ZERO WASTE AS A CARBON NEUTRALITY STRATEGY

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Introduction

Waste is a symptom of inefficiency and unsustainable practices. Seattle sent close to half a million tons of waste in 2006 to a landfill in Arlington, Oregon, three hundred miles away[1]. To do this, a mile-long train of trash left our city six days a week, the final step in processes of extraction, production and distribution of products we use, which incur considerable carbon footprints over the course of their lifecycles. The energy saved by recycling just one aluminum can, for example, will power a television set for three hours[2]. The goals of the city's Zero Waste Strategy, adopted by Council resolution in 2007, are thus an important component of Seattle's progress towards carbon neutrality.

Seattle has long been a national leader in this area and has a current goal of reaching 70% diversion by 2025. Through improved composting and recycling programs in the past few years, Seattle has increased recycling/composting to 51.1%[3]. Yet, Zero Waste as a philosophy goes beyond mere recycling, to address the processes that produce the waste stream in the first place. Indeed, from a global warming perspective, the impact of the waste stream is not principally an issue of reducing what is sent to the landfill. Rather, it is the production and transport of goods and materials in the first place that accounts for most greenhouse gas (GHG) emissions[4], rather than their eventual disposal[5]. In order to do this, we need to shift to the "cradle-to-cradle" paradigm.

Source reduction (through decreased consumption and slimming down, or "lightweighting" of products) thus represent the optimal global warming mitigation potential, preferable even over recycling. Once maximal source reduction has been achieved, reuse and recycling can play roles. Thus the dictum, "*Reduce, Reuse, Recycle —In that order*."

Prioritizing

The waste stream is comprised of many components, each of which can require a separate reduction approach. Prioritization thus becomes essential. Three criteria can be used in this process.
- o **Carbon Density**: Reduction/recycling of certain wastes save more GHGs than others. This should be data-driven, as savings can be counter-intuitive. For example, carpet recycling has a GHG savings (as opposed to manufacturing new carpet) that is second only to recycling of aluminum cans. Initial GHG savings estimates, where available, are provided in the attached matrix, but further research and quantification by City agencies can lay the groundwork for informed decision making.
- o **Win-Wins**: Focus on waste streams where other parties also benefit. Junk mail disposal, for example, currently costs ratepayers almost $2 million per year in disposal fees. Policies leading to the establishment of a carpet recycling facility in the region would create local manufacturing jobs.

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[1] Seattle Public Utilities. July, 2010. 2009 Recycling Rate Report: http://bit.ly/aMMZyx.

[2] Aluminum Association. 2010. Recycling One Can Saves the Energy Used to Watch the Super Bowl: http://bit.ly/aK73x0.

[3] *Ibid*. 1

[4] Organic material (compostables) is a notable exception. In a landfill, they release methane, a potent greenhouse gas twenty times as powerful as CO_2. Composting can prevent this.

[5] United States Environmental Protection Agency. 2002. Solid Waste Management And Greenhouse Gases:A Life-Cycle Assessment of Emissions and Sinks: http://bit.ly/acbA6K.

- **Green Synergy**: Prioritize source reduction of environmentally harmful products. These can range from those that involve destructive production processes, such as wood and metal products derived from logging and mining, to those with toxic disposal risks, such as electronics or adverse environmental post-use impacts such as disposable one-use plastic products (i.e., plastic bags).

Strategy

The current City of Seattle Zero Waste Strategy has been successful by focusing primarily on improving diversion (recycling and composting) near the tail of the waste stream, such as improvements in curbside pickup. It is time to take efforts to the next level and "*Go Beyond the Curb*" through broader policies that reform the product/waste system more holistically. These can be grouped in three ways.

- **Go to the Source**: Work for source reduction where feasible, through policies that encourage less consumption or that discourage certain products. Some product categories may no longer be needed, or their use may be drastically curtailed, e.g., phonebooks, disposable bags, junk mail, moving boxes, excess food.
- **Product Stewardship**: This is the concept that manufacturers ought to be responsible for the full lifecycle of their products and required to take them back when no longer needed. This encourages producers to design for reuse and recycling, ensuring a "Cradle to Cradle" product cycle. Such policies exist for car batteries and consumer electronics, and could be expanded to cover other categories such as appliances ("white" and "brown" goods), medical supplies, and carpet.
- **Foster Infrastructure**: The City can push the envelope on what can be recycled by jump-starting new markets and facilities. For example, banning used carpet from the landfill and requiring city purchasing of carpet with recycled content could help establish a local carpet recycling plant, as none currently exist in this region of the country. A "soft order" by the city to buy only cement produced with recycled demolition waste content, once it becomes available, could spur a company to begin producing this product.

The diversity of materials in the waste stream, and their different GHG profiles, indicates that optimal approaches should differ by category. Recycling is appropriate for products such as aluminum and carpet, where a high percentage of the GHG output from producing the virgin product can be eliminated through recycling (see chart below). Composting is appropriate to reduce the methane releases of organics in landfills (reducing food waste by retailers and food handlers also plays a major role). Landfills have been identified as the second largest source of anthropogenic methane gas in the United States, accounting for 23 percent of all methane emissions in 2007.[6]

Product stewardship requirements work well for items that remain easily identifiable by brand in the waste stream, and for which there is no ready reuse/recycling method. Outright source reduction makes sense for materials that have limited desirability to begin with, such as junk mail and phonebooks or for items there are logical durable substitutes such as reusable moving crates (as opposed to disposable cardboard boxes).

Community Engagement Process

Zero Waste Seattle is a citizen organization that builds support from the public for waste reduction. Our ongoing work involves diverse publics from across the city in the policy-making process. Our members craft our priorities. We plan to work with Seattle Public Utilities this fall to include questions about waste reduction preferences in SPU's regular survey of its customers.

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[6] United States Environmental Protection Agency. 2010 (April). Methane and Nitrous Oxide Emissions From Natural Sources. EPA 430-R-10-001.

We also plan a survey on our web page to obtain public opinion about steps to move forward. We invite community members to join our sector's work by attending our monthly meetings (this topic will be a standing agenda item), participating in the survey, or by finding us on Facebook.

Greenhouse Gas Emissions – Select Recyclables (2008)

Product / Material	kg eCO2 / Tonne Recycled or Composted
Aluminum	(9,827)
Newspaper	(3,666)
Mixed Paper	(3,236)
Wood	(2,753)
Cardboard	(2,236)
Electronics	(2,220)
PET	(1,638)
HDPE	(1,258)
Re-refined Lubricating Oil	(1,133)
Recycling/Composting Average (MSW & DLC)	**(1,152)**
Ferrous	(900)
Compostables	(757)
Glass	(181)
Asphalt/Concrete	(14)

Greenhouse Gas Emissions per Tonne – Select Recyclables (2008)
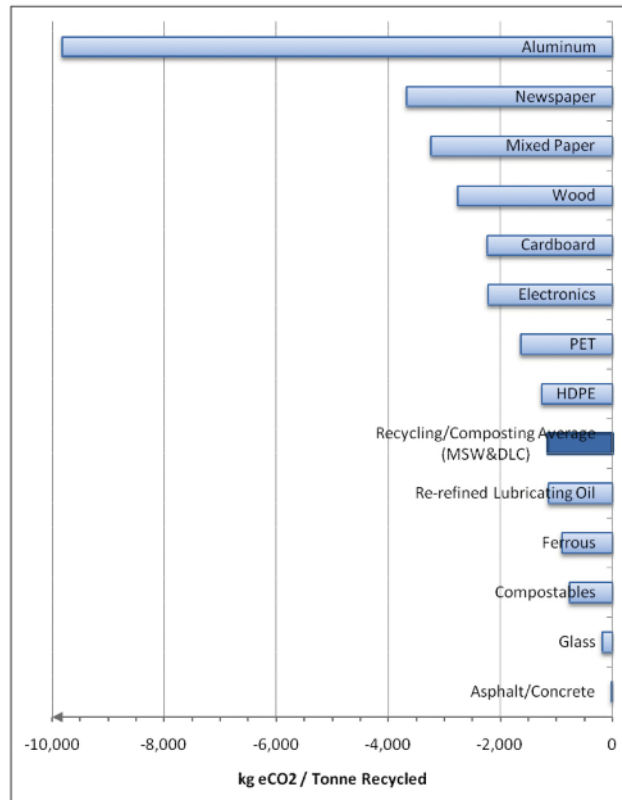

Table and graph showing the greenhouse gas benefit of recycling/reuse of products versus production from virgin materials.[7]

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[7] Sound Resource Management. 2009. Environmental Life Cycle Assessment of Waste Management Strategies with a Zero Waste Objective: http://bit.ly/bGL4Pn.

	Action Item	Long Term Goal (2030)	Short Term	Approximate Carbon Footprint, tons CO_2 equivalent[i]	Obstacles and Potential Solutions/Examples
All solid waste	Residential solid waste	Disposal bans on all categories listed below	- Stronger tiers on disposal pricing - Advanced recovery fee for products that the city has to recycle - Biweekly garbage pickup		
	Commercial solid waste	Disposal bans on all categories listed below	- Stronger tiers on disposal pricing - Mandatory Commercial Recycling Services**		
	Reusable materials	Disposal ban	Salvage And Reuse Swap Sites**		
	Education in Schools	Zero Waste Schools	Increase Seattle's successful Washington Green Schools program and include more items		Recognition that some of the best changes have come from youth
	Public Education/shifting norm	All citizens and city actions reflect a Zero Waste norm	Public education about the need to move away from disposables dependence. ("Zero Waste Hygiene")		
Organics	Composting food and organic waste	- Residential food waste disposal ban (e.g., no food allowed in garbage)** -Increase neighborhood and at-home composting (i.e., eliminate transport)	Curbside pickup universally required (including commercial, apartments, condos)	22,142[ii]*	Pesticides, plastics and other contamination in compost stream
	Reusing food from commercial/institutional facilities	A fast pick-up program that could take still-usable food directly from restaurants to shelters/soup kitchens, etc.	- Zero Waste recognition for businesses. - Incentives for restaurants.		Refrigerated city truck with pick up route of participating restaurants. Food would have to be served in shelters/soup kitchens speedily. Health code may need to be revisited.
	Reducing food waste at source (food service facilities and residences)	Significantly reduce food waste (i.e., during food preparation and no food waste)	Food waste education and incentives		Food expiration dates can be highly conservative or are misinterpreted and can result in premature waste
	Reducing yard waste at the source	Require self-mulching for lawn care	Education about native plants and shifting from "lawns" to more sustainable landscaping		
	Pet waste	Pet Waste Composting**			
	Diapers	At home diaper reuse (cloth) and	- Residential Diaper		Italian program: promotes

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		compostable diapers (new technology?)	Composting** - Subsidize Reusable Diaper Services from Fee on Disposable Diaper Purchases		reusable cloth diapers with compostable liners -- families are given an initial set of cloth diapers as a welcoming gift for each newborn.
Packaging	Cardboard boxes	- Move to reusable crates and packaging for many products - Fee on all non-durable packaging	Education about reuse/reduce versus recycle		Amazon program to deliver products in reusable bags rather than boxes Germany's Green Dot program: manufacturer of product contributes to the cost of recovery and recycling - variable fees relate to how easy material is to recycle/compost
	Stuffing/Cushioning	- Redesign packaging to reduce need for stuffing. - 100% compostable stuffing	Community re-use programs/ Incentives for returning these items to shipping companies (FedEx, UPS, U-Haul, etc) for reuse		
	Plastic packaging/product wrapping	Producer recovery fee for excess packaging** Mandates for less packaging	- Pilot reduction programs with specific manufacturers - Promote bulk dispensing of more items (soap, shampoo, etc)		Wal-Mart mandates reduced packaging with penalty of loss of business. In 2009, Dell reduced packaging by 20 million lbs for desktops (http://content.dell.com/us/en/corp/d/corp-comm/corp-responsibility-archive.aspx)
	Carry-home bags	Ban on plastic bags, fee on paper bags for all bags (including produce bags), including dry cleaners, etc.	- Ban on plastic bags, fee on paper bags for carry-home bags. - Promote selling of reusable produce bags at cost at stores	4,000[iii]*	
	Bottles	- Reuse of glass bottles mandated - Advanced recovery fee required	Incentivize/promote bottle reuse		
	Cans	Beverage Container Deposit System**	More can recycling containers in public areas		
	Food service products/other disposables	Credit/incentive program when "bring your own"	Ban Styrofoam/require compostable or recyclable (already accomplished)		Hygiene concerns need to be addressed
	Food packaging – plastic containers (milk jugs, yoghurt	- Norm shifted from disposable containers to reusable containers for most liquid/semi-liquid food.	- City study of how packaging can be reduced, how stores and producers might be incentivized,		Milk dispensers, as there are for soft drinks. Standardized size glass containers with threaded

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	containers,	- Compostable containers (and bulk) for other foods.	- - Generous incentives for participating companies, good press, recognition, etc.		lids that could be sanitized like reusable bottles, for yogurt, salsa, cottage cheese, etc.
	Glass	Promote/incentivize bottle reuse (beer, wine, etc)	Bottle glass recycled into sandblasting material or construction aggregate		
	Stretch film	- Ban in landfill - Incentivize alternatives such as reusable straps	Pilot project to recycle at commercial locations		
Paper and Paper Products	Office Paper	- Require municipal paperless mode - Incentivize in residential/commercial sector	- Pilot paperless mode (in DPD for example) - Public education about HOW to go paperless		Change some laws that relate to data archiving.
	Phonebooks	Create opt-in system	- Create enforceable "Do not deliver" opt-out system - Advance recovery fee	5,083[iv]*	
	Moving boxes	Require reusable crates	Incentivize reusable crates		
	Paperless billing	City leadership in paperless billing	Promote paperless billing methods		
	Junk Mail	Create opt-in system	Promote "do not mail" opt-out system	35,616[v]	
	Warehouse pallets/shipping	Required reuse with designated reuse/recycle streams (recycle only for broken pallets).	Diverted and outsourced for free at a collection center organized by city or ngo		
Construction/demolition	Reusable/salvageable (doors, roofing, wood, finishings, etc)	Ban from landfill	- Take-Back Program for Used Building Materials at Home Product Centers** - Community reuse centers		
	Drywall	C&D Recyclables Disposal Ban**	Purchasing requirement/Market development for uses in cement manufacture and soil amendment		
	Concrete, asphalt, metal, plastic, wood, comingled	- Market development for C&D materials - C&D Recyclables Disposal Ban**	- Building Permit C&D Reuse and Recycling Fee Deposit and ** - Incentivize Development of Private - Mixed C&D Debris Recycling Facility		City has strong C&D program in place. Next step is to bolster these programs by pushing markets and then later banning materials from landfill.
Haza-	Pharmaceuticals	Benign by Design (re-formulation to degradable products post-use)	Take-back program for unused medication at pharmacies or similar**		

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	Motor oil	Producer responsibility: Take-Back Program**			
	Used oil containers	Disposal ban**			
	Electronic equipment	Steep fines for improper disposal	Producer responsibility approach (already in place)[vi]		
	Lead acid batteries	Disposal ban			
	Mercury switches, cell phones, ink-jet cartridges, household sharps	Expand Producer responsibility: Take-Back Program**			Ink-jet cartridges: Investigate moving to universal models that can be refilled
	Used paint	Same	Producer Responsibility approach: Take back and reuse program		Oregon's new program and CA's AB 1343: Solid waste: architectural paint: recovery program
	Pesticide containers	Dramatic increase in integrated pest management leading to less pesticide containers overall	- Pesticide Container Recycling Program** - Strengthened public education about problems of pesticides		
	Used tires	Producer responsibility: Take-Back program**			HB 1671, the Waste Not Washington Act passed a $1/tire fee on retail sale of new tires – NEED TO CHECK STATUS
Household	Carpet	Producer Responsibility approach: Take-Back program	- Producer Responsibility approach - Municipal purchasing requirements to push market	18,018[vii]*	Bill passed in CA (Aug 2010): AB 2398 Product stewardship: carpet with fee to pay for recycling program
Household	Major Appliances (white goods)	Producer Responsibility approach: Take-back program	On-Demand Free Biannual Bulky Item Recycling Collection**		
Household	Small Appliances (brown goods)	Ban in landfill	City study to determine barriers to reuse and or disassembling for parts/recycling		
Household	Mattresses	Producer responsibility approach: resale, reuse, refurbishing, and recycling of mattresses and their constituent material	On-Demand Free Biannual Bulky Item Recycling Collection		85% of the contents of a typical mattress are recyclable. St. Vincent de Paul is the world leader in mattress recycling (Oakland and Eugene, OR)
Household	Furniture	Neighborhood swaps	Promotion of low-income furniture banks		
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	Action Item	Long Term Goal (2030)	Short Term	Approximate Carbon Footprint, tons CO_2 equivalent[i]	Obstacles and Potential Solutions/Examples
Institutional/comm	Medical waste	Producer responsibility approach: take-back program	Education about reuse (after sterilization) of medical supplies		Strong requirements in place to ensure health-safety which would need to be considered.
	Medical disposable gloves		Study of recycling/reuse of gloves or sterilizable durables		
Sewage Wastewater	Reclaimed water	Purple pipe required in all new construction	Incentivize purple pipe	18,594[viii]	
	Grey water	- Grey water promoted for all residences - Mandatory grey water plumbing required in all new construction	Grey water allowed		
	Discharged water (to Puget Sound)	Requirements that wastewater IS toxic-free	Improved pretreatment for wastewater (so that reclaimed water and discharges are toxic-free)		
	Wastewater (general)	- Community scale treatment facilities (with reclamation) - Encouragement of use of composting toilets			

[i] Annual estimates provided where available. Further research is needed to fully quantify GHG reduction benefits of waste reduction policies.

* Potential reduction due to suggested goals.

** Recommended in City's Seattle Solid Waste Recycling, Waste Reduction, and Facilities Opportunities (2007). Prepared by URS Corporation, Herrera Environmental Consultants, Inc. and Norton-Arnold Company

[ii] Calculated based on information from the US Composting Council. 2008. Composting, Global Climate Change and Carbon Trading http://bit.ly/a4iCFb.

[iii] Seattle Public Utilities. 2008. Alternatives to Disposable Shopping Bags and Food Service Items Volume I. Prepared by Herrera Environmental Consultants: http://bit.ly/cVXlXb.

[iv] Calculated based on information from SPU 2005 Residential Recycling Composition Study, http://bit.ly/cJvW0Y, and James DeRosa, Global Warming Initiatives, 2007, The Green PDF :Reducing Greenhouse Gas Emissions One Ream at a Time, http://bit.ly/cl8ses.

[v] Calculation based on information from 41pounds.org: http://bit.ly/crKZ6B.

[vi] Producer responsibility refers to the goal of transferring the primary cost and responsibility for handling recovery of products from the City of Seattle to those responsible for producing the products.

[vii] Calculated based on information from EPA, 2003, Background Document for Life-Cycle Greenhouse Gas Emission Factors for Carpet and Personal Computers, http://bit.ly/cLfTxn and various SPU waste composition reports from 2007 and 2008.

[viii] City of Seattle Office of Sustainability and Environment, September 2002, http://bit.ly/9e5EPY, and Seattle Climate Action Plan, Seattle's Community Carbon Footprint: an Update, 2008, http://bit.ly/dCWXHe.