to an anticipated increase in the use of reusable bags), and the region experiences additional economic cost (due to decreased paper production). Again, the City and retailers both benefit from revenue under either a plastic only or all-bag ARF.

- For the environmental categories for which data exists (which notably excludes litter aesthetics and litter marine diversity), all food service item strategies result in environmental burdens higher than the status quo. However, the permanence of plastic in the environment dictates its use be minimized.

- A shift from disposable food service items to biodegradable food service items may benefit litter persistence impacts on the marine environment due to the faster rate of degradation. Their shorter persistence in the environment still has the potential to harm the marine ecosystem.

- All education on disposable food service item use should emphasize minimization of packaging and avoidance of littering when possible, then utilization of compostable products and depositing them with food waste

in in-store commercial organics collection bins, or utilization of recyclable products deposited in curbside or in-store recycling bins. .

- An ARF on all non-compostable, non-recyclable clamshells reflects the least environmental impacts among bans and ARFs. This is due primarily to the incentive toward compostables, e.g., polylactic acid (PLA), which results in lower impacts than paper and PET in the environmental categories considered. The exception is in eutrophication, due to nitrogen and phosphorus runoff in agriculture.

Scope and Background

In recent years, Seattle's citizens and leaders have increasingly sought to accelerate the City's progress on recycling and waste reduction, as well as to reduce pollution of terrestrial and marine environments and global warming. In response, Seattle Public Utilities was directed in July 2007 by City Council Resolution 30990 to conduct research on product bans related to disposable plastic shopping bags and food containers.

This report is comprised of five sections:

- The first section presents a summary of the environmental concerns surrounding the increasing use of these two product categories.
- The second section presents the results of research on the current strategies being used worldwide to reduce the use of or amount of these two product categories.
- The third section presents the results of research into the current availability, and future likelihood of the development of, reusable, compostable, or recyclable materials and products that can be used as alternatives to these two product categories.
- The fourth section presents the results of a review of published life cycle assessments (LCA) comparing the environmental burdens associated with these two product categories for a variety of material types.
- The fifth section presents the strategies identified as possible policies to be used in Seattle to reduce the use of these product categories. Summary results of stakeholder input regarding prospective policies are also presented. This section also presents the results of an economic cost/benefit assessment and an environmental impact assessment of each of the strategies identified.

Conclusions and recommendations are provided at the end of the report.

Environmental Concerns

There are significant environmental concerns over the use of disposable bags and food service items, including adverse effects on human health, global warming and resource consumption, terrestrial and marine ecosystems, and solid waste management. All of these concerns also require significant public funding to manage or mitigate. These concerns have prompted cities and countries worldwide to seek out alternatives to traditional bags and food service items (mainly plastic) that are less harmful to human health and the environment. These environmental concerns apply in varying degrees to all bags and food service items, including those that are recyclable, reusable, or biodegradable/compostable.

Current Strategies

The City provides extensive waste reduction and recycling education and technical assistance to residents and businesses through a variety of programs. All programs emphasize the environmental benefits associated with reducing waste, reusing or donating products to the maximum extent, and recycling or composting the remainder. The City of Seattle has an extensive recycling infrastructure that includes the ability to recycle both plastic and paper shopping bags. Some food service items are accepted for recycling, including, for example, plastic dairy product tubs. The City also maintains an extensive composting system for organic waste, including soiled compostable (un-coated) paper, and specifically-approved compostable products made from other materials. Other than Ordinance #114035, which bans the use of EPS food and beverage materials by Seattle City Government and food vendors at City facilities, no other policies or regulations are used to affect the use of disposable shopping bags or foodservice items by residents and businesses.

Strategies used by other jurisdictions to address the use of disposable shopping bags include those in Table ES-1.

Strategies used by other jurisdictions to address disposable food service items include those in Table ES-2.

Alternative Products

A variety of reusable, recyclable, and biodegradable/compostable materials are available for use in manufacturing shopping bags and food service items. Many are made from renewable resources, such as corn starch, potato starch, wheat starch, rice hulls, bagasse, cellulose fiber/limestone, palm fiber, cotton canvas, durable plastic, paper, and bamboo. They are manufactured, sold, and distributed under a variety of brand names, and in a variety of product categories including bags, lidded containers, hinged containers, cold cups and lids, hot cups lids, cutlery, plates or trays, bowls, straws and stirrers, and food wraps. Many are available in Seattle through traditional and niche food service distributors, and a number of advantages and disadvantages exist for each product/material type. While most bio-based products are in the

early stages of commercial development, it is anticipated that their wider use will drive improvements in quality, versatility, environmental impacts, and cost.

Table ES-1. Summary of policy options adopted by other jurisdictions to address plastic bag use.

Policy Option	Description	Jurisdiction
Education and/or labeling requirements	Aimed at changing consumer behavior or product choices toward reusable, compostable, or recyclable alternatives	Seattle and numerous other jurisdictions
Curbside Recycling	Bags placed in curbside collection bins for later sorting and marketing. Bags including shopping, grocery, newspaper, dry cleaning, bread, produce, paper	Seattle; 25 cities in Los Angeles County
Voluntary Measures	Voluntary restrictions placed on disposable bag use by retail outlets or others. Sometimes associated with targets for use reduction or recycling	Australia, Great Britain, Hong Kong
Mandatory advanced recovery fees	A fee levied on the supplier or consumer of a product and retained by the retailer and/or government to offset the costs of disposal, discourage further use, and publicize reuse and recycling options. Paper, plastic, or both; fees range from $0.007 to $0.25 paid by supplier, distributor, retailer, or consumer; funds used by city, retailer, or both (some abuse)	California
In-store recycling	Voluntary or mandatory effort by retailers to provide facilities to accept plastic bags back for recycling. Mandatory in California but driven by the market elsewhere and favored by grocers and bag manufacturers	California; UK
Extended Producer Responsibility (EPR) mechanisms	Funds from product manufacturers are utilized to facilitate collection, processing, and advancement of end-uses.	Mostly Europe
Product bans	Ban on the sale of plastic bags; some jurisdictions also ban the production and distribution of plastic bags	San Francisco first to ban bags in the U.S., also South Africa and many other countries
Product restrictions	Restrictions on the manufacture, distribution, or sale of a specific product based on size, capacity, material type, thickness, etc. Not a complete ban. For bags, some jurisdictions limit based on a retailer's annual sales.	San Francisco, South Africa and elsewhere
Reusable bag credits, giveaway, deposit system, or sale	Credits provided when bags are brought back to a store for reuse, displacing the need for the store to provide new bags. Often $0.01 to $0.05 in credit per bag returned to store; loyalty points awarded when shoppers bring their own bag; reusable bags offered for sale in stores (IKEA)	United Kingdom, Seattle; Many US cities

Table ES-2. Summary of policy options adopted by jurisdictions outside of Seattle to address disposable food service items.

Current Strategy	Description	Jurisdiction
Curbside recycling	Clean PS cups, containers, and packaging placed in curbside collection bins for later sorting and marketing.	Los Angeles
Private recycling	Commercial and industrial EPS collected privately (primarily packaging foam from commercial generators) though there is a nascent food service effort underway.	Portland Seattle Los Angeles
Product bans	Ban on the sale of disposable food service items (primarily EPS); some jurisdictions also ban polyvinylchloride (PVC) food contact items	Many California cities, Portland, some east coast cities, Europe
Voluntary product bans	Incentives provided for retailers to voluntarily ban disposable plastic food service items (primarily EPS). Often, mandatory bans take effect after a certain time period if voluntary ban is ineffective.	Santa Cruz
Product restrictions	Restrictions on the manufacture, distribution, or sale of a specific product based on size, capacity, material type, thickness, etc.	Taipei (dishes)
Advanced recovery fee	A fee levied on the supplier or consumer of a product and retained by the retailer and/or government to offset the costs of disposal, discourage further use, and publicize reuse and recycling options.	Germany
Environmental preferable packaging	Laws and standards that stipulate percentage recycled material content, percent to be recycled, or requirement for compostability.	California, Oregon, Wisconsin

Life Cycle Analysis

In order to inform the development of policy options under consideration by the City, the environmental impacts of existing and alternative shopping bags and food service items were reviewed and analyzed, primarily through published Life Cycle Assessment (LCA) studies. Neither a full LCA nor a partial LCA was prepared for this report. Despite acknowledged limitations to LCAs, the goal of this study's review of LCAs is to create a level of environmental comparison between alternative products (and within different policy strategies) not previously made available to the City of Seattle.

Clear trends emerged from the review of LCAs regarding disposable shopping bags, including:

- Plastic shopping bags entering the marine environment represent a threat (not quantified) to marine life along with other packaging and other littered items.
- In most instances, a switch to reusable bags provides the greatest environmental benefits if reused a minimum number of times. The environmental benefits of the reusable bag relative to those of disposable

plastic bags depend on the number of times it is reused. Policies developed to discourage disposable shopping bags should focus on consumer behavior to maximize this approach.

- There was general agreement among the studies that paper bags were shown to have the greater environmentally burden, due primarily to the greater amount of resources (materials [including water], and fuels for transport from greater weight per bag) that they require.

Based on the review of available disposable bag LCAs, four policy options aimed at reducing disposable bag use were evaluated. The policy options address both paper and plastic disposable bags, and emphasize the use of reusable bags in their place. While the use of biodegradable bags shows some potential for environmental benefit, Seattle's existing plastic bag recycling and composting systems cannot support the levels of contamination that would be expected if a mixture of plastic and biodegradable shopping bags were used throughout the City.

In contrast, few clear trends emerged from the review of LCAs regarding disposable foodservice items:

- A shift from disposable food service items to biodegradable food service items would benefit litter impacts on marine ecosystems due to the faster rate of degradation.

- Reports showed that environmental trade-offs exist when considering a switch to alternative materials for foodservice items. For some materials and in some product applications, either polyethylene (PE)-coated paperboard (standard paper coffee cups are usually PE-coated), reusable EPS, polycarbonate (PC), polypropylene (PP), paper, or PLA performed best in the environmental categories considered.

Based on the review of available food service items LCAs, four policy options aimed at reducing disposable food service items use were evaluated. The policy options address both EPS and other disposable food service items, and emphasize the reduction of litter and environmental impacts from disposable food service items through the use of biodegradable products. The absence of a comprehensive labeling system for compostable and biodegradable plastics is less of a problem related to these products, since the target is much narrower and aimed at commercial establishments using "take-away" packaging.

Waste Reduction Program Strategies

Disposable Shopping Bags

The strategies to address disposable shopping bags were narrowed to the following four for further life cycle cost/benefit and environmental assessment.

- Enhanced education: Begin a public education and promotional campaign specifically focused on encouraging consumers to use reusable bags in place of disposable bags. This would become part of Seattle Public Utilities'(SPU) ongoing reduce-reuse-recycle messaging. Activity may include varying degrees of technical assistance.

- Enhanced education plus ban on disposable plastic shopping bags only at all stores in Seattle.

- Enhanced education plus a mandatory advanced recovery fee (ARF) (likely range, 10 to 25 cents) on disposable plastic shopping bags only. The ARF could be remitted entirely to the City, split by the City and merchants who would use their share to promote reusable alternatives and recycling, or retained entirely by merchants for promotion and administrative costs.

- Enhanced education plus advanced recovery fee (ARF) (likely range, 10 to 25 cents) on all disposable shopping bags. The ARF could be remitted entirely to the City, split by the City and merchants who would use their share to promote reusable alternatives and recycling, or retained entirely by merchants for promotion and administrative costs.

Cost benefit analysis of these policy options provides an insight to the likely impacts of the measures — if implementation and consumer behavior proceeds as expected. According to research, the intent of LCAs is to show the relative importance of the different environmental categories for improvement analysis (Rosselot, 2004), in our case, for each of the strategies evaluated. Table ES-3 shows a comparison between all environmental categories and the net present value (NPV) economic costs and benefits calculated earlier.

Table ES-3. Economic and environmental costs and benefits normalized to status quo.

	Units	Status Quo	Education	Ban Plastic	ARF on Plastic	ARF on Both Paper and Plastic
NPV	$	100%	97%	77%	79%	60%
Non-Renewable Energy	Megajoules (MJ)	100%	96%	70%	72%	48%
GHG Emissions	kg CO2 eq.	100%	96%	79%	77%	49%
Resource Depletion (Abiotic)	kg Sb eq.	100%	96%	65%	69%	48%
Eutrophication	kg PO4 eq.	100%	96%	100%	87%	48%
Litter Marine Diversity	kg	100%	96%	26%	50%	47%
Litter Aesthetics	Square meters	100%	96%	28%	51%	47%
Waste Generated	Tons	100%	96%	86%	80%	47%

Notes: 1. Environmental category units produced summed over a 30-year time frame
2. (NPV) economic costs and benefits over a 30-year time frame
3. Discount rate: 3 percent

The shaded fields in the Table ES-3 show those strategies with highest reductions in each of the economic cost and environmental burden categories, compared to the status quo. An ARF on all disposable shopping bags provides the most environmental gains (except for litter), and provides for much higher overall economic gains when compared to all strategies. With an ARF on all bags, consumers experience slightly less costs than with a plastic only ARF (due to an anticipated increase in reusable bags), and the region experiences much more economic cost (due to decreased paper production). Again, the City and retailers may both benefit from revenue under either a plastic only or an all-bag ARF

Disposable Food Service Items

The strategies to address disposable food service items were narrowed to the following five for further life cycle cost/benefit and environmental assessment:

- Enhanced education: Begin a public outreach, education and promotional campaign specifically focused on owners/managers of restaurants, cafes, and coffee shops to encourage replacement of disposable food service items with recyclable or compostable alternatives managed through recycling and food waste composting programs. This would become part of SPU's ongoing reduce-reuse-recycle messaging. Expanded polystyrene (EPS) products would be especially discouraged.

- Enhanced education plus ban on expanded polystyrene (EPS) products: Implementation of mandatory ban on EPS food service items only at all food vendors in Seattle. Ban to be phased in plus a later deadline for all food service items to be compostable or recyclable with restaurants enrolled in composting or recycling programs.

- Enhanced education plus advanced recovery fee (ARF) on expanded polystyrene (EPS) products only. The ARF (likely range, 10 to 25 cents) could be remitted entirely to the City, split by the City and merchants who would use their share to promote reusable alternatives and recycling, or retained entirely by merchants for promotion and administrative costs.

- Enhanced education plus advanced recovery fee (ARF) on all non-compostable and non-recyclable food service ware items. The ARF (likely range, 10 to 25 cents) could be remitted entirely to the City, split by the City and merchants who would use their share to promote reusable alternatives and recycling, or retained entirely by merchants for promotion and administrative costs.

Table ES-4 shows a comparison between all environmental categories and the NPV economic costs and benefits calculated earlier. These results were derived from a case study of hot food "clamshell" type containers and may not apply in other cases. (See page 6-23 for the assumptions regarding vendor and consumer behavior when required to switch products.)

Table ES-4. Economic and environmental costs and benefits normalized to status quo.

	Units	Status Quo	Education	Ban EPS	ARF on EPS	ARF on All Types
NPV	$	100%	119%	169%	176%	199%
Non-Renewable Energy	Megajoules (MJ)	100%	105%	214%	173%	156%
GHG Emissions	kg CO2 eq.	100%	105%	234%	185%	162%
Ozone	g ethylene eq.	100%	100%	134%	120%	105%
Acidification	kg SO2 eq.	100%	104%	179%	149%	142%
Eutrophication	kg PO4 eq.	100%	101%	104%	103%	108%
Waste Generated	Tons	100%	105%	240%	189%	162%

Notes: 1. Environmental category units produced summed over a 30-year time frame
2. (NPV) economic costs and benefits over a 30-year time frame
3. Discount rate: 3 percent

The shaded fields in Table ES-4 show that all strategies have increases in each of the economic cost and environmental burden categories, compared to the status quo. However, the permanence of plastic in the environment dictates its use be minimized. An ARF on all non-compostable, non-recyclable clamshells reflects the least environmental impacts among bans and ARFs. This is due primarily to the incentive toward compostables (e.g., polylactic acid, PLA), which results in lower impacts than paper and polyethylene terephthalate (PET) in the environmental categories considered. The exception is in eutrophication potential, due to nitrogen and phosphorus runoff in agriculture.

Higher composting rates for compostable products, and the potential increase in organics composted with compostable food service products, would likely provide additional energy and greenhouse gas benefits, and cost savings.