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TESTING THE EFFECTIVENESS OF SUPERMARKET-BASED ENVIRONMENTAL SHOPPING CAMPAIGNS IN CHANGING CONSUMER BEHAVIOR IN NEW YORK CITY

by

MARJORIE J. CLARKE

VOLUME I

A dissertation submitted to the Graduate Faculty in Earth and Environmental Sciences in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York

1999

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Abstract

TESTING THE EFFECTIVENESS OF SUPERMARKET-BASED ENVIRONMENTAL SHOPPING CAMPAIGNS IN CHANGING CONSUMER BEHAVIOR IN NEW YORK CITY

by

Marjorie J. Clarke

Advisors: Professor Victor Goldsmith and Professor Sara McLafferty

To advance waste prevention research, this study tested two environmental shopping educational campaigns in Manhattan supermarkets to impart information and motivation to shoppers, expecting that the knowledge gained would engender new, environmental shopping habits. The effectiveness of the campaigns was evaluated using baseline and follow-up surveys of hundreds of the same shoppers at two stores, before and after receiving two levels of educational treatment (brochures, signs, and video). Answers to survey questions were analyzed using a range of statistical techniques including tabulations, cross-tabulations, mean differences between pairs, and path analysis.

Central objectives were to evaluate the campaigns' effectiveness in changing shopping behaviors, to compare the results of the campaigns to one another, and to examine the impact made by each of the educational devices. Features differentiating the campaigns employed here from previously tried approaches were their implementation in small, crowded, ultra-urban supermarkets, sale of diaper service in the stores, and showing of videos.

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The survey data provided insight into what extent environmental awareness, attitudes, and behaviors of shoppers changed after exposure to environmental shopping campaigns. Shoppers at both stores increased purchases of refills and concentrates (10 to 20%), the already frequent recycling of cans and bottles increased slightly (~5%), and bringing deposit containers back increased (~15%). However, other desired environmental shopping behaviors decreased; purchasing of recyclable packaging decreased roughly 12%, and no one signed up for diaper service.

Path analyses showed that shoppers' environmental behavior was influenced only slightly by the amount of environmental knowledge they possessed, and that their behavior was influenced considerably more by their environmental attitudes and unknown factors outside the campaign.

The limited success in changing behavior, and the difficulties of implementation in an urban environment, lead to recommendations to improve store-based educational campaigns, supplemented with legislation and incentives encouraging manufacturers and retailers to market more environmentally-friendly packaging and products. Compared with recycling, waste prevention represents a new set of behavior patterns for most people. Environmental shopping programs should deploy more types of educational devices and approaches varying over extended periods, in an intensive manner, with cooperation of host stores, and augmented by media advertising campaigns.

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Chapter 1

Statement of the Problem

Introduction

In the late 1980s the US Environmental Protection Agency (EPA), many states, and environmental groups came to recognize that there was a massive solid waste crisis looming in the near future. The causes of the crisis, as seen at that time, were that the amount of landfill space was suddenly decreasing markedly, and that the resource recovery plants (state-of-the-art solid waste incinerators) that had started to proliferate were not entirely environmentally benign, and were becoming more difficult to site. At the same time, the quantity of waste generated was increasing every year, due to increases in population and to per capita increases (i.e., the amount each person generates). Also, although other more environmentally sound waste management methods, such as recycling and composting, had just begun to be implemented in curbside and drop-off programs across the country, these have not made much of a dent in the long-term solid waste crisis.

As the 1990s draw to a close, the consumption of products and packaging is continuing to rise on a per-capita basis, and disposal capacity, particularly in cities such as New York City, is dwindling. Where real estate has been at a premium, cities have increasingly started to choose what they consider to be a simpler route than developing local solid waste management capacity: export. But this option involves the additional expense and environmental impacts associated with truck, train, and barge transportation of refuse.

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Waste-importing states are showing increasing reluctance to accept ever-increasing quantities of waste, particularly from cities that have not exhausted their capacity to reduce, reuse, and recycle, choosing instead to conserve more of their own future disposal capacity.

An alternative to exporting all material that is not recycled is to design and implement incentives, programs, legislation and technologies that reduce the amount of materials that are generated, that cause products to be used longer prior to disposal, and that encourage more recycling/composting and use of recycled materials. While such initiatives will not, in the short term, come close to eliminating the need for disposal capacity or export, implementation of serious, multi-faceted approaches to these alternatives to disposal may well serve to facilitate the task of locating communities willing to provide disposal capacity, now and in the future. In the long run, reversing the trend towards increasing consumerism and the disposable society will be necessary to conserve resources for the future and to maintain a higher standard of living. It was with these objectives in mind that this research project was designed: to explore the extent to which consumer behavior can be modified to reduce the generation of waste.

The Solid Waste Hierarchy

In 1988 EPA established as national policy a hierarchy of solid waste management methods[1] as follows:

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[1] "The Solid Waste Dilemma: An Agenda For Action", Report of the Municipal Solid Waste Task Force, Office of Solid Waste, US Environmental Protection Agency, February, 1989.

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1. Source reduction (reducing the generation of waste by reducing use of products or packaging) and reuse (together referred to as waste prevention). Source reduction and reuse research, policies, programs, and legislation would be pursued to the fullest, to reduce both the volume and toxicity of the waste remaining,

2. Then, for the waste which remains, recycling and composting facilities and programs would be designed to maximize recovery of those recyclable and compostable materials left in the waste stream after reduction, and to maximize the recycling of wastes containing toxic constituents,

3. Incinerators, equipped with the state-of-the-art technology and operated in optimal fashion at all times to minimize toxic emissions, would be designed to accommodate the wastes which are not reduced, reused, recycled, or composted. Slightly lower in the hierarchy are incinerators without energy recovery, and as a last resort,

4. Landfilling would be restricted only for residues from recycling, composting, and incineration processes.

The hierarchy was devised to reflect the relative desirability of each method, from an environmental point-of-view. Methods, such as recycling, composting, reuse, and waste reduction lessen or eliminate many of the environmental impacts for landfilling and incineration (described below), and were considered environmentally preferable to them.

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The hierarchy of management options was arranged with the recognition that no single method could or should be used to the exclusion of all others, as had been the case with landfilling or incineration.

Despite the fact that these were the two least used methods to manage solid wastes, EPA stated that in order for there to be adequate management of wastes in the future, it would be necessary:

(1) to maximize source reduction and reuse of consumer products, for example, manufacture and purchase by consumers of less packaging, fewer disposables, and more durables, and

(2) to maximize the amount of materials diverted from the waste stream for recycling.

The New York State legislature agreed to establish a waste management hierarchy and passed the ambitious Solid Waste Management Act [2] that required all municipalities across the state to submit integrated solid waste management plans for the next ten years. The stated goals for 1997 were 40-42% for recycling and composting and 8-10% for waste prevention, with the remaining 50% for incineration with energy recovery. Landfilling was to be used only for residues from recycling and incineration (ash). Waste generation patterns and all the solid waste management methods are discussed in greater detail below.

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[2] New York State Solid Waste Management Plan, 1987-88 update. NYS Department of Environmental Conservation, Division of Solid Waste, March 1988.

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In order to achieve these waste prevention and recycling goals, it would be necessary to put into place extensive recycling infrastructure (for collection, sorting, processing, and manufacturing recycled-content products). But equally important, increasing recycling rates and decreasing waste generation rates requires instituting social engineering systems (i.e., programs, legislation, and incentives that motivate citizens and companies to separate materials for recycling and to adopt a set of behaviors that would result in a lower waste generation rate). A key focus of social engineering systems would be to convince consumers to change their purchasing habits so that they reliably buy (and demand) reusable, durable, less toxic, recycled, and recyclable products and packaging. However, although reduction and recycling are the preferred waste management methods, and all levels of government have agreed on these objectives (and even the average citizen typically responds positively to environmental polls and questionnaires), there is little hard data on consumer willingness to override other considerations in purchasing (e.g., convenience, price, brand, attractiveness, etc...) and buy "green". Since consumers have the ultimate power to implement prevention and recycling, it is important that they receive adequate education in these areas and be motivated to change their habits. This is the focus of the present study.

Solid Waste Management Methods and their Environmental Impacts

In addition to the fact that government and environmental organizations have supported the hierarchy, and that it is legislatively required in some places, there are short- and long-term environmental reasons for promoting waste prevention and recycling methods. For every ton of waste recycled, there is one less ton that would otherwise be disposed of in incinerators and/or landfills with their impacts to air, water, and land. The same is true

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for every ton of waste that is not generated in the first place, or that undergoes reuse or refurbishment into like-new product. Wastes collected and shipped by fossil fuel-driven trucks, barges and trains cause impacts to air, water and land, consume water and energy resources, resulting in traffic congestion and accidents. Waste prevention reduces or avoids all these impacts. Use of garbage trucks requires siting of transfer stations, which are noisy and dusty, involving more congestion. Thus, waste prevention and recycling directly reduce environmental impacts caused by landfilling and incineration.

One of the main arguments for placement of waste prevention and recycling at the top of the solid waste management hierarchy, is that the environmental costs of production are several times greater than the environmental costs of solid waste management.[3] Long-term environmental impacts are reduced by recycling, reuse and reduction (the 3 R's), because fewer virgin resources are needed to manufacture a smaller quantity of products and packaging. The 3 R's preserve some or all of the intrinsic nature of discarded items (e.g., the product value, natural resources), whereas they are largely lost when landfilled or incinerated. For example, simple waste prevention practices, like using less paper by copying double-sided, or bringing a reusable bag to the supermarket, avoid the need to mine as much oil or harvest as many trees, thus preserving those natural resources.

The new, evolving technique of lifecycle assessment suggests that production of packaging and products involves depletion of resources (energy, mineral, natural, and

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[3] Schall, John. "Production and Disposal Impacts of Packaging Materials: a Critique of the Tellus Institute Study", Panel Discussion at the 8th Annual Conference on Solid Waste Management and Materials Policy, New York, NY. January 31, 1992

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water), and impacts to all environmental media (air, water, land, life) generated by resources extraction, shipping, refining, manufacture, and marketing. All of these impacts are minimized by reducing production, and by reusing and recycling packaging and products. A crude estimate of important environmental benefits associated with producing a ton of paper made from 100% recycled waste paper instead of virgin fiber, indicates a saving of 17 trees, 7,000 gallons of water, 60 pounds of air emissions, and 4100 kwh of energy, and consumes 30% - 55% less energy than making it from virgin pulp. The important environmental benefit on the waste disposal end of the lifecycle that occurs when recycled, rather than virgin fiber is used in production, is the savings of roughly three cubic yards of landfill space per ton and the emissions and leachate which production of that ton of paper would have produced.[4] Environmental costs (i.e., emissions, ashfill space) would be avoided if the paper had not gone to an incinerator.

From a system-wide view, recycled production plus recycling produces the lowest emissions of all but one of the major categories of air pollutants. For example, it has been found that incinerator stack emissions of heavy metals are several orders of magnitude higher than those from operations of materials recovery facilities (recycling sorting plants). Recycling at a 26% rate reduces methane emissions by an amount equal to 24.2% of total methane emissions from all U.S. landfills (of the total 10.2 million metric tons of methane emissions). Solid waste output from recycled production plus recycling is 32.9% lower than it is from incineration or landfilling of virgin materials, due to reductions in industrial process wastes. Use of recovered materials rather than virgin

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[4] "Characterization of Municipal Solid Waste in the United States: 1994 Update", USEPA Municipal and Solid Waste Division, EPA/530-S-94-042, November, 1994.

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materials in manufacturing results in 1000 pounds less solid waste per ton of material manufactured. Recycled production plus recycling uses considerably less energy than virgin production plus incineration, and virgin production plus landfilling uses the most. Specifically, recycling reduces energy use by an amount equal to the energy used by almost 9 million households (895 trillion BTUs). [5]

Thus, on the front end of the product lifecycle, for every ton of product or package that is not generated to due waste prevention systems and recycling, fewer natural resources (e.g., fossil-fuels, metals, water, soil, forests) are consumed (and in some cases, irreversibly depleted). For each ton of product not manufactured due to waste prevention efforts, there are numerous avoided environmental costs to air, water, land, and ecosystems (e.g., in the extraction of natural resources, their refining, manufacturing, packaging, marketing, and transporting these from their sources in the environment to refineries, manufacturing plants and to distributors, markets, and consumers). In the case of composting, resources are not only preserved, but soil resources are restored to the environment.

On the back end of the lifecycle, recycling and waste prevention results in a net reduction of emissions, effluents, and leachate, and prevents degradation of land caused by incineration and landfilling. Methods such as reduction and recycling decrease the amount of waste requiring disposal, reducing the amount of land resource impacted. If,

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[5] Denison, Richard A. "Environmental Life-Cycle Comparisons of Recycling, Landfilling, and Incineration: A Review of Recent Studies"., Annual Reviews Energy Environment. Volume 21, pp. 191-237. 1996.

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as part of an overall waste prevention strategy, reduction in the use of toxic constituents is achieved, the quantity of toxics emitted into the air and introduced into the ash from incinerators is reduced.

Landfilling is lowest on the hierarchy, and is considered to have the greatest environmental impacts, because it produces impacts to air, water, and land, but also because the energy, mineral, water, and other natural resources utilized in production of products and packaging are largely wasted when the product is disposed in landfill. Modern incineration also involves impacts to air and, to a lesser extent, to water, as well as to land in the management of ash residue, recovers some energy resource, but, loses the natural resources and production value in the materials and products when they are burned. Recycling and certain reuse processes (e.g., remanufacturing of durable products) also have environmental impacts (e.g., due to processing and/or refining of the recyclable or reusable materials). However, since recycling, remanufacturing and reuse processes obviate the need for extraction and refinement of virgin materials, this environmental benefit offsets some of the environmental impacts caused by recycling, remanufacturing and reuse processes. In addition, recycling and reuse options retain the intrinsic value of the materials (e.g., paper, wood, glass, metal) and products processed. As great as the savings in natural resources and avoidance of environmental degradation are with recycling, waste prevention saves even more since fewer products and less packaging are made in the first place, and more of the environmental costs of both production and waste collection and processing are avoided. Source reduction practices reduce waste generation at the source, and they typically eliminate the need for extraction

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of resources, refinement, manufacturing, and product transport, as well as need for collection, treatment, shipping, and disposal of wastes. As a result, waste prevention and recycling create fewer net environmental impacts than do incineration and landfilling.

Landfilling

The predominant method of solid waste management in the U.S. has always been burying solid waste, and it is the most common method of solid waste disposal used in the U.S. as of 1995, handling about 57% of the waste stream. Landfilling has been steadily decreasing since peaking in 1985 at 83%, falling to 67 percent in 1990, down to 62 percent in 1993. As of 1995 there were 2,535 landfills, but while the number of landfills has been declining in recent years, the capacity has remained relatively constant. New landfills are much larger. At that time, thirty-seven states had more than 10 years of capacity left, while nine had between 5 and 10 years left, and two had less than 5 years left. [6]

The intrinsic value of the materials and products disposed in landfills is lost. Most landfills produce a myriad of impacts to the ground and surface water quality and water supplies, due to the leaching of organic acids, heavy metals and other compounds. Landfills also emit large quantities of greenhouse gases such as methane and carbon dioxide and trace amounts of many toxic carcinogens such as vinyl chloride and benzene. The extent of environmental impacts has been significant, having been responsible for contamination of community water supplies. Landfills are also considered to be a major

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[6] "Characterization of Municipal Solid Waste in the United States: 1996 Update", USEPA Municipal and Solid Waste Division, EPA/530-R-97-015, June 1997.

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contributor to greenhouse gas emissions globally. The emissions from landfills and their local impacts on human health and their long-term, global impacts on climate are now being assessed.

Over the years the technology of landfilling has progressed slowly from the most basic, inexpensive and rudimentary dumping to state-of-the-art "Sanitary Landfill" which employs a daily cover of soil, multiple liner systems, leachate collection and treatment systems, leak detection, landfill gas collection and treatment systems, and air quality monitoring. Occasionally, landfill gas utilization equipment is installed to make use of the natural gas extracted from the landfill. When the newer environmental controls are used, the environmental impacts are lessened, but this transition is still in process, as government regulations are under development. As more is learned about the extent of air quality impacts from landfills, and as New Source Performance Standards for landfills are phased in over the coming years, it is likely that landfills will become harder to site. Landfilling will become more expensive, and continue to decline. USEPA predicts that although the tonnage of waste going to landfills will increase in absolute terms from 118,390 in 1995 to 119,080 in 2000 to 125,370 in 2010 along with increasing population and per capita generation rates, landfilling as a percentage of waste generated will fall further, from 56.9% in 1995 to 53.7% in 2000, to 49.6% in 2010. [7] For more discussion about the processes associated with and the environmental and health impacts of landfills, see Appendix L.

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[7] "Characterization of Municipal Solid Waste in the United States: 1996 Update", USEPA Municipal and Solid Waste Division, EPA/530-R-97-015, June 1997.

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Incineration

The advent of the solid waste hierarchy occurred almost contemporaneously with the transition from the old-style incinerators (i.e., those that do not recover energy, and do not have advanced emission control systems) to today's state-of-the-art incinerators. Also at this time the public began to recognize an increasing severity of global and local environmental deterioration, engendering a rising public displeasure against incinerators and a call for increased prevention, recycling, and composting. Some plans for new waste-to-energy (WTE) plants in the U.S. have been scrapped because of objections over emissions; others have been scaled down in size because of the success in recycling programs (leaving less waste for the WTE plants). Still other incinerators, designed for 100% or more of the waste stream, have had to beg nearby communities for waste when their recycling programs became successful, in order to receive enough waste (and tip fees) to satisfy facility debt requirements. At the present time few new incinerators are being planned; most activity is in the retrofit of existing incinerators to meet new national MACT standards. The pendulum is swinging back towards landfilling for wastes not considered to be recyclable or compostable.

Incineration rates have been inconsistent over the last few decades. In 1960 incineration (albeit in antiquated low-efficiency units) burned 31% of the Municipal Solid Waste (MSW) generated. In 1980 incineration was down to 9%. By 1995 incineration had recovered to 16.1% of total generation, about the same as in 1990. At present there are 112 mass burn WTE plants (98,733 tons per day design capacity), 12 Refuse Derived Fuel plants (5,988 tpd), and 19 incinerators without energy recovery (2,751 tpd) with 11

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new WTE plants being planned or constructed (11,310 tpd). The total tonnage sent to incinerators is projected to increase over the next 10 years or so, from 33.47 million tons in 1995 to 36 million in 2000 to 39 million in 2010, rising in absolute terms with increasing population and per capita generation rates. As a percentage of the waste stream, EPA predicts that by 2000 combustion will remain fairly constant at 16.2% of the waste stream, but by 2010 combustion will decrease slightly to 15.4% due to closure of older plants, due to the expense of new regulations. [8]

The environmental benefits from incineration fall into just a few categories. Energy is recovered in WTE plants (usually in the form of electricity, but occasionally in the form of steam). It is a small fraction of the amount of the energy consumed in the extraction, transportation, production, and marketing of the products and packaging consumed in the incinerator. Refuse Derived Fuel (RDF) plants are designed to extract glass and metals, via automated means, for recycling from the waste stream prior to incineration. The predominantly paper and plastic waste that remains is prepared into fluff or pellets of RDF for incineration. Mass burn plants (that burn unsorted MSW) sometimes are designed to remove ferrous metals from the bottom ash via magnets, but the quality of the charred metals is of limited economic value.

The environmental impacts from incineration mainly result from emissions and ash, but the loss of the intrinsic value of the products and materials fed to the incinerator should not be overlooked. Incineration of a heterogeneous waste stream results in emissions of

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[8] "Characterization of Municipal Solid Waste in the United States: 1996 Update", USEPA Municipal and Solid Waste Division, EPA/530-R-97-015, June 1997.

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heavy metals (e.g., mercury, lead, cadmium, and chromium), toxic chlorinated and other organic compounds (e.g., chlorobenzenes, chlorophenols, dioxins, and furans), acid gases (e.g., HCl, SO_2, NOx and HF), carbon monoxide, and particulate matter. These contribute to ground-level ozone and acid rain, as well as to urban air quality problems. Both mercury and dioxin are seen as global pollutants, and EPA has targeted incinerators as a major contributor to both contaminants. The predominant emissions from incinerators (CO_2 and water vapor) are not locally deleterious to the environment, but contribute to global impacts from greenhouse gases. State-of-the-art incinerator technologies, designed to burn wastes efficiently and to reduce emissions as much as technologically feasible, and operating practices, to maximize combustion and emission control efficiency, advanced rapidly during the 1980s and early 1990s. Appendix I provides more detail on incinerator emissions and technologies to minimize them.

Incinerator ash is created when wastes are burned. The wastes, consisting largely of metals, glass and ceramics, do not burn and become part of the bottom ash. More combustible wastes, such as paper and plastics, food, yard waste, and wood, are predominantly organic in nature, producing CO_2 and water vapor. These wastes also contain impurities such as chlorine, nitrogen, and heavy metals, which contribute to emissions and leave the incinerator or are captured in emissions control devices. The captured emissions mix with reagents used in emissions control and become fly ash. Fly ash typically contains more heavy metals than bottom ash, and is therefore more toxic. For this reason, European incinerators are configured to keep the two ash streams separate so that the fly ash may be treated as a special waste. In the United States the two

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ash streams are usually mixed to dilute the toxic effects of the fly ash in the more benign bottom ash. Mixed ash is typically deposited in landfills or in dedicated ashfills. The environmental impacts from ash management start in the incinerator, where poor management can result in workers inhaling ash that is not contained under wet conditions. Similarly, ash leaking or blowing into the air from trucks transporting it from the incinerator, produces unwanted emissions. Once at the landfill, ash can blow away if not kept wet, and as rainfall percolates through the ash, it contributes pollutants directly to groundwater, most often via leaching of heavy metals.

Recycling and Composting

From the national perspective, recycling and composting are used to manage 27% of the waste stream as of 1995 [9]. Recovery of materials was estimated to be 22.4% for recycling and 4.6% for composting in 1995, projected to rise to 24.8% and 5.3% respectively in 2000, and to 29.15 and 5.9% respectively in 2010, up from 17% for both combined in 1990. The growth of recycling is illustrated in the per capita amount of discards after recycling and composting, which has started to decrease after having peaked at 3.59 pounds per person per day in 1990. This is projected to fall to 3.03 pounds per person per day in 2010, again reaching the 1970 level of 3.04 lb/person/day.[10] This indicates the inroads these two waste management methods are projected to have in offsetting increases in waste generation rates in the near future. However, it is not likely

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[9] "Characterization of Municipal Solid Waste in the United States: 1996 Update", USEPA Municipal and Solid Waste Division, EPA/530-R-97-015, June 1997.

[10] "Characterization of Municipal Solid Waste in the United States: 1996 Update", USEPA Municipal and Solid Waste Division, EPA/530-R-97-015, June 1997.

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that increases in recycling and composting alone can offset increases in waste generation indefinitely.

The national recycling figure of 27% underestimates what has been achieved in many localities that have higher state or local recycling, composting, and reduction requirements or goals. Some states (e.g., New Jersey, New York, California) have had recycling goals of 50 - 60%, and an increasing number of localities have already achieved "3 R's" diversion rates of 50%. (e.g., Hennepin County, MN, Newark, and numerous smaller communities). [11] See Appendix R for more detail on recycling and composting.

As large as these diversion rates may seem, the ultimate potential for recycling and composting, assuming intensive programs designed to address as many categories of materials, products, and packaging as possible, and to educate the general public and businesses to the greatest extent feasible, is quite a bit higher. An extensive 46 material-sort waste composition study done for the New York City Sanitation Department in 1989/1990 showed that 80% of that city's waste stream was recyclable or compostable and some additional quantity was reusable or repairable.[12] Half the recyclables were to be targeted in the initial basic curbside program (i.e., newspapers, magazines, corrugated cardboard, plastic bottles and jugs, glass jars, and metal cans), and the rest (food and yard waste, other plastics, other papers, etc...) were to be tested in intensive recycling pilot

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[11] Clarke, Marjorie. "Municipal Solid Waste Management: The Integrated Approach", a video by Air and Waste Management Association, 1994.

[12] A Comprehensive Solid Waste Management Plan for New York City and Final Generic Environmental Impact Statement, Appendix Volume 1.2 Waste Stream Data, New York City Department of Sanitation. August 1992.

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programs. By late 1993 NYCDOS had instituted the basic curbside program citywide, and by 1997 the NYCDOS had added mixed papers, phone books, bulk metal items, gray cardboard, and 'wax paper' cartons. At present, a majority of New York City's recyclable materials are currently targeted for collection in the curbside program (perhaps between 50 and 60%). By contrast, as of mid-1998, the curbside recycling diversion rate in New York City was 18.3%.[13] The gap between what is possible and what has been achieved in terms of recycling diversion rate is the participation rate. Theoretically, if all the people in New York City recycled all that they possibly could, then the diversion rate would rise to equal the 50-60% figure. Adding more materials to the recycling program (e.g., food waste, which accounted for 12% of the City's waste stream in the 1990 study) would have a concomitant effect on the potential recycling diversion rate. The key to improving participation is educating and motivating the residents and businesses in New York City to recycle.

Waste prevention

Despite the changes in the common perception of the causes of the solid waste crisis, from landfill space depletion to incinerator impacts, one truth remains: the amount of waste being generated is continuing to increase. The per capita generation of MSW in the US as of 1995 is 4.34 pounds per person per day. After materials recovery for recycling and composting, discards were 3.17 pounds per person per day, virtually all of which was combusted (0.70) or sent to landfills (2.47). EPA projects that the per capita generation rate will continue to increase to 4.42 pounds per person per day by 2000, and

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[13] Larry Cipollina, "Residential Recycling Diversion Report for June 1998", NYCDOS Memorandum. August 25, 1998.

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4.66 in 2010 (an increase of almost 5.5% in one decade), due to increases in consumption of material goods. By contrast, the population is projected to increase by 1.0% in the decade from 1990 to 2000 and 0.8% from 2000 to 2010. EPA projects the absolute quantity of waste generated in the US will increase due to both per capita and population increases. All of these increases will be due to increases in the consumption of material goods and packaging, as shown in Table 1, primarily made of paper and plastic, as shown in Table 2. [14] At the same time, as more goods and packaging require management as waste, certain mineral and energy resources and forests that are used to manufacture the packaging and material goods are being depleted in various parts of the world.

Looked at from a historical perspective, in 1960 only 88 million tons of MSW were generated (42% of today's waste generation rate), or 2.6 pounds per person per day (60% of today's per capita rate) with negligible recycling rates. In order to achieve real waste prevention, as required in some states, the MSW generation growth rate must be stopped and reversed. Not only will the projected increases in per capita generation rates have to be eliminated, and the projected increases in population overcome, but additional measures to reduce consumption further will also be needed. The solution to the long-term solid waste crisis is not merely to devise a way to site more incinerators and landfills, but to figure a way for society to stabilize the human population and reduce each person's consumption of goods and packaging.

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[14] "Characterization of Municipal Solid Waste in the United States: 1996 Update", USEPA Municipal and Solid Waste Division, EPA/530-R-97-015, June 1997.

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Table 1
Projections of Population, Goods and Packaging Generated in the U.S. Waste Stream

	1995	2000	2010
U.S. Population (millions)	262.76	274.63	297.72
Durable Goods* (millions of tons)	31.23	33.94	38.29
Nondurable Goods ** (millions of tons)	57.04	62.14	72.72
Packaging and Containers (millions of tons)	72.86	80.49	94.89
Other wastes *** (millions of tons)	46.92	45.10	47.10
Total (millions of tons)	**208.05**	**221.67**	**253.00**

* Durables are goods designed to last at least three years (U.S. Commerce Dept. definition)
** Nondurables are designed to last less than three years, and may be disposables or single-use items.
*** Other wastes are predominantly food and yard wastes.

Table 2 Projections of Recyclables Generated in the U.S. Waste Stream (millions of tons)

	1995	2000	2010
Paper	81.54	89.74	105.69
Plastics	18.99	20.96	24.66
Glass	12.83	13.51	14.54
Metals	15.85	16.85	18.48
Food	14.02	14.70	16.10
Yard Waste	29.75	27.10	27.40
Wood	14.86	16.55	19.61
Rubber & Leather	6.03	6.64	7.86
Textiles	7.40	8.42	10.72

Despite the fact that waste prevention is needed, and that it has been designated the most preferred waste management solution in the hierarchy, it receives the least funding for research as well as for implementation. Recycling has become a household word, but source reduction, reuse, and waste prevention are misunderstood by the public. Municipal waste management departments have traditionally preferred to have

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uncomplicated, "silver bullet" disposal solutions, of which the agency is in complete control. Landfilling was simple, and, relative to recycling, waste-to-energy was seen to be a straightforward solution. Both disposal options involved feeding unprocessed waste onto the ground or into a furnace. Sanitation departments initially resisted recycling and composting because they required cooperation by the public, new types of trucks, processing stations, and marketing of secondary materials, much of which was new and unfamiliar. But over the last ten years or so, some barriers to instituting recycling have been overcome as the public has come to support it, though lack of optimization in integrated collection systems and lack of perseverance and innovation in educating the public have been construed to make recycling seem less economically attractive than it could be.

Waste prevention involves reducing the generation of waste by a myriad of methods in which both consumers and manufacturers participate. Examples of these include:

- maximizing the manufacture, purchase, use and repair of products and packaging that has lower volume and/or toxicity, higher durability, and
- optimizing the design of products and packaging for repair, reuse, and recyclability, and reducing purchases of disposables and their packaging.

EPA expressed an interest in this area, and stated in 1989 that in order to attain the national goal of 25% reduction and recycling of MSW by 1992, three goals would have to be accomplished:

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(1) government initiatives will have to be created on the state and local levels,

(2) government and industry will have to establish markets for recyclables, and

(3) household, government, and industry attitudes and behaviors will have to change to increase availability and purchase of products and packaging that promote source reduction and recyclability.

In a report on the subject of promoting source reduction and recyclability in the marketplace[15], EPA stated that more research is necessary in this area since the relationships between education and change in behaviors is complex and poorly understood. Such research would provide industry, government, and consumer groups with greater understanding with which to design more effective strategies for promoting source reduction and recyclability of products and packaging. Examples of research that EPA believes is necessary include the following:

- design of informational strategies to promote intrinsic (satisfaction-based) motives to conserve,
- design of strategies which combine intrinsic and extrinsic (incentive-based) motives to produce more durable behavioral change,
- determination of variables, not directly related to attitudes, which affect consumer behavior, and

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[15] "Promoting Source Reduction and Recyclability in the Marketplace: A Study of Consumer and Industry Response to Promotion of Source Reduced, Recycled, and Recyclable Products and Packaging", prepared for Richard M. Kashmanian, USEPA, Washington, DC September, 1989.

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- determination of the degree to which an increase in consumers' quality of life results from adopting environmentally-appropriate behavior.

Since the EPA made these recommendations in the late 1980s, relatively little has been done, by EPA or others, to educate the public in this area. As a result, waste prevention is often confused with recycling. Despite evidence that waste prevention programs are considered to be more cost-effective than any other waste management solution because there is no need for collection, processing or disposal infrastructure,[16] governments at all levels have consistently placed waste prevention programs at the bottom of their spending priorities. As a result of this lack of funding, waste prevention remains a major frontier in solid waste management research. See Appendix R for more detail on waste prevention methods.

General Research Objectives

In order to address the clear need for a greater understanding of and motivation to implement waste prevention, this project was conceived as a means

- To research, design and implement, at a small number of appropriate venues in New York City, all aspects of a program to test the effectiveness and the most advantageous methods of implementing alternative means of maximizing waste prevention and recycling.

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16 A Comprehensive Solid Waste Management Plan for New York City and Final Generic Environmental Impact Statement, New York City Department of Sanitation. August 1992.

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- To evaluate this method of imparting information and motivating consumers to change their purchasing patterns to reduce waste and increase recycling potential, and

- To measure and compare the absolute and relative effectiveness of two alternative testing programs using standard statistical techniques.

Specific objectives and parameters for this project are:

- To design and test the effectiveness of two environmental shopping campaigns, which would educate shoppers about the relationship between their actions and the environment, specifically, on the merits of their purchases, as they pertain to solid waste prevention and recycling, providing shoppers with information about alternative purchases and their relative environmental impacts,

- To develop more specific information on effective consumer education techniques (i.e., those which produce measurable results) than that available heretofore, so that more effective in-store environmental education programs might be implemented. Such features of a successful and replicable in-store educational program would include the type, quantity, and distribution of brochures, signage and other educational devices, as well as methods of communication with store management to maximize the visibility of educational materials,

- To document whether, and under what circumstances, consumers will put into practice source reduction and recycling objectives learned as a result of educational

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programs conducted in stores as demonstrated by their purchases of consumer products at retail stores,

- To measure any changes in consumer awareness of and attitudes towards environmental issues before and after being educated about the solid waste management implications of their purchases in retail stores,

- To determine the features of a successful and replicable in-store educational program (e.g., type, quantity, and distribution of signage, environmental criteria used, questionnaires, methods of communication with store management, etc.) and

- To test whether and the extent to which environmental shopping can be successfully taught in small, crowded Manhattan supermarkets.

This investigation should facilitate a much-needed glimpse into consumer attitudes and behaviors, a very important factor in the success of waste prevention and recycling measures. Specifically, this program design should provide an indication of environmental attitudes of shoppers, and whether, and to what extent, their attitudes and behaviors can be modified as a result of environmental shopping education campaigns or ongoing programs, and what it takes to make those changes. Other useful information to be acquired will include the effects of demographics on attitudes and purchasing behavior before vs. after the education, where consumers get their environmental information, and how sophisticated the shoppers are before vs. after the education. Perhaps most

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important, this study design should permit the acquisition and analysis of data on the effectiveness of alternative environmental shopping educational programs in an inner city environment. These results should provide a contribution to the existing body of knowledge in this field.

To assist, financially, in this endeavor, a solid waste research and demonstration grant was procured in 1991 from the U.S. Environmental Protection Agency Region II. The original deadline for the project's completion was early 1993, and this was extended to late 1994 (which did affect the scheduling of the educational campaign). The financial conduit, the Environmental Action Coalition, participated by attracting volunteers to collect survey data. The benefits of the research will be provided not only to EPA, but also should be helpful in communicating effective consumer education techniques to municipalities and states desiring to implement consumer education programs to maximize reduction and recycling. The information from this investigation should also be of value to those in private sector supermarkets and chains in predicting the success of new environmental shopping programs they might institute. Where there are already existing environmental shopping programs, the information produced by this study could improve the effectiveness of such programs. Thus, the results will be provided to industry trade associations, such as the Food Marketing Institute, which could distribute it to their member stores. Finally, it is intended that the results of this study will be communicated to the research communities involved with solid waste prevention and management as well as environmental behavioral research.

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The balance of this dissertation will describe the research hypotheses and review literature pertaining to consumer psychology, environmental attitudes and behaviors, and previously-conducted environmental shopping campaigns (Chapter 2), the methodology by which the environmental shopping campaigns and the modes of their evaluation were designed (Chapter 3) and implemented (Chapter 4), the presentation and analysis of the results (Chapter 5), the comparison of the results with other, similar research (Chapter 6), and conclusions and recommendations made based on the results.

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Chapter 2

Conceptual Design and Literature Review

This chapter describes how the objectives, as outlined in Chapter 1, were molded into a research and educational program designed to gather data and test hypotheses. This chapter discusses the hypotheses to be tested in this study, and why they were chosen, based on a review of the literature of other research in this area. Also evaluated are the possible educational foci of the research and aspects of the educational materials and campaign that will need to be designed.

Consumer Behavior and Advertising

Though the average citizen responds positively to environmental polls and questionnaires, there is little hard data on consumer willingness to buy "green" [17], in supermarkets in urban areas. Many factors influence peoples' purchases, and these influences are modified over time in the natural course of events (e.g., as a result of changes in product and packaging design and availability, and shifts in the consumer's economic status, family size, and lifestyle).

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[17] Bukro, C. (1991, November 17). Shopping for an Ideal. The Chicago Tribune, Section 20, pp. 24-25; Gallup, G., Jr., & Newport, F. (1990, April). Americans strongly in tune with the purpose of Earth Day 1990. The Gallup Poll Monthly, pp. 5-14; Schorsch, J. (1990, November). Can our economy come clean? USA Today, pp. 84-85; Staff. (1991, July). Polls show support for recycling. Waste Age, pp. 16-17.

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People can also be influenced to modify their purchasing habits, as illustrated by the success of the advertising industry over the last fifty years. After World War II there was a period of peace and prosperity, where disposable incomes rose for the first time since the 1920s, which, coupled with the advent of television and wider use of advertising on radio and in the print media in the late 1940s and 1950s, engendered today's disposable society. It wasn't until the 1970s that the environmental impacts of over-consumption began to be understood by researchers, and these are still not widely known in society as a whole. In the meantime, the expenditure of resources on advertising has continued to grow, exceeding four billion dollars annually on advertising solely for food products since 1995.[18]

Since over-consumption is driven, in large measure, by the actions of consumers, one approach to reversing this trend is counter-advertising, or re-education of the general public to explain the environmental ramifications of over-consumption and provide alternative ways to shop to reduce waste. In recognition of this, environmental education has been used in recent years by governments, environmental groups and others as a serious tool by which to influence people and businesses to institute new, or modify existing environmental behaviors, pertaining to everything from recycling and littering to energy and water conservation.

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[18] Total Measured U.S. ad spending by Category and Media in 1996, 1995. Advertising Age's website: http://adage.com/dataplace/archives/dp208.html

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Research Hypothesis

Starting in the late 1980s, some supermarkets were used as venues for educating shoppers on environmentally preferable alternatives. But most environmental shopping campaigns that had been tried by the start of this research program in 1991 either did not involve post-campaign evaluation to determine the effectiveness of the educational materials in changing shopping behaviors, or did not collect objective data by which to make such an evaluation. Since measurement of the effectiveness of an environmental shopping campaign is essential to improving its success in changing behaviors and in its replication elsewhere, this investigation measures the effectiveness of an environmental education campaign carefully designed to effect changes in shoppers' purchasing behaviors.

The research hypothesis of this investigation is that New York City Shoppers will change their shopping habits and become more environmentally friendly shoppers if given motivational information in a supermarket setting.

Basic Project Parameters

In order to test the research hypothesis, a small number of retail supermarkets in heavily urbanized New York City were to serve as locations for providing education to shoppers, using specially designed educational materials, and for testing the effectiveness of these and other approaches in changing purchasing practices. If possible, more than one level of educational campaign would be evaluated using the different stores, to see which might be more effective in producing results. Since there are many aspects of environmental purchasing that could be studied, it was decided to limit the number of

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educational foci so as to increase the likelihood that shoppers would remember, and implement desired behaviors, so that the results could be more clearly attributable to the education. Measurement of changes in consumers' purchasing patterns as a result of the educational program was important, and an effort would be made to obtain this data using at least two methods.

Research Design Considerations

Aspects of the educational campaign and its evaluation that needed to be answered as the campaign and the evaluation instruments were in the initial design phase included the following:

1. On what environmental messages should the educational campaign focus? There are many possible foci, including purchase of "green products" made with recycled content packaging and/or less toxic constituents, products packaged in less packaging (buying in bulk, avoiding overly packaged products), products in recyclable packaging, and reusable products (that substitute for disposables). Some of these concepts are easier to explain to shoppers than others (e.g., recyclability is easier for the public to grasp than toxics and recycled content). The number of educational foci is important as well as the choice of which to employ, since the more education the project tries to impart, the less effective it might become, due to the saturation point of the consumers. A literature survey of environmental shopping campaigns was conducted to inform the process of designing the messages and vehicles for delivering them.

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2. Which kinds of educational devices (e.g., brochures, videos, signs, etc.) should be employed, and how should these best be developed?

3. How long should the educational campaign last? Over what period of time should the measurement tools be used to evaluate the effectiveness of the campaign? It made sense to survey the literature of similar types of campaigns to see how long those were conducted and to what degree the duration affected the results. Other important factors that had to be considered were EPA's deadline for project completion and the amount of financial support available to fund a longer program.

4. During what time of year should the campaign take place? In order that the population of shoppers exposed to the education campaign was as close to normal as possible, and consistent throughout the campaign, it was decided that summertime should be avoided, since vacations disrupt the usual shopping patterns. EPA's deadline for project completion was a factor.

5. What are the characteristics of a successful environmental shopping educational program in a retail supermarket in the unique environment of New York City?

6. Should there be more than one stage of educational program at each venue (i.e., an "active" phase where all the educational devices are deployed followed by a "passive" phase where monitoring of shoppers' behavior continues)? If so, how passive should the passive educational phase be? In order to be distinguishable from

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the active phase the educational materials used must be substantially different from and have a much smaller effect than those used in the active phase. The passive phase might involve no educational stimuli at all, or just a few brochures, to see how well the original education held.

7. In how many stores should the educational campaign be tested (i.e., how many educational programs should there be)? The larger the combination of educational elements, the greater the amount of information generated about the characteristics of successful and unsuccessful campaigns. By this token, two stores would generate a limited amount of information, but on the other hand, the addition of each new store would require considerable effort in data collection and analysis. There was also a trade-off between the number of stores and number of ways to measure the campaigns' impact, since expansion of each required a greater investment of time.

8. In what ways should the active educational programs in the stores differ from each other? Assuming that at least two educational campaigns would be designed and implemented, the differences could be: which educational instruments would be used, and when during the campaign they would be deployed. Factors influencing this decision were findings from the literature survey and the number of stores selected.

9. How many types, and which methods, of data collection and analysis should be used to evaluate the success of each educational campaign, and what types of information should be sought?

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10. What types of information should be gathered to evaluate the success of the campaign? The research questions above provide the main guidance in this regard. A literature survey was also employed to provide others' viewpoints.

11. To what extent do changes in environmental knowledge and attitudes translate to changes in environmental purchasing?

12. If a change is detected in environmental shopping behaviors, what are the reasons (e.g., level of previous environmental knowledge, previous environmental attitudes, type of motivation, demographics, and degree of awareness of the educational campaign)?

More detail on the decision-making process and the literature surveys entailed in answering these research questions is provided in this chapter and Chapter 3.

Experimental Design

Narrowing the Educational Emphasis

The universe of target products on which to focus the environmental shopping educational programs is large, potentially including many thousands of products in a store. For example, since packaging ends up in the solid waste management system, and, as of 1993, supermarket packaging constituted 12% of the nation's solid waste by

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weight[19], one educational focus could be to encourage bulk packaging, concentrates, lightweighted packaging, recycled content packaging, recyclable packaging, packaging with few toxic constituents, "biodegradable packaging", reusable packaging, and/or to discourage individual-sized packaging, packaging containing toxic precursors, and overpackaging. Even though the contents contained in most packaging (i.e. the products themselves) are consumed in such a way that the resulting residue is discharged to a municipality's wastewater treatment system rather than the solid waste management system, changes in purchasing behavior towards the following two choices of product categories can have considerable effects on the environmental impacts resulting from solid waste management: disposable products vs. reusable products, and toxic products vs. less toxic products.

Reducing purchases of disposable products would have an even greater effect on solid waste management than reducing over-packaging alone, since the packaging as well as the packages' contents for disposables are eliminated.

With this many potential subjects on which an environmental shopping program can be focused, it made sense to study only a subset at one time. To try to do otherwise would befuddle the shoppers and bankrupt the budget. By what means can the list be narrowed to a manageable number of target consumer items? One of the main criteria for determining the products and/or packaging types on which to focus the educational

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19 Seiler, Elizabeth, Grocery Manufacturers of America, during presentation at the Seventh Annual NYSDEC Recycling Conference, October 17-18, 1995.

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programs should be the relative environmental benefit[20] to be gained by customers making the choices they are being educated to make.

One methodology with which to compare the overall environmental impact of a particular product or packaging versus another, lifecycle assessment (LCA), has been under development by the Society of Toxicology and Chemistry since a ground-breaking workshop in 1990 [21]. The report produced by the participants of this workshop details the environmental, social, natural resources and other cradle-to-grave releases, costs, and impacts to be included in producing lifecycle inventories, and assessments of products, processes, and activities, and how such a study is structured. Though this methodology is not yet completed, it is nonetheless instructive to review the results of one of the first LCA's, on packaging, by the Tellus Institute.[22]

This study indicates that the environmental impacts of packaging production (i.e., mining or extraction, refining, manufacture, transportation, and marketing) are several times greater than the environmental impacts of managing packaging as solid waste. The environmental impacts and economic costs of production are lessened considerably when recycling is employed instead of repeated production of non-recycled virgin product, as is

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20 Reduced or avoided environmental impacts due to a reduced quantity of waste sent to incinerator or landfill, as well as the impacts avoided due to reduced mining, refining, manufacturing, transportation of raw materials

21 A Technical Framework for Life-Cycle Assessments, Marjorie J. Clarke, Co-Author. Published by the Society of Environmental Toxicology and Chemistry (SETAC), Washington, DC., January, 1991; Produced at product Lifecycle Workshop sponsored by SETAC, August 17-23, 1990, Smuggler's Notch, VT.

22 "Tellus Institute Packaging Study", presented by John Schall at 1992 NYS Legislative Commission on Solid Waste Management Conference.

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the case with disposable and non-recycled products and packaging. Since, in recycling, the same materials are used perhaps twenty or thirty times (the number varies depending on the material), the need for and environmental production costs associated with extraction, refinement and transportation of materials is reduced. Another reason that the environmental costs of production are reduced by recycling, is that the impacts from secondary production (using recycled materials) are significantly smaller than the impacts from virgin production.[23]

As beneficial as recycling is to reducing the environmental and economic costs of production, these costs are reduced further, or avoided entirely, when waste prevention measures, such as source reduction, or reuse of products and packaging are employed. For instance, when comparing the environmental production costs of the reusable sponge vs. the environmental production costs of disposable paper towels, it is clear that some environmental costs are expended when the sponge is made, but there is no secondary production involved in making the sponge fit for subsequent usage, since the sponge need only be rinsed to be used again. By contrast, recycling has secondary production costs and environmental impacts every time the recycling loop is traversed. As with recycling, the environmental costs of production of the product (in this case, the sponge) are expended only once, as compared with the repeated costs of producing disposable paper towels. The reductions in environmental and economic costs of production likewise apply when source reduction is applied to packaging. For example, when a package is

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[23] "Tellus Institute Packaging Study", presented by John Schall at 1992 NYS Legislative Commission on Solid Waste Management Conference.

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lightweighted or if the product is sold in bulk or concentrated form, there is a lower ratio of package to product. Were shoppers to choose to buy more products packaged in bulk, in concentrate or that are less heavily packaged, ultimately less packaging is created, and the environmental costs of production of the foregone packaging are eliminated.

Environmental impacts and economic costs associated with management of discarded packaging and products follow the same patterns as the environmental costs of production outlined. Since source reduction measures require no collection, processing, or disposal, both the economic and environmental costs of waste management are eliminated when source reduction measures are used. New York City, as part of its initial Solid Waste Management Plan, estimated in 1992 that a group of programs, which together prevent 7% of the waste stream, can succeed in avoiding the expenditure of about $90 million dollars annually, and $700-800 million cumulatively over an 18-year period in a city the size of New York.[24] Recycling programs are not nearly as cost-effective as waste prevention measures. When products and packaging are recycled, solid waste management impacts and costs are reduced but not entirely eliminated, due to the impacts associated with collection, processing, and marketing of the recyclables and management of recycling residues.

The production- and solid waste management-related environmental impacts of waste prevention are less than those for recycling; and prevention and recycling impacts are less

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[24] "A Comprehensive Solid Waste Management Plan for New York City and Final Generic Environmental Impact Statement", New York City Department of Sanitation, August, 1992, p. 17.2-2.

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than those for disposal. These relationships form the basis for deciding which products and/or packaging should be the targets for an environmental shopping educational program. The farther up a specific target item is on the solid waste management hierarchy, the greater is its desirability as a target focus of an educational or research program.

There are a number of other factors to take into account when deciding how to narrow the educational focus for an environmental shopping campaign. Location can be an important factor (e.g., an urban setting may have not been used in researching particular foci before, so doing it here would be innovative). Appendix G explores a number of possible educational foci for this environmental shopping campaign, and the knowledge gained therefrom supports the following discussion:

In order to conduct this study within pre-specified budget and time frame, the focus of the environmental educational programs, and particularly the data gathering phase, was limited to the following target products and packaging for environmental shopping education and monitoring: reduced packaging (refills and concentrates), two reusable products (cloth shopping bags and cloth diapers), and recyclable packaging vs. non-recyclable packaging.

Specifically:

1. Recyclable vs. non-recyclable (R/N) packaging, with "recyclable" defined as those materials that are recycled in the local district in which the test store is located. At

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the time the research design was being developed, the Department of Sanitation was collecting glass and metal containers, aluminum foil and foil containers, and plastic bottles and jugs in Manhattan, the Bronx, and Staten Island, and some parts of Queens and Brooklyn. Thus, the test stores would be located within these areas. Since the Associated supermarket survey (see Appendix A) showed that a typical NYC supermarkets sells thousands of products, it was decided that the storewide purchases of R/N pairs in the chosen stores would be monitored weekly for purposes of the statistical analysis. Instead of gathering data on all R/N pairs, a small sample, say a few pairs would be chosen (e.g., coffee in glass or metal vs. paper; juice in glass or High-Density Polyethylene (HDPE) plastic containers vs. paper or juice box; cleaners in HDPE pump spray vs. aerosols).

2. Disposable diapers vs. reusable diapers: The basic premises of stocking reusable diapers in supermarkets are (1) to provide the consumer a choice, and (2) to reduce the quantity of disposable diapers consumed/disposed. In comparison with suburban shoppers who live in a house and frequently own washers and dryers, New York City shoppers are not likely to have as easy access to these appliances for purposes of cleaning reusable diapers. But since the cost and convenience of diaper service is comparable to disposable diapers (see Appendix D for the calculation), having the choice available in the store was considered to be the optimal way of giving consumers a choice. Most New Yorkers do not go grocery shopping by car, and have to carry their shopping home by hand or in carts, so the purchase of fewer bulky packages of diapers means fewer trips to the

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supermarket. For these and other reasons stated above, the decision was made to offer, in the supermarket setting, the option of diaper service as the convenient, reusable alternative.

In order to make such diaper service available, it was necessary to devise a scheme to counter the advertising of the major disposable diaper manufacturers (the largest of which, Proctor and Gamble, was the leading national advertiser in 1996 in terms of dollars spent, [25] and the manufacturer of two of the top four disposable diapers, three of which are the popular store brands: Huggies, Pampers, and Luvs) The extent of the advertising budget for these brands of disposable diaper exceeded $115 million in 1996. [26] The diaper service company which serves much of New Jersey and most of New York City (General Health Care Corporation or GHCC) was contacted, and they agreed to participate in the project. GHCC had already developed a method by which their services could be offered and sales monitored within small areas such as zip codes. It was agreed that purchasers of disposable diapers would receive brochures on using diaper service and would be issued coupons for the service, which would be sent in to GHCC if diaper service was desired. Since the coupons would be encoded to ensure issuance of credit to the proper store, the stores would be compensated for all diaper services lasting for at least twelve weeks sold, by means of this method (12 weeks was seen as a reasonable commitment to diaper service). Thus, the

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[25] 100 Leading National Advertisers, Advertising Age's website: http://adage.com/dataplace/archives/dp268.html

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educational scheme could be tested, and any shift in purchasing habits could be measured.

3. Disposable bags given out at the cash register vs. reusable cloth bags to be sold at the store: The sheer number of non-recyclable plastic bags given out every week (e.g., the 20,000 at the Associated store) justifies this as a research focus. In addition, as described in the literature search below, shopping bags has been a common focus of supermarket-based environmental shopping educational campaigns (providing rebates for bringing one's own bag, provision of bins for used plastic bags, and selling reusable bags). Different kinds of cloth and string bags are available, so their procurement for use in this study would not be a problem. Chapter 3 provides more detail about the design and deployment of the bags in the educational campaign.

4. Purchase of more laundry refills and juice concentrates: This focus was added on consideration of the information in the Associated supermarket study. Though the study had been designed to show which product categories provided consumers the opportunity to select either recyclable or non-recyclable packaging, information on refills and concentrates was also gathered. Recognizing that the purchase of concentrates and refills reduces packaging use, as well as reductions in transportation impacts avoided by not having to ship the water used in diluted

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[26] Top Ten diaper brands: Market Share and Measured Advertising, Advertising Age's website: http://adage.com/dataplace/arhives/dp198.html

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products, it was clear that this was a discrete choice for consumers that could be monitored by the study.

Though the original design of the educational programs included the above research target items, it might not have been possible to inspire two stores, which met all other store selection criteria, to permit research directed at changing consumer acquisition of these particular items. As a contingency measure, three pairs of contingency target items were designated: (1) bulk packaging / small-serving packaging, (2) non-diaper service diapers vs. disposable diapers, and (3) sponges and cloth towels / paper towels. As it turned out, a grocery chain that supported the original four foci, was found. The process of selecting a store chain for the experiment is detailed below.

Selecting Purveyors of Cloth Diapers

Initially, it was conceived that cloth diapers could be made available in supermarkets in two ways: find a purveyor of cloth diapers, or work with a diaper service to stock the diapers. The choice to give shoppers a choice in diapers was guided by the convenience of diaper service vis a vis laundering cloth diapers at home, and the relative cost of diaper service vs. disposables over the diapering life of the child. In Manhattan nearly everyone lives in an apartment building and either does laundry in the basement or at a neighborhood Laundromat.

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Knowing that stores are typically not eager to change what is stocked on their shelves, and some manufacturers may pay supermarket chains for the privilege of being guaranteed shelf space, a successful strategy to encourage supermarkets to stock cloth diapers would have to be economically attractive. One means of accomplishing this would be for the diaper service association to pay the stores a fee (on a monthly basis or similar) based on the amount of shelf area used. Another would be to give the store a commission on the quantity of reusable diapers sold; this would have the added impetus of encouraging greater sales of diaper service.

FMI warned that affixing a coupon for diaper service to disposable diaper packages might not please the disposable diaper manufacturers, so they recommended distributing any advertising for diaper service via the cashiers. Also, GHCC pointed out that the replacement cost for a week's worth of diapers was $90, but the first week's diaper service costs only $15. Selling diapers in the stores risked pilferage of the diapers (buying the $15 package and never signing up for service).

Service is usually started with 90 diapers (1 week, 12/day) plus a container which stays with the customer (customer also keeps the set of diapers at the end of the need for service). 90 diapers plus container are worth $100. Diaper covers with velcro fasteners are used with these diapers. GHCC has developed a state-of-the-art, form-fitting diaper with gathers, etc. for a bit more weekly cost.

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GHCC has recruited most of its customers by targeted direct mail, and the rest by working with auxiliary guilds in hospitals and childbirth educators who give coupons to people who attend classes. The educator receives a rebate for new customers thus generated.

The advantages of giving shoppers a choice of diapers includes the following:

1. This would address a major, nonrecyclable, disposable input to NYC's solid waste stream.
2. According to FMI and the literature searches conducted for this study, nothing like this has been done before, so it would be a new innovation in education, and the data produced would also be rather unique.
3. Measurement of disposables and diaper service purchased would be straightforward. GHCC's operations are computerized, and they indicated they could help keep track of new services ordered due to the project's efforts.
4. If this approach to marketing diaper service were successful, it could aid the diaper service industry, which has been on the decline since Procter and Gamble's deceptive advertising, claiming its plastic and pulp diapers would become soil in 90 days.
5. More frequent changes are required when using cloth since the disposables use a chemical called polyacrylite, which absorbs 700 times its weight, allowing a thinner diaper which needs changing infrequently. It would be informational and motivational to address this in the educational literature.

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The disadvantage was that not every household in New York City could be serviced by GHCC. GHCC has exclusion areas, due to threats to the safety of his workers. Every day a GHCC driver is hurt, despite signs on the trucks saying there is no cash on board. GHCC won't service Harlem (122-160), most of the Bronx (except East Bronx, Van Cortlandt, and Riverdale), Bedford Stuyvesant, East New York, Brownsville, parts of Greenpoint/Williamsburg, and some parts of Queens (except Flushing, Astoria, Forest Hills, Bayside, Douglaston, LIC, Jamaica, and some of Jackson Heights). This geographical constraint was added to the others in selecting test stores, and did not turn out to be problematic in siting test stores. (GHCC's Irvington, NJ plant was operating at 20% capacity, due to P&G's advertising, so this plant could absorb all the diaper service diapers that New Jersey and New York City could generate.)

The design and deployment of the diaper service educational materials is detailed in Chapter 3.

Choosing a Store Chain and Test Stores

The choice of venue for the educational campaigns and evaluations was influenced by the choice of educational foci, as discussed above, and, in turn influenced, to some degree, the experimental design and the design of the educational materials. Since the recyclability of packaging was one of the educational foci of the project, and a limited number of New York City districts were collecting metal, glass and plastic packaging for recycling at that time, it was necessary to choose stores located within such recycling

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districts. Working with one store chain was considered better in many ways, than with two or more, so a search for a suitable store chain with at least two stores in recycling districts began. An important criterion for selecting a store chain was its willingness to track (or allow others to track) purchases by groups of customers before, during and after the educational campaign, since the data provided would be numerical and objective, perfect for producing reliable results via statistical analysis.

The investigation of supermarket chains that might be agreeable to provide test stores, with the understanding that such information would be collected from customers, was initiated prior to the start of the project. Early discussions with officials at Red Apple had showed initial agreement to participate in the study. Once more of the experimental design was known, the evaluation of store chains was expanded and advice was sought from the Food Marketing Institute (FMI) and the NYS Food Merchants Association (FMA, a statewide industry organization) on which store chains might be suitable as a partner in this project. A few names and numbers were provided, and major chains located within the New York metropolitan area were contacted to determine general interest in the research objectives of the project and get a feel for the general acceptability to the store chains of the store selection criteria, below. These organizations provided contacts at Pathmark, A&P, and D'Agostino. Contact was reestablished with the Red Apple organization, which was also the parent organization for the Gristede's and Sloans chains.

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In telephone discussions with these contacts, the project's interest in gathering customer purchase information from stores with scanners and "Club Cards" was expressed, as well as the interest in surveying their customers and marketing reusable products, such as cloth bags and diapers, in the stores. Club Cards were initially seen as the preferred method of gathering purchasing data over time from individual shoppers. FMI indicated that a number of their member chains gave cents off for returning bags to the supermarket and/or marketed reusable bags. Though FMI had not heard of any store marketing cloth diapers, they thought it an interesting idea. Unfortunately, FMA indicated that the NYS Consumer Affairs Department had begun to scrutinize privacy issues as regards consumer cards, and, when approached about this project, A&P indicated that they would not share any information on customers gathered using Club Cards. Also, A&P only had one pilot store in New York City with the Club Card, and this was in "suburban" Bayside, Queens. Pathmark did not use Club Cards, and said that they would not allow others to survey their customers.

Selecting the right store chain and test stores to conduct the experiment is a delicate process, particularly since finding cooperating stores has been found by other researchers to be critical in conducting a successful research program. The criteria and procedure by which test stores are selected is important and cannot be too numerous or stringent, or it will be too difficult to find any stores to participate in the study. On the other hand, the stores should place few demands on the project (i.e., changes to design of the campaign and the educational materials). Thus, the first unalterable criterion in selecting a store is that the store management must be happy with the research design, and be willing to

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cooperate with project team. As will be shown, it was essential to divine the true intentions of store management in this regard, and to what degree management would communicate this support to all store personnel. To choose the test stores the following criteria were initially applied:

Priority 1: Must Have:

- Location of store within DOS recycling districts. (This was critical to the packaging recyclability segment of the educational program.) During the period the study was under design, not all districts collected glass, metal, and plastic packaging, so certain parts of the City were excluded from consideration for this reason.

- Location of store within five boroughs of New York City. (This was a requirement of the project as originally submitted to EPA.)

- Electronic scanners at checkout and easy access to computerized inventory information (This was needed to track the purchasing behavior of consumers before, during, and after the educational process.)

- Location of store within service area of Diaper Service.

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- Willingness of store management to stock, go along with stocking, or make available and advertise reusable diapers and bags. (This is critical to the diapers and bags reuse segments of the educational program.)

- Willingness of store management to permit and facilitate surveying of their customers. (This was critical to the attitudes survey segment of the research program.)

- Willingness of store management to permit brochures to be distributed, and signs to be placed/hung within stores. (This was a minimum requirement of the educational program.)

- Two stores from the same type of neighborhood. (It was important to the design of the experiment to have two stores chosen from areas with similar demographics, so that they would be considered statistically the same. This will permit two educational programs to be tested as if they were tested on the same population of consumers.

Priority 2: Would Like to Have:

- Consumer purchases tracking cards (Club Cards). (This was highly desirable in that the purchasing behavior of individual consumers can be matched to their attitudes as measured in the before and after surveys.) Stores having Club Cards must also have

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electronic scanners at the checkout counters and provide access to computerized inventory information.

- Willingness of store management to permit extensive experimentation with educational tools, e.g., video, audio, booths, use of clerks in educational program.... (This was highly desirable, particularly in the store chosen for the more extensive educational program.)

- Location of store -- inner city, diverse ethnicity of neighborhood/clientele. (This would add to the uniqueness of this research program because most similar types of environmental education programs tested in supermarkets are done in smaller communities and suburbs.)

- A minimum of previous environmental educational programs in the store -- particularly in the target items -- recyclability of packaging, reuse of bags and diapers, purchase of refills and concentrates. (If there have already been extensive educational programs in any of these areas, the impact of our educational program may be harder to measure or evaluate.)

Priority 3: Would Like to Have If Possible

- Willingness of store management to print some/all educational materials and permit store clerks to assist in distributing educational materials. (Some other research

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programs in supermarkets have benefited from the store footing the bill for some of the printing costs, for example, printing the environmental message with the store's name on the grocery bags.) Having the store's name on educational materials might motivate respect for the program by some shoppers.

- Location of store -- easily accessible by mass transit. (This was highly desirable to minimize transit time of the PI and interns to the store for installation and monitoring of the educational program, and collection of survey and inventory data.

Once a short list of potentially cooperative stores was obtained (i.e., only the Red Apple and D'Agostino's chains made the short list), discussions with each was begun to describe the study objectives and the target educational foci. If an original educational focus was not acceptable, then discussions began to negotiate the possibility of a modified or alternative target focus (e.g., if diaper service is not acceptable, then maybe selling cloth diapers would be). As it turned out, D'Agostino's was undergoing a major renovation in its inventory tracking system and would not have wanted to have an educational campaign focusing at all on cloth diapers, so more extensive talks were joined with Red Apple. Upon further discussion, it appeared that Red Apple agreed to all the conditions in the Priority 1 list, and almost all of the other criteria. However, Red Apple stores (including the Gristede's and Sloans chains) did not employ scanners at the checkout to monitor storewide purchases, but Red Apple management indicated that inventory records would be made available. Management also expressed a willingness to

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permit surveying of its customers and use of distributors' invoices to gauge storewide purchases of target products.

Manhattan is the most urbanized of the five boroughs, all 12 Manhattan districts were in the full recycling program, and Red Apple had many Manhattan stores, so this borough was targeted for the location of the test stores. In order to test two different levels of educational programs, the neighborhoods in which the stores were located must be demographically similar. An analysis of Manhattan neighborhoods using Geographical Information Systems (GIS Plus package with a database including 1990 census data for New York City) was used for this purpose. Red Apple management initially suggested two Gristede's supermarkets, one on the upper east side of Manhattan (75th St), and the other on the upper west side (86th Street). The housing type in both neighborhoods is exclusively apartment buildings, and most people walk to the supermarket. The GIS analysis for these two areas showed that the per capita incomes in the census tracts immediately adjacent to the two stores was the same ($15,000 to $20,000). The racial mix was fairly similar with whites comprising 80-90% at the West 86th Street and 90-100% at the East 75th Street, blacks 5-10% at West 86th and 0-5% at East 75th, and Hispanics 10-15% at West 86th and 0-5% at East 75th. At the last minute, Red Apple management insisted upon changing the east side store to a Gristede's store on East 86th Street. The East 86th Street store's demographics were considered to be similar to the West 86th Street store, with average income at $10,000 to 20,000, with a racial mix of 90-100% whites and 0-5% blacks, and Hispanics 5-10%.

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Preliminary reconnaissance of the two chosen stores revealed the following. The East 86th Street store, just off First Avenue, is a street-level store, which was perhaps at least 50% larger than the west side store and was less cramped as well. There was a deli counter, a bakery area, and a fish/meat counter. There were about 7 checkout lines. The west side store was located in a basement just off Broadway, with access by escalator, stairway, and elevator with a small street-level vestibule. The store was small and very cramped. To compound this, delivery boxes were stacked in the narrow aisles on a regular basis. There was a deli counter, a very small bakery section, and 5 checkout aisles, making passage with a shopping cart nearly impossible. Red Apple Management suggested that the west side store would be more appropriate for the intensive educational effort because of the extra space in the lobby vestibule (where volunteer tables could be set up), as well as the space on the walls adjacent to the stairs/escalator.

Design of the Data Gathering Effort

In order to evaluate the effectiveness of the educational campaign, several measurement methods were used to gather data. In the research literature, surveys were the most frequent method used to gauge the impact of conservation education on the public, though the data gathered in this manner is subjective. In a few cases (e.g., the Suffolk County study [27] and the and Michigan SORED study [28]) the researchers asked volunteer shoppers to keep track of the purchases they made, by holding onto store receipts in

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[27] Foulke, Sally, "Environmental Supermarket Shopping -- Final Report", Cornell Cooperative Extension, Riverhead, NY

[28] De Young, Raymond, et. al., "Individual Source Reduction Behavior: A Study of the Effect of Environmental and Economic Motivational Information", Masters Project, University of Michigan School of Natural Resources, June 21, 1991.

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diaries. To make this study as useful as possible, and since previous studies did not often gather objective data, and this kind of information is less open to misinterpretation, collection of objective data was considered important for this study. Thus, the impact of the campaign would be measured using three methods, for the purpose of cross-checking and verifying the accuracy of the results.

On the recommendation of a packaging expert at Rutgers [29], surveys were administered to the same shoppers before and after the educational campaign, rather than issuing huge numbers of before and after surveys in the store to different people. Since the objective was to determine how consumers would respond to the educational campaign, it was important to survey the same individuals before and after the campaign, and repeat some of the questions in both surveys. If the education had no impact, then the answers to the repeated questions would not change. Similarly, any change measured would more accurately reflect a change caused by the experiment. Two other methods of evaluation entailed collection of objective data. Those shoppers that answered the baseline survey were asked to keep diaries of purchases, and storewide purchasing information were collected. As for the kinds of information that should be gathered and how it should be analyzed, a literature survey was undertaken to provide others' perspectives. Chapter 3 and Appendix E provides more detail on the design, administration and results of the surveys and diaries used by other researchers.

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[29] Notes from Meeting 1/9/92 with Dr. Chaim Mannheim, Rutgers Plastics and Packaging Institute, Piscataway, NJ.

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To test the research hypothesis and investigate the research questions, the data collected had to be useful in statistical analyses. The structure of the questions was purposely designed to produce numerical answers that could be used in statistical analyses. The questions were multiple choice (e.g., for demographics questions), yes/no (knowledge, knowledge sources), ranking (1 to 4) for motivation questions, and Likert scale (e.g., 1 = never to 5 = always) in the case of attitude and behavior questions. In keeping with the research questions, and instructed by the research literature, the data gathering effort was designed to elicit comparisons of the customers' shopping behaviors, attitudes, environmental knowledge, and other demographic attributes and behaviors. Collection of such data would permit comparison of the two different levels of educational campaign at the two stores.

Survey Data Gathering and Administration -- General Points

The survey design and testing was based on the strategy for its administration and analysis. In order to make the results statistically valid and useful for analysis, it was as important to have the correct number of respondents as it was that they be randomly selected. Other prerequisites of the statistical analysis, that the same target products be available in each store, and that each store be from a similar area demographically, were also satisfied. To refine the surveys and reduce the number of possible questions to those which are most useful, a questionnaire can be tested on a group in advance, to cull or reword those questions which are misunderstood or less important to the results.

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The original plan had been for the surveys to be administered by phone, as Red Apple had promised access to their check cashing customer's phone numbers. Telephone was considered to be the best option the same shoppers would complete both before- and after-campaign surveys. Mail-in surveys are notorious for poor response rates, so a greater effort would be necessary to obtain the same number of responses were that method to be chosen. In addition, respondents in mail surveys are more self-selected (less random) than by telephone, and since this is a longitudinal study, it was thought that fewer responses would be obtained for the second survey administered by this method. In-person survey administration was also problematic; having shoppers complete the baseline surveys in-person in the stores, and then finding the same ones in the store again months later would be logistically infeasible.

An initial sample size of 400 survey respondents per store was chosen to provide 95% confidence that the study would produce significant results. (Three hundred eight-four is the minimum number of individuals required to achieve this level of confidence). To get a statistically valid sample of survey respondents, survey collection volunteers were instructed to randomize the selection of respondents. Every person entering the two test stores that the volunteers could reach was asked to complete the three-page baseline survey. In order to make the answers usable in statistical analyses such as regression and correlation, the data collection instruments would have to be structured so that the answers to the questions would be discrete and quantified, preferably on an integer or ratio scale, allowing dummy variables (e.g., yes/no, true/false), or groupings (e.g., Likert scales, or 0-20%, 21-40%...)

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Though most of the decisions regarding of the experimental design were self-generated, a number of elements were imposed upon the project by the supermarket management. Just before survey administration was to begin, Red Apple unexpectedly announced its abandonment of the entire project, and it turned out to be because they did not want to give out customers' phone numbers. It was quickly agreed that the project volunteers could approach customers in the stores to have them fill out the baseline questionnaires. But this delayed and prolonged the completion of this data-gathering phase, as volunteers would have to arrange to spend hours per day at Gristede's stores. It also meant that the methods of survey administration would be mixed (i.e., in-person for baseline and telephone for follow-up), fraught with the possibility for confounding influences on the results based solely on the method of data gathering. Red Apple also reneged on their offer of coupon books as a small incentive for their customers to complete both the baseline and the follow-up surveys. As a result, it is likely that fewer follow-up surveys were completed, reducing the sample size for that cohort. Nonetheless, the sample size for the baseline survey was greater than those for many of the surveys summarized in Appendix E.

The follow-up surveys were designed to repeat many of the questions for purposes of comparison, but could not be too long or the respondents would lose patience with a telephone interview. The surveys, of about seven minutes in duration, were administered to those who filled out a baseline survey and left a name and phone number by which they could be contacted in the weeks following the educational program.

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Types of Questions to Consider in Designing the Surveys

The universe of possible question categories is considerable, therefore it was necessary to narrow the scope of the survey questions asked of shoppers. Socio-behavioral studies have been undertaken by numerous researchers to investigate and characterize the relationship between consumer education efforts, such as is planned for this study, and changes in purchasing decisions. These are summarized below: Appendix E provides additional detail from the studies specifically examining environmental shopping.

Knowledge of the environment

Knowledge of the environment is a prerequisite for having attitudes about it or appreciation of it. Questions should address both previous knowledge and attitudes categories. Examples of questions in these areas are:

- Do you believe that your shopping habits have an impact on the amount of garbage you generate?

- Rate the following as contributing to environmental ills: (inspired by a list prepared by Warwick, Baker, & Fiore [30])

  - disposable diapers
  - cloth diapers washed at home

[30] "Findings on Environmental Issues", Decision Research, March, 1991, and Warwick, Baker, & Fiore Advertising, May, 1990 (in Ottman, J. Green Marketing: Challenges and Opportunities for the New Marketing Age, NTC Business Books, Lincolnwood, IL, 1992.)

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- cloth diapers washed by a service
- plastic grocery bags
- paper grocery bags
- cloth or string grocery bags
- packaging in glass containers
- packaging in plastic containers
- packaging in metal containers
- packaging in plastic wrap
- packaging in Styrofoam
- packaging in paperboard
- concentrates
- individual-serving packages

To measure appreciation of the environment, questions were structured to measure the respondent's rating of importance of the environment on the public agenda, compared to other pressing problems (see the study by Angus Reid [31]).

Sources of environmental information

Sources of environmental information cover a considerable range (see list in Appendix E). Potential sources of environmental information are the media, building management, friends, children and other family members.

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[31] *Environment* U.S.A., The Angus Reid Group, 1991 (in Ottman, J. Green Marketing: Challenges and Opportunities for the New Marketing Age, NTC Business Books, Lincolnwood, IL, 1992.)

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Demographics

Based on information in Appendix E, demographics (e.g., social attributes such as gender, age, income, race, education, family size) were not found to influence environmental attitudes directly. However, demographics can affect the economic constraints imposed by the program, and therefore can be deterrents in some conservation behaviors.

Awareness

Awareness of a recycling program was investigated in the study by Kok and Siero [32] by asking questions about respondents' reading of advertisements in written media, how frequently respondents visit the vicinity of the recycling container, and whether respondents have a child at a school where attention to the program has been given. These types of questions were effective to some extent in making the public aware of the program.

In a study by Tracy and Oskamp [33] 96 randomly selected adults in a Los Angeles suburb were asked about their adoption of 15 ecologically responsible behaviors. The study found that a lack of awareness of what an individual or household can do to benefit the environment was associated with a very low rate of participation for all ecologically responsible behavior, including recycling and purchase of more ecologically compatible

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[32] Kok, Gerjo and Sjef Siero, "Tin Recycling: Awareness, Comprehension, Attitude, Intention, and Behavior", Journal of Economic Psychology, 6 (1985) 157-173. Elsevier Science Publishers B.V. (North Holland).

[33] Tracy, A.P. and S. Oskamp, "Relationships Among Ecologically Responsible Behaviors", Journal of Environmental Systems, Vol. 13, No. 1, 1983-4, pp. 115-126, as reported in "Promoting Source Reduction and Recyclability in the Marketplace.

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goods. Participants recycled and/or consumed more ecologically compatible products in direct relationship to their concern for environmental problems. Thus, a prerequisite for environmental behaviors is sufficient awareness of how individuals can effect positive change in the environment, and the behaviors that are and are not ecologically responsible.

Comprehension

Comprehension of ecological and recycling issues is considered to be an important predictor of recycling behavior, and an even better predictor than environmental attitude according to one researcher.[34] But Kok and Siero found that it is possible for respondents to have positive scores on attitude, intention, and behavior without having a positive score on comprehension. That is, some people did not need a full comprehension of the utility of the tin-recycling program in order to participate. (Their study did show that the vast majority of those who did have positive attitude and intention did have positive comprehension.) To measure comprehension of the recycling program, Kok and Siero asked questions designed to elicit respondents' lack of comprehension with respect to six aspects of the program: (1) location of the container 4.0%, (2) in what way the tin should be delivered 14.7%, which objects have to be put into the container 20.0%, what happens to the tin after being collected 50.3%, which are the raw materials of tin 58.8%, and which of the raw materials is scarce 70.1%.

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[34] Arbuthnot, J., "The role of attitudinal and personality variables in the prediction of environmental behavior and knowledge", Environment and Behavior, 9 (2), 1977. pp. 217-232, as reported in Kok, Gerjo and Sjef Siero, "Tin Recycling: Awareness, Comprehension, Attitude, Intention, and Behavior", Journal of Economic Psychology, 6 (1985) 157-173. Elsevier Science Publishers B.V. (North Holland).

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Attitudes

Many studies have shown positive relationships between ecological attitudes and environmentally protective behavior.[35] Recent Roper polls and others (Van Liere & Dunlap, 1980 as reported in Oskamp) have shown that people who are concerned about environmental quality tend to be younger, better educated, and more liberal politically. However, Cutter[36] indicates that in metropolitan areas such as Chicago, the highest levels of concern about pollution are apt to be shown by residents of poor, non-white, high-density neighborhoods that have high levels of solid waste. This finding has obvious implications for our study, here in Manhattan.

Fishbein and Ajzen define an attitude as a person's general feeling of favorableness or unfavorableness towards that behavior. A person's social norm is his/her perception of whether the majority of people who are important to him/her think he/she should or should not perform the behavior in question. Specific consequences of positive behavior used by Kok and Siero to measure the structure of attitudes towards participation included: that the program is pro-ecology, reduces the extent of refuse dumps, reduces waste of raw materials, reduces the amount of refuse discarded, reduces exhaustion of raw materials, favors the children's' future, reduces the waste of energy, is ineffective, always needs some kind of subsidy, gives trouble at home, and costs time and effort.

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35 Bruvold, 1972; Heberlein & Black, 1981, Humphrey, Bord, Hammond, & Mann, 1977, McGuinness, Jones, and Cole, 1977; Weigel, Vernon, & Tognacci, 1974 as reported in Oskamp, Stuart, "Psychology's Role in the Conserving Society" Applied Social Psychology, Prentice-Hall, Inc. 1984.

36 Cutter, S.C., "Community concern for pollution: Social and environmental influences" Environment and Behavior, 1981, 1, pp. 339-343.

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Kok and Siero showed that a person's attitude towards a specific behavior has an important effect on the change in that behavior. But they found that six difficulties or inconveniences associated with performing the desired behavior have a relationship with subjects implementing the behavior, though these barriers have a less significant influence than attitude and social norm. The six difficulties included: 'must keep it in mind all the time', sharp lids, cleaning the tins, occupying space at home, distance to the central collection container, bring to the central collection container, and spending time. (The last is not as significant as the others.) As one would expect, those who do not participate in the program anymore are most likely to have had difficulties.[37]

Schwartz [38] pointed out that the acceptance of responsibility is a moderator variable between attitude and behavior, and that only people with a high level of responsibility will behave in accordance with their positive attitudes. But Kok and Siero found that those respondents with a high level of responsibility have the same correlation between attitude and behavior as those with the lowest level of responsibility. Related to this idea is one posed by Fishbein and Ajzen, that persons with a high acceptance of responsibility believe that their ecological behavior has ecological consequences. The data gathered by Kok and Siero confirm this idea. Thus, for this study, it was important to measure

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[37] Kok, Gerjo and Sjef Siero, "Tin Recycling: Awareness, Comprehension, Attitude, Intention, and Behavior", Journal of Economic Psychology, 6 (1985) 157-173. Elsevier Science Publishers B.V. (North Holland).

[38] Schwartz, S.H., "Normative influences on altruism", in Advances in Experimental Social Psychology, L. Berkowitz (ed.,), Vol. 10, Academic Press, New York, pp. 221-279 as reported in Kok, Gerjo and Sjef Siero, "Tin Recycling: Awareness, Comprehension, Attitude, Intention, and Behavior", Journal of Economic Psychology, 6 (1985) 157-173. Elsevier Science Publishers B.V. (North Holland).

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understanding of actions and the environmental consequences, as well as acceptance of some responsibility for environmental problems.

A study in Sweden[39] determined that there are two basic attitudes that led to sorting of recyclables: (1) recycling is a means to protect nature and environment, ensuring a higher quality of life, and (2) recycling is economically sensible. However, it was shown that it wasn't economic motives but rather idealistic motives that more often brought people to participate in source separation. Even non-recyclers held the view that environmental protection was more important than economy as a reason to recycle. The five most frequent reasons for non-recyclers not participating in source separation were (in descending order): 1) too small a household, not worthwhile, 2) prefer to handle garbage themselves or to have another organization do it, 3) prefer to have their own compost (backyard composting of household waste is illegal in Sweden), 4) complaints against the way municipalities handle garbage collection, and 5) not enough knowledge, need more information.

A study which may explain this (by De Young)[40] has reported a close association between derived satisfactions (i.e., the structure of satisfactions people derive from behaving in an environmentally responsible manner) and intrinsic motivation. He also

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39 Israel, Lena, "Reasoning Out Recycling Reluctance", Waste Age, March 1991, pp. 226-230.

40 De Young, R. "Encouraging environmentally appropriate behavior: the role of intrinsic motivation", Journal of Environmental Systems, 1985-6, 15: pp. 281-292.

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found that intrinsic motivation mechanisms rather than overt extrinsic solutions result in a greater likelihood of continuation of behaviors for the long-term.

Motivation

Dunlap et. al.,[41] suggested that concern for the environment would be a significant motivation for recycling or other pro-environmental behavior when basic economic or survival needs are met. Higher order values (e.g. desire for high quality environment) were held more by recyclers and lower order values (e.g., safety and security) were held more important by non-recyclers. However, as awareness of the health effects of environmental pollution increased, the differences between the two groups narrowed, pointing out the importance of environmental education and awareness on attitudes. It could be useful to ask about the level of safety and security the respondent feels (in his/her building/neighborhood) in addition to income to address these concerns.

In a study relating attitudes and behaviors with respect to energy conservation, Olsen[42] found that the strongest factor stimulating energy conservation is the perception of personal consequences of the energy crisis. The counterpart to this in the solid waste field is peoples' reaction to garbage piling up in the streets, or the belief that reduction and recycling behavior will reduce garbage bills (as under quantity-based user fees). The second strongest factor stimulating energy conserving actions is holding a personal norm

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41 Dunlap, R.E., et. al., "Human values and pro-environmental behavior" in W.D. Conn (ed.) Energy and Material Resources: Attitudes, Values, and Public Policy, Westview Press, Boulder, CO 1983. pp. 145-168.

42 Olsen, M.E., "Consumers' attitudes toward energy conservation" Journal of Social Issue, 1981, 37(2), pp. 108-131.

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of conservation (e.g. feeling personally responsible to help solve the energy (solid waste) crisis). Also, two studies [43,44] indicate that those who believe there are negative comfort or health consequences of energy-conservation actions (convenience also is applicable to solid waste prevention or materials conservation) are unlikely to achieve actual energy savings.

De Young[45] demonstrates that people derive satisfaction from such frugal activities as recycling, reusing, and other types of conservation behavior. This suggests that people might carry out conservation behavior not for the promise of a tangible external reward, but for the personal satisfaction they derive from the activity. He lists a number of questions involving attitude (satisfaction items) and behavior, which we could adapt to measure our shoppers before and after education.

The aforementioned study by Kok and Siero[46] examined to what degree the following three factors facilitated or inhibited participation in a recycling program: (1) attitude change through communication -- which is the prime mechanism to be used in this study, (2) the relationships between belief, attitude, intention, and behavior, (theory of reasoned

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43 Becker, L.J. et. al., "Relating attitudes to residential energy use" Environment and Behavior, 1981, 13, pp 590-609.

44 Seligman, C., et. al., "Predicting summer energy consumption from homeowners' attitudes" Journal of Applied Social Psychology, 1979, 9, pp. 70-90.

45 De Young, Raymond. "Some Psychological Aspects of Recycling: The Structure of Conservation Satisfactions" Environment and Behavior, Vol. 18, No. 4, July, 1986, pp. 435-449.

46 Kok, Gerjo and Sjef Siero, "Tin Recycling: Awareness, Comprehension, Attitude, Intention, and Behavior", Journal of Economic Psychology, 6 (1985) 157-173. Elsevier Science Publishers B.V. (North Holland).

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action) and (3) acceptance of responsibility. One reason that awareness, comprehension, attitude change, and behavioral change may be related is that they are all steps in a process whereby the individual exposed to education is subsequently infused with these ideas and changes behavior, as suggested by McGuire.[47] Kok and Siero integrated these three theoretical points of view in a stepwise model of participation in a recycling program (see Figure 1). These authors determined a partial confirmation of the theory of reasoned action, indicating the need to take into account the difficulties with and opportunities for behavior modification.

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47 McGuire, W.J., "Persuasion, resistance and attitude change", in I. de Sola Pool and W. Schramm (eds.), Handbook of Communication, Rand McNally, Chicago, IL, 1973. pp. 216-252, as reported in Kok, Gerjo and Sjef Siero, "Tin Recycling: Awareness, Comprehension, Attitude, Intention, and Behavior", Journal of Economic Psychology, 6 (1985) 157-173. Elsevier Science Publishers B.V. (North Holland).

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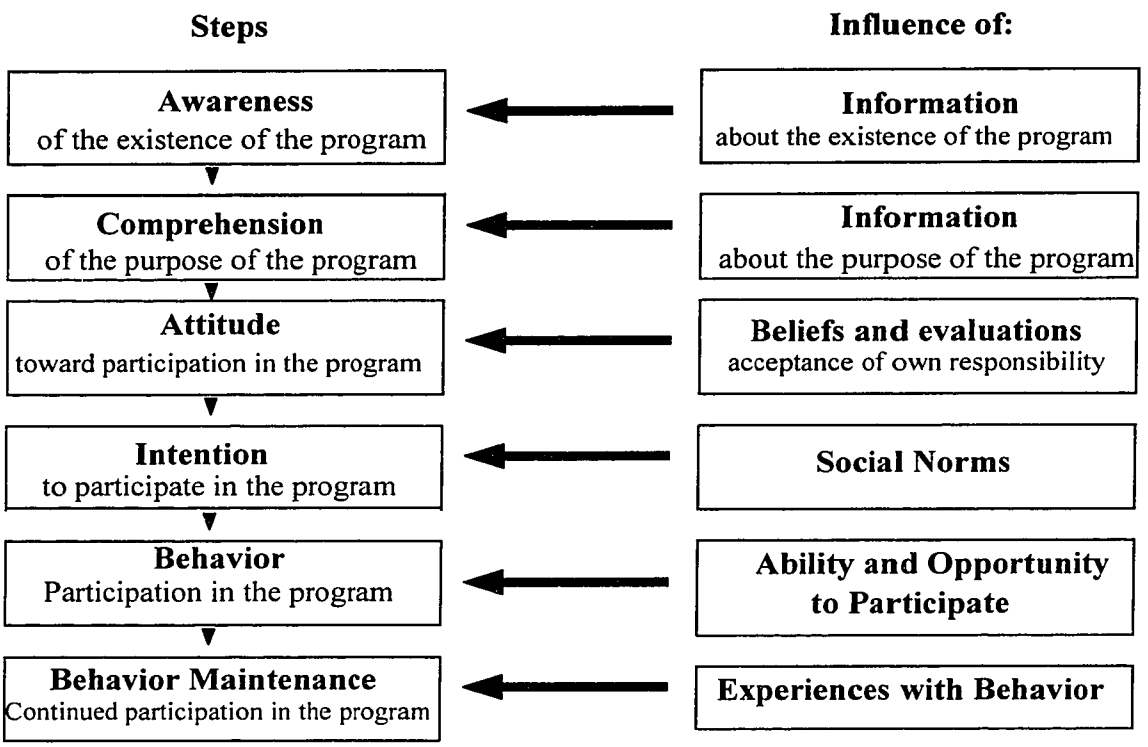
Figure 1. Model of attitude change and behavior change through communication [48]



The steps of the model and influences on these are further described and supported below:

Intentions

Intentions are a direct predictor of actual participation (in a recycling program), according to a dissertation by Florence Lansana [49]. This study also demonstrated that awareness, comprehension, attitude change, and behavioral change may be related.

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[48] Kok, Gerjo and Sjef Siero, "Tin Recycling: Awareness, Comprehension, Attitude, Intention, and Behavior", Journal of Economic Psychology, 6 (1985) 157-173. Elsevier Science Publishers B.V. (North Holland).

[49] Lansana, Florence, "Recycling Behavior: The Causal Role of Demographic, Communication, and Attitudinal Factors", PhD Dissertation, Kent State University.

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Specifically, Lansana showed that both environmental attitudes and economic constraints predict a household's intentions, and that a household's awareness of a recycling program directly affects its attitudes about the environmental impact of the program and directly affects its participation in the program.

Similarly, another study found that asking questions related to the intended behavior (e.g., attitudes towards pollution, conservation of natural resources, and importance of an unpolluted environment) are not as good in predicting the participation in Sierra Club activities as questions about the attitudes towards participating in those specific activities (i.e., intentions).[50]

Fishbein and Ajzen[51] theorize that a person's intention to perform a behavior is a function of two factors: the attitude towards that behavior and the social norms. Kok and Siero reaffirmed that direct measures of attitude and social norm are better predictors of intention than models of a person's beliefs, evaluations of the consequences of behavior, and motivation to comply. They also found that attitudes influence the intention to participate more than social norms do, though they did find that the most important reference persons for the social norm are partner, children, and friends. They also found

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50 Wiegel, R.H., et. al., "Specificity of the attitude as a determinant of attitude behavior congruence" Journal of Personality and Social Psychology 30(6), 1974, pp 724-728 as reported in Kok, Gerjo and Sjef Siero, "Tin Recycling: Awareness, Comprehension, Attitude, Intention, and Behavior", Journal of Economic Psychology, 6 (1985) 157-173. Elsevier Science Publishers B.V. (North Holland).

51 Fishbein, M. and I. Ajzen, Belief, attitude, intention and behavior: an introduction to theory and research, Addison Wesley, Reading, MA. 1975 as reported in Kok, Gerjo and Sjef Siero, "Tin Recycling: Awareness, Comprehension, Attitude, Intention, and Behavior", Journal of Economic Psychology, 6 (1985) 157-173. Elsevier Science Publishers B.V. (North Holland).

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that some people did not know that the government and utilities want them to participate in the program.

Since positive attitudes and intentions are two of the most important factors in predicting program participation (performance of desired behaviors), it is important to ask questions in these areas. Thus, to characterize shoppers' intentions, questions are asked about customers' attitudes towards environmental shopping (e.g., rated on a numerical scale), how they understand the social norms (as being/acting environmental), and to what degree they are motivated to behave according to social norm. To characterize shoppers' attitudes, we need to know what shapes these attitudes, specifically, and to what degree each type of environmental education (sources, descriptions) is effective in changing attitudes.

Intrinsic Motivation

Intrinsic motivation to act comes from within the individual. De Young [52] demonstrated that people derive satisfaction from such frugal activities as recycling, reusing, and other types of conservation behavior. This suggests that people carry out conservation behaviors not for the promise of a tangible external reward, but are motivated by the personal satisfaction they derive from the activity. Some interesting findings of De Young's research are that modern themes thought to govern purchasing habits, such as comfort and convenience, could actually be used to encourage "desired behavior patterns by emphasizing qualities such as durability and the sensual quality of environmentally

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[52] De Young, Raymond. "Some Psychological Aspects of Recycling: The Structure of Conservation Satisfactions" Environment and Behavior, Vol. 18, No. 4, July, 1986, pp. 435-449.

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appropriate products. For example, the desire for quality might be satisfied in an environmentally appropriate manner by purchasing only a few, high quality and long-lasting items rather than buying large quantities of disposable or less-durable goods."[53]

In another study [54] De Young found that important motivations for recycling behavior were non-monetary, for example environmental values and intrinsic satisfaction. Therefore, the study recommended that when promoting waste reduction and recycling one should design programs to concentrate on the effect recycling has on the environment, any benefits recycling may have for a charitable organization, and the personal, intrinsic satisfaction gained from doing the right thing. In addition, the study suggested that efforts should concentrate on helping people know how to make the choices in environmental shopping.

Extrinsic Motivation

Extrinsic motivation strategies, those outside the self that motivate behavioral change, can include rewards for performing the desired behavior (e.g., recycling lotteries) as well as reductions in cost (e.g., discounts for particular environmentally-preferable products). Monetary incentives (a form of extrinsic incentive) have been found to be successful

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53 De Young, R. and S. Kaplan, "Conservation Behavior and the Structure of Satisfactions," Journal of Environmental Systems, Vol. 15, No. 3, 1985-86, pp. 233-242 in "Promoting Source Reduction and Recyclability in the Marketplace".

54 De Young, Raymond. "Recycling as appropriate behavior: a review of survey data from selected recycling education programs in Michigan", Resources, Conservation and Recycling, 3 (1990) pp 253-266.

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reinforcers of behavior in energy conservation research.[55] Other extrinsic incentives and disincentives include increased or decreased comfort or convenience, and social approval or disapproval.[56,57] Lyben and Cummings [58] found that the combination of a prompt, lottery, and contests was more effective in promoting beverage container recycling than a baseline educational treatment using only the prompt and convenient recycling containers. Other extrinsic incentives and disincentives include increased or decreased comfort or convenience, and social approval or disapproval [59, 60]

On the other hand, Katzev and Johnson [61] showed that the desired conservation behavior is usually maintained only as long as the incentive is in effect. In another study of paper recycling, Witmer and Geller [62] found that after removal of the extrinsic incentives, there was an immediate return to baseline levels. Investigators in some experimental studies

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55 Winett, R.A. et. al., "The effects of monetary rebates and fees? on electricity conservation" Journal of Environmental Systems, 1977, 6, pp. 329-341.

56 Cook, S.W. and J.L. Berrenberg "Approaches to encouraging conservation behavior: a review and conceptual framework" Journal of Social Issues, 1981, 37, pp. 73-107.

57 Nielsen, J.M. and B.L. Ellington, "Asocial processes and resource conservation: a case study in low technology recycling", in N. R. Feimer and E. S. Geller (eds.) Environmental Psychology: Directions and Perspectives McGraw-Hill, New York, 1983.

58 Luyben, P. and S. Cummings "Motivating beverage container recycling on a college campus", Journal of Environmental Systems 11, 1981-2, pp. 235-245.

59 Cook, S.W. and J.L. Berrenberg "Approaches to encouraging conservation behavior: a review and conceptual framework" Journal of Social Issues, 1981, 37, pp. 73-107.

60 Nielsen, J.M. and B.L. Ellington, "Asocial processes and resource conservation: a case study in low technology recycling", in N. R. Feimer and E. S. Geller (eds.) Environmental Psychology: Directions and Perspectives McGraw-Hill, New York, 1983.

61 Katzev, R.D. and T.R. Johnson, "A social-psychological analysis of residential electricity consumption: the impact of minimal justification techniques", Journal of Economic Psychology 3: 1983, pp. 267-284.

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offered incentives greater than the value of the energy saved. [63] Monetary disincentives, such as increasing the costs of gasoline and electricity, have been shown to have effects on behavior, but a certain price inelasticity has been found in some, but not all cases.[64], [65] These findings illustrate the problems with depending on extrinsic incentives to promote long-term, enduring changes in behavior.

The University of Michigan Source Reduction (SORED) study [66] was designed to evaluate the effectiveness of using environmental arguments, economic arguments, and both in combination as motivation for source reduction behaviors in supermarkets. The environmental arguments were contained in educational instruments that showed the environmental benefits of environmental shopping (conserved resources, reduced pollution, etc...). The economic arguments, presented in other brochures, pointed out the typical cost savings to shoppers of buying in bulk, for example. This study found that educational prompts with intrinsic (environmental) or extrinsic (economic) arguments had a significant impact on changing source reduction shopping behavior vis a vis the

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62 Witmer, J. F. and E.S. Geller "Facilitating paper recycling: effects of prompts, raffles, and contests", Journal of Applied Behavior Analysis, 1976, 9: pp. 315-322.

63 Oskamp, Stuart, "Psychology's Role in the Conserving Society" Applied Social Psychology, Prentice-Hall, Inc. 1984.

64 Foxx, R. M. and Hake, K. F., "Gasoline conservation: A procedure for measuring and reducing the driving of college students" Journal of Applied Behavior Analysis, 1977, 10, pp. 61-74.

65 Winett, R.A. and Neale, M.S. "Psychological framework for energy conservation in buildings: Strategies, outcomes, directions" Energy and Buildings, 1979, 2, pp 101-11?

66 DeYoung, Raymond, et. al., "Individual Source Reduction Behavior: A Study of the Effect of Environmental and Economic Motivational Information", Masters Project, University of Michigan, School of Natural Resources, June 21, 1991.

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control group. But for the cohort given both intrinsic and extrinsic arguments, the change was even greater than those given either alone.

Changing Behaviors

Geller [67] found that targeted strategies designed to change consumer behavior and purchase decisions are more likely to gain widespread acceptance and produce long lasting changes in buying habits than are programs that focus solely on attitudes. Geller and Lehman [68] also found that the most successful large-scale educational programs are likely to be those which utilize a diverse set of strategies to induce and promote and desired behaviors, since different people respond to different stimuli. Similarly, studies[69], [70] have shown a negligible relationship between the actual conservation actions of people and their enthusiastic attitudes, intentions, and reports of conservation actions after they had received education. So self-reported data should be cross-checked with objective data.

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[67] Geller, E.S., "Prevention of Environmental Problems", in B.A. Edelstein and L. Michelson (eds.), Handbook of Prevention, Plenum Publishing Corporation, 1986, Ch. 16, pp. 361-383.

[68] Geller, E. S., and G. Lehman "Motivating Desirable Waste Management Behavior; Applications of Behavior Analysis", Journal of Resource Management and Technology, Vol. 15, Nos. 2&3, December, 1986, pp. 58-68.

[69] Geller, E.S., "Evaluating energy conservation programs: Is verbal report enough? Journal of Consumer Research, 1981, 8, pp. 331-335.

[70] Olsen, M. and Cluett, C. "Evaluation of the Seattle City Light neighborhood energy conservation program", Seattle: Battelle Human Affairs Research Centers, 1979.

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Maintenance of Behavior

Although studies have shown that behavior can be modified, maintenance of changed behavior does not always occur. Some studies show that extrinsic motivations (e.g., monetary incentives) are needed to stimulate desired behaviors, others show that behavior is maintained only as long as extrinsic incentives are in effect.[71],[72] Another study [73] found that the tone of the message is important to maximizing its impact (i.e., a more upbeat tone gets better results). Two studies [74], [75] show that in newspaper recycling programs the participants' accuracy in separating newspapers declines over time. Another study reaffirms this, showing that changed behavior continues only when the behavior has the expected positive consequences. [76] Yet another study [77] showed that the desired behavior is usually maintained only as long as an incentive is in effect. In

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71 Katzev, R.D. and T.R. Johnson, "A social-psychological analysis of residential electricity consumption: the impact of minimal justification techniques", Journal of Economic Psychology 3: 1983, pp. 267-284.

72 Witmer, J.F. and E.S. Geller "Facilitating paper recycling: Effects of Prompts, raffles, and contests", Journal of Applied Behavior Analysis, 1976, 9: pp. 315-322.

73 "Promoting Source Reduction and Recyclability in the Marketplace: A Study of Consumer and Industry Response to Promotion of Source Reduced, Recycled, and Recyclable Products and Packaging", prepared for Richard M. Kashmanian, USEPA, Washington, DC, September, 1989.

74 Humphrey, C.R., et. al., "Attitudes and conditions for cooperation in a paper recycling program" Environment and Behavior 9(1), 1977, pp. 107-124 as reported in Kok, Gerjo and Sjef Siero, "Tin Recycling: Awareness, Comprehension, Attitude, Intention, and Behavior", Journal of Economic Psychology, 6 (1985) 157-173. Elsevier Science Publishers B.V. (North Holland).

75 Reid, D.H., et. al., "Newspaper recycling behavior: the effects of prompting and proximity of containers" Environment and Behavior, 8(3), 1976, pp. 471-482 as reported in Kok, Gerjo and Sjef Siero, "Tin Recycling: Awareness, Comprehension, Attitude, Intention, and Behavior", Journal of Economic Psychology, 6 (1985) 157-173. Elsevier Science Publishers B.V. (North Holland).

76 Rogers, E.M., Diffusion of Innovations, Free Press, New York, 1983, as reported in Kok, Gerjo and Sjef Siero, "Tin Recycling: Awareness, Comprehension, Attitude, Intention, and Behavior", Journal of Economic Psychology, 6 (1985) 157-173. Elsevier Science Publishers B.V. (North Holland).

77 Katzev, R.D. and T.R. Johnson, "A social-psychological analysis of residential electricity consumption: the impact of minimal justification techniques", Journal of Economic Psychology 3: 1983, pp. 267-284.

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another study of paper recycling, Witmer and Geller [78] found that after removal of the extrinsic incentives, there was an immediate return to baseline levels.

In a study of newspaper recycling, Pardini and Katzev [79, 80] achieved a maintenance of recycling behavior using a moderate form of external inducement (asking participants to give a verbal commitment to recycle or to sign a legally non-binding commitment statement). They suggested that the participants, by virtue of their commitment to carry out the behavior, may have been led to find their own (intrinsic) reasons for recycling, to begin to even like it, and continue to perform these and more desired behaviors on their own. (This approach is termed the "foot-in-the-door technique".) Furthermore, these researchers found that participation rates in recycling were typically low when incentives were used, that many of the incentive programs were not cost-effective, and that incentive programs did not produce lasting changes in recycling behavior. They found that encouraging individuals to begin conserving resources by making a small commitment to recycle a household product can often times act as a catalyst for initiating and sustaining further conserving acts.

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78 Witmer, J. F. and E.S. Geller "Facilitating paper recycling: effects of prompts, raffles, and contests", Journal of Applied Behavior Analysis, 1976, 9: pp. 315-322.

79 Pardini, A.U and R.D. Katzev "The effects of strength of commitment on newspaper recycling" Journal of Environmental Systems, 1983-4, 13: pp. 245-254.

80 Katzev, R.D. and A.U. Pardini, "The Comparative Effectiveness of Reward and Commitment Approaches in Motivating Community Recycling", Journal of Environmental Systems, Vol. 17, No. 2, 1987-88, pp. 93-113 in "Promoting Source Reduction and Recyclability in the Marketplace".

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These studies illustrate the problems with depending on extrinsic incentives to promote long-term enduring changes in behavior. Since one of the objectives of this study is to design an educational program that will be successful in the long-term, it is important to design the study to focus more on intrinsic motivations. One way to determine if the shoppers in this study maintain new behaviors after the educational campaign is over is to monitor their purchasing patterns for a while (during a "passive phase" of the campaign implementation) via storewide purchases and diaries.

Feedback

Feedback regarding consumption is another important behavioral approach to conservation. When used as the only educational approach to encouraging energy conservation, it has produced savings in the 10-20% range [81], and more when used in combination with other techniques, such as modeling or monetary incentives.[82] More important for this study, feedback has been found to have continuing effects for several months after the experimental treatment was discontinued.[83],[84] Also, for best results, feedback should be at least several times a week rather than weekly or monthly. Theoretical analyses of feedback indicate that it appears to be more effective than other behavioral techniques, since it has both informational and motivational properties and can

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81 Winett, R.A. and Neale, M.S. "Psychological framework for energy conservation in buildings: Strategies, outcomes, directions" Energy and Buildings, 1979, 2, pp 101-11?

82 Winkler, R.C. and Winett, R.A. "Behavioral interventions in resource conservation systems approach based on behavioral economics" American Psychologist, 1, pp. 421-435.

83 Pallak, M.S. et. al., "Commitment and energy conservation" in L Bickman (Ed.), Applied social psychology annual (Vol. 1), Sage, Beverly Hills, CA, 1980.

84 Winett, R.A., et. al., "Effects of self-monitoring and feedback... residential electricity consumption" Journal of Applied Behavior Analysis, 1979, ...p 184.

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result in longer maintenance of changed behaviors and increased program effectiveness.[85, 86]

Schnelle tested feedback (positive information provided to participants regarding program success) as one method of encouraging continued conservation behavior,[87] and it was found that the amount of litter in city streets was significantly reduced when weekly reports of the volume of litter were published in the local newspaper. According to EPA's Kashmanian [88], another benefit of structuring opportunity for participants to feedback their experiences or suggestions into follow-up surveys is that program organizers not only learn to what extent participants change attitudes and behavior, but also to what degree consumers respond to each of the different educational tools used in the campaign (e.g., informational pamphlets, posters, etc...). This type of feedback permits the organizations conducting the education to modify the program to fit the audience.

Another approach to feedback is self-monitoring, or training the householder to read and record the utility meter (or in our case, their grocery purchases) on a periodic basis. This

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85 Seligman, C. et. al., "Encouraging residential energy conservation through feedback" in A. Baum and J. E. Singer (Eds.) Advances in environmental psychology (vol 3): Psychological perspectives. Erlbaum, Hillsdale, NJ 1981.

86 Ellis, P. and Gaskell, G.A. "A Review of social research on the individual energy consumer" Unpublished manuscript. London School of Economics and Political Science, 1978.

87 Schnelle, J.G. et. al., "Mass media techniques for prompting behavior change in the community" Environment and Behavior, 1980, Vol 12: pp. 157-166.

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has typically produced energy savings of almost 10%.[89] Therefore, use of a self-selected group to record purchases in a diary may produce biased results, since devoting attention to this activity may result in more environmental shopping. Such a bias would have to be taken into account when used as a cross-check for other methods of measuring behavioral change.

Narrowing the Focus for Data Collection

The literature survey shows the breadth of categories and topics on which the data gathering effort could focus. In keeping the with research objectives of this study, the most important area for data collection is the customers' shopping and other environmental behaviors. In order to find out what might cause or be related to these behaviors, surveys about shoppers' environmental attitudes and knowledge, sources of environmental information, and demographics are important. Based on other research into consumers' environmental behaviors, it makes sense to focus questions to elicit shoppers' self-reported behavior utilizing two methods: surveys to elicit information on recycling and other environmental behaviors already practiced by the respondents (e.g., what percentage of your recyclables do you recycle?), and volunteer reports on store purchases specific to our target items. The questions could address the frequency of purchase/use of the target items (recyclable/non-recyclable pairs, reusable/disposable

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88 "Promoting Source Reduction and Recyclability in the Marketplace: A Study of Consumer and Industry Response to Promotion of Source Reduced, Recycled, and Recyclable Products and Packaging", prepared for Richard M. Kashmanian, USEPA, Washington, DC, September, 1989.

89 Winett, R.A., et. al., "Effects of self-monitoring and feedback... residential electricity consumption" Journal of Applied Behavior Analysis, 1979, ...p 184.

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bags, and disposable diapers/ diaper service. Since studies [90], [91] have shown a negligible relationship between the actual conservation actions of people and their enthusiastic attitudes, intentions, and reports of conservation actions after they had received education, it would be useful to verify the accuracy of the self-reporting data generated by the surveys. One method would be to check those who claim to have started diaper service, since the names of those who do will be available. Another objective verification of shopper purchases of the other target items could be comparison of storewide purchases of these items. The two objective mechanisms used to confirm the self-reported results will be discussed later in this chapter.

Parameters of Questionnaire design

Key questions in the survey measure changes in purchasing behaviors in the supermarket. Other questions delve into shoppers' motivations for such behaviors (e.g., their attitudes on various environmental issues including environmental shopping and their environmental knowledge), as well as demographics, to explain changes in behavior. Certain questions are targeted towards the use of diapers and bringing one's own bag to the supermarket.

Expanding upon the hypothesis and research questions, the basic parameters for the baseline and follow-up surveys accomplish the following:

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[90] Geller, E.S., "Evaluating energy conservation programs: Is verbal report enough? Journal of Consumer Research, 1981, 8, pp. 331-335.

[91] Olsen, M. and Cluett, C. "Evaluation of the Seattle City Light neighborhood energy conservation program", Seattle: Battelle Human Affairs Research Centers, 1979.

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1. determine whether and to what extent environmental education as part of an in-store campaign, targeted to certain environmental behaviors, resulted in positive changes,

2. determine the relationship of age, race, gender, income, and other attributes of consumers with their environmental knowledge, attitudes and behaviors before vs. after education,

3. test the level of consumer awareness of environmental issues and problems, including the local recycling program, and "environmentally friendly" products (including target items) and towards "environmentally friendly" behaviors in general (e.g. recycling, environmental shopping).

4. test shoppers' awareness and understanding of the educational program's existence, purpose, features, and message, and the relative effectiveness (recognition) of each of the project's educational channels (brochures, video, signage, etc...). Determine the extent to which the consumers understood the environmental messages in the education program. Determine whether and to what extent the consumer found each educational method to be pleasing (fostering knowledge) or whether there was a negative impression,

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5. determine the sources of shoppers' environmental knowledge (e.g., through which channels consumers learn about environmental products and activities -- media, in-store brochures, signage, etc...),

6. determine environmental satisfactions (e.g. to what degree respondents are satisfied by conservationist behaviors such as frugality, self-sufficiency, and participation in community-wide programs),

7. test consumer attitudes towards purchase of environmentally friendly products (and what it takes to encourage this)

8. find the motivations for consumer attitudes towards environmental friendly behaviors in general (e.g. recycling, conservation)

9. determine the non-environmental factors and barriers that influence consumer willingness to purchase environmentally friendly products (e.g., cost, convenience, brand name),

10. determine the shoppers' practice of environmental behaviors (e.g. purchase of "environmentally friendly" products and target items, participation in specific recycling and reuse activities,),

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11. evaluate the relative effectiveness of each of the educational materials featured in the campaign.

12. evaluate the feasibility of expanding environmental shopping programs. Determine whether and to what extent the presence of the environmental education program enhanced their likelihood of shopping at the store, and effect of the educational program on the store.

The literature survey provided extensive guidance with regard to the types of questions often asked on surveys, and to the questions themselves. Based on the literature survey, the following is an expansion of the outline used by Kok and Siero [92], that lists types of survey questions that might be suitable for this study.

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[92] Kok, Gerjo and Sjef Siero, "Tin Recycling: Awareness, Comprehension, Attitude, Intention, and Behavior", Journal of Economic Psychology, 6 (1985) 157-173. Elsevier Science Publishers B.V. (North Holland).

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Figure 2 Potential Topics for Survey Questions

Question area		Examples / or influenced by
I	Demographic information	Income, race, gender, education, age
II	General knowledge and appreciation	Information about knowledge of environmental problems, solid waste crisis, natural resources depletion, solid waste conservation behaviors, lifestyle impacts, lifecycle impacts, high regard for environment
III	Preexisting environmental satisfactions	De Young, e.g. frugality, self-sufficiency, Participation
IV	Preexisting environmental behaviors	Intensity/frequency of recycling, reuse, etc (De Young)
V	Sources of environmental info	See questions delineated in Appendix E
VI	Awareness of program existence	Information about the existence of the program
VII	Comprehension of program purpose	Information about the purpose of the program
VIII	Attitude towards participation	Beliefs and evaluations positive and negative) regarding value of contribution made by environmental shopping and solid waste conservation behaviors / acceptance of responsibility for actions and their impacts on the environment
IX	Intention to participate	Understanding and motivational factors motivation to adhere to Social norms (and economic constraints, safety considerations, intrinsic satisfactions, extrinsic motivation) Lansana, safety considerations – Dunlap, satisfactions -- De Young, extrinsic motivation -- Olsen, Lyben & Cummings)
X	Baseline purchasing behaviors	Questions should center on the frequency of purchase/use of the target items (recyclable vs. non-recyclable pairs, reusable/disposable bags, and disposable diapers/ diaper service.

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The following would be in a survey administered immediately after the campaign

XI Understanding of program teachings	Information about target items, impact of target vs. non-target items on environment
XII Perceived benefit of program	Impacts of one's actions on the environment
XIII Behavior -- participation	Ability and opportunity to participate; problems understanding or implementing our message; self-reported shopping practices
XIV Sources of our program information	Evaluation of the degree to which each of our educational materials (and the information in them) were noticed and produced desired behaviors

The following would only be in a post-passive phase survey

XV Behavior Maintenance	Experiences with behavior; recollection of our message

Taking into account the research questions and the literature review, as well as the assumption that objective data on actual changes in purchasing behavior would be available via the diaries and storewide purchase data, it was decided to include at least one from each of the following categories of questions:

- Demographics
- Recycling and Environmental Shopping Knowledge
- Sources of Environmental Knowledge
- Attitudes Towards Environmental Issues
- Intrinsic vs. Extrinsic Motivations
- Preexisting Environmental Behaviors

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- Awareness of the Environmental Shopping Campaign and its Message (post-survey only)

More detail on the actual questions chosen for the baseline and follow-up surveys and the rationale for choosing them is provided in Appendix E and Chapter 3.

Parameters of Diary Design

In order to gauge, more objectively, the impact of the educational program on the purchasing behavior of the customers, recruitment of volunteer shoppers to keep track of purchases in a diary was an option. Self-reported survey data may or may not be reliable; so if a subset of the original survey group to were asked to keep track of their purchases by means of store receipts, it would increase confidence in the veracity of the self-reported survey answers. Since the research design called for multiple means of measuring the impact on consumer behavior of the environmental shopping campaign, volunteer shopper diaries was one method explored for its potential for use in this study. The Suffolk County [93] and Michigan SORED [94] studies studied shopper behavior both via questionnaires and diaries of purchases kept by shoppers over the study period. Suffolk trained their 50 volunteer families for two hours. The Michigan SORED study also asked volunteer shoppers to keep their store receipts before and during the educational phase of the study. The two studies lasted from eight to ten weeks and varied with regard to how

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[93] Foulke, Sally, "Environmental Supermarket Shopping -- Final Report", Cornell Cooperative Extension, Riverhead, NY. 1992.

[94] DeYoung, Raymond, et. al., "Individual Source Reduction Behavior: A Study of the Effect of Environmental and Economic Motivational Information", Masters Project, University of Michigan, School of Natural Resources, June 21, 1991.

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the shoppers were trained (weekly reminder postcards and focus groups were two methods of keeping the volunteers involved). This and lessons learned from these two studies is explored further in Appendix VD.

In order to evaluate whether the educational program actually motivated the shoppers to choose a product in recyclable packaging vs. the same product in a non-recyclable package, for example, the diary should be designed to elicit specific information about the purchases, not just that they bought coffee, but the brand, size, price, and container material. Diary volunteers were asked to keep track of their purchases of selected items for 18 weeks, before, during, and after the 10-week educational campaign.

Information to be obtained from the diary volunteers included the product's size, whether it came in refill or concentrate form, and the type of packaging from a list (e.g., glass, tin can, plastic bottle, aluminum, paper carton, juice box, cardboard box, plastic bag). It was important to include a number of other questions on the diary record sheets regarding the number of product and grocery bags taken or purchased, and the number of disposable diapers purchased. More specific detail about the design of the diary instruments and the experience with this aspect of the data gathering effort is in Chapter 3 and Appendix VD.

Parameters of the Storewide Purchasing Evaluation

To verify the survey results with objective data, the project was designed to collect storewide inventory information before, during, and after the educational campaigns. For example, it is beneficial to know that survey respondents self-report that they have

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changed their purchasing habits to buy more products in recyclable packaging, and more so that a cohort of diary-keepers have receipts to demonstrate that fact. But if storewide purchases of products in recyclable packaging rise at the same time that those same products packaged in non-recyclable packaging fall, and that this change occurs at the same time as the educational campaign, its impact is demonstrably greater as was hoped. Since changes in purchasing habits can best be traced by studying only those products for which there is a choice between environmentally preferable and less preferable packaging, tracking the all the thousands of products sold in these stores would be unnecessary. As a cross-check on the purchasing patterns being tracked by the volunteer diary-keepers, it made sense to track the purchases of the same products storewide. The products targeted to track the use of recyclable vs. nonrecyclable packaging included orange juice, coffee, milk, chocolate pudding, chicken soup, detergent, and fabric softener. A subset of these was also available in either concentrate or refill (orange juice, detergent, and fabric softener), so purchase of these products signified this purchasing behavior.

Parameters for the Design of the Educational Campaign

The design of educational materials is integral to the results of the investigation. The focus is on the target items, but not entirely to the exclusion of other compatible environmental messages (bulk packaging, reduced purchase of other disposables). In order to design educational campaigns for two supermarkets in Manhattan it was necessary to decide and justify the kinds of educational materials to be used in each store, and when, where and how they should be deployed. In addition, the materials themselves

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would need to be designed to inform and motivate the shoppers regarding the desired environmental behaviors, and to do this in such a way as to maximize the impact on harried New York shoppers. The designs of the educational campaign and materials had to reflect the study's research questions, and mesh with the design of the surveys and other measurement devices. For example, one purpose of the educational materials was to increase shoppers' awareness of the relationship between their actions and the environment, specifically, on the merits of their purchases, to modify attitudes and environmental behaviors. Another purpose was to provide information about the City's recycling program. Thus, the main thrust of the educational materials was to induce long-term changes in behavior via positive, intrinsic motivations and informational messages. Since the impact on behavior of two levels of educational program was tested at two stores, the hypothesis that intrinsic motivation optimizes the effectiveness of environmental shopping programs can be tested twice. Chapter 3 will provide more detail about how the campaign and each of the educational devices were designed, and why.

Educational Instruments -- Literature review

The following is a discussion of some specific types of strategies available for inclusion in educational programs, as found in the literature. These form the basis on which the educational strategies, as well as the designs and installations of the educational instruments themselves, were chosen.

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Educational Instruments or materials are used to convey the environmental messages of the campaign. They can include such items as brochures, videos, posters, as described below.

Prompts

Prompts are brief signals about what actions to take. They can vary from general ("Conserve electricity") to specific ("Students and faculty -- turn off lights after 5:00 p.m. or when room is empty"). Geller [95] found that such prompts are more successful if they are polite rather than demanding, request a response that is easy to perform, and are administered close to the point of response. Signage placed in a supermarket near products targeted in an educational study would be considered to be prompts. Such prompts are generally more effective when combined with reinforcing consequences than when used alone. Other educational tools that prompt behavior include: informational / motivational brochures, buttons worn by store personnel, imprints/logos for shopping bags, shelf labels, posters in store windows, booklets given away at tables set up in the supermarket, and "bag stuffers". In the Boulder study [96], it was found that shelf labeling (i.e., labeling products by their characteristics or in environmental groups – green for good, red for bad) was difficult to maintain, in practical terms. While a shelf label would remain stationary, the products on the shelves were usually shifted to the left and right as

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[95] Geller, E.S., "The energy crisis and behavioral science: A conceptual framework for large scale intervention" in A.W. Childs and G.B. Melton (Eds.), Rural psychology, Plenum, New York, 1981.

[96] Peters, Alison Gold. "Precycle" Final Report, by Recycle Boulder, Boulder, CO. 1991.

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new inventory came in, necessitating considerable continuing expenditure of effort to shift the labels. Also arguing against use of shelf labels for this study were the results of a question asked by the Food Marketing Institute in its 1990 survey of shoppers (see Appendix E for details on others' survey questions and results). Shelf labels were considered the least effective means of communicating information about products; labels on the products were perceived as most effective, followed by brochures.

In one study [97] that is somewhat similar to this one in design, a project logo was developed and used on the shopping bags as a means of identification with the project and to increase participation. A logo can also be used on signage, brochures, and other educational instruments.

As the project brochure is a common feature of environmental shopping educational programs, special care was taken in exploring how others implemented this educational approach. The initial design phase for our project brochures included a survey of existing environmental shopping brochures and booklets, by Cooperative Extensions in Florida and a number of local and state solid waste management agencies. Many of these brochures used numerous startling statistics to convey information and to motivate a change in attitude or behavior. Others used cartoons, logos, and effective use of color to make a message memorable.

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[97] Foulke, Sally, "Environmental Supermarket Shopping -- Final Report", Cornell Cooperative Extension, Riverhead, NY

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Modeling procedures

Modeling procedures present information in ways that make it more concrete and easier to learn. By definition, modeling involves explicit demonstration of desired behaviors or practices. [98] This can be done through audiovisual media, or through in-person demonstrations where participants can try out the desired behaviors and receive feedback and further individualized instruction. Several energy conservation behaviors resulted from the use of a 20-minute video on the subject [99], and in-person modeling of desired hot-water conservation behaviors was shown to be much more successful than a prompting sign alone. [100]

Number, variety and focus of educational devices

For large-scale programs designed to educate and change behavior, Geller and Lehman[101] found that the most successful ones are likely to be those which use a diverse set of strategies to induce and promote desired behaviors, since different people respond to different stimuli. In addition, Geller [102] found that targeted strategies designed to change

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98 Bandura, A. Social learning theory, Prentice-Hall, Englewood Cliffs, NJ, 1977.

99 Winett, R.A. et. al., "The effects of videotape modeling and daily feedback on residential electricity conservation, home temperature and humidity, perceived comfort, and clothes worn: Winter and summer" Journal of Applied Behavior Analysis, 1982, 15, pp. 381-4??

100 Aronson, E and O'Leary, M "The relative effectiveness of models and prompts on energy conservation: A field experiment in a shower room" Journal of Environmental Systems 1982-3, 12, pp. 219-224.

101 Geller, E. S., and G. Lehman "Motivating Desirable Waste Management Behavior; Applications of Behavior Analysis", Journal of Resource Management and Technology, Vol. 15, Nos. 2&3, December, 1986, pp. 58-68.

102 Geller, E.S., "Prevention of Environmental Problems", in B.A. Edelstein and L. Michelson (eds.), Handbook of Prevention, Plenum Publishing Corporation, 1986, Ch. 16, pp. 361-383.

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consumer behavior and purchase decisions are more likely to gain widespread acceptance and produce long lasting changes in buying habits than are programs that focus solely on attitudes. For these reasons our environmental shopping program will consist of a number of strategies both to communicate background information about the solid waste crisis to raise awareness and change attitudes, as well as to encourage the desired purchasing behaviors.

Presentation

In order to maximize the possibility for success, both the message and the desired behavior changes must be simple and readily understandable both by the consumers and store personnel. If the prompts are not seen, or if the objectives of the educational program are not quickly comprehended, or if the program requires significant alteration of behavior, the program may be ignored. This was illustrated in the Red Owl stores in Wisconsin, which initiated a program to encourage consumers to reuse containers.[103] In this case both the customers and store personnel found that giving small cash refunds for reusing grocery bags and refilling egg cartons, milk and soda bottles became too cumbersome, making the campaign unsuccessful. Taylor[104] found that if awareness programs were poorly run, if communication, consistency, and dependability of the program were poor, then households were confused and uncooperative. However, De

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103 "Promoting Source Reduction and Recyclability in the Marketplace: A Study of Consumer and Industry Response to Promotion of Source Reduced, Recycled, and Recyclable Products and Packaging", prepared for Richard M. Kashmanian, USEPA, Washington, DC September, 1989.

104 Taylor, E.H., "Consumer Reaction to Solid Waste Problems and Regulations", The Procter & Gamble Company, a report on work in progress, July 15, 1988 in "Promoting Source Reduction and Recyclability in the Marketplace".

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Young [105], and Crosby and Taylor [106] found that if sufficient time and help were given to overcome barriers or difficulties in recycling, behaviors were more reliably improved. The latter study also found that it took six to eight months for consumers to adapt to the new behaviors required under a beverage container deposit law. The authors suggested that the reasons for this might be that the development of recycling-oriented behavior follows standard skill development processes (i.e., it requires practice), and that as behavior is learned and becomes more efficient, it will tend to be perceived as more convenient.

Non- Store-Based Methods of Communication

Vining and Ebreo [107] recommended that an educational approach should emphasize the role played by recycling in protecting the environment and ways to make recycling more convenient. The medium used for education and information campaigns should be tailored to the demographic characteristics of the target audience: television and school programs should be more effective for lower and middle income groups, and newspapers for those with higher educational and income levels.

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105 De Young, Raymond. "Clean Michigan Fund (1986-1987) Resource Recovery Education Grants: A Comparison of Selected Programs," University of Michigan, School of Natural Resources, Spring, 1987. in "Promoting Source Reduction and Recyclability in the Marketplace".

106 Crosby, L.A. and J.R. Taylor, "Consumer Satisfaction with Michigan's Container Deposit Law -- an Ecological Perspective," Journal of Marketing, Winter 1982, pp. 47-60 in "Promoting Source Reduction and Recyclability in the Marketplace".

107 Vining, Joanne, and Angela Ebreo "What Makes a Recycler? A Comparison of Recyclers and Nonrecyclers" Environment and Behavior, Vol 22, No. 1, January 1990, pp. 55-73.

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Shapek [108] reported that recycling rates in 63 Florida counties was highly correlated with the use of radio (r =.53), newspapers (including news conferences and press releases) (r =.59), direct mailings (including newsletters and billing inserts) (r =.49), county sponsored events (r =.45) and the use of other printed matter (including displays, brochures and stickers)(r =.42). A lower correlation was found in the use of hotlines (r = .15), TV advertising (r =.10), billboards (r =.25) and consultants (r=.002). Though the use of specific media was significantly correlated to recycling rates, these may or may not have caused the higher or unchanged rates.

Other Factors Affecting Success of an Educational Campaign

Since De Young and others have found that a large percentage of people agree that recycling is an appropriate behavior, future programs need to focus more on overcoming barriers and converting people's good intentions to actual behavior, and for prolonging participation until the changed behavior is perceived as convenient.

Several other factors, identified by EPA's Kashmanian, [109] were found to affect the success or failure of educational programs to stimulate consumer purchase of source reduced and recyclable products and packaging:

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[108] Shapek, Raymond A. "Measuring the Effect of Media Use in Recycling Education/Information Programs" based on Incentives for Recycling in Florida, University of Florida, Gainesville, FL July, 1990.

[109] "Promoting Source Reduction and Recyclability in the Marketplace: A Study of Consumer and Industry Response to Promotion of Source Reduced, Recycled, and Recyclable Products and Packaging", prepared for Richard M. Kashmanian, USEPA, Washington, DC September, 1989.

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- consumer awareness of the Municipal Solid Waste management crisis and environmental consequences of their purchase decisions,

- content and quality of consumer education and promotional activities,

- involvement of different interest groups and cooperation of retailers, and

- development of consumer education programs designed for the long term. Three program features, key to longevity and success of an environmental shopping program are: long-term funding, effective feedback of audience responses, and adaptability of program elements to needs of the situation.

- Following from these factors, EPA has suggested some general principles shown to have advanced the effectiveness of consumer-oriented programs designed to promote source reduction and recyclability:

- Attention-getting techniques for education programs must compete with other advertising. To be successful, educational programs must be of high quality and as sophisticated as other advertising in targeting appropriate messages to various audiences. In addition, there should be no other competing store-wide campaign vying for the consumers' attention. One example of an environmental shopping campaign, undertaken in the 1970s in Palo Alto, featured large, in-store posters resembling traffic lights. This design grabbed shoppers' attention, and the three

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colors were used on shelf labels to identify packaging characteristics: refillable (green), recyclable (yellow), and costly to recycle (red).[110]

- Another example of an attention-getting technique would be a booth situated near the entrance of the store with a setup containing free literature, examples of reusable bags and diapers, and staffed by a person knowledgeable about the program and environmental shopping. A glass container filled with candy is one means of drawing customers to the booth.

- Long-term changes in consumer behavior depend upon changing basic consumer attitudes and motives. Consumer education programs should not be limited to short-term, non-durable incentives, but should be combined with self-sustaining motivation (having long-term durability). Kashmanian compiled evidence from various sources that public education campaigns should not make consumers feel that they are losing control of their environment or lowering their standard of living. Instead the program should be designed to stress the relationship between source reduction/recyclability and environmental effects and associated societal benefits.

- Household consumer awareness programs should make consumers feel that their participation will be a positive contribution to the solution of an important problem. For example, Kashmanian has suggested that the consumer education program needs to take on a positive tone (e.g., "We can do it!" or "Be a Part of the Solution").

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[110] Palo Alto Material Resource Recovery Program, "Report on Packaging Labeling" and other materials, 1970s in "Promoting Source Reduction and Recyclability in the Marketplace".

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Otherwise, consumers might become overwhelmed by the problem to the point that they feel their actions are futile and their contribution to the solution is meaningless. Thus, consumer education programs should focus on the benefits that come from recycling, rather than the problems created by not recycling. Put another way, conservation should be promoted by how it can make us "richer, more self-reliant, and secure in our economy".

These points are in agreement with other research on consumer environmental attitudes and behaviors. The following is a discussion of some specific strategies available for inclusion in educational programs:

- Definitions, labeling, and other important messages must be standardized, simple, and well publicized, so that they are readily recognized and understood by consumers. In addition, others who have undertaken similar campaigns have recommended that there needs to be a simple and effective method by which consumers can identify target products and packaging, and that store personnel must have a thorough understanding of the elements of the program and be enthusiastic about it. It has also been suggested that programs should make use of in-store promotions and free media publicity, for example, the store's newspaper advertising and flyers.[111]

[111] Environmental Action Foundation, Implementing Waste Reduction at the Supermarket, 1976 in "Promoting Source Reduction and Recyclability in the Marketplace" A Study of Consumer and Industry Response to Promotion of Source Reduced, Recycled, and Recyclable Products and Packaging", prepared for Richard M. Kashmanian, USEPA, Washington, DC September, 1989.

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- Another example of the benefit of a positive emphasis was evinced by an environmental shopping program implemented by the Pennsylvania Resources Council[112], which was severely under-funded and short-lived, was nonetheless quite successful in reaching consumers with the message because it emphasized the effectiveness of individual actions. Ergo, if the tone of an environmental shopping education program is positive, and there is sufficient information and emphasis to demonstrate clearly how an individual's actions have an impact, then it is possible to counteract the effect of having a short-lived program.

Olsen [113] has summarized several recommendations for future studies, which can be adapted here:

(1) emphasize individual benefits of conservation rather than sacrifices (e.g., fewer diapers to take home, fewer bags to throw away),

(2) don't make financial savings the sole justification for conservation,

(3) don't expect information alone to motivate people to conserve,

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[112] Becker, R.H., "Packaging and Waste Reduction: The Need for Consumer Awareness," paper presented at the Conference on Solid Waste Management and Materials Policy, New York, NY., February, 13, 1987.

[113] Olsen, M.E., "Consumers' attitudes toward energy conservation" Journal of Social Issue, 1981, 37(2), pp. 108-131.

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(4) stress the benefits of conservation to society in order to give people an altruistic rationale for conserving, and

(5) whenever possible, spread conservation information through interpersonal interaction and "hands on" demonstrations, rather than through the impersonal mass media.

Research on Other Environmental Shopping Campaigns

In order to augment the information gathered from the conservation literature with some real world experience specific to environmental shopping campaigns, practitioners in this field were interviewed and written surveys were sent to supermarkets currently or previously involved in environmental shopping campaigns.

Over forty supermarkets and chains in the U.S. which have conducted environmental shopping campaigns in their stores were mailed a survey to improve the prospects of creating an optimal design for the educational materials for this study. The two-page survey, sent to a list of supermarkets and chains that FMI indicated had experience with in-store environmental shopping campaigns, requested information on the target items chosen by each store, copies of the educational materials used, and the results of the educational program. Some of the questions in the survey asked, to whom the brochures were distributed, how many, and over what time period, when the brochures were distributed, and how effective the educational materials were in improving peoples' knowledge, attitudes, and/or behaviors. Of the few that responded, most did not answer

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the questions, but some sent copies of brochures or flyers. These were useful as an introduction to the types of materials that have been used.

To get a better idea of the success of environmental shopping campaigns, a number of Cooperative Extensions and agencies were interviewed, using the aforementioned survey to elicit information. Appendix X provides a synopsis of each discussion with designers/issuers of environmental shopping brochures and campaigns. In addition to surveying environmental shopping programs conducted by supermarkets, existing brochures, booklets, slide shows, videos, and other educational tools which have been developed by governments, environmental and consumer groups were gathered for further evaluation. Finally, the results of a few other environmental shopping investigations similar to this one were examined in order to learn successful approaches and avoid the pitfalls experienced in these other studies.

To summarize, a few state agencies (e.g., Minnesota), city/local governments (e.g., San Francisco), and County Cooperative Extensions (e.g., Hillsborough and Broward Counties in Florida, Cornell, in New York) developed various educational materials and analyzed their effectiveness using different measurement methodologies. The educational materials included brochures, videos, shelf cards and posters. One organization's campaign logo, an earth in a shopping cart, was considered to impart a message similar to the one intended for this investigation. The measurement techniques involved questionnaires, which provide subjective information (that is, self-reported descriptions of attitudes and behaviors), and cash register scanner data and diaries, which

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objectively quantify changes in purchasing behavior due to the campaign. The campaigns also varied; some materials were never distributed in supermarkets; other agencies (e.g., the State of Washington) came back year after year with new materials and approaches with new displays each month after experiencing initially undesirable results.

In the case of Minnesota's campaign, posters and shelf cards were displayed, and 7500 brochures were distributed at each of two stores in one week. (This provided an idea of how many brochures that could physically be distributed in such a short period.) Minnesota found that 50% of respondents were aware of the campaign and a third could recall some of the message. These results provided our project with the idea that some questions should be directed towards finding out the extent to which the campaign materials were actually noticed. See Appendix X for more details regarding these and other environmental shopping campaigns.

Summary of the Experimental Design

To accomplish the project's objectives and research questions, two multi-focus environmental shopping educational campaigns (and educational instruments) were designed to be conducted in two Manhattan Gristede's supermarkets, located in congested neighborhoods of the upper east and upper west sides of Manhattan (east and west 86th Street), with similar demographic characteristics so that only the difference in intensity of the two educational efforts could be measured. The purposes of the in-store educational campaigns were to inform and motivate shoppers to buy products in

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recyclable rather than non-recyclable packaging, to buy more refills and concentrates, and to buy and use cloth bags sold in the store, and cloth diapers via the GHCC service. Data derived from the baseline surveys were compared with data from the follow-up surveys at each store in order to measure and evaluate the effectiveness of each educational program in changing attitudes, environmental knowledge, and other attributes and behaviors of the survey respondents. To validate this self-reported, subjective information, sales of target items storewide and purchase diary data were to be measured before, during, and after the education at each store. Also, purchase data after the active educational campaign was to be compared with that after the passive education to note how well shoppers retained the education and maintained changed behaviors.

The study's design phase involved a review of other investigations of conservation attitudes and behaviors and other environmental shopping programs. In addition, information was gathered to aid the selection of the target grocery items for which storewide purchase data would be sought. Many aspects of the study design drew from successes and avoided failures experienced by other researchers in this field. Other aspects of the study design innovated new areas of research, including the evaluating an urban area such as Manhattan for conduct of an in-store environmental shopping campaign, the sale of diaper service in supermarkets, and evaluating impact of the education via storewide purchasing information. Other innovations, in the selection and design of educational materials and analytical methods, will be described.

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In Chapter 1 the relative lack of investment by the public sector in researching and implementing waste prevention was apparent. In New York City participation in recycling lags far behind the potential. More must be done to find out why this is so to remedy this problem if large-scale waste export in the near-term is to be avoided. This study design, as described above, aspires to analyze the reasons for the low waste prevention and recycling rates, and offer some answers regarding the willingness of New Yorkers to change their behaviors if they are given information and motivation to do so. In Chapter 3 the design, development and production of the educational materials, surveys, diaries, and storewide purchasing methodology, in preparation for implementation of the educational campaigns is described.

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Chapter 3

Project Planning: Methodologies for Designing and Evaluating the Effectiveness of the Campaign

This chapter explores the basic study parameters, identifies the means by which they are to be influenced and measured, and evaluates the locations for the experiments to take place. Innovative aspects of the project design (i.e., those that had not been explored in studies by others) are highlighted. In order to conduct the educational campaign in the supermarkets and evaluate the results, planning and decision-making in a number of areas was necessary. Decisions were needed to define the educational objectives and targets, the types and designs of educational instruments to be used, procurement of the educational instruments, as well as how and when these instruments would be deployed in the stores. Planning also required decisions regarding the methods for evaluating the results of the project (e.g., the selection of survey questions, design of diary instruments, and the method for transcribing and inputting storewide purchase data). Some of these were, of necessity, joint decisions with EAC and Red Apple. Others were influenced by the prior research of others in the fields of environmental consumer behavior and environmental shopping. In this chapter the planning for the environmental shopping campaign and for the measurement of results is detailed and rationale is given for decisions made.

The research program consisted of three phases: study design, implementation, including data gathering and the educational campaign, and analysis/writing. The project schedule was as follows:

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⇒ **Design Phase: September, 1991 – October, 1993**

The study design phase began with review of other studies of conservation attitudes and behaviors, and other environmental shopping programs and educational materials. The overall statistical design was devised, the educational focus was narrowed, including selection of grocery items for monitoring.) The educational materials were developed and printed, arrangements were made with purveyors of reusable goods to have them available in stores during the campaign. The data gathering and measurement instruments and methodologies were designed. The stores at which the experiments were to take place were chosen.

⇒ **Implementation Phase: June, 1993 to April, 1994**

During this period, the statistical measurement instruments were deployed, and results gathered. All educational materials developed and procured for the campaign were placed and maintained in the stores.

⇒ **Analysis/Writing Phase: May, 1994 to late 1998**

During this period the results of the statistical measurement instruments were analyzed to test the research hypotheses and elucidate findings. These were compared with the findings of research previously or concurrently conducted in this field of research. Conclusions and recommendations were prepared, based on the significance of the findings.

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Survey design, testing, and administration

Categories of Survey Questions

In order to develop specific questions for the baseline survey, 28 surveys and studies were reviewed, and their objectives, study designs, survey questions, statistical methodologies, and findings were summarized (see Appendix E). Some of the issues studied included the extent to which consumers were concerned about the environment, and the degree to which price was considered important in purchasing decisions vs. environment, profiles of "green consumers" and of recyclers, how important individuals vs. governments are in solving these problems. These studies provided a wealth of experience regarding various aspects of environmental shopping and conservation behaviors, and were of great value in preparing questions for use in this study, and for comparison purposes for evaluating the results. Appendix W contains groups of questions, adapted from those in Appendix E plus new ones developed for this study, that constituted the "short-list" from which the final baseline and follow-up survey questions were eventually drawn.

Based on the research design and research objectives, detailed in Chapter 2, survey questions were designed to elicit information on knowledge, sources of information, attitudes, motivations, self-reported behaviors, demographics, and recollection of the educational treatment for the purpose of evaluating the campaigns' effectiveness. The literature review suggested certain questions that fit this study's research objectives, and other questions that could be modified. For example, in order to ascertain what motivates the shoppers to exhibit (or not exhibit) conservation behaviors, one area, explored by the

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Food Marketing Institute and others, and included in this study's survey, was shoppers' opinions of who bears responsibility for solving the garbage problem. The answer to this attitude question points to shoppers' motivation to perform conservation behaviors; if government is to solve the problem, the shopper won't feel the impetus to change, but if the individual is responsible, then the campaign may have more impact. If the factors that motivate people to increase conservation behaviors were better known, then more effective educational programs could be designed to focus on those.

Another group of questions, some of which could not be repeated in the second survey due to space/time constraints, tested attitudes towards participating in the desired behaviors, and environmental satisfactions (e.g. to what degree respondents are satisfied by conservationist behaviors such as frugality, self-sufficiency, and participation in community-wide programs).

Since the educational materials were designed to use intrinsic motivators, as De Young has championed, some lines of questioning that he had used in shopper surveys to determine the extent to which intrinsic motivation was responsible for conservation behaviors were adapted for this study. Examples of these, the answers to which were structured on a 5-point Likert scale (e.g., the ends of the scales as agree/disagree) include: People in the US consume too much; Items are not made as durably as they were in the past; Mandatory recycling would infringe on my rights; How convincing do you find the following reasons to source reduce? (Depletes landfill space, Natural resources....) To address the relative importance of environment vs. other considerations in motivating

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purchasing decisions, one question was designed to find out how environment ranked with brand name, price, and convenience. Another question (similar to one used in the 1990 and 1991 Food Marketing Institute studies) asked the likelihood of changing shopping patterns to go to stores that encouraged environmentally preferable products. Other questions directly asked how likely it would be that a two or five cent rebate would entice them to bring their own bags (economic, or extrinsic motivation).

Clearly, the key area for questioning was the self-reported environmental behaviors. Examples of questions in this area delved into purchasing patterns (e.g., the frequency with which the shopper buys products in recyclable or reduced packaging), the shopper's recycling activity, use of repair shops, and other conservation behaviors. Other specific behavior questions asked about bringing one's own bag to the supermarket and about type of diapers are purchased. Again, questions were structured on 5-point Likert scales.

A fruitful avenue to explore was whether and to what extent there might be a relationship between the amount shoppers understood about environmental shopping and recycling (i.e., environmental knowledge). The Champaign-Urbana recycling study[114] asked which materials were recycled in the local program, including materials that were and weren't actually collected for recycling; and the 1990 Food Marketing Institute study asked whether the local recycling program was mandatory or not. These lines of questioning were adopted for this study.

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[114] Vining, Joanne, and Angela Ebreo. "The Pulic Response to Model Recycling Programs", Institute for Environmental Studies, University of Illinois at Urbana-Champaign, UILU-IES 90 Report 11. March 1990.

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A few of the studies reviewed also concentrated on the source of environmental knowledge, and this was deemed an important line of inquiry. It was found that some demographic groups received their information more from TV and others from newspapers. Identifying the most effective methods of conveying information is important for planning educational efforts.

Another area for questions was demographics, since it is of great interest to know whether and the extent to which different demographic groups respond differently to educational treatments. Therefore, questions on income, race, heritage, age, gender, and educational level were asked in the baseline questionnaire. Since the baseline and follow-up surveys were administered to the same people, it was not necessary to ask demographic questions in the follow-up survey.

Finally, as the Minnesota [115] and Boulder [116] studies also illustrated, it was important to find out the extent to which the shoppers actually recalled seeing the educational materials and received the intended messages. If the shoppers missed the educational message, they surely would not respond to it, making the follow-up survey results useless. Such an outcome would also point to problems in the design and implementation of the educational treatments.

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[115] Ledermann, Jeff, and Linda Countryman, "Executive Summary of SMART Shopping Pilot Evaluation", Minnesota Office of Waste Management, July 13, 1992.

[116] "Precycling – Final Report", City of Boulder, Environmental Affairs. 1991.

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Once a "short-list" of questions for each category of interest was assembled, in Appendix W, the beta baseline survey questions were developed.

Wording of Questions

Once the ideas for questions had been narrowed, great care had to be given to choosing language to keep the questions objective. Surveys have recently become a tool to be used to extract whatever biased information the survey funder wants to see. This is possible because individual questions can be framed and lists of questions ordered to predispose the respondent towards particular answers. As the purpose of this investigation is to find the truth, the questions were carefully worded to be neutral, and the order of questions was arranged in a logical, straightforward sequence.

Numbers, Types, and Order of Questions

Despite the plethora of questions available from previous studies and the temptation to include many questions, the surveys could not be overly long, or shoppers would not finish them, or the answers they did provide might be rushed and inaccurate. Since length of the baseline survey had to be limited (three pages was chosen based on the beta-testing experience described in Appendix ST), many useful questions had to be pared from the baseline survey both before and after beta testing.

The baseline survey began with straightforward knowledge and source of information questions, followed by attitude and motivation questions, followed by the behavior questions, with demographics at the end. It was expected that the shopper would be tired

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after filling out the survey, so ending with demographics was something they could do without much thought. This was better than starting with demographics, because that might cause the shoppers to think that the research was delving into their privacy.

The design of the baseline and follow-up surveys were similar, differing mainly in that the baseline survey asked demographic questions, whereas the follow-up survey asked respondents to recall specific aspects of the educational programs. For the follow-up survey, as many questions as possible (particularly in the behavior and knowledge areas) were repeated to gauge the degree to which responses were altered after the educational treatments. Regrettably, since the follow-up survey had to be administered by telephone, and this method of data gathering is more time consuming than checking off answers on a clipboard (or at least seems that way to the respondent hanging on the phone), the follow-up survey had to be shortened even more, reducing the opportunity to compare before / after results for some of the behavior and most of the attitude questions.

Baseline Survey Testing and Refinement

Once the questions for the baseline survey were devised, they had to be put in logical order and tested. The three-page baseline survey was designed in the late spring of 1993, and the prototype was pre-tested in the east side store over an hour and twenty minute period in late June on 30 randomly-chosen shoppers. Most questions were deemed to be sufficiently well-worded for the actual survey, but a few questions had to be dropped to limit the length of the questionnaire to three pages. One of the parts of the question asking what motivates the respondent to recycle: it reduces incineration, was dropped

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because it would have elicited a similar response to: it reduces landfill space. A subpart in the question asking about the respondents' environmental behaviors (do you recycle newspapers) was considered to be similar to: do you recycle magazines. One question, in which respondents were asked to rank four items, produced a number of errors, chief of which was use of ratings rather than rankings. This question was reworded in an attempt to produce answers with four different numbers to rank the four items. Two questions, asking "Are you the primary shopper in your household?" and "What percent of your grocery shopping is done at Gristede's?" were dropped due to lack of space. Appendix ST details the survey beta testing process. Appendix Q shows the baseline questionnaire after refinement.

Baseline Survey Administration

The baseline survey data gathering effort began in late June 1993, when volunteers recruited by the Environmental Action Coalition and the author, over a period of about seven weeks, enlisted 800 shoppers at the two test stores to complete it. It was hoped that the volunteers would get about 100 surveys completed per store per day, but EAC did not attract as many volunteers as they had expected. Typically one or two volunteers worked at a time, and an attempt was made to cover all time periods (with a preference for the 4 to 7 pm time slot, since store managers said this was the busiest time). Also, to make the time during which the surveys were completed random, surveys were collected every day of the week that the stores were open. (Appendix DG details the particulars regarding the data gathering effort.) The shoppers were randomly selected; that is, volunteers went after everyone they could who walked in the door, and most obliged. The respondents

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were offered no inducement to fill out the questionnaire other than the knowledge that they were participating in a research study. In most cases a survey was handed to each respondent on a clipboard just inside the store near the entrance; others were approached in the checkout line. This method made it possible for volunteers to have up to six respondents completing questionnaires at once. The average completion rate was seven questionnaires per hour, though this rate ran as high as 20 in one hour on one occasion. The data collection took place in July and August, 1993. The number of baseline surveys completed on the west side was 401 and on the east side 399.

In the first few days of the data collection process, less than 50% of the respondents were providing their names and phone numbers for the follow-up telephone survey. Since it was clear that the eventual percentage of those completing the survey would be less than 50% if this trend were to continue (and the pool of possible respondents for the follow-up survey would likewise be further reduced), the request for name and phone was rephrased to increase the likelihood of receiving a response. Tabulations indicated that the improved wording did increase the rate at which respondents gave their names and phone numbers at the west side store to over 51% from 46%, but at the east side store the rate dropped from 46% to 32% after this modification. This oddity worked in our favor since a considerably higher percentage of surveys was collected in the east side store during the initial period than in the west side store. The cumulative percentage of potential follow-up survey recipients ended up at slightly over 50% of the baseline survey respondents at the west side, and 43% of the baseline survey respondents at the east side – 46% overall. Appendix DG includes a log of the baseline data collection for each store, as well as

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tables showing the change in the rate of respondents' providing name and phone number during the data collection period.

Survey encoding and data analysis

The encoding of the baseline survey data by one dedicated volunteer began in December 1993 and was completed in March 1994. The final baseline survey, as administered, is included in Appendix Q. The results and analysis of these results and comparison with the data from follow-up surveys are given in Chapter 5. Comparison with data from other similar studies is in Chapter 6.

Follow-up Survey Preparation and Pre-testing

This survey was designed to look as much like the baseline survey as possible, so as to maximize the number of questions that could be compared for each individual answering both surveys. The demographic questions in the baseline survey were eliminated for the follow-up survey, and replaced with a few questions to determine how well, or poorly, the shoppers noticed and learned from the educational program. To keep the follow-up survey to about seven minutes, it was necessary to remove a few questions used in the baseline survey. Four of these questions were actually somewhat repetitive of other questions (two asking about bag use, one about the effect of incentives for reusing bags, and one asking if magazines were recycled). A multi-part question, designed to elicit detailed information about the shoppers' environmental attitudes regrettably had to be dropped, again, to make the survey shorter.

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The pre-testing of the follow-up (after education) survey took place over two days -- January 22 and 23, 1994, and consisted of two parts. The survey was initially read to two people who were familiar with the research, but who had not been part of the initial survey respondents. The questionnaires took about nine minutes to administer in both cases. As a result of this step it was decided that a question asking if there was anything about the campaign that could have been better, should be removed to save time. Also, to assist the interviewers and save time, some possible answer categories were listed for the open-ended questions. Other minor wording changes to speed interviewing also resulted from this initial pretest.

The second phase of the pretest was conducted between 8 and 9:20 pm on Sunday, January 23, 1994. Twenty-two of the initial respondents from the east side store had to be phoned in order to obtain five completed surveys. Two of the phones were disconnected, nine asked that we call back at another time, for four of the calls no one was at home, one had weekday hours, and wasn't called, one was the answering machine of someone else. Time was measured for four of the five completed surveys; two took seven minutes, one took six minutes, and one took five minutes. Since this fell into the desired time range, it was decided that no additional questions had to be removed, and the questionnaires were finalized in nearly the same form as the pretest surveys. Both the east and west side final surveys fit on two sides of one 8.5 x 11 inch page. About 250 follow-up surveys were completed. All of the original 800 respondents were not reached because in the months since the baseline survey was administered, many had moved and

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some were no longer interested. Others could not be reached after several attempts to contact them.

Design and Administration of the Volunteer Diaries

In order to recruit volunteers to keep diaries of their purchases, the baseline questionnaire was used. One of the last questions on the baseline survey asked whether the shopper would participate in such a study (participants were promised a cloth bag as an incentive). An astonishing 110 out of 800 replied in the affirmative. Prior to the start of the campaign, roughly a month after the completion of the baseline survey effort, EAC volunteers called all of the prospective diary volunteers to explain what was involved and confirm their interest in the research, and only 50 still had an interest. Those were sent a booklet containing a welcome letter, an instruction sheet, and diary sheets (see Appendix VD for more detail). The diary-keepers were asked to keep track of their purchases from November 1, 1993 until early March 1994, eight weeks after the educational materials were removed from the stores. All were encouraged to call if there was any question or difficulty. A couple of diary volunteers did call with minor questions, and EAC volunteers were supposed to call all of them periodically as reminders. Unfortunately, this did not occur. In order to increase the chance that more diary information would be returned, diary volunteers were asked to send their diary pages back in two stages of nine weeks each. At the halfway point in the diary-keeping exercise, eight returned their diary sheets, and one of these simply apologized that she could not continue beyond the first week. At the end of the diary-keeping period, four returned the second half of their diary sheets, thus there was insufficient data to use this method to measure project impact.

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Appendix VD has more detail on how the diaries were designed, how they were to be maintained by the volunteers, and which products were to be tracked.

Design and Administration of the Storewide Purchases Data Gathering

In addition to the self-reported surveys and diaries, an important third strategy to measure the impact of the educational campaign on shopper behavior, and the only one to gather purely objective data, was the measurement of storewide purchases of the thousands of target recyclable/nonrecyclable pairs, refillable/concentrates and nonrefillable/nonconentrates counterpart products, disposable diapers and disposable shopping bags made by shoppers in the two test stores.

The methodology for documenting and analyzing whether, to what extent, and under what circumstances, all the customers in a store would change their purchasing habits as a result of in-store educational programs depended to a large extent on the inventory methods used by the test stores. In stores with automatic checkout scanners, this information is computerized and available for any discrete time period. But the test stores for this study did not have scanners, so the data would not be actual sales data. Though Red Apple stores did not have scanners or Club Cards with which to measure individual customers' purchases, Red Apple management did agree, initially, to provide printouts within a few weeks of the end of each month for numbers and descriptions of all relevant products delivered to each of the two test stores. Since the deliveries of most of the products of interest were on a weekly and sometimes daily basis, changes in consumption patterns by the shoppers would soon be reflected in the store's ordering

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patterns. So changes in consumer purchases inspired by environmental shopping education could be measured by studying the delivery invoices, a less precise method, but the only method available for inferring changes in storewide purchases by customers over time. Also, the data would have to be collected and inputted manually since the inventory data were not available in computerized form.

In order to assess changes in packaging purchased, the attributes to be tracked were the product, brand, number delivered, date, size, and packaging. Diaper offers taken were to be monitored by the project, and diaper service ordered was to be tracked by GHCC. Red Apple management was to provide the project with invoice information on quantities of disposable diapers and shopping bags (both disposable ones given to customers and sales of the project's cloth bags) on a weekly basis for purposes of the statistical analysis. Measurement of product purchases, in the case of reduced packaging, is straightforward because categories of products sold in concentrate or refill form are few and easy to identify.

In order to record purchases of recyclable packaging, it is first necessary to isolate the recyclable/non-recyclable (R/N) pairs in the test supermarkets. Only if a consumer switched from a commodity packaged in a non-recyclable package to one in a recyclable package could it be interpreted as resulting from the educational program. To approximate the types and quantity of R/N pairs and packaging types of the target products in a real supermarket, an informal survey was first conducted at an Associated supermarket in Upper Manhattan. Later, as the campaign was about to begin in the two

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test stores, surveys were done to ascertain which products and packaging types were actually stocked there (see Appendix A for the survey results). More detail on the design of the storewide purchases tracking strategy, including specifics on brands and packaging types, can be found in Appendix SP.

In order to establish a baseline period so that long-term trends can be accounted for, data for the period commencing before the start of the educational campaign (November 1, 1993), were needed. Several hundred baseline questionnaires from shoppers were collected at these stores in July and August, so invoice information starting before July 1993 would be useful. Since the educational period ran through the Thanksgiving, Hanukkah and Christmas holidays of 1993, it was necessary to have data for the two stores for the same months of the previous year (July 1992 - February 1993) to serve as a comparison, to show normal holiday period trends (so that seasonal variations would not confound the analysis). Monitoring of storewide purchasing behaviors was to continue for another two months after the educational campaign was completed to determine whether, and to what extent, any changed behaviors were maintained. In an attempt to reduce the chance of confounding variables, that is, other reasons for a correlation than the ones in the hypotheses being tested, a number of precautions were to be taken. For example, it was important to control for price changes, differences in advertising between products in a target pair (e.g., recyclable/nonrecyclable), and differences in shelf visibility.

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Regrettably, as the time approached for the educational campaign to begin, Red Apple management continued to delay setting up a meeting to discuss how and when they would provide the needed information. In fact, discussions with the two store managers elicited the news that once they made note of what they wanted on the only copies of the store delivery printouts, they disposed of them. Numerous attempts were made to get the information in computerized form.

Eventually, the only form made available was paper invoices, in a roomful of very large cardboard boxes provided by each vendor, stacked over seven feet high, each one not clearly marked, and with all hundred or so Gristede's stores mixed together with Sloan's and Red Apple stores. For several of the product categories, a single distributor provided invoices for hundreds of products, all mixed together on single invoices. In most cases the line items were in severely abbreviated form, rather difficult to pick out from the other products, increasing the potential for errors in transcription. Invoices for the two stores of interest were mixed with invoices from scores of other stores and some invoices could not be found. Red Apple insisted that the invoices could not be removed from the hot, roach-infested basement of the store in which they were stored. Nonetheless, over months of visits to the basement, six thousand data records for the time period prior to the educational campaign (through September, 1993) were recorded (an estimated one-third of the total records needed to make the evaluation).

In late 1994, when it was time to get access to invoice data after September, 1993, kept at the headquarters offices, there was another delay in getting access, as much of the data

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from months previous "had to be redone". Boxes of data arrived from the warehouse and the data mavens were overwhelmed by it. We were told to be more patient. Requests were also made, but answers not received, to get sales price information on each of the tracked product items (and, if possible, to keep the prices stable during the educational campaign). Later, it was learned that the invoices for the period during and after the education were inaccessible (in a trailer in a warehouse in the Bronx) due to space constraints by the store chain, thus ending the possibility of tracking storewide purchases.

Design / Selection of the Educational Materials and Campaign

In the months immediately preceding the start of the educational campaign a number of last-minute design details were finalized. The number and location of stores were chosen in which to implement the experiment. The number and type of educational devices to be used were chosen and the designs completed. To maximize the impact on harried New Yorkers, expert at unconsciously filtering out all but the most important stimuli necessary to enable them to finish their shopping as expeditiously as possible, it was decided that the educational devices would be many and varied, and placed in as many locations as possible throughout the stores. The educational materials (including brochures developed especially for the project, three-color storefront posters with the project logo announcing the project, and environmental shopping posters, signs advertising the cotton bags, and some shelf cards borrowed from different sources) would need to be designed for the unique requirements of this campaign, and produced in sufficient quantity. Also, the

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methodology for displaying, distributing, and maintaining these instruments in the stores, over time, had to be determined.

The design of educational materials is integral to the results of the investigation. If the materials don't focus on the message, are hard to understand, or are not well placed in the store, or if there is insufficient number, then the expected changes in attitudes and purchasing behavior may not occur.

The focus of the materials was on the target items (recyclable packaging, reusable diapers, and reusable bags), but not entirely to the exclusion of other compatible environmental messages (reduced packaging, reduce purchase of other disposables, etc.) Since there are many avenues for educating the shopping public, and therefore, many different possible educational programs, this project will tested two programs: a basic strategy employing three new brochures, designed especially for this project (one introductory and all-encompassing, one on packaging, and one on reuse), shelf cards (from Seattle) on reuse of produce bags, and signs from the State of Minnesota in one store, and a more intensive campaign employing these features plus additional devices (e.g., video from Florida's Cooperative Extension and from Ulster County, NY at the checkout counters and a staffed booth with free booklets, fact sheets, and other educational materials) at the other store. For interest to remain high, the additional educational materials in the intensive store were phased in over the active educational period.

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Elements Chosen for the Campaign

Use a Large Number of Educational Devices

Supporting evidence for the decision to use a large number of educational devices in our study is found in the research by Geller and Lehman who found that in large-scale programs designed to educate and change behavior, the most successful ones are likely to be those which utilize a diverse set of strategies to induce and promote desired behaviors, since different people respond to different stimuli. For this reason three brochures were developed, and a number of different signs, and other devices such as videos, diaper service offers, reusable bags, were included in the educational campaign.

Number of Stores

Based on Minnesota's experience with two stores, and the desire to test the effectiveness of different intensities of educational effort, it was decided that a more extensive educational program would be tested in one store, and a less extensive one in the other. Environmental shopping videos, brochure distribution and tabling by volunteers were added to the other educational devices.

Logo

A number of logo concepts were considered, including the use of a red apple, which seemed appropriate since that symbol embodied New York City as well as the Red Apple grocery chain we were using. However, this notion was discarded in favor of a logo more directly combining images of the environment and shopping. Another concept considered was an Earth inside a shopping bag. At around this time, others' logos were

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being gathered and examined, and the National Consumer League's environmental shopping logo, the Earth in a shopping cart, was noticed. That organization agreed the concept could be adapted for use in campaign brochures, storefront posters and other project literature. A simpler shopping cart was drawn, with an earth with more detailed landforms, but without latitude and longitude lines. Appendix EM shows all educational materials developed and/or used for this project.

Slogan

The National Consumer League and Metro-Dade's slogans referring to the future helped inspire one of our slogans: "The Earth's Future is in Your Shopping Cart: Be An Environmental Shopper at Gristede's", which was used on two of the brochures and half the storefront posters. The other slogan was "Be an Environmental Shopper ... Shop with Concern For the Environment at Gristede's".

Focus message on changing behavior and purchasing decisions

Geller found that targeted strategies designed to change consumer behavior and purchase decisions are more likely to gain widespread acceptance and produce longer lasting changes in buying habits than are programs that focus solely on attitudes. For this reason this environmental shopping program was designed to consist of strategies both to communicate background information about the solid waste crisis to raise awareness and change attitudes, as well as to encourage the desired purchasing behaviors.

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Focus Message on Intrinsic Motivators

Based on the literature review (DeYoung, Katzev & Johnson, Witmer & Geller, etc...) described earlier, it was decided that the brochures should emphasize an intrinsic, or satisfaction-based, approach to encouraging shoppers to change their purchasing behaviors over the long-term. The decision to concentrate on using intrinsic motivation in our educational materials was also based on one of our project's objectives: to maximize sustainable changes in consumer behavior, rather than provide short-lived extrinsic (or monetary) motivation. Thus, though one of the brochures and a few of the posters used as educational materials in this project described economic benefits of choosing reduced packaging, little value was seen in designing a short campaign in which customers were financially rewarded for bringing back bags, or purchasing items packaged in recyclable materials, since the beneficial effect would fall off after the economic incentives were removed.

Use a Positive Message in Educational Devices

New York State Food Marketing Association, an grocery industry trade group, convinced us that any educational campaign that featured messages prompting customers not to buy something because of its poor environmental qualities was not likely to be accepted by most retailers. Having a negative focus could create difficulties in locating a cooperative supermarket in which to perform this study. Kashmanian[117] also indicated that better results are achieved with a more upbeat message.

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[117] "Promoting Source Reduction and Recyclability in the Marketplace: A Study of Consumer and Industry Response to Promotion of Source Reduced, Recycled, and Recyclable Products and Packaging", prepared for Richard M. Kashmanian, USEPA, Washington, DC September, 1989.

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Simple Message; High Quality Presentation

EPA recommended that messages be simple and that the educational devices be of high quality to compete with other advertising (e.g., a booth situated near the entrance staffed with a knowledgeable person). EPA and De Young recommended stressing durable, internal reasons for environmental shopping, not external (short-lived) incentives. An attempt was made to follow the recommendation that store personnel be knowledgeable about and supportive of the campaign (by numerous meetings with VP, district manager and store managers), and information sheets were provided for all cashiers. As EPA recommended, the campaign solicited and got cooperation from Red Apple to have storefront posters made up by the store's own sign makers. Unfortunately, despite best efforts, store personnel were not always supportive, and at times, were counterproductive.

Use of Recycling/Prevention Statistics

San Francisco's environmental shopping guide and the Stauffer article in Resource Recycling were the inspiration for including in our brochures statistics on energy and pollution saved or avoided by recycling various materials. Startling statistics to grab the attention of the shoppers were used in the brochures.

Maintenance of Educational Devices / Displays

Taylor[118] found that if awareness programs were poorly run (i.e., if communication, consistency, and dependability of the program were poor), results would be poor.

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[118] Taylor, E.H., "Consumer Reaction to Solid Waste Problems and Regulations", The Procter & Gamble Company, a report on work in progress, July 15, 1988 in "Promoting Source Reduction and Recyclability in the Marketplace".

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Therefore, maintenance consisted of visits to the stores every three days or so to ensure availability of brochures, audibility of videos, sufficient number/proper display of bags, signs, etc.

Brochure Design and Procurement

Since most environmental shopping campaigns depended heavily on brochures to convey information / motivate shoppers, and in fact the state of Minnesota found [119] brochures to be the most useful educational device they used in an environmental shopping pilot study, brochures were used as the primary means of education for this project. In line with the rationale to focus on intrinsic motivators, the project brochures were designed to make consumers want to change their shopping behaviors because of the beneficial effects on the environment. Thus, the brochures highlighted how reducing the consumption of disposable products, overly packaged products, and non-recyclable packaging diminishes environmental impact. Burn & Oskamp [120] found that using persuasive prompts (a flyer encouraging recycling and citing its advantages) significantly increased the number of people participating in a recycling program. Suspecting that persuasive educational materials would be more effective than simply informational ones, it as decided that three informative and persuasive brochures should be designed for this campaign. To attract shoppers' attention the brochures would use surprising or alarming facts about the extent

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119 Ledermann, Jeff and Linda Countryman. "Executive Summary of SMART Shopping Pilot Evaluation", Minnesota Office of Waste Management, July 13, 1992.

120 Burn, S., and Oskamp, S. "Increasing Community Recycling with Persuasive Communication and Public Commitment." Journal of Applied Social Psychology, Volume 16, pp. 29-41. 1986 as referenced in Lin, Nancy, et. al., "Toward a sustainable Society: Waste Minimization Through Environmentally Conscious Consuming", Journal of Applied Social Psychology, Volume 24, Number 17, pp. 1550-1572. 1994.

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of natural resources use caused by consumption in supermarkets, as well as the potential for air pollution and energy savings resulting from recycling.

The initial design phase for the brochures included an extensive survey of existing environmental shopping brochures and booklets, by Cooperative Extensions in Florida and a number of local and state solid waste management agencies. Numerous startling statistics were either adapted from some of these brochures or developed as part of the project to show, for example, the tens of thousands of disposable bags given away weekly by each store, the more than one million trees consumed annually in the U.S. for disposable diapers, and the potential energy savings and air pollution avoided by recycling different packaging materials. The brochures also suggested methods the shoppers could use to practice environmental shopping and contained information about the requirements New York City's curbside recycling program. See Appendix EM for the brochures and other educational materials used.

The project brochures, the primary means of education, were designed to make consumers want to change their shopping behaviors because of the beneficial effects on the environment. Each of the brochures featured the project logo, was done in a different color: cream, apple green, and goldenrod, and used one or the other of the two project slogans, in two different size formats, to signal to shoppers that they were different brochures. All stressed the importance of individual action in reducing environmental problems. In keeping with the environmental shopping theme, all brochures were printed using soy ink (dark green), on recycled content paper. The specific total recycled content

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and post-consumer content (originating from recycling programs, not industry scrap) were clearly stated at the back of the brochure, and was as high as 100% post-consumer in the cream brochure.

The first brochure to be distributed was 8.5 x 11 inches, a tri-fold in dark green on cream, and introduced the concept of environmental shopping. It featured the three aspects of environmental shopping on which this project was focused -- recyclable packaging, reusable bags, and reusable diapers -- and their environmental advantages. The second brochure, a 8.5 x 11 inches bi-fold in bright green, described some of the environmental impacts of depleting natural resources for disposables, such as grocery bags, and recommended ways shoppers could reduce the number of bags they take. The third brochure, 8.5 x 11 bi-fold in goldenrod, described the environmental and energy advantages of choosing recyclable packaging over that which cannot be recycled in New York City's curbside program. This brochure also suggested choosing refills, concentrates, and recycled packaging, bulk purchasing, and avoiding overly packaged products. (This brochure is illustrated in Appendix Z.) Minnesota's experience helped estimate the number of brochures needed for campaign (several thousand of each brochure). Bids were received from three purveyors of recycled content papers and printing. Seven thousand of each of the three project brochures were printed by Lyn-Bar Printing at a total cost of $1670. The budget for this and other educational devices is listed here for purposes of comparison with some of the advertising budgets of the large food and diaper vendors, mentioned earlier.

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Storefront and In-Store Posters

A number of posters were used in the educational campaign. Their purposes varied; some were designed to introduce the project; others were intended to cajole or to educate.

EPA's Kashmanian, in recommending utilization of the store's own advertising mechanisms, inspired the decision to request Red Apple to produce and display three-color storefront posters with the project logo and slogan announcing the project to show the store chain's support for the project. These served a second purpose, introducing the new campaign to shoppers. Two full-size 34" x 44" window posters were made for each store by the same company that made signs announcing prices on sale products. Appendix Z shows one of these posters at the east side store. In addition, Red Apple provided four 17"x22" three-color posters, using the project logo with the other brochure slogan, for hanging on walls inside the store.

Minnesota Office of Waste Management and the NYCDOS sent large in-store environmental shopping posters some of which were used. Minnesota's posters featured their slogan (SMART: Saving Money And Reducing Trash) with a single focus with information about the economical aspects of environmental shopping. They were 23" x 35", green and white on "recycled-brown" background. DOS' 18" x 23" color posters featured the prominent slogan: "Earth needs some friends" with children and earth beach balls to grab the attention and many aspects of the main message: Reduce, Reuse, and Recycle (see Appendix Z). Had there been more wall space available, more posters would have been used.

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Reusable Bags

Minnesota's environmental shopping campaigns showed that sale of reusable bags could be a useful part of this campaign, since it fit into the target foci, and since it was expected that the sale of the reusable bags and the quantity of disposable plastic and paper shopping bags distributed could also be measured. A compact, cloth bag design was chosen. The Compak bag, in addition to being sturdy (Compak claims a 40-pound limit and has no seam at the bottom), with wide, short handles that don't cut the fingers, contains a small pouch into which the bag can be stuffed. The outside of the off-white bag was imprinted using dark green ink with a 6x7-inch representation of the project's logo and the words, Environmental Shopper (see Appendix Z). This short slogan was conceived to save space and in hopes it could be used more generally by other stores. Even the pouch had a smaller version (2x2-inch) of the logo imprint. Five hundred bags was the minimum order from Compak, and these cost roughly $2,000. As Red Apple had never disagreed with the premise, it was assumed they could advance the money needed to manufacture the minimum order of bags (500 for $4 each). But after some delay, it was learned that they didn't think the project's cotton bags would sell. (Even later it was learned that Gristede's had previously had a promotion selling heavy canvas bags for $4, but this was not successful.) In order to maximize the number of bags sold, the sale price of $4 was initially chosen to equal the cost to the project. In order to market the bags, signs and displays needed to be designed, and these also became part of the campaign as educational prompts.

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Bag Signs

The NYC DOS' Bring Your Own Bag signs (shown in Appendix Z) were sturdy, roughly 9x12 inches, on laminated plastic, bright and attractive, eye-catching, in green and yellow on a black background, and had the message clearly printed on them, "Please Take a Bag Only if You Need it, or BRING YOUR OWN BAG --We'll be happy to pack your purchases in it to Help PREVENT WASTE". Since they were donated by the NYCDOS to cajole shoppers into bringing their own bags, and were available in the quantity needed, they were placed at each cash register near the bag displays.

To market the reusable bags, small 5.5" x 8.5" hot pink or lime green signs with a cardboard backing, advertising the cotton bags, were stapled to the bottom of the DOS signs and affixed to locations nearby. They used the project's logo and a picture of the project's cotton bag folded into a small pouch. The message was quick to read, and advertised the bags as convenient and portable, displaying the $4 price.

Shelf Cards / Bag Reuse

To encourage shoppers to reuse produce and bakery bags, the project received from the Seattle Solid Waste Utility roughly twenty 4x6-inch "Shop Smart shelf talkers", in red, yellow, black, and white (see Appendix Z). To maximize their utility, these shelf-talkers were taped on or near the stands from which shoppers took the disposable plastic produce bags. Because of the unsatisfactory experience in Boulder, this study did not make major use of small shelf labels of the sort used in Boulder.

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Diaper Offers

Based on the information received from the NYCDOS and others about the significant presence of diapers in the waste stream, and their inherent recyclability problems and only partial degradability in landfill, a search was conducted to locate and team up with a diaper service providing coverage for Manhattan. The General Health Care Corporation agreed to suspend all other advertising in the zip codes of our two test stores, to keep track of new diaper service orders made by customers from the stores, and to provide large quantities of professionally produced invitations for advertising their services. The offers, inserted into a sealed envelope with a fluorescent yellow sticker on it saying "Special Diaper Offer", included a number of items: a brief letter from GHCC addressed to "Expectant Parents" comparing benefits of cloth to disposable diapers, a bulleted list of benefits (no pins, no plastic pants, no rinsing, no trash, no stop shopping, no environmental problems), and an invitation to call the 800 number to talk about it, a card with the price per week, and a postage-paid post coupon to take advantage of the offer. GHCC supplied several hundred offers for distribution in each store and offered to record the timing and location of new diaper service customers generated by the campaign. Coupons were included for discounted service (fifth week free), possible since no telemarketing would be required in the two zip codes around the stores. The coupons were to be encoded to ensure issuance of credit to the proper store. As compensation for allowing the sale of diaper service in the stores, the stores would be paid $10 per customer for all diaper services lasting for at least twelve weeks, sold by means of this method. As part of the storewide purchasing measurements, purchase of disposable diapers in the store would also be measured to detect any shift in purchasing habits. The

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plan for the campaign was to have cashiers distribute diaper offers to those buying disposable diapers, and for some offers to be available in a holder near the disposable diaper shelves.

Videos

After review of several environmental shopping videos, three environmental shopping videos (two from Hillsborough County, Florida Cooperative Extension and one from Ulster County Resource Recovery Authority) were adapted for testing in the education-intensive store. The first two videos, each ten minutes, covered most, if not all, aspects of environmental shopping, emphasizing the 5 R's (Reduce, Reuse, Recycle, Reject, and Respond), and showing additional "at-home" waste prevention behaviors such as recycling and reuse. The Ulster County video, at five minutes, emphasized the source reduction aspects of environmental shopping. Criteria for review included the degree to which the videos focused on this project's target foci, the extent to which it presented information clearly, and the use of examples. The Hillsborough videos were condensed slightly into a single video. The Ulster County, NY, Resource Recovery Authority video, done in cooperation with Cornell Cooperative Extension, and hot off the presses, was secured three weeks after the first two videos began showing. In order to show the videos continuously, the two initial videos were recorded repeatedly to fill up a 2-hour videotape, to be replayed continuously on video equipment set up above two checkout counters. In an effort to keep interest high in the campaign, these videos were shown starting in week six of the 12-week campaign, after all the brochures were phased in.

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The Ulster County tape was also recorded repeatedly to fill a separate 2-hour tape. So that there would be no need for rewinding and restarting the tapes, a VCR with a special repeat function was procured. This was important so that the success of this educational treatment would not depend upon cashiers or other store personnel. Although the videos themselves were procured gratis from the Cooperative Extensions, the VCR and two 19" monitors and two wall mounts cost roughly $1000.

Use of Volunteers at Information Tables

EPA recommended that one effective attention-getting technique would be a booth situated near the entrance of the store with a setup containing free literature, examples of reusable bags and diapers, and staffed by a person knowledgeable about the program and environmental shopping. For this reason, volunteers were recruited on several occasions to distribute project and other programs' brochures and answer questions at a table at the entrance of the store at which the more extensive educational effort was made. NYCDOS contributed waste prevention handbooks, household hazardous waste literature, a promotion on reducing unwanted junk mail as well as recycling literature. EPA contributed recycling coloring books and other brochures on waste prevention. In addition, copies of EPA's environmental shopping booklets for children and their waste prevention booklet were offered to shoppers. The project's own brochures and cotton bags rounded out the selection at the table. Tabling was done (and the videos were shown) to increase the variety of educational methods at the education-intensive store, and to increase the likelihood that education would be imparted in that store, as a means of comparison to the basic campaign in the other store.

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Input from Store Chain Management

Though most of the decisions regarding the selection and design of educational devices, and of the experimental design itself was self-generated, it is important to recognize that the store management had to approve all educational materials to be used in their stores. Once Red Apple headquarters selected the stores, there were discussions with each store manager to clearly describe the study objectives (e.g., allow signage, brochures, pass out diaper service coupons, etc...). The reason for this approach is that each store is different in how it has evolved to achieve smooth functioning, and the research program may be disruptive to the store's functioning.

Campaign Elements That Could Not Be Used Due To Constraints

A Longer Campaign

De Young, and Crosby and Taylor found that if sufficient time and assistance were given to participants in overcoming barriers or difficulties in recycling, behaviors were more reliably improved. Though this campaign was 10 weeks in length, the original funding from EPA included deadlines and monetary constraints that precluded the campaign from being longer.

Personnel to Distribute All the Project Brochures

In the Minnesota environmental shopping campaign, a lot of effort was necessary during the pilots to make sure customers received the brochures. With the help of OWM staff and local volunteers they were able to have someone stationed at the entrance to the store from 10am to about 7pm on weekdays; later on weekends. With a little encouragement,

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most customers were willing to accept a brochure. Such an intensive effort, to have a staff member present at each store all day every day was not possible for this study because of inadequacy of funds and volunteer help.

Use of a Media Campaign

The MN Office of Waste Management believed that its in-store campaign would have been more successful if augmented by a media campaign by the local governmental authority. While this would have been desirable for this project, it was not possible due to lack of funding.

Advance Planning for the Campaign

Procurement of Brochures

The number of brochures ordered was influenced by several factors. The active educational phase was to last two and a half months, and the store managers said that the most heavily trafficked period was from roughly 3 - 8 p.m., during which a thousand shoppers could pass through each store. In addition, the literature survey indicated that thousands of brochures could be distributed during a campaign of a few weeks. On the other hand, the printing budget was limited. For these reasons, it was decided that seven thousand of each of the three project brochures should be ordered.

Display and Placement of Educational Materials

Once Red Apple headquarters reviewed every educational material to be used (and not requesting modification), a half hour meeting was held with each of the store managers to

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discuss the method of displaying each educational device, placement in the stores and timing of their introduction (see Appendix DM for more detail on these meetings). The stores' personnel were asked to outline what they could do in their particular store to help achieve the project objectives. However, this additional step introduced more delays in starting the campaign and one change in educational materials. The stores had promised their own large, heavy canvas bags could be sold but then reneged. This change probably had a beneficial effect on the project, since superior bags, with the project logo, were procured, though it also cost the project an additional $2,000.

It was agreed that many of the materials would appear at the start of the campaign, November 1, 1993. Others would be phased in to keep interest higher for a longer period. Both store managers offered to allow the project brochures to share the magazine racks immediately adjacent to each cashier, and that in-store posters could be taped to walls and suspended from the ceiling in a few locations. The store managers also agreed to have the storefront posters up on the store windows for the start of the campaign. The cost for these was negligible (less than $5 per poster), and this cost was underwritten by Red Apple. The production was "quick and dirty" (hand done, in the same style as all their storefront signs), but quite serviceable. Red Apple also agreed that the cashiers could give out diaper offers to those purchasing disposable diapers. As to the video installation, Red Apple agreed to put up the brackets on support columns adjacent to the checkout area in the west side store. Requests that the store chain mention the environmental shopping project in their circulars went unfulfilled.

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Length of the Educational Campaign

Just prior to the start of the educational campaign, it was important to revisit the length of time that the educational materials should remain in stores, and over what time period(s) diary volunteers should maintain their diaries. Originally, there was to be an active phase followed by a passive phase. During the active phase most or all of the educational materials would be present in the stores. Afterwards, for a couple of months, diaries would continue to be kept, and storewide data could continue to be tracked, to note any waning in environmental shopping behaviors after removal of the educational treatments. Perhaps only the signs and the brochures would remain during the passive phase. Alternatively, the passive phase might involve no educational stimuli at all, or just a few brochures in holders, to see how well any changed behaviors were maintained. Since both the diary and storewide purchasing data gathering efforts were dropped due to insufficient data, these points became moot.

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Chapter 4

The Educational Campaign

Once the baseline surveys were administered, the educational materials were ordered, and arrangements were made with the test stores' management, the educational campaign could begin. Though extensive efforts had been made to research optimal methods of presentation of the educational materials, it will become evident that the actual implementation can be fraught with pitfalls and unexpected developments that can have significant impacts on the campaign's effectiveness.

Campaign Summary

The active educational phase ran from November 1, 1993 until January 17, 1994. During this phase all the educational materials developed for the campaign were placed in the stores. Since there was so much information to present, it was decided that the educational materials would be deployed in a staggered fashion, to keep awareness and interest in the program at a higher level. The educational materials for both stores included posters, brochures, and some shelf cards. The posters and signs went up November 1, as did the bags, the diaper offers, and the first brochure. The cotton bags with the project's logo were sold at the checkout counters at both stores as an alternative to disposable grocery bags. The west-side store had an environmental shopping video playing at the checkout area and volunteers distributed brochures at a literature table.

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It was expected that once the initial installations were made, there would not be much need for frequent maintenance visits. This was not the case. It was necessary for someone to check the installations frequently to make sure that there were enough brochures, diaper offers, and bags, and to check that the displays were intact and that the posters were still up. Volunteers were solicited for this task, but just one assisted a few times with the east-side store. On average, to maintain the displays, each of the stores was visited every three days for the duration of the campaign.

Campaign Experiences -- East and West Side stores

An important factor, which must have affected the ability of shoppers to receive the educational messages, was the size and layout of the two stores. The east-side store is larger, with higher ceilings and wider aisles than the west side store. But compared to a typical supermarket in the suburbs, both stores are cramped. The stores are small, with narrow aisles, and no extra room near the checkout counters. The daily receipt of boxes of inventory and the perpetual shelf-stocking process further reduced aisle width, and was most certainly a distraction to store customers. The use of the large educational posters was not maximized, what with the shortage of wall space, and the difficulty of hanging posters from ceilings in these stores.

Another factor that affected shoppers' exposure to the educational treatments was competition for their attention from other advertising and distractions. Holiday promotions and decorations competed directly with this project for space on the walls and ceilings. Competing images and decorations for the Thanksgiving, Hanukkah, Christmas

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and New Years holidays were present throughout both stores starting a few weeks after the beginning of the educational phase of the project, and this probably had some impact on shoppers' ability to focus on and remember environmental messages. Special holiday sales competed for attention. Christmas music was also a factor, as is described below in discussion of the video education. Perhaps the most important factor of all influencing the success of the educational campaign was the degree to which the store managers and staff facilitated or interfered with the transmission of the environmental messages.

Relationships with the East Side Store Managers -- (Initial Installation)

The first installation of brochures and signs began on the morning of November 1 woth many interruptions, and was completed later that day. The day manager, was initially amenable to the project, but the day of setup (November 1), was hectic. The storefront Environmental Shopping posters were placed back to back on the outside window near the store's entrance, in the deli and meat/fish counter areas, the bakery, and the manager's courtesy counter. But it took hours to get the posters, brochures, the first gerry-rigged bags, and bag signs installed. At one point he provided ideas for placing the signs and stacks of brochures in several parts of the store, including deli and meat/fish counters, which were adopted for the west side store. After a couple of weeks his enthusiasm waned considerably, and he mentioned that the cost of the bags was too high and none was selling. He broke his leg at the store the end of November, so the assistant manager took over for the rest of the project.

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The assistant manager was extremely supportive and forthcoming with clever ideas, some of which were used in the west-side store. These included cutting down small cardboard boxes to use as brochure holders, and innovating permanent installations for the display of the cotton bags. He took notes when he was asked to put up posters or replace brochures, and twice requested the head cashier to see to it that all cashiers knew to distribute diaper offers. Despite this, the next week the posters were not put up, the brochure racks were largely empty, and a check of the deli/meat/fish counters showed no brochures left, and the 'Bring your own bag' signs were down. The assistant manager did assign a cashier to put brochures into the racks, and a chief cashier to hand out more diaper offers to the cashiers, which he had done once before. Once the snafu with the code number for the bags was cleared up (latter part of December), the assistant manager kept statistics on bag sales, which he provided to the project on January 11.

Relationships with West Side Store Managers – (Initial Installation)

The west side manager was quite innovative, and by November 1 had taken the initiative to design and put up two arrangements of posters, signs, and bags, on the walls on either side of the escalators/stairs. The store manager was so supportive that he suggested the diaper offers should be taped to each package of diapers on the shelves. The assistant manager was also supportive, helping late at night on December 6 to hoist the TV's and VCR's into place.

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Orientation -- Both Stores

Two 'welcome to the project' letters were distributed to store managers and staff describing the project and its purpose (one for the cashiers, instructing them on bag sales and diaper offer distribution, and the other for the managers and the rest of the staff) were distributed at the start of the project. Follow-up questionnaires for the cashiers for both stores were prepared for distribution in the middle of January, after the campaign was finished, to learn to what extent the cashiers actually gave out diaper offers. These orientation and follow-up letters to the Gristede's managers, staff, and cashiers are located in Appendix M.

Placement / Maintenance of Educational Materials in the Stores

Brochures

For the east side store 2500 of each brochures was allocated; for the west side store, 4500 of each brochure was allocated, in view of the planned tabling and more intense brochure distribution efforts. The brochures were introduced in a staggered fashion to keep awareness and interest in the program at a higher level. Distributing just one brochure during a two-month campaign would become old quickly, so it was decided that one of the three project brochures should be brought out every couple of weeks. Each of the brochures was done in a different color: cream, apple green, and goldenrod, with two size formats, to signal to shoppers that they were different brochures with different information.

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At the suggestion of the store managers, the project brochures were placed in magazine racks which happened to be empty at the time the materials were first set out, and in Plexiglas brochure holders affixed to the wall in a couple of cases. One complication arising from the strategy of using magazine racks was noticed early. Magazine vendors paid for the racks and for the right to place their magazines there. Piles of brochures were seen to have disappeared entirely from the racks upon periodic inspection. Rarely were individual stacks of brochures depleted only partially, which might have been the case if shoppers were removing them one at a time. A few times all the brochures were gone when the magazines were freshly stocked, implicating the vendors, so a new strategy was devised: a smaller number of brochures were placed in a larger number of locations -- sometimes partially covering up magazines, particularly if there were no open locations. Keeping enough brochures displayed at all times required constant attention, and the stores had to be visited frequently to make sure that each of the brochures was available at each checkout lane.

Another location for display of brochures was the deli counter in each store, and the meat/fish counter in the east-side store. Initially, brochure holders, fashioned from empty cardboard boxes, were placed on top of the counters so that the brochures could be visible to customers while they were waiting for their orders to be filled. These installations lasted anywhere from a week or two to a month or two, but eventually, all had to be replaced. Since no one from the project saw how these or any of the other educational devices came down, it is left to speculation as to who took them down and why. It is possible that such a display might have impeded the view over the counters in both

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stores. In the west side store, it is also possible that store personnel in the deli area, who once expressed the desire to throw out the boxes of project brochures being stored there, might have removed the display. It was possible to keep small piles of brochures at a few of these counter positions. A successful location was a rack holding pantyhose next to one of the registers. The vendors apparently did not come to the store on a regular basis since the materials never disappeared from there. Appendix Z shows some photos of the educational campaign setups in both stores.

In both stores management offered space near where the store flyers containing discount coupons were kept. To attract attention to the brochures in the deli counters, the magazine racks, and other brochure locations, 4 x 6 inch "Take One" signs, with the project logo printed on bright pink, orange, and neon yellow paper, were taped (and retaped) wherever brochures were displayed, initially and for the first few weeks of the educational program. However, since the locations of the brochures in the checkout magazine racks migrated regularly, and the "Take One" signs frequently came down (or were taken down by the vendors), it became difficult to continue using these signs.

At first the brochures, signs, posters, and extra bags were stored in the locked managers' courtesy counters. But as these are extremely cramped and busy spaces, measuring 3x8 feet, after a few weeks all the boxes of brochures, diaper offers, bags, and posters were moved to the deli area in the west side store, and to an auxiliary, unlocked area outside the courtesy counter at the east-side store.

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In the west-side store in December, as an element in the intensive educational effort, brochures were placed into filled grocery bags waiting near the elevator for home delivery, as another means of getting the word out. During this cold, snowy winter, more customers were taking advantage of the store's free delivery policy. Management was asked if the cashiers could hand brochures out to each customer on a few occasions. This turned out to be a limited effort; there was one complaint about brochures being thrown on the floor, so this practice was quickly halted. It had become apparent by mid December that it would be difficult to give out all the brochures by the scheduled end of the educational period with the mainly passive measures of distribution used in this study.

Environmental Shopper Bags

Giving the customer a clear choice in bags near the checkout counters, in the vicinity of where the bagging operation takes place, was seen as very important. Gristede's previous failure with marketing heavy canvas bags may have influenced Red Apple's initial insistence to sell these bags at the manager's service counter instead. Selling bags at the manager's box would have made it impossible to get the same volume of sales possible at the checkout counters, because the managers' areas are built like impenetrable fortresses, customers would have had to wait in line there, and advertising the bag would have been difficult. The courtesy counters are intended for other purposes, including vendor delivery accounting, customer - store manager interactions, and refunds for bottle deposits, among others. Sending customers there to buy a bag would likely have been fruitless. But the store managers eventually agreed the bags could be displayed at the checkout lines.

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The placement of the Environmental Shopper bags was immediately behind and/or above the cash registers. This afforded the bags good visibility and increased the likelihood they would be sold. The store managers suggested using "shelf extenders", or short metal rods which are able to swivel, and which attach to the shelves. However, the "shelf extenders" were not sturdy and two were required to display each set of bags properly (to have the logo and the size and shape of the bags clearly visible). This early experiment did not work out, since these installations stayed in place for only a matter of days. Also, finding adequate space for such a display near the cashier was difficult in the east side store and nearly impossible in the west side store.

Bag installations

Initially, the cloth bags were gerry-rigged using "shelf-extenders" (long, delicate, steel hooks which clamped onto existing crammed magazine racks as the framework.). Checking every couple of days on these installations showed that they were not going to be a good long-term solution. After a couple of weeks, the east side store's night manager devised a solution (a pole extending upwards from each cash register) for a more permanent installation. A hose clamp fixing two long brackets, from which bags were suspended about six feet off the floor (with each bracket going through one handle in the bags), was found to be satisfactory and inexpensive, not only for the east side store, but also for the west side store. The poles extend higher in the east side store, and the installations remained in place for the rest of the campaign. With regard to maintenance,

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it was difficult to keep bags in stock prior to installation of the brackets. After that time, all the installations were easy to keep stocked.

In the West side store the cash registers did not have a vertical pole from which to attach hose clamps and brackets, but there was a part of the cash registers on a few of the checkout lines that could accommodate the bracket pairs. Once these were set up, maintenance of the bags and the displays was not as difficult, though the bags were affixed immediately behind the cash registers, facing the customers in line, and hanging, to some extent, over the conveyor. A couple of times one display seemed to be bent out of shape (perhaps an impatient cashier or customer?). In early January two of the four bag racks were down (lost without a trace), and no explanation was given. The assistant manager suggested the customers had gotten annoyed -- that the bags got in the way.

For the latter part of the educational campaign store manager recommended that a new arrangement taking less space was needed, and so one using bent coat hangers attached to the magazine racks for display of the bags balled up in their pouches was devised. Most of these remained in place until the end of the campaign.

Bag Price

Initially, since the objective was to sell as many cloth bags as possible, the price was set at $4 (wholesale cost). Within a week of the start of the campaign, the day manager at the east-side store made negative comments about the bags because they were not selling. He told of the experience Gristede's had three years before, when they tried to sell hefty

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canvas bags for $4, and didn't have success. Some of the cashiers were enthused to some degree about the campaign, but became less so as time went on, perhaps because the bags didn't sell. The cashiers seemed to think the bags would sell if we lowered the price to $2 or $3. It took longer to get feedback regarding bag sales from the west-side store on this issue than the east-side store, but the word eventually came through that the bags were too expensive. Cashiers and store managers agreed that the price should be lowered a dollar or two.

To optimize sales of the cloth bag, another strategy, including a coupon ($1 off) in the advertising flyer for the two stores was discussed with management. Red Apple did not agree to the request to subsidize the bag sales, so it was decided this would be done at the cost of the project. By mid-December, in an attempt to increase sales, the price was reduced to $2.50, in part based on the feedback from store managers and cashiers. At this time a replacement sign using brightly-colored neon pink or orange paper was deployed. The timing of this price change was originally planned to take place towards the end of November, but it took Red Apple two weeks to change the cash register code for the bags. Therefore the signs advertising the reduced price could not go up until December 14. Once this change took place restocking was necessary more than once a week in both stores.

Bag signage and literature

In each store the bag displays employed two types of signs to advertise the bags at the checkout counters. The 8" x 11" NYCDOS' plastic "Bring Your Own Bag" signs were

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placed and maintained on the side of every cash register in both stores, and in the west side store, these signs were also part of the displays in the lobby and escalator areas. Additional signs, in green with a cardboard backing, and developed especially for the project, included a picture of a hand holding the environmental shopping bag, in its pouch, with the slogan, "It's convenient, it's portable, it's the environmental shopping bag, and it's only $4". The latter sign was used separately, and in some cases, stapled to the bottom of the DOS sign for each display. Though the signs themselves were sturdy, most of those attached to cash registers or in that vicinity, did not stay in place because of the awkward location. The plastic DOS signs were hardest to keep up. This was one of the educational materials that had to be mounted and remounted on a frequent basis, in slightly different locations, trial and error, to determine where they would not block the cashiers' access to the credit card machines at the rear of their registers, or be knocked down by customers. They required constant monitoring. By end of December, most had come down. The pink, 4x4 inch $2.50 signs stayed up in both stores, perhaps because they were lighter and smaller.

Some promotional materials were sent by Compak in December to advertise their environmental shopper bags. These were taped up in a few locations in the east side store, but, being on brown paper they were just not flashy enough to attract attention; and some just fell down. On the other hand, one shopper from one store called Compak and complimented the bags.

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Bag Signage

Vendors of everything from pantyhose and disposable shavers to magazines pay the stores to have their racks full of their merchandise, all crammed in together right at the checkout counter. DOS' plastic sign, admonishing shoppers to bring their own bag to prevent waste, was initially taped to a vertical metal edge of the merchandise display or to the cash register itself. The green signs developed for the project were sometimes stapled to the bottom of the DOS sign, or just taped to each register. It took a few weeks of trial and error to find places to tape these where they would not be in the way of cashiers or customers or merchandise sold near the register. Often the best place was up out of the way on an advertisement provided (paid for) by Marlboro, or away from places of activity, for example, at the back of each cash register) proved somewhat more durable. In early December, the marketer of the Compak bags, recommended that a few bags be balled up in their pouches and taped to the walls and advertisements next to the price sign. This was soon done, and augmented in late December. In addition to the cashier area displays, bag signs were also put in one or two other locations in the store (e.g., taped to walls).

Posters

Two full-size, 3-color, storefront Gristede's posters "The Earth is in your Shopping Cart" were mounted the first day, back-to-back on the window immediately to the left of the entrance in the east side store, and along the escalator in the west side store. The smaller, 3-color Gristede's signs were put up near the shopping carts, in the deli and meat/fish counter areas, the bakery, and the manager's courtesy counter.

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Unfortunately, the use of the large educational posters was not maximized, because of the shortage of wall space, the large size and weight of the posters, and the difficulty of hanging posters from ceilings in cramped stores where other signs were already hanging from the ceilings. A few of the Minnesota SMART posters, which used the technique of extrinsic motivation by showing the economic benefit of buying concentrates vs. non-concentrates, for example, were placed in each store at the outset. Unfortunately, most did not stay in place for long (one to two weeks). In the east side store, since there was an almost total lack of wall space, the Minnesota posters were taped, using cardboard from used cartons as backing, to the permanent "aisle number signs" which were hanging from the ceiling. This arrangement lasted a couple of days. The posters were never put back up, even though the managers had agreed to do it. Four of the EPA posters, featuring kids playing with earth balls, were taped to the walls in the produce section, a pillar in one aisle, at the manager's box, and at the cart storage area. Most of these stayed up; only the manager's came down after a number of weeks, due to heavy traffic.

In the west side store, a few of the Minnesota posters, interspersed with the Environmental Shopper bags and DOS' bag signs, were put up along the escalators. These also came down a week before Hanukkah, December 8, replaced with cardboard toy soldiers. In the first few weeks (until a week before Hanukkah) the cubbyhole on the left side of the stairs heading downstairs was occupied by the manager's arrangement of the project's materials (including bags, bag signs, brown Minnesota signs). The store manager explained early on that the menorah setup always took precedence for that spot at Hanukkah, so that installation was also short-lived. At the same time the larger

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environmental shopping displays were removed at the west side, the manager designed and put up a smaller arrangement on a less noticeable spot high up on the wall, on the right near the exit for the remainder of the campaign.

The week before Thanksgiving, the one facing out came down so that the store's Thanksgiving day hours could be advertised. It never went back up. The one facing inside came down a week later. All of the smaller project posters remained up throughout the campaign. At the west-side store the manager indicated that he would put up more posters after Christmas, then after New Years (replacing the Coke Christmas display down the escalator wall). He didn't want to have any other signage up, except the ones above the exit on the ground floor, until then. But by January 2 the replacement posters were still not up.

It was a challenge to get more posters up on the walls. Aside from the few used in the storefront displays, it was difficult to contemplate asking either of the store managers to put more of these up, with all the other demands this project was placing on them. An additional problem was there was almost no wall space in the stores, and the suspension from the ceiling was not a sturdy solution.

Produce Bag Shelf Cards

At the east-side store the manager affixed these small shelf cards to the metal brackets holding spools of produce bags above the produce. Since this wasn't too visible to

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shoppers, they were subsequently taped flat to the metal produce cases immediately adjacent to the bag spools. These largely stayed in place.

At the west-side store the shelf cards were taped to the four metal vertical floor stands from which customers would pull off plastic produce bags. These stayed in place, though the metal stands were sometimes rotated so that the cards faced away from the aisle. (These were rotated back whenever out of line.) The cards largely stayed in place and did not need replacement, though they were well worn by the end of the campaign.

Diaper Service Brochures

The diaper offers were to be handed out by the cashiers to those who bought disposable diapers. For the first few weeks of the educational campaign cardboard holders for diaper offers and "take one" signs were affixed to shelves stocked with disposable diapers, and were stocked with offers periodically, but they were gone within a few weeks without explanation. At the beginning of the active educational phase the store managers were given a supply of background letters about the project for distribution to each of the cashiers and other store personnel. The letters were designed to introduce them to the research program, indicate Red Apple headquarters' support, and express our desire that they hand out diaper offers to *all* who buy disposable diapers, and to sell the reusable bags. The diaper offers were distributed to all the cashiers at both locations during store maintenance visits every few days. In the east side store the assistant manager asked a chief cashier to make sure that each cashier passed out the diaper offers, and supplies of these offers were gone before the end of November. The DOS volunteers

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made a special effort to give them out when they were tabling. GHCC sent two boxes of diaper offers to each store by November 1 and sent another two boxes for distribution starting December 4.

Cashiers

The east side cashiers made frequent comments that the bags were too expensive. In certain lines, they frequently displaced the DOS bag sign because it interfered with using the charge-it machine, kept behind the register.

The west side store managers were asked if cashiers could hand out the overall brochures to every customer on about four occasions starting the last two weeks of November. This continued once or twice a week until the first week of December when there was a complaint that brochures were found on the floor. Cashiers made frequent comments that the bags were too expensive. One said a customer thought the bags should be free. Cashiers frequently displaced DOS bag signs and price signs because they interfered with customers' seeing final sales figure on cash register.

Video

During December and January the environmental shopping videos played continuously on two TVs above the checkout area at the west-side store. Two different videos were shown during the period, each for two to three weeks. Since it was crucial to design a video display system that could run unattended, a VCR with auto-repeat feature was selected. Using such a VCR, the tape automatically rewinds at the end, *and* restarts itself,

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resulting in a continuously playing loop. The first two videos were copied in alternating fashion onto a two-hour VHS tape, and the third was copied sequentially onto another two-hour tape. Since continuous operation of VHS tapes for such long periods (weeks) can lead to tape stretching and degraded video or audio quality, a number of copies of the two-hour tapes were made. Again, to maintain a greater shopper interest, the Florida tape was used from December 6 until December 29, and the Ulster County tape was used from then until the video display was removed on January 17.

The installation of the video equipment also presented unexpected challenges. After an initial 6-day delay (the store chain's only installation person was involved with a number of store openings), the VCR and two 19"/20" television monitors were installed on December 6. The store manager agreed that they could be mounted near the ceiling on a large, square concrete pillar situated between the two center checkout lines. Two wall-mount brackets, which permitted swivel and tilt for the TV's, and a VCR bracket suspended from one of these, were used. About five minutes after the TV's and VCR were placed on the brackets, a store employee noted that one was starting to come off the wall. This was a lucky find, since, in addition to possible injury to cashiers and customers, and damage to equipment, a mishap with this installation would probably have ended the educational campaign instantly. It was another week before that auxiliary TV installation was restored.

The operation of the video setup was smooth insofar as the functioning of the equipment was concerned. However, it was a constant challenge to find a volume level that would

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attract viewers from the checkout line, but not drive the cashiers and managers to distraction. During the first month, almost every time an unannounced visit was made to the store, the volume on the TV's had been turned down to a barely audible level. Both store managers were asked to keep it at a reasonably high level -- enough to attract customers' attention. Although the sound level was restored after each subsequent visit, subsequent to January 2 the sound level was found to be entirely off at the time of each visit. On one occasion the auto repeat lever had been turned off, and the video was not playing. The managers usually disavowed knowledge of the tampering, though there was evidence they had received complaints that the volume was too loud. It turned into a running battle; it was never clear who turned off the volume. On January 9 the store manager was shown that the video volume was essentially off, and he apologized and let it be turned on low. On January 11, not only was the audio off, the picture was off too. Someone had switched the auto repeat lever to off and had turned off the switch that prevented tampering. Both were switched back on, the video was set to play, and the volume was raised to a low level. Photos of the setup are located in Appendix P.

A new problem was introduced in mid-December. The store's own audio system was playing music and interfering with the ability of shoppers to hear the project's video. A request to have the store's audio system shut off was only partly successful. Several days later the store manager asked if the store could use the equipment to advertise the video movies it was marketing, but just on Christmas Eve. On the December 26 visit, "Free Willy" was playing, and it appeared that customers were paying more attention to it than they had been to the project's video. Two store personnel corroborated this conclusion.

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Video Experiences

One night a few days after the initial video installation, a customer was heard to ask the cashier whether she knew her 5 "R"'s and then rattled off three of them. Immediately thereafter, the person behind in the line then rattled off a fourth. A couple of days later, a cashier mentioned that a customer purchased a bag after mentioning the video. The first day the new video from Ulster County was played (December 29), one person in line commented he liked the program.

Tabling

The original intent had been to have a permanent table installation in the upper lobby of the west-side store. In early discussions with the store manager, it turned out that this would have been unwise because the homeless and other vagrants might have disturbed, destroyed, or stolen the table and any displays attached to it. Similar incidents had happened, and everything in the lobby (e.g., candy dispensers, children's' rides) was chained down. The table size was limited to something the size of a card table, which could be stored downstairs in the store. In fact, the store's own metal table with wheels, used for moving dairy and other products through the store, was used for the tabling effort. The store manager agreed in the third week of November to permit table setup in the deli/produce area, but eventually the lobby was found to be a better location (all shoppers pass through the lobby twice each visit to the store).

As a prelude to the full tabling effort, brochures were handed out by volunteers inside the front door beginning in November (13^{th}, 26^{th}, 28^{th}). Since this store's campaign was

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designed to give shoppers the intensive educational treatment, most of the volunteer time was committed to this store. (Appendix V includes the advertisements for volunteers.) A high school student handed out brochures on one of these occasions, towards the end of November. One volunteer from the Manhattan Citizens' Solid Waste Advisory Board also passed out brochures (December 10th). An ad to a volunteer organization, called Recycle Boost, attracted the chief attorney from NYS Department of Environmental Conservation's regional office, who lived nearby. He handed out brochures on two occasions in mid-November.

The full tabling effort took place for a couple of hours on each of five occasions, with the first occurring December 1. Two new tabling volunteers recruited by EAC began December 1. NYCDOS provided one of their waste prevention staff and an intern on two occasions in mid-December (December 14th, 15th).

Literature contributed by other jurisdictions was on hand for the table stationed in the store lobby. (Most of the following materials were available for distribution; a few were on hand as display copies.)

- EPA's environmental shopping booklets for children and their waste prevention booklet.
- Broward County, Florida Cooperative Extension Service's table display
- Broward County Cooperative Extension Service 'Enviroshopping Makes a World of Difference' pamphlet

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- Broward County Cooperative Extension Service Enviroshopping and Precycling pamphlet
- NYCDOS (Waste Prevention booklet, recycling program flyer, junk mail reduction post card, and Household Hazardous Waste brochure)
- San Francisco Environmental Shopping Guide
- Pennsylvania Resources Council (PRC) Shop for the Environment pamphlet
- PRC Become an Environmental Shopper: Vote for the Environment booklet
- PRC Become an Environmental Shopper: It's Fun (coloring book)
- Hillsborough County, Florida Cooperative Extension 'You can become an Enviroshopper' brochure
- Dade County, Florida 'Earth buying: A guide to smart, ecologically safe buying' brochure
- National Consumers League 'The Earth's Future is in your Grocery Cart' booklet
- Onondaga County, New York, Resource Recovery Agency's 'Hey Lighten Up! Operation Separation's Guide to Waste Reduction' brochure

The project's own brochures and cotton bags rounded out the selection at the table.

Implementation of the environmental shopping campaign in New York City supermarkets was a challenge. The cramped layout of the test stores, the competition for space throughout the store, and the modifications to the materials setups by store personnel and vendors made deployment and maintenance of the educational materials in an optimal configuration difficult. The time of year that the campaign took place also turned out not

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to be optimal. On the other side of the coin, the video was heard by at least some of the customers, and as the next chapter illustrates, several thousand brochures were distributed, several hundred cloth bags were sold, and the bag signs were noticed by many shoppers.

The differences between the deployment of the educational campaign in the two stores had been intended to be considerable, since the west side store would have videos at the checkout counter, more brochures available, and volunteers tabling. But the videos became almost useless after a short period, and volunteers distributed literature on a relatively few number of occasions, perhaps not enough to be significantly different from the east side store. The east side store was more spacious, possibly making the campaign materials easier to pick out of all the competing messages there. So, as a result of situations encountered during the campaign, the differences in the educational treatments from one store to the other were not likely to be as great as had been planned.

In the next chapter the results of the baseline and follow-up surveys will be presented, and various statistical techniques will be used in order to elucidate findings. In Chapter 6 these will be compared with the findings of research previously conducted in this area. In the final chapter the conclusions and recommendations for future use of environmental shopping campaigns will be based on the findings and their significance.

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Chapter 5

Results, Analyses, and Findings

This chapter explores the results of the educational campaign, including the distribution of brochures and diaper offers, sales of reusable bags and diaper service, and tallies for the baseline and follow-up surveys. These survey results are further analyzed to extract general findings of the study.

Baseline Survey Results

The baseline survey was administered from late June, 1993 until August, 1993, in-person to 401 shoppers at the west side Gristede's store and 399 shoppers at the east side Gristede's store. The results, in percents of total responses, are delineated in Table 3 below.

Table 3 -- Baseline Survey Results -- Demographics

Which do you consider yourself to be?

	White	African descent	Asian	Other
West	71.8%	7.5%	3.0%	6.0%
East	73.8%	4.3%	3.3%	4.8%

Are you of Spanish or Hispanic origin?

	Yes	No
West	5.7%	71.8%
East	6.3%	72.0%

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Please check the highest level of education you have completed.

	West	East
Some high school	2.0%	1.5%
High school graduate	8.0%	4.8%
College graduate or some college	45.4%	47.9%
Graduate work or advanced degree	37.2%	35.8%

Are you

	West	East
Male	31.2%	30.2%
Female	57.6%	57.4%

Please check the range which reflects your total household income.

	West	East
Less than $20,000	9.2%	8.6%
$20,000 - $30,000	15.5%	16.4%
$30,000 - $40,000	16.0%	16.9%
$40,000 - $50,000	11.2%	11.8%
Over $50,000	33.9%	33.2%

Please circle your age range.

	West	East
less than 30	25.9%	34.5%
30 – 44	38.7%	31.5%
45 – 60	23.4%	15.9%
over 60	4.2%	6.5%

The demographic questions, taken together, show that the two sample populations (west and east) are very similar (within a few percentage points) in almost all respects. The age distribution is slightly different, with the east side having slightly more younger shoppers,

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and the west side having slightly more middle-aged shoppers. These data show that the original basis for structuring the experiment to test two different levels of education at the two stores as if they were being tested on one population was sound.

Table 4 -- Baseline Survey Results -- Knowledge

To your knowledge, does the City government *require* all Manhattan residents and businesses to separate materials for recycling?

	Yes	No	Don't Know
West	77.6%	8.2%	11.7%
East	76.6%	12.3%	9.3%

Which of the following materials are picked up from apartment buildings by the City for recycling?

		Yes	No	Don't Know
Plastic bottles and jugs	West	89.8%	1.0%	9.0%
	East	92.2%	1.8%	5.5%
Plastic bags	West	33.7%	29.2%	30.7%
	East	41.1%	24.7%	26.2%
Aluminum cans	West	88.3%	2.2%	8.0%
	East	87.7%	2.8%	7.6%
Aluminum foil	West	63.1%	11.2%	21.2%
	East	67.8%	10.6%	18.1%
Tin cans	West	81.3%	3.5%	14.0%
	East	76.8%	6.3%	14.4%

Environmental shopping involves the purchase of fewer disposable items, fewer products containing toxics, more durable items, and more products in recyclable, reduced, and recycled packaging.

Have you heard about environmental shopping before?

	Yes	No
West	57.4%	41.4%
East	59.7%	39.3%

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The knowledge questions showed a basic understanding of New York City's recycling program, a good foundation on which to begin education about environmental shopping. The questions that required more sophisticated understanding were answered correctly by fewer shoppers, as expected. For example, that the City's recycling program was mandatory was not as well understood as the recyclable materials collected by the program (a shortcoming in the City's recycling enforcement program by that time). Also, more of the shoppers didn't realize that plastic bags were not recyclable and fewer understood that aluminum foil was as recyclable as aluminum cans. Slightly more than half had even heard of environmental shopping. As expected, since the demographics of the east and west side shoppers were the same, the baseline survey showed little difference between the responses to these questions.

Table 5 -- Baseline Survey Results -- Source of Knowledge

As expected, the shoppers had received decidedly more education about recycling than environmental shopping prior to the educational campaign, and from a variety of sources, chief among them, TV/radio, building management and newspapers/magazines. Their environmental shopping knowledge came more from newspapers/magazines, TV/Radio and their friends and neighbors. The differences between the east and west side shoppers for all responses were small.

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Where have you heard about .....

		RECYCLING		ENVIRONMENTAL SHOPPING	
		Yes	No	Yes	No
Mailings	West	58.9%	28.7%	11.5%	63.3%
	East	66.0%	25.4%	11.1%	69.0%
TV or radio	West	75.8%	15.0%	24.4%	52.6%
	East	77.6%	16.1%	21.9%	58.7%
Subway Ads or billboards	West	65.3%	21.4%	10.5%	64.3%
	East	67.8%	22.9%	7.6%	70.3%
Videos in store displays	West	15.7%	63.3%	4.5%	68.8%
	East	12.6%	68.8%	2.5%	75.6%
Posters or brochures in stores	West	39.2%	42.9%	11.5%	62.6%
	East	39.8%	44.8%	10.1%	67.8%
Your building's management	West	75.8%	15.2%	6.2%	67.8%
	East	70.0%	22.2%	3.5%	74.6%
Friends or neighbors	West	58.1%	26.2%	24.7%	52.4%
	East	58.9%	26.7%	24.7%	55.2%
Newspapers and magazines	West	80.0%	11.0%	27.2%	50.9%
	East	75.8%	15.6%	26.7%	55.4%

Table 6 -- Baseline Survey Results -- Attitudes

The shoppers' attitudes towards environmental concepts and conservation, in general, were quite positive, with over half to two-thirds agreeing with all the statements that would indicate a predisposition towards the environment. The questions that would elicit a negative personal attitude towards the environment (e.g., that technology would solve our environmental problems, mandatory recycling infringes on personal rights, and a personal preference to buy disposable products) were agreed with by fewer shoppers.

A few questions probed shoppers' motivations when buying products. Cost was the most important factor and brand name and environmental considerations were the least important when shoppers were asked to rank the motivations. When asked specifically

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about the importance of certain intrinsic and extrinsic factors in motivating them to recycle, shoppers considered the intrinsic motivators (e.g., conservation of natural resources, landfill space, the right thing to do) to be considerably more important. The fact that it is a legal requirement to recycle in New York was important to these shoppers, but far less so than the intrinsic motivators. Interestingly, there was a difference between west and east side shoppers in the answer to this question, with those on the west side considering this extrinsic factor to be more important than the east siders (perhaps due to differences in the Department of Sanitation's recycling education or enforcement programs in these two areas).

If a new store opened near you that encouraged environmentally safe products and practices, all other things being equal, would you be likely *to change* the supermarket where you do most of your shopping?

	Definitely not	Probably not	Don't know	Probably	Definitely
West	1.7%	11.5%	16.2%	39.2%	30.4%
East	1.8%	9.1%	14.4%	38.3%	35.5%

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Please indicate how you feel about the following statements using this rating scale:

1) strongly disagree 2) mildly disagree 3) neutral 4) mildly agree 5) strongly agree

		1	2	3	4	5
People in the US buy/consume too much	West	3.0%	2.5%	12.5%	21.4%	54.6%
	East	4.0%	3.8%	13.6%	19.9%	50.6%
Environmental shopping is important for preserving the natural environment	West	0.7%	2.0%	10.2%	20.0%	60.6%
	East	2.3%	1.8%	10.6%	19.6%	56.9%
A person helps the environment by reducing the quantity of packaging and products they buy	West	1.7%	2.2%	8.0%	19.5%	62.3%
	East	2.5%	2.5%	7.8%	20.2%	58.7%
***Individuals must take the most active role* in solving any trash disposal problems**	West	3.2%	3.2%	13.0%	26.9%	46.9%
	East	3.3%	4.5%	8.1%	26.7%	48.4%
Governments must take the most active role in solving any trash disposal problems	West	3.2%	4.0%	15.0%	26.9%	42.9%
	East	3.8%	5.0%	11.6%	24.9%	45.6%
Mandatory recycling infringes on my rights	West	56.4%	14.0%	10.2%	5.2%	4.5%
	East	52.4%	13.6%	12.3%	6.8%	4.5%
Technology alone will solve any trash problem	West	57.4%	20.0%	8.7%	3.0%	3.5%
	East	49.6%	20.9%	9.3%	5.0%	6.5%
I like to repair things rather than discard them	West	8.0%	6.0%	32.4%	21.9%	24.2%
	East	6.0%	7.3%	27.0%	23.9%	25.7%
I prefer to buy disposable products	West	19.0%	15.7%	30.2%	14.0%	13.5%
	East	17.6%	16.4%	29.0%	14.4%	13.9%
Products are not made as durably as they were in the past	West	3.7%	3.2%	25.2%	19.2%	41.4%
	East	4.3%	3.5%	20.2%	22.7%	39.8%
Using refills or concentrates is good for the environment	West	2.5%	1.5%	16.7%	24.7%	46.6%
	East	1.8%	3.0%	15.1%	20.9%	50.4%

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Please rank the following *in order of preference* from 1 to 4 in their importance to you when buying groceries (where 1 is most important).

		1	2	3	4
Brand name	West	16.0%	18.2%	22.2%	29.2%
	East	16.4%	17.4%	15.1%	33.8%
Economic value or cost	West	53.6%	19.5%	7.2%	6.5%
	East	52.4%	17.4%	8.3%	5.0%
Product's convenience	West	12.7%	31.9%	25.9%	13.7%
	East	12.6%	26.2%	28.0%	14.1%
Environmental impact	West	6.7%	18.7%	28.2%	30.7%
	East	7.1%	18.6%	26.7%	27.0%

If you do recycle, please indicate how important each of the following is in inspiring you to recycle. (where 1 is of no importance and 5 is extremely important)

		1	2	3	4	5
I recycle to help conserve natural resources	West	2.2%	1.0%	11.5%	17.7%	57.9%
	East	4.0%	1.3%	8.1%	16.1%	56.7%
I recycle to help conserve landfill space	West	3.5%	2.0%	16.7%	19.0%	48.9%
	East	3.5%	3.3%	12.8%	17.4%	49.4%
I recycle because it's the law	West	14.7%	7.5%	13.5%	13.5%	40.6%
	East	14.4%	10.8%	19.4%	14.4%	28.7%
I recycle because it seems like the right thing to do	West	3.2%	0.7%	8.5%	18.7%	59.4%
	East	3.5%	3.8%	7.8%	16.4%	55.4%

The behavior questions are the most useful ones in determining the degree to which the educational campaign changed shoppers' habits, and form the basis for comparison with the post-intervention survey responses. Comparing the general tenor of the shoppers' behaviors with their attitudes and level of environmental knowledge, there appears to be a disconnect. Whereas the shoppers tended to have positive attitudes and a high level of recycling knowledge, they seemed a bit more ambivalent when it came to actually practicing environmental behaviors. Recycling was one exception to this, where a vast

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majority of shoppers from east and west recycled cans, bottles, and magazines. On the other end of the spectrum, it was clear that shoppers did not bring their own bags to the supermarket. Though more than half didn't buy products in single-serving packages, they did buy disposable products, so again shoppers showed a reluctance to abandon environmentally deleterious behaviors. There was, once again, little difference between the east and west side shoppers.

Table 7 – Baseline Survey Results -- Self-Reported Behaviors

How often do you, personally, *actually do* each of the following things? (where 1 is never and 5 is always)

		1	2	3	4	5
Buy disposable products	West	4.5%	9.2%	46.9%	20.0%	8.2%
	East	2.8%	13.1%	45.6%	22.2%	4.3%
Buy refills or concentrates	West	10.7%	12.2%	31.2%	29.7%	7.0%
	East	7.8%	11.6%	30.7%	29.0%	10.1%
Buy items in single-serving packages	West	23.7%	23.4%	25.7%	13.2%	4.2%
	East	24.7%	21.%	23.4%	13.6%	4.5%
Select products in recyclable packaging	West	4.7%	8.7%	28.9%	36.2%	11.7%
	East	4.5%	7.8%	30.5%	35.5%	9.6%
Avoid buying aerosols	West	11.0%	9.5%	16.0%	16.7%	37.4%
	East	9.1%	9.3%	15.9%	17.9%	37.8%
Return beverage containers for deposit	West	28.7%	7.0%	11.2%	12.7%	31.7%
	East	27.2%	9.3%	11.8%	11.6%	28.7%
Bring your own bag to the store	West	51.9%	14.2%	13.2%	8.7%	4.0%
	East	51.1%	13.1%	12.6%	10.3%	2.3%
Patronize repair shops	West	9.0%	15.5%	34.2%	18.2%	13.2%
	East	12.6%	12.1%	31.5%	19.9%	11.1%
Recycle cans and bottles	West	2.5%	2.5%	5.0%	18.0%	64.1%
	East	5.3%	4.3%	6.3%	17.1%	56.7%
Recycle magazines	West	11.0%	4.7%	5.5%	13.5%	57.6%
	East	8.6%	4.8%	8.6%	15.4%	52.1%

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Follow-Up Survey Results

The follow-up survey was administered by telephone to as many baseline survey respondents as possible from late January 1994 until April 1994. The results of this survey are given in the tables immediately below. Analyses of the baseline and follow-up surveys are discussed in the next section.

After the administration of the educational treatment in each store some small differences in the shoppers' responses between stores began to appear in some cases. The west-side shoppers became more aware of the mandatory nature of the City's recycling program, and they noted the in-store videos as a source of environmental shopping knowledge. The east side shoppers noted the posters and brochures as a source of environmental information more so than the west side shoppers, possibly because the store was more spacious and the educational materials had less competition per square foot of space. There was also a disparity in the amount of information on recycling they received from their building management, possibly pointing to differences in distribution of the City's recycling educational materials.

As compared with the baseline survey, more of the respondents knew that the City government requires them to separate materials for recycling, perhaps due to heightened awareness of the program after having been surveyed the first time. Strangely, fewer respondents could correctly identify materials collected by DOS for recycling after the educational program; sometimes as many as 40% fewer, in the case of tin cans. The fact that the baseline question had a "don't know" option would have served to reduce the

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number of respondents answering these questions correctly for the baseline questionnaire. One possible explanation for the discrepancy could be the difference in survey administration (in person vs. telephone), though it is not clear why that could have made a difference here.

Table 8 Follow-Up Survey Results -- Knowledge

To your knowledge, does the City government *require* all Manhattan residents and businesses to separate materials for recycling?

	Yes	No	Don't know
West	87.9%	3.0%	8.3%
East	80.6%	5.8%	11.7%

Which of the following materials are picked up from apartment buildings by the City for recycling? (*Note: "Don't Know" was an option in the baseline survey)*

		Yes	No
Plastic bottles and jugs	West	78.8%	21.2%
	East	77.7%	22.3%
Plastic bags*	West	47.7%	52.3%
	East	52.4%	47.6%
Aluminum cans	West	55.3%	44.7%
	East	73.8%	26.2%
Aluminum foil	West	41.7%	58.3%
	East	40.8%	59.2%
Tin cans	West	39.4%	60.6%
	East	39.8%	60.2%

*Plastic bags have never been picked up for recycling by New York City.

Have you heard about environmental shopping before?

	Yes	No
West	53.0%	47%
East	55.3%	44.7%

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Where have you heard about ...

		Recycling	Environmental Shopping
Mailings	West	28.0%	3.0%
	East	28.2%	3.9%
TV or radio	West	53.8%	10.6%
	East	53.4%	8.7%
Subway Ads or billboards	West	31.1%	6.8%
	East	29.1%	4.9%
Videos in store displays	West	9.1%	6.8%
	East	1.0%	3.9%
Posters/brochures in stores	West	13.6%	18.2%
	East	23.3%	15.5%
Your building's management	West	18.9%	0.0%
	East	29.1%	3.9%
Friends or neighbors	West	26.5%	9.8%
	East	28.2%	13.6%
Newspapers and magazines	West	57.6%	12.9%
	East	64.1%	21.4%

Due to space constraints in the follow-up questionnaire, many of the attitude questions had to be dropped. Again about two-thirds of respondents from east and west were positively disposed towards shopping at a store that encouraged environmental products, and again cost was the most important factor for motivating shoppers towards their purchases. Second was convenience, and here this seemed a little more important to east-siders than west-siders. In this survey environmental considerations were alone at the bottom of shoppers' priorities, when compared with other, extrinsic and intrinsic factors. In evaluating the importance of the three intrinsic and one extrinsic motivators to recycle, a clear majority of shoppers considered the intrinsic motivators to be important or extremely important, again more so than the fact that it is against the law not to recycle. However, some differences between east and west appeared after the educational intervention. For all three intrinsic motivators, 12 to 23% more west-siders considered

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these reasons extremely important in motivating them to recycle, as compared with east siders. Perhaps the greater educational intensity at the west side store influenced these shoppers about the relationship between their recycling and conservation of natural resources, landfill space and environmental quality, in general. This difference was not apparent for the extrinsic factor, which was not mentioned in the educational materials.

Table 9 Follow-up Survey Results -- Attitudes

If a new store opened near you that encouraged environmentally safe products and practices, all other things being equal, would you be likely *to change* the supermarket where you do most of your shopping?

	East	West
Definitely not	3.9%	3.8%
Probably not	17.5%	12.1%
Don't know	13.6%	15.2%
Probably	35.0%	33.3%
Definitely	29.1%	35.6%

Please rank the following *in order of preference* from 1 to 4 in their importance to you when buying groceries (where 1 is most important).

	Rank	1	2	3	4
Brand name	West	28.8%	16.7%	23.5%	28.0%
	East	26.2%	26.2%	21.4%	26.2%
Economic value/cost	West	47.0%	32.6%	11.4%	6.1%
	East	47.6%	22.3%	18.4%	10.7%
Product convenience	West	12.9%	25.8%	31.8%	26.5%
	East	20.4%	27.2%	28.2%	21.4%
Environmental Impact	West	12.1%	21.2%	28.0%	35.6%
	East	10.7%	18.4%	27.2%	40.8%

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If you do recycle, please indicate how important each of the following is in inspiring you to recycle. (where 1 is of no importance and 5 is extremely important)

I Recycle:

		1	2	3	4	5
To help conserve natural resources	West	6.8%	5.3%	14.4%	16.7%	56.1%
	East	3.9 %	14.6%	22.3%	22.3%	33.0%
To help conserve landfill space	West	4.5%	8.3%	16.7%	20.5%	48.5%
	East	4.9%	17.5%	19.4%	26.2%	28.2%
Because it's the law	West	18.9%	16.7%	17.4%	12.9%	33.3%
	East	8.7 %	7.8%	24.3%	24.3%	31.1%
Because it seems like the right thing to do	West	6.1%	6.1%	13.6%	21.2%	52.3%
	East	3.9 %	8.7%	11.7%	31.1%	40.8%

As with the baseline survey, shoppers did not exhibit a convincing tendency towards environmental shopping behaviors, again with the exception of recycling cans and bottles. Behaviors were varied, depending on which purchasing habit they were being queried about. For example, a clear majority frequently returned containers for deposit, but almost all the rest of the respondents never did (in other words, the respondents were either avid about the behavior or non-participants). On the other hand, behaviors like patronizing repair shops, buying refills and concentrates, and buying disposable products were so varied that no trend was evident. Comparing these results to the baseline produced more interesting results. These are discussed in the analysis section.

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Table 10 Follow-Up Survey -- Self-Reported Behaviors

How often do you, personally, *actually do* each of the following things? (where 1 is never and 5 is always.

		1 (never)	2	3	4	5 (always)
Buy disposable products	West	4.5%	14.4%	38.6%	16.7%	25.8%
	East	3.9%	14.6%	26.2%	26.2%	28.2%
Buy refills or concentrates	West	16.7%	18.9%	15.2%	21.2%	28.0%
	East	8.7%	17.5%	18.4%	24.3%	29.1%
Buy items in single-serving packaging	West	27.3%	24.2%	25.0%	9.1%	11.4%
	East	22.3%	20.4%	26.2%	13.6%	15.5%
Select products in recyclable packaging	West	4.5%	26.5%	31.8%	19.7%	15.2%
	East	2.9%	22.3%	36.9%	21.4%	15.5%
Avoid buying aerosols	West	18.9%	10.6%	10.6%	18.9%	39.4%
	East	8.7%	5.8%	16.5%	23.3%	43.7%
Return containers for deposit	West	31.8%	3.8%	6.8%	13.6%	42.4%
	East	24.3%	8.7%	3.9%	22.3%	36.9%
Bring your own bag to the store	West	51.5%	22.7%	13.6%	5.3%	6.1%
	East	34.0%	29.1%	17.5%	8.7%	8.7%
Patronize repair shops	West	25.0%	23.5%	22.0%	15.2%	12.9%
	East	18.4%	24.3%	32.0%	12.6%	11.7%
Recycle cans and bottles	West	7.6%	0.8%	2.3%	12.1%	73.5%
	East	5.8%	5.8%	6.8%	15.5%	65.0%

It is interesting to note that well over 50% and often more than 60% or 70% of both east and west side shoppers sometimes, often, or always (values = 3, 4, or 5) participated in most of the environmental behaviors above. The exception was bringing their own bags to the store, where the participation rate was between 25% and 30%.

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Bag results

In addition to the questionnaire results, above, a special focus of the data gathering and analysis efforts was the impact of the educational campaign on the use of disposable and reusable grocery bags by the shoppers. Data to illustrate changes in bag use came partially from the questionnaires, originally to be verified by objective data from Red Apple.

Disposable Grocery Bags given out by Gristede's

Red Apple headquarters promised monthly data on disposable bags given away by the stores before, during and after the campaign. However, after repeated requests once the campaign was over, none was forthcoming. Also, Red Apple headquarters had originally agreed to provide information on the distribution to customers of the smaller, produce bags, but did not. The project never received information on how many disposable bags of any kind were given away. So it was not possible to evaluate whether the educational campaign or sales of the project's cotton bags had any negative impact on the number of disposable grocery bags taken by customers.

Cloth Bags Sold

The last-minute decision to permit sales of the Environmental Shopper bags by the cashiers, instead of at the courtesy counter, resulted in some confusion in accounting for the number of bags sold. The bags were assigned a code, which the cashiers were to register at every sale. Though the west side store seemed to have this straight from the outset, the east side store rang up bags under another code for the first several weeks of the educational period. The store chain assigned these bags a code number (901) so that

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sales could be monitored and the project could be reimbursed. Data under code #901 was never forthcoming from headquarters, despite attempts to get it. The project was eventually reimbursed for bags delivered to the stores.

Without realizing that this would be relied upon as a source of project data, a log was kept to record each delivery of bags to each store, including the number of bags delivered and the date. Since actual bag sales data were not available, this information was used to infer the sale of the Environmental Shopper bags. By mid-February, 200 bags had been left at the west-side store, an estimated 13 per week during the six weeks before the price change and 10 per week during the twelve weeks that followed. Somewhat at odds with this, was the perception of the west side's assistant store manager that the bags did not sell very fast in November and at least the first half of December, but they did seem to start selling better when the price was reduced. At the east-side store 160 bags had been left during the campaign, an estimated 10 per week during the six weeks before the price change and 8 per week during the twelve weeks that followed.

On March 18, about two months after the posters and brochures were removed at the end of the active educational campaign, the assistant store manager in the east side store continued to report bag sales down. He attributed it to the absence of the project brochures, etc. Similar to the east-side store, the west-side's assistant manager also reported bag sales down two months after the end of the campaign. Since the passive campaign phase was not to include as frequent maintenance visits, the coat hanger rigs on which balled up cotton bags were displayed, were beginning to look a bit shabby, and this may have contributed to lowered sales in the west side store. However, since a similar

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drop in sales was also noted by the east side store manager (with no alteration of the bag display there), it is more likely that the lowered sales were due to saturation of the market or the lack of supportive messages from the educational campaign, or both.

Bags were removed from stores on April 27, 1994. By this time, it is inferred that 337 bags had been sold at the two stores (150 for the east side store, and 187 for the west side store) taking into account the bags that were remaining unsold at the end of the campaign (10 – East; 13 – West). This would indicate that there were roughly 20% more sales at the west side store during the same period. Table 11, below, shows the bag deliveries for each store.

Table 11 Bag Deliveries as of May 2, 1994

Date	East (50)	West (56)
10/29/93		20
11/1/93	20	
11/2/93	10	10
11/10/93		20
11/19/93	30	30
12/16/93	30	30
12/26/93		30
1/2/94	30	30
1/8/94	20	10
2/14/94	20	20
Totals	**160**	**200**

The price change, from $4 each to $2.50, took place on December 15, 1994.

These data may have to be viewed cautiously. Due to the efforts of the assistant manager, the east-side store provided weekly, and in some cases, daily data on number of bags sold (see Table 4). According to him, the east-side store sold only 53 bags during

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the same period that 150 bags were left at the store. This can be interpreted optimistically (the assistant manager did not have accurate data for all the bags sold while he was not at the store – he worked nights and not every day) or pessimistically (all the unaccounted bags were stolen), or something in-between. No comparable sales information was forthcoming from the west-side store managers. It seems likely that there might be some missing sales data from the east side store because certain days of the week are preferentially covered in the sales breakdowns in Table 12, and other days are typically missing. Pilferage is always a problem in supermarkets, but considering the facts that the bags were within an arm's length and in full view of the cashiers, and in the east side store, above her head, and clearly marked with neon green or pink price signs, stealing bags would not be so easy. Logic would dictate that the actual number sold is close to the higher figure.

Table 12 East side bag sales
(from the assistant store manager's figures)

Week ending	Number sold	Breakdown
12/26/93	6	Na
1/2/94	10	1 Mon, 9 Sat.
1/9	20	5 Mon, 9 Wed, 1 Th, 2 Sat
1/16		Na
1/23	2	1 Wed, 1 Sat
1/30	1	1 Sat
2/6	2	Na
2/13	1	Na
2/20	6	Na
2/27	4	Na
3/6	1	Na
Total	**53**	

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Survey Bag Results

The following data, extracted from the baseline surveys, indicates that increasing the economic incentive to shoppers for bringing their own bag from two to five cents would have a small positive impact on the likelihood of doing so. After the educational campaign, these numbers did not change much. When asked whether and how frequently the shoppers bring a bag to the supermarket, before and after the educational campaign, the west side shoppers were fairly consistent, but the east side shoppers did tend to bring more bags than before the education.

Table 13 Baseline and Follow-Up Survey Bag Results

Baseline:
If you were offered a small incentive, say 2 cents, to bring your own bag to the supermarket for your groceries, would you bring your own bag?

	Definitely not	Probably not	Don't know	Probably	Definitely
West	8.7%	26.9%	12.5%	28.2%	23.2%
East	7.6%	24.9%	12.8%	36.3%	18.1%

Baseline:
If the incentive were five cents, would you bring your own bag?

	Definitely not	Probably not	Don't know	Probably	Definitely
West	7.2%	21.2%	12.2%	29.7%	27.9%
East	5.3%	20.9%	13.1%	35.5%	23.7%

Follow-Up:
If the incentive were five cents, would you bring your own bag?

	Definitely not	Probably not	Don't know	Probably	Definitely
West	12.1%	19.7%	9.1%	33.3%	25.8%
East	9.7%	21.4%	18.4%	26.2%	24.3%

Baseline:
Have you used one of Gristede's reusable canvas bags in the past month?

	Yes	No	Can't remember
West	3.2%	85.0%	3.7%
East	2.5%	81.9%	4.5%

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Baseline:
If yes, how often have you brought one with you when you go shopping?
(Of total respondents)

	Occasionally	Sometimes	Often	Always
West	4.7%	4.5%	2.2%	.7%
East	4.3%	6.3%	2.3%	.3%

Baseline:
How often do you, personally, *actually do* each of the following things?
(where 1 is never and 5 is always)

		1	2	3	4	5
Bring your own bag to the store	West	51.9%	14.2%	13.2%	8.7%	4.0%
	East	51.1%	13.1%	12.6%	10.3%	2.3%

Follow-Up:
How often do you, personally, *actually do* each of the following things?
(where 1 is never and 5 is always.

		1	2	3	4	5
Bring your own bag to the store	West	51.5%	22.7%	13.6%	5.3%	6.1%
	East	34.0%	29.1%	17.5%	8.7%	8.7%

Diaper Results

About 175 diaper offers were initially sent to each store, and it was about three weeks before these were depleted. A second supply of 175 was sent in early December, and these were largely depleted by the end of the active educational phase. About 70 undistributed diaper offers came back from the east side store at the end of the campaign and about 5 came back from the west side store. There was no indication that anyone at the stores replenished the cashiers' supplies of these offers as they were depleted, though a handful was given to each cashier during the periodic visits to each store. There was no accurate way to track how many shoppers who bought disposable diapers were not given

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diaper service offers, though there were questions on the follow-up survey inquiring about this.

In a conversation with General Health Care Corporation, on March 8, 1994 it was learned that, despite project efforts to educate shoppers (particularly those having infants) about the solid waste generation and disposal benefits of switching from buying disposable diapers to using diaper service, there were no new GHCC customers resulting from the educational campaign. GHCC indicated that all personnel fielding calls on the 800 number given out to prospective customers, via the diaper service offers, were familiar with the Gristede's educational effort. Although GHCC could not guarantee that all shoppers calling the number were asked if they were from the Gristede's stores, any serious calls from shoppers would have soon resulted in their identification as having been generated due to the project, because the diaper offers featured special low pricing.

GHCC suggested a reason for the poor results. The most important explanation given was that people are loathe to switch to using cotton diapers or to diaper service once they are used to disposables. The decision to change to diaper service has been rare and usually in instances where the baby has severe diaper rash. Also, even GHCC's own customers don't tend to stay with diaper service for the diapering life of the child. This is because older children void more quantity at a time, possibly requiring double-diapering when using cloth. In addition, because the gels used in some disposable diapers are designed to absorb many times their weight, some parents who use disposables on their infants may leave the diaper on their child for longer periods of time (as much as six

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hours at a time and for 3 or more voids). Even though common wisdom dictates that to minimize rash, diapers should be changed after each voiding, parents would be disappointed to find that cotton diapers cannot be left on the child as long as is typical for disposables.

Reluctance on the part of consumers to change to a product viewed as less convenient is the reason for GHCC's main advertising efforts having been directed towards pregnant women, and mothers of newborns at the hospital. If this were the explanation for the project's results, it suggests either that the supermarket is not the best venue for educating people regarding the solid waste impacts of diaper selection or that the diaper offers should have been given to pregnant shoppers rather than those purchasing disposable diapers.

There may be other reasons to explain why no shoppers signed up for diaper service. The follow-up survey included a question designed to find out if respondents with infants had received a diaper offer at the store. This information could also help explain to what extent the poor response rate for diaper service was due to the design of the educational materials, the message itself, and/or the distribution of the diaper offers. As it turned out, only 17% of respondents with babies received diaper offers in the east side store and 6% in the west side store. The former corresponds to 2 of 12 respondents with babies receiving the education in the east side store, and 1 of 17 on the west side. Oddly enough, the survey results showed that one shopper in each store said that he or she signed up for diaper service. Even if this were the case, it is clear that it is not primarily

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the design of the educational materials or the message which is the cause of the poor enrollment rate at the diaper service, but rather that the vast majority of the intended audience never received the educational treatment in the first place. The store chain and managers had agreed that the cashiers could be asked to hand out these diaper offers. Each manager had been given letters for the cashiers describing the project and what they were being asked to do; and there was always sufficient stock of diaper offers in each store. Two possible conclusions are that the cashiers did not receive the letters, or did not implement it. So the shoppers, most not having received the educational treatment, could not have been expected to switch to diaper service.

Survey Results for Diaper Use

This section shows the results of the surveys as they pertain to the use of diapers by shoppers. As expected a small minority of shoppers buy diapers, twice as many on the west side as the east side. The number of shoppers with babies increased by a considerable factor after the educational campaign was over. Also, the vast majority of those using diapers use disposables, though about 5% used diaper service before the start of the campaign, and some use some disposables with diaper service (see Appendix D for a fuller discussion of the cost comparison for diapers). Despite the low penetration of the diaper service advertising in the stores, the results show that other alternatives involving cloth diapers (e.g., washing them, diaper service) were used by more respondents after the educational intervention than before, and that the rate of increase in these alternatives was greater than that for disposable diapers.

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Since there was a suspicion that not all parents of infants were receiving diaper offers during the campaign, a few questions were added to the follow-up survey to elicit more information about this cohort and how the campaign impacted their decisions. No one in the west side store claimed to have received a diaper offer either from a cashier or from the shelf. At the east side store one of the nine answering the questions received a diaper offer from a cashier and another got one off the shelf. One shopper in each store claims to have registered for diaper service. Of the 11 who answered the question at the west side store, one gave cost, another gave inconvenience, and a third gave health considerations as reasons for not using diaper service; five liked disposables. Three at the east side store thought that diaper service was too expensive, one thought it inconvenient, and another cited health reasons; four liked disposables.

Table 14 Baseline and Follow-Up Survey Diaper Results

Baseline:
Is there an infant in your household, who uses diapers?

	Yes	No
West	10.0% (40)	80.8% (324)
East	5.5% (22)	83.6% (332)

Follow-Up
Is there an infant in your household, who uses diapers?

	Yes	No
West	12.9% (17)	74.2% (98)
East	11.7% (12)	85.4% (88)

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Baseline:
If yes, how does your household deal with soiled diapers? Do you

		Percent of shoppers	Percent of those using diapers	Number
Throw them in the garbage?	West	9.2%	92.5%	37
	East	5.3%	87.5%	21
Wash them at home or in your building?	West	0.5%	5.3%	2
	East	0.0%	0.0%	0
Wash them at a nearby laundry?	West	0.0%	0.0%	0
	East	0.0%	0.0%	0
Have them picked up by a diaper service?	West	0.5%	5.3%	2
	East	0.3%	4.0%	1

Follow-Up
If yes, how does your household deal with soiled diapers? Do you

		Percent of shoppers
Throw them in the garbage?	West	10.6% (14)
	East	8.7% (9)
Wash them at home or in your building?	West	1.5% (2)
	East	2.9% (3)
Wash them at a nearby laundry?	West	2.3% (3)
	East	0.0% (0)
Have them picked up by a diaper service?	West	0.0% (0)
	East	1.0% (1)

Follow-Up Survey
Did you receive an offer for diaper service?

	Yes	**No**
West	0.8% (1)	10.6% (14)
East	1.9% (2)	9.7% (10)

Refills and Concentrates Results

Questions were asked in both the baseline and follow-up surveys to gauge shoppers' attitudes and behaviors regarding buying refills and concentrates. The disconnect between attitude towards refills and concentrates and actually purchasing products in

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these packages is evident in the baseline survey (see tables below). Comparing the baseline to the follow-up survey, behavior question responses showed a definite increase in those who always buy refills and concentrates (from roughly 10% before to almost 30% after for each store), but there was also an increase in those who never or infrequently choose this behavior (from about 21% before to about 26% (east) and 36% (west). A possible explanation is that those who were already buying this kind of packaging on some occasions increased this behavior, and those who said they were ambivalent to begin with, may have recognized that they overstated their actual purchases of refills and concentrates.

Table 15 Baseline and Follow-Up Survey Results – Refills and Concentrates

Baseline:
Please indicate how you feel about the following statements using this rating scale:

1) **strongly disagree 2) mildly disagree 3) neutral 4) mildly agree 5) strongly agree**

		1	2	3	4	5
Using refills or concentrates is good for the environment	**West**	**2.3%**	**2.1%**	**15.6%**	**22.4%**	**49.3%**
	East	**1.9%**	**3.3%**	**16.6%**	**22.9%**	**55.2%**

Baseline:
How often do you, personally, *actually do* each of the following things?
(where 1 is never and 5 is always)

		1	2	3	4	5
Buy refills or concentrates	**West**	**9.0%**	**11.9%**	**31.6%**	**29.3%**	**8.4%**
	East	**8.8%**	**13.0%**	**34.5%**	**32.5%**	**11.3%**

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Follow-Up Survey:
How often do you, personally, *actually do* each of the following things?
(where 1 is never and 5 is always.

		1	2	3	4	5
Buy refills or concentrates	**West**	**16.7%**	**18.9%**	**15.2%**	**21.2%**	**28.0%**
	East	**8.7%**	**17.5%**	**18.4%**	**24.3%**	**29.1%**

Brochures Distributed

By the end of the educational campaign it became clear that thousands of brochures had been distributed at the test stores. In ten weeks, 1800 overall summary brochures had been distributed at the east-side store and 2600 had been given out at the west side store. Of the green brochures, 1350 were distributed at the east-side store and 1750 were distributed at the west-side store. Of the goldenrod brochures, 2100 were distributed at the east-side store, and 1500 at the west side store. The store managers at west side were asked if cashiers could hand out the overall brochures to every customer on about four occasions starting the last two weeks of November. Roughly two hundred were handed out each time. It is estimated that at least 500 brochures or sets of brochures were handed out as a result of this effort. Roughly 75 summary brochures were given out on November 13, another 200 were given out on November 26 and 28.

Respondents' Recollections of the Educational Campaign

Table 16, below, illustrates the results of the follow-up survey questions pertaining to respondents' recollection of the features of the educational treatment. Perhaps due to difficulties cited earlier in displaying educational devices, many of the survey respondents did not recall one or more of the educational features or required prompting to remember them. The educational materials that were noticed most were the cotton

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bags and the NYC DOS Bring Your Own Bag signs. Reasons for this are that the items are large (i.e., take up more of the visual field near the cashier than the other educational materials), are unusual and attention-grabbing (e.g., colorful), and the materials likely stayed in place throughout the campaign. The Environmental Shopper bags were noticed by over 45% of the east-side shoppers and about 57% of the west-side shoppers (prompted plus unprompted). This might be explained by the fact that the bag displays in the west side store were arranged lower down than in the east side store, more at eye level, over the conveyor. The DOS Bring Your Own Bag signs were noticed by almost 64% on the east side and about 61% on the west side, a negligible difference, but still a relatively high figure. The brochures, noticed by roughly 40% (prompted plus unprompted) coexisting in racks with magazines and tabloids, may have blended in with them in some shoppers' eyes, accounting for the lower recognition rate. It's possible that the brochures were moved or discarded, lessening their impact. It is known that the posters were not up for long, and were in locations that some shoppers could have missed, and the shelf cards were only near the produce bags (not all shoppers buy produce). Both of these educational materials were noticed by about 15%. At the west side store, the sound on the video was frequently not audible, and volunteers distributed literature on several occasions, but could easily have been missed by shoppers. Nonetheless, these educational treatments were noticed by about a third of respondents. That not all of the survey respondents received the educational treatment guided the design of some of the data analyses, as described in the next section.

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Table 16 Follow-Up Survey -- Recollection of Education

Can you tell me, what features of the environmental campaign you noticed?

	Unprompted		Prompted	
	East	West	East	West
Three brochures	24.3%	17.4%	14.6%	25.0%
DOS' Bring Your Own Bag signs	40.8%	37.9%	23.3%	23.5%
Environmental Shopper bags	34.0%	38.6%	11.7%	18.9%
Gristede's or Minnesota store posters	6.8%	9.8%	10.7%	14.4%
Shelf cards (bring back product bags)	6.8%	7.6%	6.8%	9.1%
Video		18.9%		17.4%
Volunteers distributing literature		12.9%		23.5%

Survey Analyses

In order to assess whether, and the degree to which the educational campaigns were effective in changing shoppers' purchasing attitudes and behaviors, and to answer the other research questions posed in Chapter 2, the baseline and follow-up surveys can be analyzed using statistical techniques. In this section the techniques used include test of mean difference between paired measures, factor analysis, regression and path analysis. Further analyses of the data are made by examining subgroups of the sample populations. For example, certain demographic groups may have answered questions differently from other demographic groups. Groups of different age, race, educational level, and income might respond differently to the educational devices and to the environmental shopping campaign as a whole, and this information would be useful in tailoring such campaigns to the locality. Answers to questions by cohorts of shoppers that received different combinations of the educational treatment can be compared with the responses of other groups that somehow missed seeing the educational materials. Such comparisons are useful in evaluating the effectiveness of the materials and/or their display and distribution. These analyses are described below.

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Socio-demographic Differences in Environmental Attitudes and Behaviors

Tables 17 – 23 show some of the more interesting comparisons of means between groups (in this case, demographic groups) for the baseline survey results. Since responses to survey questions were all numerical (e.g., yes/no (1/0), on a scale of 1 to 5, or ranked 1 to 4), the mean or average answer for each question by each group can be calculated, and is a useful measure for comparisons. The baseline analysis combines the east and west side respondents into one cohort with a sample size of roughly 700; the follow-up crosstabs sample size is closer to 200 (the exact numbers vary depending on the specific question asked). Knowing how different groups respond to questions about environmental attitudes and behaviors both prior to and after educational intervention can be helpful in designing educational materials and targeting educational campaigns to optimize participation across-the-board.

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Table 17 Selected Cross-tabulations of Race vs. Attitude and Behavior (For precise wording of questions, see questionnaires in Appendix Q)

Race	Whites	Blacks	Asians	Hispanic
Baseline Survey	**Means**			
ATTITUDES (1 = strongly disagree; 5 = strongly agree)	N=( )	N= ( )	N= ( )	N= ( )
People in US buy/consume too much	4.34 (576)	3.58 (45)	4.48 (25)	4.40 (45)
Mandatory Recycling infringes on my rights	1.67 (565)	2.23 (44)	2.13 (23)	2.09 (44)
I prefer to repair over discarding	3.63 (568)	3.18 (44)	3.30 (23)	3.43 (44)
Products are not made as durable as in past	4.02 (569)	4.00 (46)	3.67 (24)	3.79 (43)
Individuals must take most active role in solving any trash disposal problems	4.20 (572)	4.09 (45)	4.16 (25)	4.46 (44)
I prefer to buy disposable products	2.82 (567)	3.28 (45)	3.04 (25)	3.20 (45)
BEHAVIORS (1 = never; 5 = always)	N= ( )	N=( )	N= ( )	N= ( )
I buy single-serving packages	2.46 (561)	2.77 (43)	2.25 (24)	2.50 (42)
I select products in recyclable packaging	3.48 (558)	3.07 (46)	3.54 (24)	3.44 (43)
I avoid buying aerosols	3.82 (566)	2.89 (45)	3.24 (25)	3.47 (43)
I return beverage containers for deposit	3.13 (565)	2.67 (45)	3.04 (25)	2.91 (42)
I bring my own bag to the store	1.90 (570)	1.58 (45)	2.12 (25)	1.73 (44)
I patronize repair shops	3.15 (558)	2.89 (46)	2.92 (24)	2.81 (43)
I buy disposable products	3.14 (555)	3.46 (46)	3.21 (24)	3.50 (44)

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Race	Whites	Blacks	Asians	Hispanic
Follow-up Survey	**Means**			
BEHAVIORS (1 = never; 5 = always)	N= ( )	N= ( )	N= ( )	N= ( )
How Often do you buy disposable products?	1.80 (176)	.182 (11)	1.78 (9)	1.53 (15)
How often do you buy refills & concentrates	1.97 (175)	1.00 (11)	1.78 (9)	1.93 (15)
I buy single-serving packages	1.45 (175)	.36 (11)	1.22 (9)	.80 (15)
I select products in recyclable packaging	3.36 (179)	3.18 (11)	3.67 (9)	2.93 15)
I avoid buying aerosols	3.86 (178)	3.64(11)	3.56 (9)	3.87 (15)
I return beverage containers for deposit	2.96 (172)	2.55 (11)	3.00 (9)	3.13 (15)
I bring my own bag to the store	2.02 (175)	1.82 (11)	.87 (9)	1.67 (15)
I patronize repair shops	2.65 (177)	3.18 (11)	3.11 (9)	2.87 (15)

For the most part, the cross-tabs did not show a great deal of disparity amongst the groups, usually less than a few tenths of a point separated the different demographic groups. In the case of race (Table 17), whites and Asians were often the groups that had the more positive environmental attitudes and behaviors, but not always. Blacks bought single-serving packages and disposable products significantly less than the other racial groups in the follow-up survey, but bought more of them at the time of the baseline survey. This might indicate more of an effect of the campaign on this group, or be an artifact of a small follow-up survey sample size for that group. Interestingly, when it came to bringing a bag to the store, whites and blacks both increased this behavior slightly after the campaign, but Asians and others decreased it dramatically. After the

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campaign whites didn't patronize repair shops as often, and blacks patronized them more. Blacks bought fewer products in recyclable packaging and returned beverage containers for deposit both before and after the campaign as compared with the other groups. When compared with individual racial groups (Table 17), Hispanics did not appear to be too different. However, when compared to non-Hispanics as a whole, Hispanics were a study in contrasts (Table 18). On the one hand, they more firmly believed that individuals must take the most active role in solving trash problems, but on the other they prefer to buy disposable products more so than non-Hispanics before the educational campaign, and were less likely to practice environmental shopping behaviors after the educational campaign.

Table 18 Selected Cross-tabs of Hispanic Origin vs. Attitude and Behavior

Hispanic Origin **Non-Hispanic** **Hispanic**

Baseline Survey	**Means**	
ATTITUDES (1 = strongly disagree; 5 = strongly agree	N=560-565	N=44-45
Individuals must take active role in solving trash problems	4.20	4.46
I prefer to buy disposable products	2.85	3.20
BEHAVIORS (1 = never; 5 = always)	N=550	N=44
I buy disposable products	3.14	3.50

Hispanic Origin **Non-Hispanic** **Hispanic**

Follow-up Survey	**Means**	
BEHAVIORS (1 = never; 5 = always)	N=174-177	N=15
I buy single-serving packaging	1.36	.80
I select products in recyclable packaging	3.33	2.93
I bring my own bag to the store	1.98	1.67
I buy disposable products	1.67	1.53

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Table 19 Selected Cross-tabs of Education vs. Attitude and Behavior

Education	Some H.S.	HS Grad	College	Grad school
Baseline Survey	**Means**			
ATTITUDES (1 = strongly disagree; 5 = strongly agree)	N=13-14	N=41-44	N=359-361	N=268-283
Mandatory Recycling infringes on my rights	2.79	1.90	1.82	1.70
I prefer to repair over discarding	3.14	3.50	3.60	3.57
Products are not made as durable as in past	3.62	4.07	4.00	4.00
BEHAVIORS (1 = never; 5 = always)	N=12-14	N=44-47	N=356-366	N=278-284
I buy disposable products	3.93	3.20	3.18	3.13
I select products in recyclable packaging	3.62	3.07	3.46	3.50
I avoid buying aerosols	3.33	3.04	3.74	3.78
I recycle cans and bottles	4.64	4.26	4.37	4.44
I return beverage containers for deposit	3.69	3.45	3.09	3.05

Education	Some H.S.	HS Grad	College	Grad school
Follow-up survey	**Means**			
BEHAVIORS (1 = never; 5 = always)	N=5	N=11	N=107-110	N=89-93
I buy disposable products	.60	1.27	1.84	1.66
I select products in recyclable packaging	3.40	3.45	3.35	3.31
I avoid buying aerosols	3.80	3.72	3.83	3.89
I return beverage containers for deposit	2.80	3.09	2.89	2.92
I buy refills concentrates	1.00	1.64	1.99	1.89
I buy single-serving packaging	.80	1.00	1.47	1.26
I patronize repair shops	2.60	3.18	2.71	2.68
I recycle cans and bottles	3.20	3.18	3.60	3.66
I bring a bag to the store	1.60	1.64	2.03	2.04

The degree of educational level sometimes was loosely associated, positively or negatively, with certain environmental attitudes and behaviors (Table 19). For example, in the baseline survey returning beverage containers for deposit was more likely to be practiced by those with less education. Those with less education bought disposable products less frequently (both baseline and follow-up). In the follow-up survey, bringing

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a bag to the store and buying refills and concentrates both increased with increasing education. In general, recycling-related behaviors were practiced more across-the-board than those more associated with source reduction. Thus, it would appear that there is no consistent correlation between educational level and participation in environmental shopping and recycling behaviors.

Table 20 Selected Cross-tabs of Gender vs. Attitude and Behavior

Gender	**Men**	**Women**
Baseline Survey	**Means**	
ATTITUDES (1 = strongly disagree; 5 = strongly agree)	N= 230-240	N= 443-453
People in the US buy/consume too much	4.06	4.38
Mandatory recycling infringes on my rights	2.07	1.65
BEHAVIORS (1 = never; 5 = always)	N= 234-235	N= 445-446
I avoid buying aerosols	3.37	3.91
I return beverage containers for deposit	2.85	3.24
I bring my own bag to the store	1.62	2.02

Gender	**Men**	**Women**
Follow-up Survey	**Means**	
BEHAVIORS (1 = never; 5 = always)	N= 72-74	N= 130-134
I avoid buying aerosols	3.84	3.88
I return beverage containers for deposit	2.83	3.01
I bring my own bag to the store	1.89	2.09

Where there was a noticeable disparity in the answers given by men and women, it was the women who exhibited the environmental behaviors and attitudes (Table 19). Men considered that mandatory recycling infringed more on their rights. Both sexes brought bags to the supermarket more often after the campaign. The disparities between men and women seemed to be less after the campaign.

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Table 21 Selected Cross-tabs of Age vs. Attitude and Behavior

Age	< 30	30 – 44	45 – 60	> 60
Baseline survey	**Means**			
ATTITUDES (1 = strongly disagree; 5 = strongly agree)	N=239	N=271-272	N=151-152	N=41-43
I prefer to buy disposable products	2.86	2.89	2.87	3.16
Products are not made as durably as in the past	3.72	3.99	4.33	4.37
BEHAVIORS (1 = never; 5 = always)	N=236	N=268	N=150	N=38
I select products in recyclable packaging	3.54	3.49	3.35	3.05

Age	< 30	30 – 44	45 - 60	> 60
Follow-up survey	**Means**			
BEHAVIORS (1 = never; 5 = always)	N=81-83	N=73-76	N=40-43	N=15
I select products in recyclable packaging	3.35	3.43	3.09	3.33
I bring my own bag to the store	2.13	1.91	1.95	.94
I buy single-serving packaging	1.53	1.18	1.18	1.67
I buy disposable products	1.93	1.61	1.42	1.87
I buy refills and concentrates	2.16	1.84	1.60	1.73
I return beverage containers for deposit	2.96	2.93	3.03	2.53

In some cases the answers to the attitude and behavior questions were correlated positively with age (e.g., agreement with the statement that products are not made as durably as in the past), or negatively with age (e.g., I bring my own bag to the store, and I return beverage containers for deposit, I select products in recyclable packaging). In other cases the middle-aged shoppers were more environmental than either the young or the old (e.g., purchasing fewer products in single-serving packaging). The oldest shoppers said they preferred to buy disposable products more so than the other groups, but the youngest group bought the most refills and concentrates, but also the most disposable products.

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Table 22 Importance of Mandatory Recycling Law in Motivating Attitudes / Behavior Amongst Demographic Groups: Means (baseline survey)

(1 = of no importance; 5 = extremely important)

RACE	White	Black	Asian	Other	
	3.45	4.07	3.79	3.64	
EDUCATION	**Some HS**	**HS Grad**	**College**	**Grad school**	
	3.71	3.96	3.34	3.62	
GENDER	**Men**	**Women**			
	3.22	3.67			
INCOME	**< 20K**	**20K - 30K**	**30K - 40K**	**40K - 50K**	**> 50K**
	3.09	3.39	3.52	3.55	3.64
AGE	**< 30**	**30 – 44**	**44 - 60**	**> 60**	
	3.22	3.46	3.90	3.98	

The groups that considered the extrinsic factor of a mandatory recycling law the most important in getting them to recycle were blacks, women, those with higher incomes and older shoppers.

Table 23 How Often Do You Bring a Reusable Bag With You?: Means Comparison Amongst Demographic Groups

(1 = occasionally; 4 = always) (baseline survey)
Mean, (Standard Deviation), N

RACE	White	Black	Asian	
	1.90 (1.2) n=570	1.58 (.89) n=45	2.12 (1.24) n=24	
GENDER	**Men**	**Women**		
	1.62 (1.08) n=236	2.02 (1.22) n=449		
AGE	**< 30**	**30 - 44**	**45 - 60**	**> 60**
	1.98 (1.23) n=239	1.84 (1.15) n=270	1.87 (1.26) n=154	1.71 (1.01) n=41

The groups that most often brought a bag to the supermarket prior to the introduction of the educational treatment were Asians, women, and the younger shoppers.

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Table 24 If You Were Offered Two Cents Would You Bring You Own Bag? (baseline survey)

(1 = definitely not; 5 = definitely)

Mean, (Standard Deviation), n

GENDER	Men	Women			
	3.00 (1.27) n=245	3.54 (1.23) n=457			
INCOME	**< 20K**	**20K - 30K**	**30K - 40K**	**40K - 50K**	**> 50K**
	3.44 (1.28) n=71	3.45 (1.21) n=127	3.53 (1.30) n=131	3.33 (1.19) n=92	3.16 (1.30) n-267
AGE	**< 30**	**30 – 44**	**45 - 60**	**> 60**	
	3.57 (1.23) n=241	3.18 (1.21) n=278	3.30 (1.39) n=156	3.19 (1.26) n=43	

Younger, lower income and women shoppers were more likely to be motivated to bring a bag to the store if a small, extrinsic inducement were proffered. But, as with Table 23, the differences were so small, and standard deviations so large, that it is not possible to consider these differences statistically significant.

Comparisons of Means between Baseline Store Shoppers

In order to determine if the two cohorts of shoppers (east and west sides) were samples from essentially the same population, the test of mean difference between paired measures was used. This test is conducted by comparing pairs of responses from shoppers from the east and west side stores. The means are calculated by averaging the shoppers' responses on individual questions. For example, a mean of 4 for one of the behavior questions for which the answers are measured on a 1 to 5 scale, where 1 is never and 5 is always, indicates that the group as a whole practices the behavior frequently. If the same groups are measured for the same questions subsequent to an educational

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intervention, and the mean response is 4.5, the difference of the means is 0.5. The data can be further analyzed to determine if this difference is statistically significant.

The groups that were compared were the full baseline group from the east side store and the baseline group from the west side store. As expected, the shoppers' awareness, attitudes and self-reported behaviors and the purchases of target items made at one store before the education begins were not significantly different from those at the other store. The 2 tail prob values for the differences in means of east side vs. west side baseline groups varied from a low of .075 to 1.000, the latter representing no difference in means east side vs. west side the education for a particular question (People Buy/Consume too much). This supports the null hypothesis of no difference of means. At the other end of the spectrum, the .075 prob value indicates that there was a 7.5% probability that the difference in means for that variable was significant in statistical terms. Using a standards significance level (α) of .05, we do not reject the null hypothesis in this case. This demonstrates that the differences in means between the east and west side shoppers' answers to the baseline surveys are not significant. This was expected since the stores were selected to be in demographically similar areas, and the demographics of the east and west baseline respondents were also shown to be similar. The mean values for these two groups of shoppers, as well as t values, and prob values are included as a table in Appendix SA.

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Differences Between Persons Exposed and Not Exposed to Educational Materials

The results section indicated that many shoppers did not receive the educational treatment (i.e., they didn't notice the brochures, posters, videos, etc.). Since the shoppers that didn't see the educational materials were exposed to everything else going on in the test stores (and in society in general) at the time that those shoppers that did get the experimental treatment, the shoppers not exposed to the treatment could be considered as controls. Having a cohort of controls with which to compare any changes in knowledge, attitudes and behaviors is useful, since the difference between the controls and the experimental cohorts isolates the impact of the educational campaigns on the shoppers. For this study those who did not see the brochures are considered to be the controls, since the brochures contained the most information.

Several comparisons of experimental cohorts with the controls can be made since the follow-up survey elicited information on shoppers' recollection of each of the educational materials (i.e., brochures, Bring Your Own Bag signs, the bags themselves, and the videos). Another type of variation in the experimental cohort is that those who did notice one or more aspect of the education varied in their degree of recollection of it. For example, some did not have to be prompted to recall details of the educational treatment, and others did; some remembered specific details of the messages, and others didn't. Those who not only remembered the brochures, for example, and who also recalled a specific message (e.g., recycling, reuse, or resource conservation) could be considered to have received more educational treatment than those who merely remembered having seen the brochures. Therefore, the answers from each of the subgroups that recalled

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different aspects of the educational materials and the messages contained in them were compared with the controls separately.

Table 25 shows the changes in self-reported behavior that occurred at the each store after the educational campaign. The six groups of shoppers that received educational treatments that were large enough to have a significant sample size were (1) those who did see brochures (east [N=37-40] and west [N=52-54]), (2) those who saw brochures and remembered a recycling message (east [N=24-25] and west [N=25-26]), (3) those who saw the brochures and remembered either a reuse, conserve resources or pollution from production message (east side only [N=27-29]), and (4) those who saw the brochures and the video (west side only [N=21-22]). Those groups of east and west side shoppers who didn't see brochures were considered to be controls against which these intervention groups were compared. Columns in the tables not only show the "before" and "after" percentages, but also the difference or net change between before and after for each group. The difference between the net change of each educational treatment group (after – before) and the control group's net change (after – before) is also depicted to show the incremental impact of the campaign on those who received the educational treatment (as compared with the controls). Some of the results are puzzling.

On the one hand, in some cases, the groups receiving more intervention became less environmental. For example, they reported buying more products in single-serving packaging. This net increase (vs. the controls) was a few percentage points for the east-side store but ranged from 18 to 30% at the west-side store. (Perhaps there were more

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items available in single-serving packaging by the time the campaign was finished.) Recycling of cans and bottles and patronage of repair shops occurred somewhat less frequently after the campaign among those receiving treatment vs. the controls. In absolute terms though, recycling of cans and bottles at home was reported as often or always by over 80% of the respondents in all groups.

Also disappointing was the fact that shoppers reported buying fewer products in recyclable packaging in both stores. In absolute terms, 35 to 40% of east side shoppers reported buying recyclable packaging often or always after the campaign, as did 25 to 40% of west side shoppers. But the east-side controls decreased such purchases by about 10%, and the west side controls by 20% before vs. after the campaign. This disparity between the changes in the two stores' controls probably caused a larger range in net decrease of the intervention groups (from 12 to 26%, depending on the intervention group) vs. the controls at the west-side store, though this comparison at the east-side store varied a only few percent in either direction.

On the other hand, the more intensive the educational treatment, the greater the number of respondents that brought cans and bottles back to the store for deposit. This effect was across-the-board; those that saw the brochures were 12% more likely to bring the cans and bottles back to the east side store and 5% more likely on the west side. But those who also remembered the resources message at the east-side store were 20% more likely to bring the cans and bottles back, and those remembering the recycling message were 24% more likely to bring them back to the east side store and were 30% more likely at

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the west-side store (vs. controls). (In absolute terms, those who often or always brought these items back to the store for deposit increased considerably after the campaign, ending up between approximately 50% and 70%, still less than recycling at home.) One conclusion that might be drawn from this is that economic considerations were driving behavior, since bringing back cans and bottles for deposit was more remunerative than giving them to the City for free, so home-based recycling was sacrificed slightly in favor of getting the deposit back.

Also on the positive side, those receiving the educational treatments at the east side store bought fewer disposable products than the controls after the campaign (in five of the six intervention cases). Specifically, shoppers bought from 20 to 36% fewer disposables than the controls (who bought more after the campaign than before). Respondents increased their purchases of refills and concentrates after the campaign to a greater extent than the controls (ranging from 6 to 25% more on the east side, with the 25% representing the cohort remembering the resource message, and ranging from negligible to 26% more on the west side with the higher number representing those who recollected the recycling message). In absolute terms, those who reported buying refills and concentrates often or always after the campaign were well in excess of 50% for east-side shoppers. The same was true for purchase of disposable products.

In the west-side store there was great variation in those who bought disposable products. Those who saw the brochures and the video bought 15% fewer disposables than the controls, but those who saw the brochures and remembered a recycling message bought

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21% more disposables than the controls. There were also mixed results insofar as bringing a bag to the store was concerned, but the percentages varied just a few percent in either direction. In absolute terms, more east side than west side shoppers reported bringing a bag to the store often or always after the campaign, over 20% (east) and 10 to 15% (west), depending on intervention group. But the east-siders also bought more disposable products than west-siders in absolute terms after the education (over 50% vs. over 40%, respectively).

That impacts of the educational campaign appear to trend in different directions depending on which question was asked, indicates that the different survey methods (in-person baseline vs. telephone follow-up) did not result in consistent samping error with respect to environmental behaviors. In some cases the behaviors became less environmental after the educational treatments as compared with the control group, but in other cases the education seemed to have a positive effect.

Tables 26 and 27 show the changes in the amount and source of knowledge that occurred at the stores after the educational treatments (these are distilled from Appendix SA). Oddly, more respondents knew more about what was collected in the City's recycling program and environmental shopping in general before the educational campaign vs. afterwards, and only a few more shoppers knew that the City's recycling program was mandatory after the campaign. There was not much difference between the cohorts receiving different levels of intervention, with one notable exception. The west side shoppers who saw brochures and videos experienced a smaller fall-off in knowledge

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about the recycling program and environmental shopping than the controls by twenty to thirty percent in four cases (e.g., metal and tin cans, foil, and hearing about environmental shopping). At the same time, these same shoppers gave the wrong answer for whether the City picks up plastic bags in its recycling program, and by the same margin.

Table 27 (and the more complete depiction in Appendix SA) shows changes in where shoppers got their environmental information before and after the campaign. It's hard to fathom how, in nearly every case, the shoppers claimed to have gotten far less environmental information after the campaign than before it. A reduction in the City's overall recycling education program during the course of the campaign could explain some of this change (e.g., the drop by 30 to 50 percentage points in receipt of information via recycling mailings, and a drop by 50 to 70 percentage points by those receiving information in the subway). The recycling program was in an expansion phase in the late summer of 1993 and DOS had rolled out an educational program at that time. However, this educational program had been completed long before the end of the supermarket environmental shopping campaign,

An interesting phenomenon about these data is that patterns emerge if one looks only at the columns of "after" data. When examined this way, there is an apparent relationship between the amount of education that the campaign provided and the percentage of shoppers that said they received recycling or environmental shopping knowledge from

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each source. This relationship is particularly evident for environmental shopping knowledge from posters and brochures, and in-store videos.

Comparison of East- Vs. West-Side Store Data

Another of the hypotheses tested was that the west-side's educational program would result in a more significant change in knowledge, attitudes, and/or self-reported shopping behavior as compared with the east side store's program. It was expected that those exposed to the more intensive educational treatment given at the west-side would behave more environmentally than those given the basic educational treatment for the east-side.

In most cases, comparing impacts of the campaign on the environmental behaviors of east vs. west-side shoppers, there was little difference between shoppers at the two stores. Where a difference was found between cohorts of shoppers who received the interventions at the east vs. west side stores, east side shoppers reported more net increases in environmentally sound purchasing and other behaviors (i.e., buying less single-serving packaging and disposable products, and buying more recyclable packaging, and patronizing more repair shops).

With regard to knowledge about the City's recycling program, there was not much difference between east and west side, with the exception of the shoppers on the west side who saw the brochures and video, more of whom knew about the recycling program's mandatory nature. In absolute terms, a large proportion (at least 75%) of all the respondents knew the City required residents to separate recyclables. West side

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intervention shoppers increased their knowledge more about what materials the City picked up for recycling than the west side controls, vs. their east side counterparts. East side intervention shoppers that saw the brochures, and those who saw brochures and remembered the recycling message, knew about environmental shopping more than the west side shoppers. But comparing only the shoppers in each store who received more educational treatment, the shoppers from the west-side store knew more than the east side shoppers. In absolute terms, after the campaign, west side respondents who saw brochures and the videos knew which materials were picked up for recycling, and said they knew about environmental shopping 20% to 30% more than any other intervention or control cohort at either store.

East and west side shoppers differed in where they got their environmental information after the campaign. Comparing those who saw the project brochures and recalled the recycling message in each store, 20% more east-side shoppers got recycling information from posters and brochures than their west side counterparts. But 15% more west side shoppers, who saw the project brochures, but didn't recall any specific message, said they got recycling and environmental shopping information from posters and brochures than their east side counterparts. As would be expected, 15 to 20% more west side shoppers, who saw the project brochures and videos, claim to have received both recycling and environmental shopping information from in-store videos after the campaign as compared with the east side shoppers. Possibly due to the complementary effect of the in-store videos in the west side store, 10 to 20% more west side shoppers who saw the brochures and videos said they got environmental shopping information from posters and brochures,

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as compared with the various post-intervention cohorts from the east side store. Similarly, almost 10% more west-side shoppers who saw the brochures and videos said they got environmental shopping information from their friends, as compared with the east-side cohorts.

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Table 25 Changes in Behavior vs. Extent of Educational Intervention*

East side	Didn't see brochures (controls)			Saw Brochures				Saw Brochures & Recycling Message				Saw Brochures & either resources, reuse or pollution message			
	Before	After	Change	Before	After	Change	Diff. From Control	Before	After	Change	Diff from Control	Before	After	Change	Diff. from control
Buy Disposable Products	20.60%	55.50%	34.40%	43.20%	55.00%	11.80%	-22.60%	54.20%	52.00%	-2.20%	-36.60%	48.10%	62.00%	13.90%	-20.50%
Buy Refills/ Concentrates	43.30%	49.10%	5.80%	38.50%	62.50%	24.00%	18.20%	48.00%	60.00%	12.00%	6.20%	31.00%	62.10%	31.10%	25.30%
Buy single-servings	20.00%	27.10%	7.10%	20.50%	32.50%	12.00%	4.90%	20.00%	40.00%	20.00%	12.90%	20.60%	37.90%	17.30%	10.20%
Buy Recyclable Packaging	56.70%	35.00%	-21.70%	60.60%	40.00%	-20.60%	1.10%	58.30%	36.00%	-22.30%	-0.60%	55.10%	37.90%	-17.20%	4.50%
Avoid aerosols	66.70%	67.30%	1.00%	76.90%	70.00%	-6.90%	-7.90%	76.00%	64.00%	-12.00%	-13.00%	72.40%	69.00%	-3.40%	-4.40%
Return deposit containers	41.60%	58.60%	17.00%	36.90%	65.00%	28.10%	11.10%	28.00%	68.00%	40.00%	23.00%	35.70%	72.40%	36.70%	19.70%
Bring Bag	6.70%	13.60%	6.90%	20.50%	22.50%	2.00%	-4.90%	16.00%	24.00%	8.00%	1.10%	20.60%	24.10%	3.50%	-3.40%
Patronize repair shops	35.60%	31.70%	-3.90%	28.20%	15.00%	-13.20%	-9.30%	32.00%	24.00%	-8.00%	-4.10%	24.10%	13.80%	-10.30%	-6.40%
Recycle cans/bottles	83.30%	81.70%	-1.60%	89.70%	80.00%	-9.70%	-8.10%	84.00%	76.00%	-8.00%	-6.40%	89.60%	79.30%	-10.30%	-8.70%

West side	Didn't see brochures (controls)			Saw Brochures				Saw Brochures & Recycling Message				Saw Brochures & Video			
	Before	After	Change	Before	After	Change	Diff. from Control	Before	After	Change	Diff from Control	Before	After	Change	Diff from control
Buy Disposable Products	30.00%	42.60%	12.60%	32.70%	42.60%	9.90%	-2.70%	24.00%	57.70%	33.70%	21.10%	42.80%	40.90%	-1.90%	-14.50%
Buy Refills/ Concentrates	44.50%	45.40%	0.90%	41.50%	51.90%	10.40%	9.50%	30.80%	57.60%	26.80%	25.90%	52.40%	54.60%	2.20%	1.30%
Buy single-servings	19.40%	12.50%	-6.90%	18.50%	30.20%	11.70%	18.60%	11.50%	34.60%	23.10%	30.00%	22.70%	38.10%	15.40%	22.30%
Buy Recyclable Packaging	49.30%	38.90%	-10.40%	66.70%	29.60%	-37.10%	-26.70%	57.70%	26.90%	-30.80%	-20.40%	63.60%	40.90%	-22.70%	-12.30%
Avoid aerosols	59.10%	60.30%	1.20%	60.40%	59.30%	-1.10%	-2.30%	48.00%	65.40%	17.40%	16.20%	54.50%	59.10%	4.60%	3.40%
Return deposit containers	51.50%	54.70%	3.20%	46.20%	57.70%	11.50%	8.30%	34.60%	68.00%	33.40%	30.20%	47.60%	50.00%	2.40%	-0.80%
Bring Bag	10.90%	13.30%	2.40%	9.30%	9.50%	0.20%	-2.20%	3.80%	12.00%	8.20%	5.80%	18.10%	14.30%	-3.80%	-6.20%
Patronize repair shops	29.60%	29.40%	-0.20%	41.60%	29.80%	-11.80%	-11.60%	34.60%	24.00%	-10.60%	-10.40%	40.90%	19.10%	-21.80%	-21.60%
Recycle cans/bottles	90.40%	91.60%	1.20%	88.90%	84.90%	-4.00%	-5.20%	80.80%	84.60%	3.80%	2.60%	86.30%	81.80%	-4.50%	-5.70%

*** Percentages refer to those answering 'often or always'.**

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Table 26 Changes in Knowledge vs. Extent of Educational Intervention*

East side	Didn't see Brochures (controls)			Saw Brochures				Saw Brochures & Recycling Message				Saw Brochures & either resources, reuse or pollution message			
	Before	After	Change	Before	After	Change	Diff. From Control	Before	After	Change	Diff from Control	Before	After	Change	Diff. from control
Govt Require Separation of Materials	75.40%	80.00%	4.60%	75.00%	84.60%	9.60%	**5.00%**	76.00%	83.30%	7.30%	**2.70%**	79.30%	82.10%	2.80%	**-1.80%**
NYC Pick up Plastic Bottles	95.10%	82.00%	-13.10%	85.00%	72.50%	-12.50%	**0.60%**	88.00%	64.00%	-24.00%	**-10.90%**	89.70%	65.50%	-24.20%	**-11.10%**
NYC Pick up Plastic Bags	51.80%	47.50%	-4.30%	33.30%	60.00%	26.70%	**31.00%**	41.70%	68.00%	26.30%	**30.60%**	35.70%	65.50%	29.80%	**34.10%**
NYC Pick up Aluminum Cans	83.30%	68.90%	-14.40%	80.00%	82.50%	2.50%	**16.90%**	84.00%	84.00%	0.00%	**14.40%**	86.20%	82.80%	-3.40%	**11.00%**
NYC Pick up Aluminum Foil	67.80%	39.30%	-28.50%	57.50%	45.00%	-12.50%	**16.00%**	52.00%	44.00%	-8.00%	**20.50%**	62.10%	41.40%	-20.70%	**7.80%**
NYC Pick up Tin Cans	66.70%	41.00%	-25.70%	65.00%	40.00%	-25.00%	**0.70%**	64.00%	40.00%	-24.00%	**1.70%**	69.00%	39.70%	-29.30%	**-3.60%**
Heard of Environmental Shopping Before?	67.20%	58.90%	-8.30%	59.00%	62.20%	3.20%	**11.50%**	52.00%	54.20%	2.20%	**10.50%**	57.10%	59.30%	2.20%	**10.50%**
West side	**Didn't see Brochures (controls)**			**Saw Brochures**				**Saw Brochures & Recycling Message**				**Saw Brochures & Video**			
	Before	After	Change	Before	After	Change	Diff. From Control	Before	After	Change	Diff from Control	Before	After	Change	Diff from control
Govt Require Separation of Materials	85.90%	91.90%	6.00%	81.50%	85.20%	3.70%	**-2.30%**	80.80%	76.90%	-3.90%	**-9.90%**	81.80%	95.50%	13.70%	**7.70%**
NYC Pick up Plastic Bottles	96.00%	84.00%	-12.00%	94.40%	70.40%	-24.00%	**-12.00%**	96.20%	73.10%	-23.10%	**-11.10%**	95.50%	77.30%	-18.20%	**-6.20%**
NYC Pick up Plastic Bags	39.10%	45.30%	6.20%	43.10%	48.10%	5.00%	**-1.20%**	44.00%	53.80%	9.80%	**3.60%**	23.80%	54.50%	30.70%	**24.50%**
NYC Pick up Aluminum cans	95.90%	54.70%	-41.20%	92.50%	55.60%	-36.90%	**4.30%**	88.50%	61.50%	-27.00%	**14.20%**	95.20%	77.30%	-17.90%	**23.30%**
NYC Pick up Aluminum Foil	75.30%	37.30%	-38.00%	82.70%	48.10%	-34.60%	**3.40%**	73.10%	38.50%	-34.60%	**3.40%**	85.00%	68.20%	-16.80%	**21.20%**
NYC Pick up Tin Cans	89.00%	38.70%	-50.30%	87.00%	42.60%	-44.40%	**5.90%**	88.50%	38.50%	-50.00%	**0.30%**	77.30%	59.10%	-18.20%	**32.10%**
Heard of Environmental Shopping Before?	62.20%	50.70%	-11.50%	71.70%	58.80%	-12.90%	**-1.40%**	76.90%	48.00%	-28.90%	**-17.40%**	68.20%	81.00%	12.80%	**24.30%**

***Percentages refer to those answering "yes"**

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Table 27 Changes in Sources of Environmental Information vs. Extent of Educational Intervention*

East side	Didn't see Brochures (controls)			Saw Brochures				Saw Brochures & Recycling Message				Saw Brochures & either resources, reuse or pollution message			
	Before	After	Change	Before	After	Change	Diff. From Control	Before	After	Change	Diff from Control	Before	After	Change	Diff. from control
Mailings – Recycling	72.40%	21.30%	-51.10%	67.50%	37.50%	-30.00%	21.10%	60.00%	40.00%	-20.00%	31.10%	58.60%	48.30%	-10.30%	40.80%
Mailings – Env shopping	16.70%	4.90%	-11.80%	5.60%	2.50%	-3.10%	8.70%	4.80%	4.00%	-0.80%	11.00%	7.40%	3.40%	-4.00%	7.80%
Posters/Brochure – Recycling	50.90%	18.00%	-32.90%	39.50%	30.00%	-9.50%	23.40%	33.30%	32.00%	-1.30%	31.60%	37.00%	27.60%	-9.40%	23.50%
Posters/Brochure - Environmental shopping	15.40%	18.00%	2.60%	8.60%	10.00%	1.40%	-1.20%	4.80%	16.00%	11.20%	8.60%	3.80%	10.30%	6.50%	3.90%
Friends – Env shopping	35.80%	9.80%	-26.00%	37.80%	20.00%	-17.80%	8.20%	27.30%	20.00%	-7.30%	18.70%	37.10%	20.70%	-16.40%	9.60%
Store videos – Recycling	28.30%	0.00%	-28.30%	5.40%	2.50%	-2.90%	25.40%	8.70%	4.00%	-4.70%	23.60%	7.40%	3.40%	-4.00%	24.30%
Store videos – Env shop	0.00%	4.90%	4.90%	0.00%	2.50%	2.50%	-2.40%	0.00%	0.00%	0.00%	-4.90%	0.00%	0.00%	0.00%	-4.90%
West side	**Didn't see Brochures (controls)**			**Saw Brochures**				**Saw Brochures & Recycling Message**				**Saw Brochures & Video**			
	Before	After	Change	Before	After	Change	Diff. From Control	Before	After	Change	Diff from Control	Before	After	Change	Diff from control
Mailings – Recycling	72.70%	22.70%	-50.00%	78.40%	33.30%	-45.10%	4.90%	76.00%	34.60%	-41.40%	8.60%	76.20%	36.40%	-39.80%	10.20%
Mailings – Env shopping	17.90%	2.70%	-15.20%	11.40%	3.70%	-7.70%	7.50%	19.00%	0.00%	-19.00%	-3.80%	11.80%	4.50%	-7.30%	7.90%
Posters/Brochure – Recycling	41.00%	13.30%	-27.70%	47.90%	14.80%	-33.10%	-5.40%	60.90%	11.50%	-49.40%	-21.70%	50.00%	22.70%	-27.30%	0.40%
Posters/Brochure – Environmental shopping	17.50%	14.70%	-2.80%	13.60%	24.10%	10.50%	13.30%	19.00%	15.40%	-3.60%	-0.80%	5.90%	27.30%	21.40%	24.20%
Friends – Env shopping	35.10%	5.30%	-29.80%	26.10%	13.00%	-13.10%	16.70%	28.60%	15.40%	-13.20%	16.60%	16.70%	27.30%	10.60%	40.40%
Store videos – Recycling	12.10%	8.00%	-4.10%	24.50%	9.30%	-15.20%	-11.10%	30.40%	11.50%	-18.90%	-14.80%	30.00%	18.20%	-11.80%	-7.70%
Store videos – Env shop	7.10%	5.30%	-1.80%	4.50%	7.40%	2.90%	4.70%	9.50%	7.70%	-1.80%	0.00%	0%	18.20%	18.20%	20.00%

*** Percentages refer to those answering "yes"**

Relationships between Shoppers' Knowledge, Attitudes, and Behavior

An ancillary research objective was to determine the effect of shoppers' environmental knowledge on their environmental attitudes and behavior. One of the premises of this research project was that educational campaigns, such as the ones tested here, could be useful in imparting information and motivating shoppers to modify their purchasing attitudes and behaviors. Earlier in these analyses, a disconnect was found between shoppers' knowledge and attitudes (both of which were initially quite high) and their self-reported behaviors. Since path analysis is a statistical technique that is useful in structuring and quantifying models involving causative factors that interact to produce effects, path analysis was used to determine if and the degree to which a shopper's environmental knowledge causes environmental behaviors. In this case, two similar path analyses were performed to determine if there were any causative relationships between knowledge and attitudes, between knowledge and self-reported behavior, and between attitudes and self-reported behavior. Behavior was always the dependent variable, the effect produced by the interaction of environmental knowledge and/or attitudes. As only the baseline data sets included the attitude questions, useful for this analysis, and since the east side store was the largest of the data sets, both path analyses used this data set.

In order to conduct this analysis, it was first necessary to group the survey questions according to those most clearly reflecting the three categories: environmental knowledge, attitudes, and behaviors. This was done in two ways: first, by simply making three composite variables, averaging the answers to all the questions relating to knowledge, attitude and behavior, and second by using factor analysis to create new factor variables

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for knowledge, attitude and behavior. The survey questions (variables) which contributed to the three composite variables are shown in Tables 28, 29, and 30 below.

The first path analysis utilized the composite variables, KNOWLEDG, ATTITUDE, and BEHAVIOR and investigated the simple model of environmental and recycling knowledge impacting directly on environmental attitudes and on environmental behavior with attitudes, in turn, impacting directly on behavior (see Figure 3).

The path coefficients measure the effect of one variable on another, expressed in standardized units. For example, the results in Figure 3 show that KNOWLEDG, by itself, has little direct impact on BEHAVIOR (.213) and a moderate impact on ATTITUDE (.472). The indirect effect of KNOWLEDG on BEHAVIOR via ATTITUDE (.472 x .623) is also small, at .294. Thus, the total impact (in this case, equal to the direct impact) of ATTITUDE on BEHAVIOR (.623) is greater than the total (direct plus indirect) impacts of KNOWLEDG on BEHAVIOR combined via attitudes is (.213 + (.472 x .623) = .507). Further, the residuals (unexplained sources of impact) for BEHAVIOR and ATTITUDE are both quite large. Sixty-eight percent of the impact on BEHAVIOR is caused by something other than KNOWLEDG and ATTITUDE, and almost all (97%) of the influences on ATTITUDE are caused by factors external to the model. External influences can include everything from social norms or peer pressure, religious beliefs, convenience, and economic issues, to name a few.

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Table 28 Survey Variables Comprising Composite Variable: KNOWLEDG

Survey Variables	Survey Questions
REQRECYC	Does the City require Manhattan residents and businesses to separate materials for recycling?
BOTTLJUG	Are plastic bottles and jugs picked up by the City for recycling?
PLASTBAG	Are plastic bags picked up by the City for recycling?
ALUMCANS	Are aluminum cans picked up by the City for recycling?
ALUMFOIL	Is aluminum foil picked up by the City for recycling?
TINCANS	Are tin cans picked up by the City for recycling?
HRDENVSH	Have you heard about environmental shopping before?
Where have you heard about recycling.... environmental shopping	
MAILRECY	Mailings (recycling)
MAILSHOP	Mailings (environmental shopping)
TVRDRECY	TV or radio (recycling)
TVRDSHOP	TV or radio (environmental shopping)
SUBWRECY	Subway Ads or Billboards (recycling)
SUBWSHOP	Subway Ads or Billboards (environmental shopping)
VIDEOREC	Videos in store displays (recycling)
VIDEOSHP	Videos in store displays (environmental shopping)
POSTRREC	Posters or brochures in stores (recycling)
POSTRSHP	Posters or brochures in stores (environmental shopping)
BLDGRECY	Your building's management (recycling)
BLDGSHOP	Your building's management (environmental shopping)
FRNDRECY	Friends and neighbors (recycling)
FRNDSHOP	Friends and neighbors (environmental shopping)
NSPRECY	Newspapers and magazines (recycling)
NSPSHOP	Newspapers and magazines (environmental shopping)

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Table 29 Survey Variables Comprising Composite Variable: ATTITUDE

Survey Variables	Survey Questions
TWOCENT	If you were offered a small incentive, say 2 cents, to bring your own bag to the supermarket for your groceries, would you bring you own bag?
FIVECENT	If the incentive were 5 cents, would you bring you own bag?
CHNGSTOR	If a new store opened near you that encouraged environmentally safe products and practices, all other things being equal, would you be likely to change the supermarket where you do most of your shopping?
Please rank the following in order of preference from 1 to 4 in their importance to you when buying groceries (where 1 is most important)	
BRANDNAM	Brand Name (rank)
COST	Economic Value or cost (rank)
CONVENCE	Product's convenience (rank)
ENVIMPC	Environmental impact (rank)
Please indicate how you feel about the following statements using this rating scale: 1) strongly disagree 2) mildly disagree 3) neutral 4) mildly agree 5) strongly agree	
BUY2MUCH	People in the US buy/consume too much
PRESVENV	Environmental shopping is important for preserving the natural environment
REDUCPKG	People help the environment by reducing the amount of packaging and products they buy
INDSOLVE	Individuals must take the most active role in solving any trash disposal problems
GOVSOLVE	Governments must take the most active role in solving any trash disposal problems
INFRING2	Mandatory recycling infringes on my rights (inverse)
TECHALO2	Technology alone will solve any trash problem (inverse)
PRFREPAI	I like to repair things rather than discard them
PRFDISP2	I prefer to buy disposable products (inverse)
NOTDURAB	Products are not made as durably as they were in the past
REFILLGD	Using refills or concentrates is good for the environment
If you do recycle, please indicate how important each of the following is in inspiring you to recycle, (where 1 is of no importance and 5 is extremely important)	
NATRESRC	I recycle to help conserve natural resources
LANDFILL	I recycle to help conserve landfill space
THELAW	I recycle because it's the law
RIGHTHNG	I recycle because it seems like the right thing to do

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Table 30 Survey Variables Comprising Composite Variable: BEHAVIOR

Survey Variables	Survey Questions
How often do you actually do each of the following things? (Where 1 is never and 5 is always)	
DISPROD2	Buy disposable products (inverse)
REFILLS	Buy refills or concentrates
SINGLSV2	Buy items in single-serving packages (inverse)
RECYCPKG	Select products in recyclable packaging
AEROSOLS	Avoid buying aerosols
DEPOSIT	Return beverage containers for deposit
BRINGBAG	Bring your own bag to the store
GOREPAIR	Patronize repair shops
RECYCANS	Recycle cans and bottles
RECYMAGS	Recycle magazines
USEDIAPR	Is there an infant in your household, who uses diapers?
	If yes, how does your household deal with soiled diapers? Do you:
GARBAGE	Throw them in the garbage?
WASHHOME	Wash them at home or in your building?
WASHNEAR	Wash them at a nearby building?
DSERVICE	Have them picked up by a diaper service?
REUSBAGS	Have you used one of Gristede's reusable canvas bags in the past month?
OFTNBAGS	If yes, how often have you brought one with you when you go shopping?

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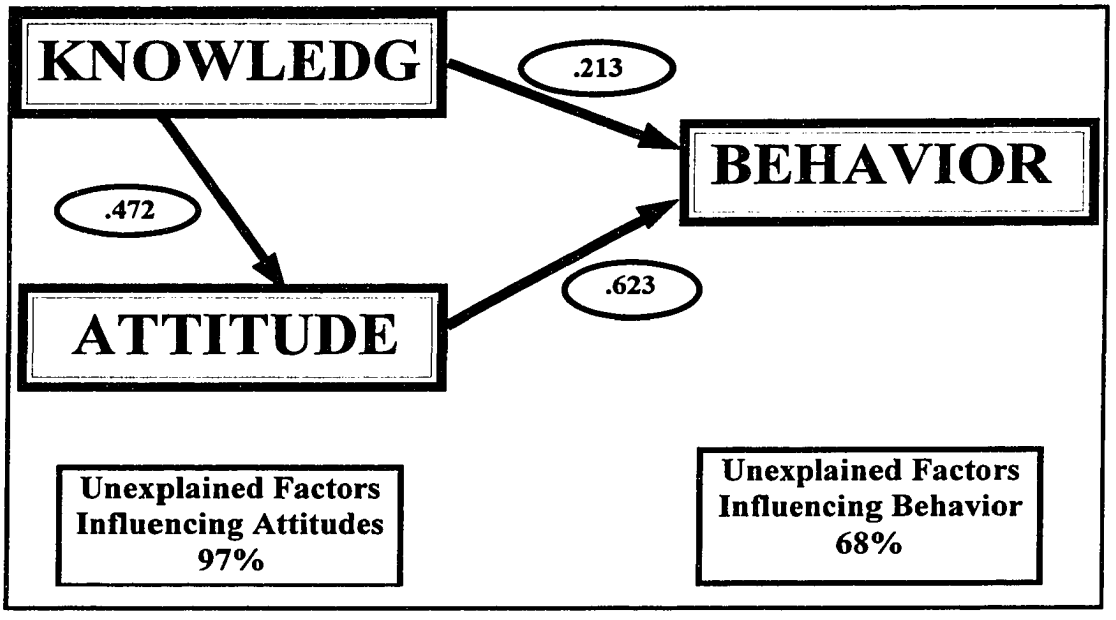
Figure 3 Path Analysis for Composite Knowledge, Attitude, and Behavior Variables



The second path analysis utilized factor variables. Factor analysis of the questions probing shoppers' environmental shopping and recycling knowledge yielded two knowledge factor variables. ENVSHKNO represents the questions dealing with environmental shopping knowledge (i.e., Have you heard of environmental shopping?, and most of the questions dealing with the source of environmental shopping knowledge. RECYCKNO is clearly associated with correct answers to the questions about which materials the City collects for recycling.

Factor analysis of all the questions probing shopper attitudes yielded one clear factor, ENVIRATT, which included the survey questions asking respondents' attitudes (1) towards changing the store they shop at if it became more environmental, (2) regarding

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the importance of conserving natural resources and landfill space as factors that motivate them to recycle, (3) towards the statement that recycling doesn't infringe on their rights, (4) towards buying products in reduced packaging, and (5) regarding the statement that environmental shopping is important for preserving the natural environment.

Factor analysis of the behavior-related questions yielded two factors. The more dominant of these, RECYCBEH (Recycling behavior), was found to be influenced by how often the respondent actually buys recyclable packaging, recycles cans and magazines, and brings cans and bottles back for deposit. All these behaviors imply a less sophisticated behavior modification pattern than environmental shopping, since recycling has been a household environmental word (and practice) for some time in New York City and the country, whereas environmental shopping behavior modification involves understanding more concepts (reduced consumption of packaging and non-durable products and substitution of durable products).

Figure 4 shows that most of the total impact on recycling behavior (RECYCBEH) comes from environmental attitudes (ENVIRATT), at .63, which is remarkably similar to what was found in the composite path analysis. The next greatest direct impact on recycling behavior comes from ENVSHKNO, or the effect (.21) of environmental shopping knowledge (the same as the direct impact of the composite variable, KNOWLEDG, on BEHAVIOR in the path analysis above). ENVSHKNO does have a similar effect via ENVIRATT on RECYCBEH (.335 x .6299 = .21) Oddly enough, RECYCKNO, or recycling knowledge, has a slightly negative contribution on behavior at -.035, but

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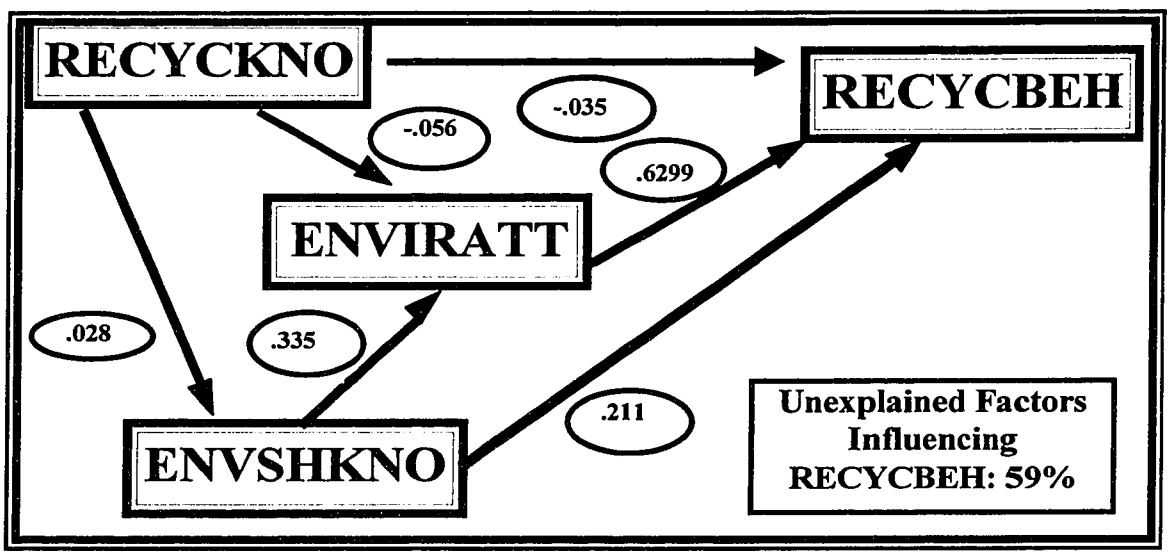
RECYCKNO did have a small positive impact on environmental shopping knowledge (0.028). Again, a substantial percentage (59%) of the variation in recycling behavior which is unexplained in this model, similar to the analysis above. A more complete discussion of the regression and other analyses performed to support these path analyses are contained in Appendix FA.

Figure 4 Path Analysis for Factor Knowledge, Attitude, and Behavior Variables



Increases in environmental knowledge should translate to increases in environmental behaviors, but this was not the case in the composite path analysis above, nor in the factor path analysis. These two path analyses show that the amount of environmental or recycling knowledge that a shopper possesses has relatively little direct or indirect effect on the shopper's environmental behavior. Attitudes have a considerably greater effect on behavior, and are the main determinant of behavior among the factors studied.

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One possible explanation for the small impact of KNOWLEDG on attitudes or behavior is that since recycling violations go to building owners and not tenants, and since most respondents are tenants, there can be a disconnect between having received recycling knowledge from the City and implementing it. On the other hand, some people know a lot about recycling and environmental shopping because they care about the environment; these people would have recycling behaviors. With respect to ATTITUDE's strong effect on BEHAVIOR, if people have a positive attitude towards the environment, they are more likely to recycle and perform other positive environmental behaviors This finding agrees with the disconnect between shoppers' knowledge and attitudes and their environmental behaviors mentioned above.

Findings and Discussion

The following points summarize the findings of this study.

Baseline questionnaire

- The knowledge questions showed a basic understanding of New York City's recycling program, a good foundation on which to begin education about environmental shopping. Fewer shoppers correctly answered the questions that required a more sophisticated understanding.

- The shoppers had received decidedly more education about recycling than environmental shopping prior to the educational campaign, and from a variety of

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sources, chief among them, TV/radio, their building's management and newspapers/magazines. Their environmental shopping knowledge came from newspapers/magazines, TV/Radio and their friends and neighbors.

- The shoppers' attitudes towards environmental concepts and conservation, in general, were quite positive, with over half to two-thirds agreeing with all the statements that would indicate a predisposition towards the environment. Fewer shoppers agreed with the questions that would elicit a negative personal attitude towards the environment.

- There appears to be a disconnect between the shoppers' level of environmental knowledge and attitudes, and their actual behaviors. Whereas the shoppers tended to have positive attitudes and a high level of recycling knowledge, they seemed a bit more ambivalent when it came to actually practicing environmental behaviors. Recycling was one exception to this, where a vast majority of shoppers from east and west recycled cans, bottles, and magazines. On the other end of the spectrum, it was clear that shoppers did not bring their own bags to the supermarket.

Effect of the Educational Campaign on Purchases of Recyclable Packaging, Refills, Concentrates

- Respondents who were exposed to more educational materials and recalled environmental messages, self-reported buying refills and concentrates to a greater extent than those who did not notice the educational materials. In absolute terms,

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those who reported that they often or always bought refills and concentrates after the campaign were well in excess of 50%.

- Shoppers exposed to more educational materials tended to buy fewer products in recyclable packaging as compared with the controls, particularly in the west side store.

- There was a net increase in purchases of refills and concentrates reported by shoppers who received the intervention after the campaign as compared with the controls, and this result was true for both stores. The net increase by east side shoppers ranged from 6 to 25% more on the east side, with the 25% representing the cohort seeing the brochures and remembering the resource message. The net increase by west side shoppers ranged from negligible to 26% more with the higher number representing those who saw the brochures and recollected the recycling message.

Effect of the Educational Campaign on other Environmental Behaviors

- As with the baseline survey, in absolute terms, shoppers did not exhibit a convincing tendency towards environmental shopping behaviors, but did report they recycled cans and bottles.

- In absolute terms recycling of cans and bottles at home was reported as often or always by over 80% of the respondents in all groups. By comparison, those who often or always brought these items back to the store for deposit increased

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considerably after the campaign, ending up between approximately 50% and 70%. Bringing back bottles for deposit increased for the controls and even more for the intervention groups, while shoppers reported somewhat less recycling of cans and bottles at home. The more intensive the educational treatment, the greater the number of respondents that brought cans and bottles back to the store for deposit most frequently. This effect was across-the-board. As compared with the controls, east side shoppers that saw the brochures were 12% more likely to bring the cans and bottles back, but those who also remembered the resources message were 20% more likely, and those remembering the recycling message were 24% more likely. At the west side store, those that only saw brochures were 5% more likely to bring cans and bottles back for deposit, but those who also remembered the recycling message were 30% more likely (as compared with the controls).

- Purchase of products in single-serving packaging (a bad environmental behavior) occurred more frequently and patronage of repair shops (a good environmental behavior) occurred somewhat less frequently after the campaign among those receiving educational treatments vs. the controls.

- In the west side store there was great variation in those who bought disposable products. Those who saw the brochures and the video bought 15% fewer disposables than the controls, but those who saw the brochures and remembered a recycling message bought 21% more disposables than the controls.

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Effect of the Campaign on Bags and Bag signage effort

- In absolute terms, more east side than west side shoppers reported bringing a bag to the store often or always after the campaign, over 20% (east) and 10 to 15% (west), depending on intervention group.

- There was little change between the bag attitudes (effect of incentives) and behaviors (actually bringing bags) after the campaign comparing those who received various levels of educational treatment vs. the controls, but all the groups increased slightly in absolute terms.

Effect of the Campaign on the Diaper Service Effort

- There were no new GHCC customers resulting from the educational campaign.
- Only 17% of respondents with babies received diaper offers in the east side store and 6% in the west side store.

The Relative Effect of the Campaign on East- vs. West-side shoppers

- With regard to knowledge about the City's recycling program, there was little difference between east and west side, with one exception. The shoppers on the west side who saw the brochures and video tended to know more about the recycling program vs. the west side controls, as compared with their east side counterparts (east side shoppers who received the most educational treatment vs. east side controls).

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- East and west-side shoppers differed in where they got their environmental information after the campaign. Comparing those who saw the project brochures and recalled the recycling message in each store, 20% more east-side shoppers got recycling information from posters and brochures than their west side counterparts. But 15% more west side shoppers, who saw the project brochures, but didn't recall any specific message, said they got recycling and environmental shopping information from posters and brochures than their east side counterparts.

- As expected, fifteen to twenty percent more west side shoppers, who saw the project brochures and videos, claim to have received both recycling and environmental shopping information from in-store videos after the campaign as compared with the east side shoppers. Ten to twenty percent more west side shoppers who saw the brochures and videos said they got environmental shopping information from posters and brochures, as compared with the various post-intervention cohorts from the east side store. Similarly, almost 10% more west side shoppers who saw the brochures and videos said they got environmental shopping information from their friends, as compared with the east side cohorts.

- Where there was a difference between the behavior of shoppers who received the interventions at the east-side vs. west-side stores, more environmentally sound purchasing and other behaviors were reported by east side shoppers (e.g., buying 12 to 26% more recyclable packaging than the controls vs. the west side comparison). Those receiving the educational treatments in the east side store bought fewer

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disposable products than the controls (in five of the six intervention cases). Specifically, shoppers bought from 20 to 36% fewer disposables than the controls (who bought more, in absolute terms, after the campaign than before).

The Effect of an Educational Campaign (Knowledge) on Attitudes and Behavioral Change

- The two path analyses show that the amount of environmental or recycling knowledge that a shopper possesses has relatively little direct or indirect effect on the shopper's environmental behavior (amounting to .21 direct impact plus an additional amount for the indirect impact depending on which model is used). Attitudes have a considerably greater effect on behavior (.63 to .68), but there are still other factors unaccounted for in these models. In the first model 97% of attitude is explained by external influences. The factors contributing to behavior, unaccounted for in both models, are .59 to .68.

Effect of the Educational Campaign on Environmental / Recycling Knowledge

- More respondents knew more about what was collected in the City's recycling program and environmental shopping in general before the educational campaign vs. afterwards, and only a few more shoppers knew that the City's recycling program was mandatory after the campaign. There was not much difference between the cohorts receiving different levels of intervention, with one notable exception. The west side shoppers who saw brochures and videos knew more about the recycling program and environmental shopping than the controls by twenty to thirty percent in four cases

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(e.g., responding with the correct answer about items the City picks up in its recycling program). At the same time, these same shoppers gave the wrong answer for whether the City picks up plastic bags in its recycling program, and by the same margin.

Effects of Demographics on Knowledge, Behavior, etc.

- For the most part, the cross-tabs did not show a great deal of disparity amongst the groups; usually less than a few tenths of a point separated the different racial groups.
- Where there was a noticeable disparity in the answers given by men and women, it was the women who exhibited more environmental behaviors and attitudes.
- Both sexes brought bags to the supermarket slightly more often after the campaign.
- Younger, lower income and women shoppers were more likely to be motivated to bring a bag to the store if an extrinsic inducement were proffered.

Effect of Educational Materials

- Many of the survey respondents did not recall one or more of the educational features or required prompting to remember them.

- The educational materials that were noticed most (by two-thirds, including prompted and unprompted) were the cotton bags and the NYC DOS Bring Your Own Bag signs.

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Discussion

Although some of the messages seem to have gotten through and changed the shoppers' behaviors (most notably to buy more refills and concentrates, and to a small extent to more bring bags to the store), what could explain those cases in which the campaigns had no impact (or negative impact) on the shoppers? A number of factors contributed to the results of the study. The two path analyses showed that the amount of environmental or recycling knowledge that a shopper possesses has little direct or indirect effect on the shopper's environmental behavior. So the premise that an educational program could be completely effective in modifying shopper behavior is erroneous. Attitudes have a considerably greater effect on behavior, but attitudes are only modestly related to knowledge. So a campaign to improve only the shoppers' knowledge of environmental shopping and recycling would be expected to fall short of the goals. There are still other factors (unexplained variance) unaccounted for in these models, which if identified and used in an environmental shopping campaign, would likely lead to a more positive outcome. The results of this study agree with the disconnect, noted earlier, between shoppers' knowledge and attitudes and their environmental behaviors. An analogy is the influence of information and addiction on smoking behavior. Information alone (even that which is strongly compelling) is often not sufficient to dissuade people from abandoning a long-held smoking habit. Thus, an environmental information campaign, even in tandem with motivational arguments, is only one small factor among many that influences environmental behaviors.

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External Influences on Campaign Results

The path models showed that there are many other factors besides knowledge that mold attitudes and behaviors, and indeed, there were confounding influences on the shoppers at the time of the environmental shopping campaign. A number of these confounding factors pulled shoppers in the opposite direction from where the educational materials were designed to take them. For example, the holidays might have caused shoppers to pay more attention to competing influences, such as cost and convenience, or may have constrained shoppers' time and attention, interfering with the effectiveness of the educational materials. It is even possible that some of the shoppers were irritated by one more set of competing messages and displays in stores already crowded to the max during holiday season. Additionally, around the time of the baseline survey administration, the NYC DOS was expanding its recycling collection programs in Manhattan. As new districts came online, DOS sent recycling literature to each resident and required building superintendents to post signs about recycling in each apartment building. DOS supplemented this with other media and print advertising, which some of the survey respondents probably saw. This temporary outside source of information may have heightened recycling awareness at the time the baseline survey data were collected. Another possibility is that economic considerations were beginning to drive behavior more, towards the end of the campaign, as evidenced by the increase in shoppers' bringing back cans and bottles for deposit instead of recycling them. Likewise, by the time the follow-up survey was administered in early 1994, the beginning of the

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"Republican Revolution" may have engendered an anti-environment sentiment that may have adversely affected responses on that later survey.[121]

Aside from time-dependent factors that may have influenced the campaign's impact on shoppers, other factors could have motivated shoppers to ignore the campaign's messages. For example, shoppers were asked to perform some behaviors which were clear-cut (i.e., buying cloth bag instead of taking a disposable one). But in other cases, shoppers were asked to buy recyclable packaging, concentrates, and refills, which may have appeared to conflict with pre-existing beliefs about environmental shopping. For example, environmentally sophisticated shoppers might consider that buying detergent in a recyclable plastic bottle that contains a nonrenewable resource (petroleum) and heavy metals (in the pigments), and which could produce some environmental impacts when melted for recycling, is less environmental than buying the product in paperboard, made from a renewable resource and readily degradable into a benign product in the landfill. Buying soup in a recyclable can vs. Ramen in a non-recyclable plastic wrap is what the campaign recommended, but the plastic wrap uses fewer resources because the product was actually a concentrate (the removal of the water in the product reduced packaging needs). Such confusion can occur because prior knowledge or attitudes can influence the way that a consumer interprets the instructions. So changing consumer behavior where

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[121] Results released from a national survey conducted on the eve of the 1996 election show that a candidate's stand on environmental issues was a top consideration for voters in 1996. According to the survey of 788 adults, 85% of Americans said that a candidate's position on "clean air, clean water standards, and protecting the environment" was very important or somewhat important in determining how they would vote. This is a 27% increase from last year and a 55% increase from 1994. The poll, conducted by ICR Research of Media, PA, has an error margin of +/- 2.5%.

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there are many possible choices and conflicting considerations may not be as easy as changing behavior when it's either an all or nothing proposition.

Another factor which may explain the results is that encouraging shoppers, who have to carry their groceries home by hand (as the vast majority of these shoppers do), to buy more recyclable containers could be at odds with the fact that the non-recyclable packaging is usually lighter in weight. The recyclable packaging for coffee is either a tin can or glass container, but the non-recyclable alternative is packaged in laminated metal/plastic wrap, which weighs a few ounces less. Similarly, the detergent packaged in a recyclable bottle also contains a considerable amount of water, and is consequently heavier as compared to the powdered detergent in a paperboard container. Shoppers may have ignored the message to buy in recyclable containers to save the effort of hauling the extra ounces or pounds. By the same token, refills and concentrates are, by definition, lighter than those with dilute contents, and so encouragement to buy these products would not have faced the same barrier (inconvenience) as encouragement to purchase products in recyclable packaging would. That a compact, durable cloth bag was available for purchase at a reasonable price right at the checkout counter, was a measure designed (and that succeeded to some extent) to overcome the inconvenience barrier that might have been encountered had the shoppers been asked to bring a bag they didn't own or one that was too unwieldy to carry along.

The literature review showed that shoppers are more likely to change their behavior when they have both a favorable attitude (including intrinsic motivations) as well as when

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positive external conditions exist (such as pleasant or supportive physical, financial, legal, or social conditions). But even if someone has a somewhat positive attitude towards a behavior, if the external conditions are negative (i.e., barriers exist), then the behavior won't change. This could explain the disappointing results with the diaper experiment. Many parents find disposables much more convenient than diaper service (despite the fact that delivery of new and collection of used diapers is taken care of by the company). The follow-up survey showed that a significant percentage of the shoppers with infants who did not want to start diaper service cited cost as a reason for not switching, despite the fact that there is little difference in cost between using disposables and diaper service (see Appendix D for further discussion), but inconvenience was cited by a few. GHCC's experience with advertising for new customers showed that parents are loathe to switch once they have been using disposables for some time, and that is why they attracted most of their new customers by directing their advertising to new mothers at the hospital. That large barrier needed to be overcome before shoppers would forsake disposables for diaper service suggests that some venues are more fruitful than others for launching environmental educational campaigns. Perhaps the diaper focus should have been excluded in favor of some other focus more appropriate for a first-time, small-budget environmental campaign at a supermarket.

These findings are consistent with other research on the relationship between government informational campaigns and behavioral change. A recent study by King County, Washington (Seattle) concludes that there are many barriers besides information which

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must be overcome in achieving changes in behavior.[122] The typical government method of changing peoples' behaviors by creating a brochure ("if we build a brochure, they will come"), is questioned by pointing out that if information alone changed behavior, then there would be no more smokers, all kids would wear bike helmets, and all businesses would follow regulations. They quote Jamieson and VanderWerf in supporting the contention that there is no clear causal relationship between providing information and changing behavior. There are two primary reasons why this is true:

1) lifestyle changes require role models
2) people may ignore information or interpret it so it reinforces existing attitudes, beliefs, or values.

Further, King County found that to change an audience's behavior, it is essential to determine their barriers to change. These may be external (e.g., cost of the behavior, technology or feasibility of the behavior is lacking, it isn't convenient) or internal (e.g., person doesn't know what to do, doesn't recognize the problem, doesn't think it a priority, thinks it's too hard, doesn't have friends doing it, etc...). Only the first internal barrier is addressed by most brochures and educational campaigns, in general, although a conscious attempt was made here to show in the brochures the importance of

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[122] Frahm, Annette, et. al., "Changing Behavior: Insights and Applications", Local Hazardous Waste Management Program in King County" King County Water Pollution Control Division, Seattle, WA, July, 1996.

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environmental shopping behavior in conserving resources and protecting the environment (i.e., addressing the issues of problem recognition and prioritization).

Researchers [123], [124] found that when people make a commitment to act in a certain way, then they are more likely to act in that way. Commitments ranged from having people sign a pledge or send postcards to officials, to having their names used in publicity about a conservation activity. Simply reminding people of their initial commitment strengthens a "bond" between commitment and behavior. And small commitments lead to larger ones. Another way to overcome barriers to behavior is providing specific, positive reinforcement (feedback) regarding the consequences of their behavior changes. Also, the effectiveness of a message depends directly on the credibility of the message's source. Thus, a disadvantage of using brochures is that people see information from friends and relatives as more credible than information from other sources. Thus, the effectiveness of a message depends directly on the credibility of the message's source.

Impacts of Survey Administration on Campaign Results

In addition to the fact that other influences on shoppers' behaviors were more important to them than the messages from a supermarket-based educational campaign, factors associated with the administration of the surveys that may have affected the shoppers' responses to questions. The shoppers may have overestimated their environmental

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123 Pardini, A.U and R.D. Katzev "The effects of strength of commitment on newspaper recycling" Journal of Environmental Systems, 1983-4, 13: pp. 245-254.

124 Katzev, R.D. and A.U. Pardini, "The Comparative Effectiveness of Reward and Commitment Approaches in Motivating Community Recycling", Journal of Environmental Systems, Vol. 17, No. 2, 1987-88, pp. 93-113 in "Promoting Source Reduction and Recyclability in the Marketplace".

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attitudes and behaviors when asked the first time, in front of a data collection volunteer, but once the shoppers had been exposed to information about environmental shopping, they were better able to assess their feelings and behaviors. An example of this is the set of questions asking shoppers what things are the most important motivators in getting them to recycle. Initially the responses were surprisingly high for the three intrinsic motivators (saves natural resources, saves landfill space, and is the right thing to do). So, if the initial responses were artificially high to begin with, there was more room to fall in the follow-up survey. Similarly, the knowledge questions about the City's recycling program showed a high percentage of correct answers in the baseline survey, and fewer in the follow-up survey.

Another possible impact of survey administration on survey results could have stemmed from the fact that the follow-up survey was administered by telephone. Understanding questions read by a stranger over the phone could cause confusion where none existed, whereas the same question read by the respondent from a written survey might have been comprehended without error.

Impacts of Campaign Design on Results

The analysis of the different levels of intervention (i.e., combinations of brochures, videos, signage, etc.) points to the likelihood that a campaign with many educational materials and approaches will be more successful in changing behaviors. One explanation for the mixed results of the analyses is that the campaign was not conducted for a long enough period. It takes time to change peoples' behaviors, particularly if they

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are long-held, or if there are other opposing motivations to overcome or barriers to surmount. It also takes sufficient funding to create and sustain a longer, more intensive educational campaign. For example, if the campaign could have hired a full-time staff person to ensure that all purchasers of disposable diapers received a diaper offer, the results of that part of the campaign may have been different. If that staffer were to have handed a project brochure to every shopper while standing in the checkout line during the first week each brochure was available, it would have been more certain that shoppers received those educational materials. Such a staffer could have also worked to keep the video volume at an audible level. A longer educational campaign could have been designed to have more elements to outreach to the shoppers (e.g., a series of flyers focusing on a narrow message, issued on a weekly basis). More tabling events would have enabled shoppers to ask questions, receive more detailed reasons for changing their behaviors, and get feedback.

The City's recycling program is one example of a long-standing environmental educational campaign that has attempted to modify environmental behavior. But even though the City has been collecting materials for recycling from most districts since the early 1990s, the capture rate (a measure of the participation rate) for targeted materials is still far less than 50% in most districts (the range is from 17% to 62%) as of 1998. [125] The budget for educational outreach has usually been roughly $5 to 10 million per year over the time period in question, or one dollar per resident. One explanation for the low capture rate is that there has been insufficient funding to sustain the message

[125] Cipollina, Larry, "Residential Recycling Diversion Report for April, 1998", NYCDOS Memorandum. July, 24, 1998.

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continuously every year, and to develop and deploy new approaches (both education and enforcement) to identify and reach geographic and demographic groups that remain more resistant to recycling. So, the time and the monetary resources available for an environmental educational campaign is critical to its success.

Effects of Educational Materials Design and Placement on Results

One very important factor affecting the campaign's results was that not all the shoppers even saw the educational campaign. The data show that the Environmental Shopper bag displays and the Bring Your Own Bag signs were noticed more than the other educational materials. Since the first step in imparting information and motivating shoppers is to ensure that the shoppers see the materials, it is instructive to examine the aspects of the educational materials that attracted the attention of the shoppers. As compared with the brochures, which were placed in magazine racks and might have been ignored by shoppers not interested in buying magazines, the bag signs were larger, in more striking, bright and contrasting colors, with larger letters, and were displayed right on the side of the cash registers. The message was brief and could be read quickly, whereas reading one or more brochures is more time-consuming, and naturally, fewer shoppers would have taken that step. The bags, themselves, were also educational devices, in that they were noticed almost as much as the Bring Your Own Bag signs. One common link that might help explain success of these two educational materials is that both of these were displayed right near the cashiers. Being able to purchase the bags there implied to the customers that the store was supportive of the effort. By contrast, the brochures may have appeared to the shoppers as having been left in the magazine racks by someone not

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associated with or supported by the store management. The follow-up survey results also showed that the videos in the west Side store were remembered by less than 40%, either prompted or unprompted. This was not surprising considering that the video was frequently not audible. That certain behaviors of those who saw both the brochures and videos changed to a greater extent than the controls, and those who received less of the educational treatments, suggests that video could have great potential for educational campaigns if their use could be better managed.

Impacts by Campaign Partners on Results

The study design, including the intricate scheduling of many interconnected planning and design activities (e.g., preparation and administration of the surveys, design of the educational materials, planning for storewide purchasing information, etc.) was predicated on the prearranged agreements with EAC and Red Apple that they would be contributing important functions and providing critical information and access on a timely basis.

EAC was to contribute volunteers to gather baseline and follow-up survey data and to provide volunteers to make periodic reminder calls to diary keepers. They had also agreed to arrange for sufficient volunteers to allow for frequent tabling at the west side store and to assist with maintenance checks and brochure and bag restocking for both stores. EAC had also agreed to assist in the design of educational materials and other planning aspects. However, as a result of insufficient numbers of baseline surveyors, the surveying took several weeks longer than planned. The extra time required for the

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design of educational materials resulted in an additional delay of two months after the completion of the baseline survey data gathering effort and prior to the start of the educational campaign. Due to the need to call many of the baseline survey respondents repeatedly to find them at home, the volunteer phone surveyors for the follow-up surveys were unable to make reasonable progress, so a delay was introduced between the end of the educational campaign and the administration of the survey. As a result, it became necessary to hire a phone bank to administer the follow-up survey.

These compound delays may have had a deleterious impact on the number of follow-up survey respondents that could be reached, as much as ten months after the baseline surveying began (New Yorkers are a mobile lot). Also, since it is desirable to minimize the time between baseline survey, educational campaign, and follow-up survey, so as to minimize extraneous factors impacting respondents' responses to the campaign and their recollection of the educational devices and messages, it is possible that these delays affected the results. As EAC volunteers, a phone bank, and I all administered the follow-up survey, this may have introduced variation in the consistency of answers given. Since EAC was not able to provide sufficient volunteers for phoning diary keepers, to provide them encouragement and to answer questions, this may have reduced the number of those eventually providing data, resulting in an insufficient sample size, ensuring that this method of measurement could not be used. That there weren't as many tabling events in the west side store reduced the degree to which the two stores' educational efforts were different.

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Red Apple management had initially agreed to provide storewide purchase data for specific target products, disposable grocery and produce bags, as well as the Compak cotton bags. The manner in which only some distributors' invoices were provided, ensured that storewide purchases could not be used as a method of measurement. That Red Apple was not able to provide information about the number of disposable or cotton bags given away/sold, meant that this aspect of the educational effort could not be objectively evaluated. That the prices for target products (e.g., those in recyclable/non-recyclable packaging pairs) may not have remained stable throughout the campaign period, may have affected the purchasing behaviors reported by respondents.

Red Apple headquarters had provided assurances that the store management would cooperate in providing a hospitable environment for the campaign, and this occurred to some extent. The west side manager had been innovative in the initial display of educational materials, and the east side's assistant manager was also of great assistance in designing display boxes for the diaper offers, and in keeping track of bag sales. However, the problem with maintaining the video volume is likely to have been the main reason that most shoppers in the west side store did not receive this educational treatment. This, in turn, contributed to a smaller difference between the two stores' educational efforts. The difficulty encountered in maintaining displays for posters and brochures also undoubtedly impacted the degree to which shoppers could receive these educational treatments. Additionally, although store management had agreed that cashiers would distribute diaper offers, and although it was agreed that diaper offers would be affixed to shelves where disposables were sold, neither of these was

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implemented fully, and few diaper offers were received by respondents. This situation may have contributed to the failure of the effort to have shoppers purchase diaper service.

The foregoing discussion points out the great importance to the success of an environmental shopping campaign of having co-sponsors that are enthusiastic and very supportive of the campaign's goals and follow through on commitments.

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Chapter 6

Comparison of Results with Other Research

In this chapter, the findings of this study are compared with others that had similar objectives to show how this study has contributed new information to this field of research. Comparisons will be made of findings, research and experimental methods, and designs that support overall conclusions of these studies.

Cornell / Ulster County, NY

Starting about the same time as this research study, Cornell University Waste Management Institute, funded by the New York State Energy Research and Development Authority, conducted a Waste Reduction through Consumer Education research project to determine how environmental educational strategies influence purchasing behavior in the supermarket.[126] Five different consumer education strategies were developed: county-wide education, in-store shopper education, direct mailings, educational shoppers' tours of supermarkets, and financial incentives (i.e., coupons). Each of these campaigns addressed environmental and energy conservation issues, as well as other consumer concerns such as cost and safety. Fourteen product categories were identified to shoppers as having more waste generating and less waste generating product choices (similar to the approach taken here to identify target products for diaries and storewide purchases). The educational messages were organized around the following waste reduction principles:

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[126] Harrison, Ellen Z., "Waste Reduction Through Consumer Education", New York State Energy Research and Development Authority, Report 96-8.

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(1) Buy in large containers and less wasteful packaging, (2) concentrates generate less packaging per use than dilute versions, and (3) durables reduce waste generation vis a vis disposable goods.

Three groups of shoppers (randomly assigned) received different educational approaches (some more, some less) and a fourth group was the control. All groups were exposed to the county-wide education and the in-store education. The three experimental groups received targeted treatments (direct mail, shoppers' tour, or coupons). Using supermarket scanner data and a type of Club Card system, the research tracked the purchases of shoppers in the different education treatment groups for nine months so all the subjects' shopping behaviors at the experimental store could be accurately evaluated. No shopper surveys were used. Statistical tests were applied to the purchase data to assess patterns of change between the groups by treatment period.

As compared with this study, which had roughly one-fourth the funding level, the Cornell project was able to maintain its educational effort longer (about four times as long) and provide additional educational interventions (i.e. direct mailings and financial incentives) that were too costly for this study. In addition, Cornell was able to provide more types of educational interventions as compared with this study since the active partners in the project included Ulster County (which undertook the county-wide education), and Shop-Rite (which has demonstrated a large commitment to environmental shopping education, not only by cooperating in this effort with Cornell/Ulster County, but also by designing and implementing environmental shopping campaigns of its own in its stores, and by

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making conference presentations and writing reports on its environmental shopping campaigns).

Despite positive expectations, Cornell stated that "while educational treatments for the study were carefully designed and conscientiously executed... there may not have been a sufficient number of message reinforcements to push shoppers to make real changes." Analysis of Cornell's purchase data revealed "virtually no meaningful statistical differences between treatment groups or changes in behavior over time." (In essence the same findings as for this study.) In its study Cornell recognized that the supermarket is a challenging environment in which to impart waste reduction messages, competing with a blizzard of information, appeals, and advertisements. Under such conditions consumers may have difficulty even recalling environmental shopping messages in recently conducted and well-designed campaigns.[127] That a sizeable percentage of shoppers did remember some of the New York City's educational materials is a credit to their design and placement in our test stores as close to the checkout as possible (where shoppers' idle moments are more plentiful than elsewhere in the store).

The expectation had been that successive waves of waste reduction education would lead to growing reductions in the amount of waste associated with shoppers' purchases. But at least one of the treatments was not administered as successfully as they may have

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[127] Harrison, Ellen Z., "Waste Reduction Through Consumer Education", New York State Energy Research and Development Authority, Report 96-8 referring to: Frierson, B. "Consumer Waste Reduction Awareness Report", Report prepared for the City of Alameda, CA, 1994; and to Schultz, J. C., and Brill, C. R., "Consumer Cognition of Cornell Cooperative Extension "Trash Lite" Shopper Awareness Campaign", Report prepared for Cornell Cooperative Extension of Tompkins County, NY. 1993.

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hoped. The shoppers' tour drew few participants (26) despite invitations to 200 and a $10 incentive. Some of the interventions, for example, the store tours, could probably have not been conducted in New York City supermarkets due to the lack of space. This assumption is supported by the fact that the NYC Department of Sanitation twice issued Requests for Proposals, in the early 1990's attempting to hire consultants to promote environmental shopping education in New York City supermarkets by means of environmental shopping tours, and failed to convince anyone to respond. Discussions with some of those who attended pre-bid conferences revealed that the idea of having store tours as a basis for environmental shopping education in New York City supermarkets was unworkable.

The coupon treatment was also problematic. Due to problems in coordination with the store management for the two supermarkets under study and the parent company, data on number of coupon users was unclear, but this cohort did receive a waste reduction message with the coupons. Despite the problems with these interventions, it is likely that Cornell's in-store educational interventions were presented to the shopping public in a more optimal way without disruption since the commitment of the Shop-Rite organization to environmental concerns is high. Store management could have displayed and maintained educational materials in the stores more effectively than was possible here.

Cornell's findings suggested to them that broad-brush consumer education about waste reduction is not effective in changing purchasing behaviors in the short term, but it may

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help create awareness about environmental shopping issues. The study concluded that the answer to waste reduction might require action on the parts of manufacturers and retailers, government intervention, and better-informed consumers.

University of Illinois at Urbana-Champaign / Model Community

As reported in 1994 by the University of Illinois at Urbana-Champaign [128], another experimental environmental shopping campaign was undertaken in three IGA supermarkets. The purpose of this study was to examine the effects of prompts and education on environmental shopping awareness and behavior. Over the period of a year, the experimental program examined the effects of an environmental product tagging program and an educational intervention on self-reported buying of environmentally friendly goods. Three different tags labeled products that (a) were recyclable in the community, (b) represented least waste packaging, or (c) were an alternative to more toxic chemicals. The prompts (shelf tags) were placed on the supermarket shelves underneath environmentally friendly products to remind the consumer which products were environmentally friendly. In addition to these prompts, an educational intervention was placed in stores to increase consumer awareness. This campaign consisted of explanatory brochures and a display that promoted and described the tagging program. The stores also advertised the program in the local newspaper, on store billboards, and on their paper sacks. This program was part of a county-wide waste reduction program called Model Community, and also included persuasive communication and education,

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[128] Linn, Nancy et. al., "Toward a Sustainable Society: Waste Minimization Through Environmentally Conscious Consuming", Journal of Applied Social Psychology, 1994, Vol. 24, #17, pp. 1550-1572.

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specifically newspaper and television ads explaining precycling (source reduction), education in elementary schools, and more opportunities for recycling.

The experimental instruments were pre-intervention and post-intervention surveys, conducted by telephone and randomly sampled. Subjects were classified as shopping at an experimental store if they did at least 10% of their shopping at that store. Control subjects did less than 10% of their shopping at an experimental store. Their pre-intervention and post-intervention sample sizes, 109 and 132 respectively, were considerably less than that for this study, and the subjects were not followed over time as was the case for this study and the Cornell study. The surveys were shorter than for this study (12 questions in the pre-intervention and the same questions plus seven more for the post-intervention), but did cover some of the same ground. Both asked the extent to which the respondent saw and remembered the environmental interventions, and questions about the extent of recycling and environmental purchasing. This campaign was expected to stimulate self-reported environmentally conscious shopping behaviors above the level generated by the tagging program alone and above the levels reported by shoppers who did not shop at the experimental stores.

Contrary to their expectations, there was no significant interaction effect pre-intervention vs. post-intervention survey results (after nine months of intervention), nor was there one between the groups examined (experimental vs. control group), implying that the experimental educational intervention did not change behavior. One explanation might be that none of the subjects of their survey recalled having read a brochure, but a total of

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418 brochures were taken. Also, the Model Community tagging program received more news and popular press coverage in 1990 than in 1991. The main positive effect of shopping at the tagged stores was a significant positive effect on purchasing less toxic products, knowledge about the Model Community, and awareness of the environmental tagging program.

Like the Cornell study, the Illinois experimental period was much longer (over five times what was possible for this study), and as a result, seasonal effects on the results were reduced. Also, some of the same environmental shopping themes were emphasized (recyclability, reduced packaging), and some of the same prompts were used inside the stores (brochures). Unlike this study, but similar to Cornell, the Illinois experiment was larger in scope as a result of the cooperation of both the local government in spreading the educational interventions beyond the stores, and the stores themselves in being able to establish the tagging program (like the shopping tours and incentives in the case of the Cornell study).

The three studies differed in how they measured behavioral change. Two studies (Cornell, New York City) tracked shoppers pre- / post-intervention vs. matching separate pools of subjects (Illinois), and two (Illinois, New York City) used self-reported information from surveys vs. actual shopper purchases to measure change in behavior (Cornell). Essentially the same hypotheses were tested in all three studies (i.e., do self-reported environmental shopping behaviors increase as a result of environmental shopping educational interventions), and similar results are reported by all three studies

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(i.e., that there was no significant effect on shopping behaviors resulting from the educational interventions). In the Illinois study, the results were apparently negative in some cases. The authors tried to explain the result by suggesting a ceiling effect (the initial results being so high, the later results couldn't go higher). But it could also have been possible that respondents in that study were overly optimistic in the baseline survey, never really having thought about their attitudes and behaviors before, and then after having thought about it, were more realistic. Another explanation the authors offered for the poor results pre- vs. post-intervention was that information the shoppers gathered from sources other than the tagging program might have been the most important in guiding the their perceptions and priorities. This conclusion matches that from this study (that a significant proportion of the influence on shoppers' attitudes and behaviors is unrelated to their level of environmental knowledge).

Minnesota

The Minnesota Office of Waste Management conducted two short-term environmental shopping studies [129] in each of two supermarkets in Eagan and Willmar, MN, for one week in April, 1992. The educational materials consisted of posters, shelf cards, and brochures. All three devices emphasized both the environmental and economic messages associated with environmental shopping. The actual cost savings and waste reduction achieved by choosing a specific product in one packaging alternative vs. another were illustrated. According to OWM, a lot of effort was necessary during the pilots to make sure customers received the brochures. With the help of OWM staff and

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local volunteers, someone was stationed at the entrance to the store from 10 am to about 7 pm on weekdays, and later on weekends. With a little assertiveness, most customers were willing to accept a brochure, and in one week 7500 brochures were distributed at each of two stores. Minnesota considered the brochure to be the most effective educational tool, since shoppers left very few of them behind in carts. It was partially on this basis that three brochures were the centerpiece for the Gristede's campaigns.

To measure the campaign's impact, the intention was to use scanner data to see if there was a change in purchase of 15 products, but the stores didn't have staff time to do that. Minnesota shoppers completed 100 surveys before, during, and after the campaign per store (i.e., 300/store, 600 for whole campaign). The exit survey included the question: "Check the top two sources you think are most effective at educating you on environmentally smart shopping." TV was selected by 75% of the consumers and newspaper was selected by about 50%, education at the store was chosen by about 40% of the customers. Minnesota found that 50% of Eagan shoppers and 59% of Willmar shoppers were aware of the campaign and 31% of Eagan shoppers and 36% of Willmar shoppers could recall some of the message without prompting after the week-long program. These results provided this project with the idea that some questions should be directed towards finding out the extent to which the campaign materials were actually noticed. In Eagan the customers said they seldom brought bags to the store (1.57 on a scale of 1 to 5), and this did not vary during the week. The Willmar shoppers had a slightly higher mean (1.67). (The range of values for this question as answered by east

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[129] Ledermann, Jeff and Linda Countryman. "Executive Summary of SMART Shopping Pilot Evaluation", Minnesota Office of Waste Management, July 13, 1992.

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and west side shoppers was 1.9 to 2.6.) The fact that there was almost no variation in the answers to this or any of the behavior questions during the weeklong pilot study indicates that a week was not a long enough period to change shoppers' behaviors.

Boulder

In September, 1990 the City of Boulder launched a pilot three-month project [130] in ten stores, for the purpose of increasing consumer awareness about ways to minimize waste when shopping and reducing the quantity of waste material actually purchased. The project was designed to develop a broad-based, highly visible source reduction campaign, identify those program features that are most effective and could be most easily duplicated in other communities, and to serve as a model program for the Rocky Mountain EPA Region.

The educational campaign included on-shelf labeling, using a distinctive pink color for all labels, in-store signs, employee buttons, weekly precycle information booths offering precycle brochures, and featuring a low-waste "product of the week", letter-writing campaigns, product tallies, and consumer surveys. The project developed a logo: "Precycle: Reach for a Change" to unify the various features of the campaign, and store employees were asked to wear buttons with this logo. Approximately 2,000 shoppers talked with a campaign volunteer. The campaign also benefited from local media coverage, including stories in the local newspaper, the university newspaper, the TV station, and an interview on the radio station.

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130 "Precycling – Final Report", City of Boulder, Environmental Affairs. 1991.

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To measure the effectiveness of the campaign, consumer surveys and tallies of target products were conducted. The surveys were distributed via a "Boxx", a specially designed portable computer, placed under a sign at the front of the supermarket, encouraging shoppers to answer a sixty-second questionnaire. It was recognized that this would not produce a truly random sample, but it offered a direct and relatively inexpensive way to reach people at the supermarket. One set of surveys was run in the two weeks before the program kickoff and another at the end of the program. Each survey had 16 questions, to measure demographics, consumers' awareness of packaging waste issues before and after the precycle campaign, and self-reported behaviors.

The product tallies were designed to include a list for each store of about 10 sets of matched products -- high-waste and low-waste. They included such things as four-ounce yogurt containers vs. 8, 16, and 32 oz containers; ketchup in plastic vs glass containers; and aseptic juice packs vs. large glass bottles of juice. Products were matched as closely as possible, using the same brand, close proximity to each other, and the same purpose/usage where possible. Product tallies were planned to begin 13 weeks prior to the start of the campaign, and were to continue during the 13 weeks of the campaign. The baseline surveys were answered by 333 shoppers and the post-campaign surveys were answered by 653. After the campaign, 84% of survey respondents said they were familiar with the environmental shopping program and 74% said it had helped them reduce packaging waste. To test these assertions, multiple-choice questions asked specifics about what precycling involved. Fifty-four percent of all the respondents said they were familiar with the program and were able to answer the multiple-choice

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questions correctly. To double-check the results of the computer surveys' knowledge questions, an exit poll was conducted of 100 shoppers at each participating store during the last week of the program. Shoppers were asked only 2 questions: "Have you heard about the precycle program?" and "What stands out in your mind about it?" Half the respondents said they had heard of the program, and a third were able to name a key element of precycling. This was viewed to fit with the computer survey results, since the latter posed multiple choice questions and permitted guessing.

In addition to demographic and knowledge questions, the surveys also included a few questions in their baseline and follow-up questionnaires to measure the impact of the campaign on self-reported shopper behavior. These questions probed the frequency with which shoppers brought bags back to the store, purchased products in bulk, purchased products in single-serving packages, and exhibited a willingness to pay more for a product for environmental reasons. After the campaign all of these behavior questions showed a negligible (1-2%) change from the pre-program to post-program surveys, which was at odds with the 74% response that the campaign helped the shoppers reduce packaging waste. But this negligible difference in self-reported change in shopping behavior did agree with the findings of this study. And, as with this study, there was a disconnect between the shoppers' environmental knowledge and their shopping behaviors.

It was initially recognized that the storewide data collections could be affected by extraneous influences (e.g., sale promotions, coupons, changes in shelf locations, and

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time of year), and a number of the products under study were affected by these kinds of changes the simple tallying technique could not resolve. Further, no tallies were kept in certain stores, because of a lack of computerized sales data, or because of errors in recording data by store employees. Tallies of paper and plastic bag use were sought, but none of the stores provided it. Such accounts are similar to the experiences in this study. In three large chain stores that did provide purchase data (one of which was a control store outside of Boulder), sales for both the high-waste and low-waste products rose in many cases. For the smaller experimental store, there also appeared to be no discernable trend in purchases. These findings were consistent with the results of the surveys' behavior questions. One exception to this was sale of cloth shopping bags. Sales rose 40% in the non-participating store, but nearly 700% in the participating stores, which indicated that one of the campaign messages was heeded to some extent. However, there was little change in shoppers' actually bringing their own bags to the store after the campaign vs. before, as reported in their surveys.

Store ownership and involvement of the managers appeared to play an important role. In two stores information booth materials mysteriously disappeared and had to be replaced, and in some stores employees stopped wearing their buttons, but these problems were never disclosed to the project by the store managers. Store ownership and involvement also had an impact on the shoppers' awareness of the campaign. Of five large chain stores in the program, four were clustered around 41% and one was at 47%. The latter had a particularly supportive manager and well-maintained educational materials. One of the smaller stores, that had a low campaign recognition level, had low participation by the

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store management. The highest campaign recognition level, 75%, was recorded at the store where the program kickoff was held. It is speculated that having this event at their store gave the employees a strong sense of program ownership. For this and reasons given above, the Boulder study recommended future studies conduct campaigns in only one cooperative store chain (this recommendation was heeded by this study).

Suffolk County, NY [131]

To investigate consumer behavior in the selection of environmentally friendly packaging, Suffolk County, in tandem with Cornell Cooperative Extension, interviewed 221 randomly selected individuals in front of six supermarkets in Suffolk County, NY using a 27-item questionnaire during the summer of 1991. At the end of the interview, respondents were given a recruitment brochure offering the opportunity to become an environmental shopper. Other methods to recruit the 50-family sample included an article in local papers, a notice in LILCO bulletin, and leaders of 4-H were contacted. Fifty families were recruited and given two hours of training on how to evaluate and select packaging that is friendlier to the environment. Volunteers kept diaries of purchases, documented by register tapes, over an eight-week period, and all were given environmental shopper bags with the project's logo, and were encouraged to use the bag. Focus groups were held with the participants, four weeks into the study. These shoppers completed a 40-item self-administered questionnaire. Those filling out diaries were called "environmental shoppers" and those interviewed outside the stores (controls) were "general shoppers".

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The Suffolk project's survey explored some of the same motivating factors for purchasing products as the surveys given to Gristede's customers. Suffolk's environmental shoppers ranked price highest (34%), then quality (22%), environmental impact (20%), brand name (13%) and last, convenience (11%). The general shoppers ranked them almost the same: quality (28%), price (25%), environmental impact (17%), brand name (15%) and convenience (15%). As compared with the Suffolk study, results for this study are somewhat different, in that our controls ranked environmental impact lowest, and price highest. For most of the interventions in the New York City study, the ranking stayed the same, with the exception of those west side shoppers who saw the brochures, and those who saw brochures and video. In these cases environmental impact was ranked third. One reason that the two studies may not have similar results is that the Suffolk study's environmental shoppers were recruited, given two hours of training on how to evaluate and select environmentally friendly packaging and an environmental shopper bag, and they kept diaries for eight weeks. By comparison, this study's intervention shoppers were more randomly selected, and they saw only brochures, posters and/or videos, perhaps for just a few minutes. It cannot be presumed that the commitment to the environment was as strong as those who received so much personalized attention and who took the trouble to maintain diaries for eight weeks. The Suffolk County study was also notable in the high percentage of general shoppers (controls) who ranked environmental impact as important a reason to purchase a product as those who received intensive environmental shopping education.

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[131] Foulke, Sally, "Environmental Supermarket Shopping -- Final Report", Cornell Cooperative Extension, Riverhead, NY. 1992.

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Since, as part of their indoctrination, the environmental shoppers were provided a shopping bag with the project logo, and encouraged to use it, it is not surprising that 66% of the Suffolk's environmental shoppers reported that they sometimes or usually brought their own grocery bag to the store. By comparison, 38% of east side Gristede's shoppers who saw the bags or bag signs said they brought bags to the store sometimes, often or always, and 26% of west side shoppers receiving the same treatment did likewise. That Gristede's shoppers had to spend $2.50 to $4 to buy an environmental shopper bag, meant that a small percentage of the intervention shoppers would own one. This, in addition to the absence of personalized encouragement explains why more of Suffolk's environmental shoppers would bring a bag to the store.

Ninety percent of Suffolk's general shoppers never brought their own grocery bags to the store even though some of the stores offered a 2-cent incentive. By contrast, well over half of the baseline shoppers at the east and west side stores said they would probably or definitely bring a bag to the store if a two cent incentive were provided. Fifty-one percent of the baseline shoppers at both Gristede's stores said they never actually brought a bag; this figure remained the same after the campaign for the west side shoppers, but went down to 34% for the post-intervention east side shoppers. A possible explanation for this is that Long Islanders go shopping by car, but Manhattanites do their shopping on foot on their way home from work, and might be more likely to have a bag or briefcase to carry their purchases home.

As expected, Suffolk's environmental shoppers tended to recycle a higher percentage in 10 item categories than general shoppers. The environmental shoppers recycled ferrous

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and aluminum cans 95% of the time vs. the general shoppers (72% for ferrous cans, 94% for aluminum cans). Glass was recycled by environmental shoppers 93% of the time and 83% by the controls. These figures agree with the recycling behaviors reported by shoppers in this study, where slightly over 80% of east side controls and slightly over 90% of west side controls said they recycled cans and bottles. However, somewhat fewer said they recycled as much after the intervention; and the increased educational interventions seemed to reduce the recycling rate slightly. Again, the amount of personalized education provided by the Suffolk campaign may well explain why their intervention recipients' recycling behavior increased more.

Michigan

The University of Michigan SORED study [132] was designed to evaluate the effectiveness of using environmental and economic arguments as motivation for shoppers' source reduction behaviors in supermarkets, to evaluate the role of procedural knowledge, motivation, attitudes, and barriers on shopping behavior, and to develop a procedure for quantifying source reduction behavior. Three hypotheses were tested: (1) education on the environmental benefits of source reduction, combined with specific instructions on how to source reduce, would increase source reduction behavior, (2) education on the economic benefits of source reduction, combined with specific instructions on how to source reduce, would increase source reduction behavior, and (3) education combining the first two approaches would increase source reduction behavior more than either approach alone. To test the hypotheses, an experiment was conducted utilizing a two-

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variable factorial design. The two variables were "environmental reasons to source reduce" and "economic reasons to source reduce". Participants in the research were volunteers, and were randomly assigned to one of the four treatment groups (control, receiving environmental reasons to source reduce, receiving economic reasons to source reduce, and receiving both reasons to source reduce). In order to measure the impact of the educational campaign, data were gathered in two forms: direct shopping data from supermarket receipts, and survey data from three separate surveys.

The study took place at a Chelsea, Michigan supermarket over a period of 13 weeks from September through December, 1990. At the beginning of the study period a screening survey instrument was administered to shoppers on a voluntary basis as they entered or exited the store. The survey contained fifteen questions designed to measure shoppers' attitudes, knowledge, and behavior and to provide demographic information and took less than 5 minutes for shoppers to complete. On September 22 and 23, 1990, a total of 688 surveys were collected, and from this, 178 individuals volunteered to participate in the study. Subsequent analyses of the volunteers vs. the non-volunteers showed no significant differences between them with respect to attitudes, knowledge, behavior and demographic data, with one exception (gender). The study participants were 82% female as compared with 64% of the non-participants. The participants were allocated to the groups as follows: control (56), economic (40), environmental (41), and both (41).

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[132] DeYoung, Raymond, et. al., "Individual Source Reduction Behavior: A Study of the Effect of Environmental and Economic Motivational Information", Masters Project, University of Michigan, School of Natural Resources, June 21, 1991.

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All participants agreed to save their supermarket receipts for the duration of the study. After a 3-week baseline period, the selected participants were asked to complete a detailed baseline survey. The educational intervention began with three treatment groups receiving similar looking pamphlets. Each pamphlet contained an identical definition of source reduction, and "how to" information on carrying out simple source reduction activities through shopping or at home. "Recipe" sheets providing non-toxic alternatives for the homeowner were sent to all three treatment groups along with a letter encouraging them to read the materials and consider adopting the proposed changes in behavior. The pamphlet for the environmental group justified source reduction as an activity to help protect the environment, while the economic group pamphlet justified source reduction as a way to save money. The combined group received both justifications. The controls received nothing. Following this intervention, data collection continued for 10 weeks. Volunteers in all categories were asked to collect their grocery receipts for the period of the study, and were provided stamped, self-addressed envelopes in which to send the receipts to the researchers. All groups except the control group received source reduction tips on the postcards during the 10-week "treatment" period and all were promised a canvas tote bag if they completed the study. At the end of the study period, a follow-up survey was administered to measure changes in source reduction behaviors, knowledge, and attitudes attributable to the intervention, as well as other constructs such as motivation, tendency to act and barriers. This data was also collected to corroborate the data collected from the receipts. This survey was mailed to all participants. One hundred fifteen surveys were returned (approximately 65% of the 175 mailed). The surveys

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returned were split between the treatment groups as follows: control (33), economic (23), environmental (31), and both (26).

There were 25 behavior change questions and these were aggregated into one "Overall Behavior Change" variable. The Likert scale (1 to 5) was used to evaluate the results, with 1 = no change and 5 = great change. The questions were all worded as follows: How much change has occurred in your shopping and household habits due to your participation in the study? Then each of 25 specific behaviors (e.g., buy more durables, buy in bulk, use fewer paper towels) were listed. The Overall Behavior Change grand mean was 2.62, standard deviation of 1.11. The four groups' means were: control (2.18), economic (2.54), environmental (2.58), and both (3.34). A "Shopping Trash Reduction" variable, consisting of six of the questions, showed the following results: grand mean (2.66), standard deviation (1.20), control (2.24), economic (2.71), environmental (2.57) and both (3.30). All the effects were significant at $p = .05$ or less. Other results, just for the effect of the pamphlet and for the postcard prompts on behavior, showed similar results.

The major finding of this study was that participants did show statistically significant changes in their behavior when given either economic or environmental reasons to source reduce, and that these treatments yielded roughly the same results. More important, a combination of both of these strategies yielded greater behavior change than a single strategy alone for every behavior change variable and factor studied. Since it was determined that interactive effects were minimal, an additive model of environmental

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plus economic contributions are said to explain this result. The results of the study also suggested that the study participants were more likely to practice home-based source reduction (e.g., reusing aluminum foil and using fewer paper towels), rather than modifying their purchases at the supermarket to reduce packaging consumption.

The results from the Michigan study are not as directly comparable with this study as some of the other studies reviewed, because the behavior change questions allowed the respondents to assess at one point in time how much their behaviors changed. By comparison, the Gristede's customers were asked at two separate points in time how often they practiced a certain behavior. As they were not likely to remember how they answered the questions several months before, this method of questioning could have resulted in more objective answers (and a lower estimate of behavioral change), by Gristede's shoppers.

Comparison can be made of the answers to very similar questions, to indicate the degree to which there might be differences in motivations of Michigan and New York City shoppers. For example, both sets of follow-up surveys asked how important (or convincing) shoppers found conserving landfill space and natural resources as reasons to recycle (or source reduce). The means, using the same five-point scale, were considerably less for the New York City shoppers as seen in the Table 31, below, supporting the finding that there are numerous outside influences on the Gristede's shoppers' environmental behaviors. The differences in these figures may also point to differences in the amounts of intervention provided the shoppers. The Michigan

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shoppers received both intrinsic and extrinsic motivational literature whereas the Gristede's shoppers only received intrinsic motivation. Those (Michigan) who received the largest amounts of educational treatment, which taught them the impacts of their shopping behaviors on environmental problems, responded that this information was most important motivation for recycling (source reduction). The shoppers receiving the smallest educational intervention, at the east-side store, seemed to have the least intrinsic motivations.

Table 31 Intrinsic Motivations for Recycling / Source Reduction

	East	West	Michigan
Conserve Landfill Space	3.7864	4.0909	4.62
Conserve Natural Resources	3.8932	4.1439	4.62

San Francisco

Shop Smart '96 [133]

A large-scale waste reduction campaign in nine counties in the San Francisco Bay Area, called the Shop Smart: Save Resources and Prevent Waste campaign, was a public-private partnership conducted by the City of San Francisco, and co-sponsored by 103 Bay Area cities and counties and 225 supermarkets, the California Integrated Waste Management Board, and other corporate and government sponsors. Shop Smart involved a massive in-store and media campaign, and total staffing for the campaign included more than 500 people, at least half of whom were volunteers. Aside from staff time, which in this New York City campaign dwarfed other costs, total cost of the campaign

[133] Assman, David. "Shop Smart: Save Resources & Prevent Waste Supermarket Campaign", San Francisco Recycling Office, 1996.

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exceeded $350,000. The campaign lasted three and a half weeks, from January 7 through January 31, 1996.

The purpose of the project was to bring shoppers messages about the importance of waste prevention and buying products made with recycled content. The campaign combined in-store materials with a major media campaign to promote waste prevention and buying products made from recycled materials. In particular, the campaign focused on seven waste prevention and buy recycled messages. The seven messages were:

- Close the Recycling Loop: Choose recycled packaging: glass, aluminum and steel
- Close the Recycling Loop: Look for "Made with Recycled Content" on products and packaging
- Reduce Waste: Bring your own reusable bag
- Reduce Waste: Concentrates and economy sizes use less packaging
- Reduce Waste: Reusable products save resources
- Reduce Waste: Items with less packaging save resources
- Reduce Waste: Compost your fruit, vegetable & plant trimmings

City and county staff and volunteers installed either one or two display units, 150 - 200 shelf tags, and one or two posters in each participating supermarket. Each display unit included a poster with the seven messages, five entry pads for entering the grocery certificate drawing, six holders for literature (one holder for the Shop Smart waste prevention brochure, one for the Department of Conservation's Buy Recycled brochure,

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one for either the California Integrated Waste Management or a local composting brochure, and 3 additional for local brochures). The Shop Smart waste prevention brochure was also translated into Spanish and Chinese and distributed in a number of the participating supermarkets. In addition to the above listed materials, Safeway, Inc. also provided printed messages on eight million paper shopping bags (the messages included the seven campaign themes), and printed messages on cash register coupons (Catalina coupons). Safeway, Inc. also included a Shop Smart message in their coupon book (mailed to more than 5 million homes) and in four-color newspaper ads. In order to attract additional attention to the campaign, $100 and $500 grocery certificates were given away in a random drawing at the end of the campaign. One $500 grocery certificate was awarded in each county (for a total of 9 certificates).

In addition to supermarket campaigns, Shop Smart's display units were set up in several county buildings, one city sent literature out in water bills, another promoted the campaign in schools

The regional media strategy maximized the frequency of media coverage by combining purchased advertising, donated advertising, public service announcements, and local print and radio features to achieve high visibility for the regional campaign. The cooperative and regional characteristics of this campaign generated media interest, resulting in enhanced media coverage.

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The paid media campaign included over 1,600 commercials on more than 60 radio stations, 780 television commercials on 4 broadcast television and 7 cable stations and ads in 50 newspapers. This was augmented by public service announcements on 4 broadcast television stations, 29 cable stations and 19 radio stations. Campaign ads were also translated into Chinese and Spanish for radio and print.

As a result of the interest that the campaign generated, it received in-depth coverage by the media throughout the region as a news story, including reports in more than 46 newspapers and 29 newsletters, in-depth interviews on 9 radio stations, and news coverage by 5 TV stations. More than 1,370 traffic report sponsorship radio spots (each featuring one of the seven campaign themes) were combined with 259 spots on four radio stations, including some live reports from a Safeway Store in San Jose during the campaign and giving away an additional four grocery certificates ($101 each). The television campaign included buying 688 spots on 4 network and 13 cable TV. Individual jurisdictions also supplemented the regional effort through radio ads, newspaper ads and direct mail.

In addition to the media blitz, Pacific Bell Directory supplied, free of charge, the use of a regional telephone recycling 800 hotline number. This number could be programmed individually by each city or county, and most cities and counties did tailor their messages to their county, including a Shop Smart message and local information with a referral to a local hotline telephone number. The hotline message first gave the economic message:

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"You can also enter a drawing to win one hundred dollar and five hundred dollar grocery gift certificates." Then it provided five of the environmental messages of the campaign.

Both storewide purchasing trends and surveys were employed to measure the impact of the educational devices used in these supermarket campaigns. A market research firm interviewed shoppers at stores in each of the nine counties and used sales data from Safeway, Inc. to measure product sales. The campaign had a significant impact, not only in educating shoppers, but also in influencing buying habits. Sales analysis of product sales at Safeway Stores showed sales of well packaged products (minimal packaging, recycled content) increased by 19.4% during the campaign, while sales of over-packaged products declined by 36%.[134]

Exit polls (conducted both during and after the campaign) showed that 72% of shoppers who noticed the materials were interested in the messages of the campaign. Forty-three percent of shoppers remembered one or more elements from the campaign, thereby reaching more than one million shoppers. This was considered to be a conservative estimate based on participation by half the supermarkets in the Bay Area, and assuming that supermarkets have a 50% market share. Shoppers at other supermarkets were reached by the media campaign, but are not included in this total.
While the campaign was still in progress 59% of shoppers remembered elements of the campaign. The main messages shoppers took from the campaign were:

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Support Recycling	37%
Reduce Waste	34%
Buy Recyclable Packaging	30%
Buy Less Packaging	20%
Buy in Bulk	17%
Bring Your Own Bags	15%
Avoid Disposable Products	13%
Avoid Single Serve Sizes	12%

While the messages of the campaign impacted large numbers of shoppers, relatively few took brochures (3%), and even fewer entered the contest (.6%). Shoppers reacted positively to the look of the campaign materials, with an average of 57% saying they liked the display, shelf tags, radio and television ads. The display units received the most favorable response, with 65% saying they liked the units. Radio ads were liked by 50%. The media campaign (radio, television and print) was remembered by more than 1.5 million people. On average, each Bay Area resident would have heard 6 radio spots and seen 3 television ads.

Almost 30% of shoppers said the campaign affected their buying habits. The following were self-reported behaviors:

Bought in bulk	29%
Bought reusable products	20%
Bought items with minimal packaging	18%
Bought items with recycled packaging	18%
Brought own bags to the checkout counter	10%

[134] The increase in sales of well-packaged products was considered statistically significant, whereas the decline in sales of over-packaged products was not considered statistically significant since virtually all of the sales decline was in one product category.

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The least cost-intensive educational materials were not always the least effective, and vice versa. Newspaper articles, messages on grocery bags, TV news stories and register coupons didn't cost the cities/counties anything, but were responsible for almost 20% of the recognition of the project. Radio was the least cost-effective, responsible for 8% of the recognition, but costing $75,000.

Based on the favorable response generated by the *Shop Smart* campaign, representatives of cities and counties in the Bay Area meeting on March 5th, 1996 decided to make the campaign an annual event.

Shop Smart '97 [135]

The second annual Shop Smart campaign was even larger than the first one, combining the efforts of 110 cities and counties in a 10-county Bay Area region with 285 supermarkets. Supermarket chain participation increased by 500% over 1996. The seven-week campaign kicked-off January 13 and ran through February 28, 1997. The budget was lower than for the 1996 campaign.

As in 1996, the campaign consisted of an in-store promotional component complimented by a multi-media outreach campaign. In-store promotional material included shelf tags, self-standing display units with brochures, posters and printed paper shopping bags. The campaign focused on four specific waste prevention and buy-recycled messages. The four messages were as follows:

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[135] 1997 Shop Smart Save Resources and Prevent Waste: National Award Winning Bay Area Consumer Education Campaign. Final Report. San Francisco Recycling Office. 1997.

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- Save Resources: Choose Less Packaging
- Save Resources: Reuse Bags, Containers and Products
- Close the Recycling Loop: Choose Recycled Packaging: Steel, Aluminum and Glass
- Close the Recycling Loop: Look For Made With Recycled Content

City and county staff, non-profit organizations and volunteers installed in each participating supermarket:

QUANTITY	ITEM	PLACEMENT
1-2	Display Unit(s) (2' X 5 ')	Supermarket entrance
250	250 shelf tags – four separate messages	Selected types of products
1-2	1-2 two posters (2' X 3')	Supermarket entrance

Each display unit included a poster highlighting the four messages and brochures holders for seven different pieces of literature. Each of the campaign's four messages were included on separate shelf tags. The shelf tags were placed on the supermarket shelves near selected types of products. For example: the message "Save Resources: Choose Less Packaging" was often placed near bulk items or concentrates. The "Close the Recycling Loop": Look For "Made With Recycled Content" was placed near products made from recycled paper or plastic, or near items packaged in recycled paper or plastic. Each shelf tag was a different, bright color. The color scheme not only assisted in initial supermarket set-up, but it also helped consumers identify the different messages. The poster was printed using the same basic color scheme as the shelf tags. The poster was either attached to each of the display units or placed or hung separately in store windows. Four store chains printed campaign messages on an estimated 2.5 million paper shopping

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bags. Shopping bag distribution began in mid-January 1997 and continued in some supermarkets until May.

The regional media campaign included:

- A "comic wrap" in Sunday papers (both the San Francisco Chronicle/Examiner and the San Jose Mercury News)
- Other print advertising,
- Articles in corporate publications and city and county newsletters,
- Press releases to newspapers, radio stations, television stations, and other print publications
- Radio and television commercials,
- Public Service Announcements to print outlets, radio stations and television stations public Interviews with broadcast and print media

The campaign kicked-off in San Jose with a two-hour press event that included a drawing and prizes, a quiz testing shoppers' waste prevention knowledge, price comparisons, mascots from the Steel Recycling Institute and the San Jose Conservation Corps, interactive and educational games for children and a live-remote radio broadcast by KARA 105.7 FM. Reporters from four television stations attended the event.

The known media activity included 37 newspaper articles, 19 newspaper ads, 12 City/Private Newsletters, 33 television public service announcements reaching more than 80 jurisdictions, 2 stations running paid radio advertising, 7 radio stations with news coverage, 10 stations running radio public service announcements, 5 stations running

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paid television ads, 5 stations with television news coverage. Much of the press coverage was bi-lingual. However, the overall media effort was considerably less than in 1996.

As in 1996, Pacific Bell Directory provided the use of their regional 1-800 recycling hotline. Jurisdictions could utilize a generic message or write their own individualized Shop Smart message. The campaign included the hotline number in various outreach materials, namely the television public service announcements, paid television commercials, "comic wrap" and other newspaper advertising, press releases and the printed shopping bag.

As in 1996, the campaign was evaluated for overall effectiveness. Comprehensive in-store surveys were conducted at participating supermarkets in four counties. Survey questions ranged from asking consumers what elements of the campaign they remembered to what they felt the campaign was trying to communicate. The survey format was identical to that developed for the 1996 campaign.

Exit polls showed that 42% (similar to the 43% in 1996) of shoppers remembered one or more elements from the campaign, thereby reaching more than one million shoppers. This was considered to be a conservative estimate, based on participation by 70% of the supermarkets in the Bay Area, assuming that one out of every two residents shop for groceries and assuming that supermarkets have a 50% market share. The elements of the campaign were recognized as follows (see Table 32):

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Table 32 Elements of San Francisco 1997 Shop Smart Campaign Noticed

Comic wrap	19%
Grocery bag	17%
Display unit	16%
Shelf tags	16%
Television commercial	11%
Newspaper ads	10%
Newspaper articles	8%

Four percent remembered the "buy recycled" radio commercials run by the Environmental Defense Fund and assumed they were part of the Shop Smart campaign. These results compare favorably with those from the one-week Minnesota study and with the Gristede's campaigns (in fact, twice as many remembered bags and bag signs as remembered some of the educational materials in the San Francisco campaign).

Eighty-four percent who noticed the materials were interested in the messages of the campaign (up from 72% in 1996), with 54% saying it affected their buying habits (up from 30% in 1996). Self-reported behaviors increased in two cases and decreased in another.

Table 33 Behavior Change from 1996 to 1997 San Francisco Shop Smart Campaign

Behavior	**1997**	**1996**
Bought items with recycled packaging	30%	18%
Brought their own bags to the store	23%	10%
Bought bulk products	19%	29%

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Table 34 Recollection of Main Message of San Francisco Campaigns: 1996/1997

The main messages shoppers took from the campaign were:

Message	1997	1996
Support Recycling	35%	37%
Reduce Waste	27%	34%
Buy in Bulk	15%	17%
Buy Recycled Products	13%	Not asked in 1996
Buy Recycled Packaging	11%	Not asked in 1996
Buy Recycled Content	11%	Not asked in 1996

While the messages of the campaign impacted large numbers of shoppers, relatively few took brochures (4% vs. 3% in 1996).

Shoppers reacted positively to the look of the campaign materials, with an average of 62% saying they liked the display, shelf tags, radio and television ads (up from 57% in 1996). The display units received the most favorable response, with 74% saying they liked the units.

As of 1997, Shop Smart has been recognized with the following state and national awards from the National Recycling Coalition, the National Association of Counties, the U.S. Department of Energy, the California Resource Recovery Association, Local Government Commission and the California Integrated Waste Management Board, and the National Awards Council for Environmental Sustainability. In early March 1997, the working group unanimously agreed to continue support of an annual Bay Area Shop Smart campaign.

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Discussion of Shop Smart

The foregoing illustrates the kind of successful implementation and thorough saturation in a comparably sized metropolitan area that can be achieved with a well-designed, short-term environmental shopping campaign, that has the benefit of millions of dollars of direct and in-kind funding, hundreds of staff and volunteers, dozens of civic and corporate sponsors, and media advertising. It is interesting to note that when the media coverage (by paid advertising and free coverage) was cut, presumably due to the reduced budget for 1997, the recognition of the specific educational messages of the campaign were either about the same or less than that from the year before. This finding may indicate that there is a critical level of funding necessary to get the message out in a regional environmental shopping campaign. But despite the lower recognition of the specific issues, and despite the lack of monetary incentives (the $100 and $500 drawings did not occur in 1997), two of the three self-reported behaviors rose by over 10%. But despite the fact that shoppers reported increased environmental shopping behaviors in a couple of cases from 1996 to 1997, it is important to recognize that the percentages of shoppers practicing the environmental shopping behaviors are relatively low (10 to 30%), as compared with the follow-up Gristede's shoppers, 25 to 75% of whom participated in the recycling and environmental shopping behaviors sometimes, often, or always. Another interesting finding is that brochures were taken by only three or four percent of those receiving treatment in both years. Since the degree to which the San Francisco shoppers participated in the environmental behaviors did not appear to be as high as the Gristede's shoppers, 40% of whom saw the project brochures (as compared with 4% of

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the San Francisco shoppers), including brochures as part of a multi-media educational campaign may be critical to influencing behaviors.

Other Research

Though prompts, such as brochures, are low cost and have been effective as the basis for environmental shopping, recycling, and other campaigns, it has been found that behavior can revert to baseline levels once the prompt is removed,[136] when a one page informational handout on buying returnable bottles was withdrawn,[137] when newspaper articles and feedback on littering were discontinued [138], and when informational feedback and decals are discontinued.[139] If this reversion to baseline levels occurred in this study, the effect could have been shown in the follow-up questionnaire, since the bulk of the telephone surveys occurred about two months after the educational campaign was discontinued.

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136 Geller, E.S., The Behavior Change Approach to Litter Management", Journal of Resource Management and Technology, Volume 14, pp. 117-122, 1985 as referenced in: Linn, Nancy. et. al., "Toward a Sustainable Society: Waste Minimization Through Environmentally Conscious Consuming", Journal of Applied Social Psychology, Volume 24, Number 17, pp. 1550-1572, 1994.

137 Geller, E. S., et. al., "Prompting a Consumer Behavior for Pollution Control", Journal of Applied Behavior Analysis, Volume 6, pp. 367-376. 1973. as referenced in: Linn, Nancy. et. al., "Toward a Sustainable Society: Waste Minimization Through Environmentally Conscious Consuming", Journal of Applied Social Psychology, Volume 24, Number 17, pp. 1550-1572, 1994.

138 Schnelle, J., et. al., "Prompting Behavior Change in the Community – Use of Mass Media Techniques". Environment and Behavior, Volume 2, pp. 157-166. 1980, as referenced in: Linn, Nancy. et. al., "Toward a Sustainable Society: Waste Minimization Through Environmentally Conscious Consuming", Journal of Applied Social Psychology, Volume 24, Number 17, pp. 1550-1572, 1994.

139 Seaver, W and Patterson, A. "Decreasing Fuel-oil Consumption Through Feedback and Social Commendation." Journal of Applied Behavioral Analysis, Volume 9, pp. 147-152, 1976, as referenced in: Linn, Nancy. et. al., "Toward a Sustainable Society: Waste Minimization Through Environmentally Conscious Consuming", Journal of Applied Social Psychology, Volume 24, Number 17, pp. 1550-1572, 1994.

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Vining, et. al.,[140] found that in a survey evaluating a community recycling education program, the respondents rated environmental concern higher on a scale of reasons to recycle than monetary or social reasons, suggesting an intrinsic motivation for continuing to recycle. This result compares favorably with one of the baseline survey results of this study; in that conserving landfill space and natural resources, and that recycling is considered "the right thing to do", were more important motivators than the legal requirement to recycle.

Simmons and Widmar[141] have suggested that public familiarity with recycling may not necessarily generalize to waste prevention behaviors such as reuse, composting, and precycling or to other conservation behaviors. They concluded that, because waste prevention represents a new set of behavior patterns for most people, more extensive waste reduction and minimization education programs would be needed as compared with a recycling program. Bringing deposit containers back and recycling of magazines, cans and bottles was high (well over 4.5 on a scale of 1 to 5) but other waste prevention behaviors like patronizing repair shops and bringing bags were considerably lower (from 2 to 3.7 or so). The conclusion, that to be successful, an educational campaign to introduce new waste prevention (i.e., environmental shopping) behaviors should be more

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[140] Vining, Joanne, et. al., ""Why Recycle? A Comparison of recycling Motivation in Four communities." Environmental Management, Volume 16, pp. 785-797., 1992 as referenced in: Linn, Nancy. et. al., "Toward a Sustainable Society: Waste Minimization Through Environmentally Conscious Consuming", Journal of Applied Social Psychology, Volume 24, Number 17, pp. 1550-1572, 1994.

[141] Simmons, D., & Widmar, R. (1989-1990). Participation in household solid waste reduction activities: The need for public education. Journal of Environmental Systems, Vol. 19, pp. 323-330.

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extensive (i.e., deploy more educational devices and approaches over a longer period of time) seems warranted.

Findings of the Comparison with Other Research

The environmental shopping campaigns studied, for purposes of comparison, span a wide range of educational foci, educational devices, products on which the campaign was focused, budgets available, time span used for each campaign, and methodologies for evaluating the results. Though this study used some of the same educational targets, strategies, and devices as the others, the combinations were strikingly different, as were the timeframes and circumstances, and hence the results would have been expected to differ also. Despite these differences, for any given target behavior, several of the campaigns had little impact on changing shoppers' behaviors; the outcomes were, for the most part, similar to this study. Though many shoppers were aware that the Gristede's campaign was going on, and answered that they bought more refills and concentrates, and to a small extent brought more bags to the store, the effects were not dramatic, and the campaign did not turn our consumers into environmental shoppers.

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Chapter 7

Conclusions and Recommendations

Conclusions

This study has attempted to innovate, optimize and test designs of two environmental shopping educational campaigns in Manhattan supermarkets to impart information and motivation to shoppers, with the expectation that the knowledge gained would give rise to new, environmental shopping habits. To do this, varied approaches and devices to communicate with and motivate shoppers, that had been successful in other studies, were used, previously problematic approaches were avoided, and new strategies were pioneered. One feature differentiating the environmental shopping campaign employed here from others that had been tried before was that it was implemented in a densely populated area and conducted in small, crowded stores. The store was used to sell diaper service, a unique feature of this campaign, and videos were shown above the checkout registers in one store. Also, a central objective of this study was to evaluate the effectiveness of the campaign in achieving the desired results, to compare the two campaigns conducted to one another, and to examine the impact made by each of the educational devices used. The effectiveness of the campaigns was evaluated by means of baseline and follow-up surveys of the same shoppers at two stores, before and after receiving two levels of educational treatment. The answers to the survey questions, the data, were analyzed using a range of statistical techniques including tabulations, cross-tabulations, mean differences between pairs, and path analysis, to determine absolute and

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comparative effectiveness of the campaigns, and of the individual educational materials. These results contribute to the existing body of knowledge in this field, and are helpful to those planning to implement environmental shopping campaigns in the future.

Changing Behaviors via Education

At the beginning of the educational campaign, the shoppers' attitudes towards environmental concepts and conservation, in general, were quite positive, with over half to two-thirds agreeing with all the statements that would indicate a predisposition towards the environment (e.g., a willingness to change to an environmentally friendly supermarket, beliefs that environmental shopping is good for the environment, and that people consume too much). But there appeared to be a disconnect between the shoppers' level of environmental knowledge and attitudes, and their actual behaviors. Whereas the shoppers tended to have positive attitudes and a high level of knowledge about the city's recycling program and did recycle, shoppers did not exhibit a convincing propensity to implement the entire collection of environmental shopping behaviors that were the focus of the educational treatments. On the pro-environment side, and in absolute terms, a vast majority (80 to 85%) of shoppers from the east and west side stores recycled cans, bottles, and magazines and 55 to 60% brought back deposit bottles and cans after the campaign. Half the shoppers (50 to 55%) bought refills and concentrates, and 42 to 52% did not buy products in single-serving packaging. On the anti-environment side, it was clear that most shoppers (60 to 75%) never or infrequently brought their own bags to the supermarket, and 40-50% always or frequently bought disposable products after the campaign.

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A comparison of baseline and follow-up surveys of shoppers receiving the educational treatments and of those who did not, provide some insight into what extent environmental awareness, attitudes, and behaviors of shoppers were modified after exposure to environmental shopping campaigns, and what it takes to make those changes. On the face of it, and similar to the results of most of the studies reviewed in the last chapter, the educational campaign did not have an unequivocally positive effect on shoppers' environmental purchasing behaviors as had been hoped. Some of the environmental shopping behaviors that were part of the educational focus, did seem to increase after the campaign. Shoppers at both stores increased purchases of refills and concentrates (10 to 20%), the already frequent recycling of cans and bottles increased slightly (~5%), bringing deposit containers back increased (~15%), and shoppers at the east side store brought bags to the store slightly more often than before. In other cases, the desired environmental shopping behavior decreased; purchasing of recyclable packaging decreased (~12% overall) at both stores.

It had been anticipated that the higher the level of intervention (i.e., the extent to which a group of shoppers saw an educational device and/or remembered a message), the greater would be the positive effect on the shoppers' environmental behaviors. But different levels of interventions at the two stores were not consistently associated with positive or with negative changes in knowledge or behavior after the campaign. Certain cohorts of intervention respondents (e.g., those who remembered seeing brochures) exhibited improved environmental shopping behavior vs. the control group, after exposure to more

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educational devices. For example, with increasing educational intervention, the intervention respondents were 12-30% more likely than the controls to bring deposit containers back to the west side store, a few to 25% bought refills and concentrates more often, and at the east side store 20-36% bought fewer disposables than the controls. But in other cases, the educational treatments seemed to have a more negative impact on the intervention respondents' practice of environmental behaviors vs. the controls. Purchases of single-serving packaging by intervention respondents increased 5 to 30% as compared with the controls, their purchases of products in recyclable packaging decreased 12-27% in the west side store, and patronage of repair shops decreased from 4-22% during the campaign vs. the controls. In other cases, behaviors increased for some intervention cohorts or at one store but not for another (e.g., buying disposable products). In general, those receiving and remembering the campaign information at the east side store reported more environmentally friendly habits than the intervention groups at the west side store. Underlying the impact of the campaign on the intervention shoppers, and probably influencing some of the anti-environmental trends, was a foundation of decreasing recycling knowledge and environmental behaviors on the part of all the shoppers. This effect was evidenced by the fact that as many as 50% more of the controls, those who did not see any educational intervention, gave incorrect answers about New York City's recycling program after the campaign (vs. before), and as much as 50% fewer controls indicated they received recycling information after vs. before the campaign.

Clearly, something or perhaps a few factors outside the control of the educational campaign could have been at work, influencing the shoppers' behaviors and even their

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knowledge of the City's recycling program. The two path analyses showed that environmental behaviors of our shoppers were influenced only to a minor degree by the amount of environmental or recycling knowledge possessed by the shoppers, and that their shopping behavior was influenced considerably more by their environmental attitudes and unknown influencing factors outside the campaign. King County and others' research[142], described earlier, showed that barriers to environmental behaviors can thwart the good intentions of brochures and educational programs. New York shoppers face perhaps more barriers than shoppers in many parts of the country because supermarkets are smaller, and more crowded than most, and are visually "busy", with competing visual images and promotions. Since this campaign was conducted at holiday time, Christmas music competed on an auditory level with the campaign's messages.

Extrinsic factors, such as cost and inconvenience, may have impeded the shoppers' adoption of new behaviors. For example, the cost of living in Manhattan is the highest in the country, [143] hence shoppers here are likely to consider product price more important than in other locales. Where price is more important, other factors such as environmental impact, become less important. Since more shoppers brought their cans and bottles back to the store for the deposit after the campaign, while at the same time recycling fewer at home after the campaign, this also signals a shift by shoppers towards more extrinsic motivations for recycling at the time of the campaign. One possible explanation for this

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142 Frahm, Annette, et. al., "Changing Behavior: Insights and Applications", Local Hazardous Waste Management Program in King County" King County Water Pollution Control Division, Seattle, WA, July, 1996.

143 "Worldwide cost of living survey from the EIU, London at highest ranking for 20 years", The Economist Intelligence Unit Press Release. http://www.eiu.com/4GfQ663M/pressrelease/WCOLJN98.html

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was that the holiday season may have not only diverted shoppers' attention away from the educational campaign, but may have also influenced them not to experiment with new purchasing habits and to save money for holiday expenses.

In New York, due to its unique characteristics, shopping can be inconvenient; Manhattanites typically have to carry their groceries home several blocks in bags by hand, so such factors as the weight of products can affect their purchasing behaviors more than elsewhere, where cars are used to transport groceries. In fact, it is so difficult to navigate grocery carts through the narrow, crowded aisles, they aren't used much in Manhattan stores, so shoppers usually carry their purchases around with them through the store in large plastic baskets. The survey results support the notion that convenience may have been a barrier to buying products in recyclable packaging, due to the added weight of dilute products and recyclable packaging (glass and metal), but it would not have been a barrier to buying refills and concentrates, since they are lighter. Similarly, shoppers' perceptions (correct or not) that diaper service is more inconvenient and more expensive, as well as campaign-related factors (i.e., shoppers' non-receipt of diaper service offers), are likely to have caused the failure of this educational effort. Finally, the shift that permitted the Republican Revolution to occur (with its clearly anti-environment sentiments being broadcast in the media) was just beginning at the time the follow-up surveys were taking place, possibly creating a negative mood towards the environment. Social pressures against the environment could have been at work. Despite the barriers and other factors influencing shopper behavior, shoppers did buy refills and concentrates,

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bring deposit containers, and to some extent, carry cloth bags to the store more often after the campaign.

East- vs. West-Side Stores

One of the objectives of the research was to determine if the increased educational effort (i.e., having videos, volunteer literature tabling and extra brochure distributions) at the west-side store would result in a greater increase in environmental behavior at that store. Contrary to expectations, where there was much of a difference in the change in behavior of shoppers who received the interventions at the two stores, the east side shoppers reported more net increases (or lower net decreases) in environmental behavior as compared with the west side shoppers. Examples of this more environmentally friendly behavior at the east side store included a lower net decrease of purchasing recyclable packaging and patronizing of repair shops, and less of an increase in purchasing single-serving packaging and disposable products. By contrast, those receiving the heaviest educational treatment (remembered brochures and video or resources message in the west side store), generally seemed to retain more of their knowledge about the City's recycling program and environmental shopping after the campaign than any other group in either store.

That the west side shoppers would retain more of the environmental knowledge presented during the campaign than their east side counterparts, is easy to understand and was expected. That the same west side shoppers would, at the same time, improve their environmental shopping behaviors to a lesser extent after the campaign, is more puzzling

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and underscores the disconnect between shopper knowledge and behavior, already discussed. Recalling that the two stores were chosen such that the populations were matched on the basis of race and income, it would be difficult to argue that race or income would have influenced this outcome. The west-side shoppers may have experienced a greater number of outside negative influences or barriers to environmental shopping than the east-side shoppers (e.g., the more crowded nature of the store). The east side shoppers might have fewer barriers to practicing certain environmental behaviors (e.g., a greater number of thrift shops available).

Designing the Most Effective Campaign

One of the purposes of this investigation was to determine the characteristics of a successful environmental shopping campaign. This section describes what was learned, not only from the experience of conducting two environmental shopping campaigns in New York City, but also by comparison of these experiences with other campaigns.

Scale, Intensity and Length of Environmental Shopping Campaigns

As mentioned previously, Simmons and Widmar[144] suggested that waste prevention represents a new set of behavior patterns for most people. Therefore, environmental shopping programs would need to deploy more educational devices and approaches, continuously, using different approaches at different times, in a more intensive manner, than recycling program education in order to be successful in reaching the various target

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[144] Simmons, D., & Widmar, R. (1989-1990). Participation in household solid waste reduction activities: The need for public education. Journal of Environmental Systems, Vol. 19, pp. 323-330.

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populations. This notion is supported by the fact that the Gristede's shoppers had received decidedly more education about recycling than about environmental shopping prior to the educational campaign, and from a variety of sources, and therefore environmental shopping education would need to be thorough, intense, and prolonged to make up lost ground.

The two government-supported, multi-county, San Francisco Shop Smart campaigns were important in illustrating that an environmental shopping campaign can motivate hundreds of thousands of people in a large metropolitan area to adopt more environmentally-friendly behaviors. As to whether the degree of behavioral change was significant was not clear. (The percentages of shoppers practicing the environmental shopping behaviors after the Shop Smart campaigns were relatively low (10 to 30%), as compared with the Gristede's shoppers queried after our campaign, 25 to 75% of whom participated in the recycling and environmental shopping behaviors sometimes, often, or always.) An explanatory factor for the apparently smaller behavioral change in San Francisco could be that the Shop Smart brochure was distributed to a much smaller fraction of San Francisco area shoppers as compared with the fraction of east and west side shoppers receiving brochures in the Gristede's stores. The Illinois study also showed that no one remembered getting a brochure, and as a result, there was a statistically insignificant change in environmental shopping behaviors there, indicating the importance of the size and intensity of the education effort in reaching shoppers.

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It may be that in addition to saturation (i.e., a high percentage of shoppers seeing the information), a successful program also requires that shoppers not only see but also remember messages from at least some minimum number and diversity of educational devices (e.g., riveting signs and brochures), delivered via a variety of different means, continuously. This conclusion agrees with Geller and Lehman,[145] who found that the most successful campaigns are likely to be those which utilize a diverse set of strategies to induce and promote desired behaviors, since different people respond to different stimuli.

A narrowed educational focus, as was adopted for this study, should also be more successful, since fewer things to focus on result in less confusion and less to remember. The second Shop Smart campaign in San Francisco reduced the variety of messages in an attempt to improve shopper retention and implementation of the messages.

Along these lines, designing an environmental shopping educational campaign to take place over a longer period of time (or continuously), as Simmons and Widmar suggest, would also appear to make sense, since it was clear from this and other studies that only a fraction of shoppers remember the educational materials. More exposure to the materials and repetition of the messages (perhaps in different formats) over a longer time frame, increases the likelihood that more shoppers see the message. Since changing habits not only requires that shoppers know what the desired behavior is and why it is beneficial

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[145] Geller, E. S., and G. Lehman "Motivating Desirable Waste Management Behavior; Applications of Behavior Analysis", Journal of Resource Management and Technology, Vol. 15, Nos. 2&3, December, 1986, pp. 58-68.

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and easy, it also requires practice. Habits are not established overnight. The Minnesota study, conducted over a week, showed no changes in shopper behaviors during that time, underscoring that more time is needed to change behavior.

Another strategy to improve the impact of an environmental shopping campaign would be to give shoppers more intensive instruction, free cloth bags, and constant encouragement and monitoring, to increase the likelihood that the shopper received the information, was motivated, and had no impediments (lack of a bag). This approach was tried in the Suffolk County study, and naturally, a large fraction of those given the educational treatment participated in the target behavior (bringing a bag). But such a strategy conducted on a large scale would likely be prohibitively expensive and impractical, since not everyone will sit still for hours of instruction and maintain diaries for weeks. Designing an environmental shopping campaign that is practical, effective, but not too expensive is a challenge.

Designing Effective Environmental Materials and Displays

The Gristede's campaigns described here employed a number of educational materials, each designed to impart different educational and motivational messages and to serve different purposes within the educational program. Some devices conveyed the message quickly, almost instantaneously (e.g., the environmental shopper bag displays, the posters and the brightly-colored, high-contrast Bring Your Own Bag signs). These cloth bags and signs quickly imparted the environmental shopping message to the shoppers, and consequently, were noticed by the greatest number (two-thirds) of the shoppers

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(prompted and unprompted). Other campaign materials, the brochures and the videos, required a few minutes of attention on the part of the shoppers, but provided more in-depth information, motivation, and suggested behaviors. It was understood that there would be times when shoppers wouldn't have much time or patience to read brochures or watch videos, but on the other hand there would be times where idle minutes would be spent standing at the checkout line. The experience at the Gristede's stores has suggested that the educational materials that imparted the message quickly were the most effective in being remembered by shoppers (a first step in changing behavior), and possibly more such attention-grabbing, signs or flyers should have been designed to impart different messages. Also, deploying a variety of educational materials is important, since some people only have time or interest for the short messages, but others might need to read more to be persuaded.

The results of this study and the comparisons with other studies also suggest that the educational messages must not only be informational and motivational about the intrinsic reasons to participate in the desired behavior, but must also contain credible information about how various barriers (e.g., cost, inconvenience) to participating in the environmental behavior can be overcome. The Minnesota posters included direct comparisons of the cost and waste generated by an environmental product with its less-environmental counterpart (e.g., concentrates), to address the perceived economic barrier as well as to provide positive motivation. However, these posters were very large, and were in muted colors, so the size made them impractical for New York City stores and they were not as eye-catching as the NYCDOS Bring Your Own Bag signs, so were not

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noticed nearly as much. Thus, designing educational materials that are sized appropriately and are attention riveting, and deliver short, informative, and persuasive messages, is critical to having the messages remembered.

The results of this study also suggest that even minor differences in how an educational brochure or video is displayed in the store can be extremely important to its impact on shoppers. The fact that many of the survey respondents did not recall one or more of the educational features, or required prompting to remember them, indicates that it is of utmost importance to place educational materials in displays that look like the store supports the campaign, and that the displays be located where the shoppers will have the opportunity to see the display and receive the message.

Designing Environmental Shopping Campaigns for Different Demographics

One of the original research objectives was to determine if there is a relationship between demographics and shoppers' environmental knowledge, attitudes and purchasing behavior, and source of environmental information. There was not a great deal of disparity amongst the demographic groups (usually less than a few tenths of a point measured on a scale of 1 to 5 separated the different demographic groups on most questions). These data do not make a case for emphasizing certain environmental messages more than others to different demographic groups, with one exception. Where there was some disparity in the answers given by men and women, it was the women who exhibited more environmental behaviors and attitudes (though the mean differences were in the vicinity of 0.5 on a scale of 1 to 5).

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Selling Diapers, Bags in Stores

Clearly, the diaper experiment was not successful, since no one signed up to receive the service. The data showed that almost all of the survey respondents purchasing disposable diapers never received the diaper service offer, and this was due to factors within the control of the supermarket. Thus, in-store educational programs may not be effective locations for encouraging shoppers to switch from disposable diapers to diaper service, unless there is surer way of transmitting persuasive information to those who purchase disposable diapers. The packaging of the diaper offer was also not flashy enough to attract attention, even if the holders on the shelf had stayed in place.

On the other hand, the campaign's bag experiment was more successful. The bags themselves and the DOS Bring Your Own Bag signs were the two most remembered features of the campaign, and shoppers self-reported bringing their own bags more frequently to the east side store after the campaign. Hundreds of environmental shopper cloth bags were sold at the checkout counters at both stores. This is particularly noteworthy, since Gristede's considered its prior effort to sell canvas shopping bags to be unsuccessful.

Timing of Environmental Shopping Campaigns

There are certain times of year that are more and less auspicious for conducting environmental shopping campaigns. During the holiday season, as was the case for this study, shoppers are more likely to be rushed, pinched for funds, and facing other pressures which can impede their ability to learn and actually practice new behaviors.

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The supermarkets themselves are also more hectic during the holidays than at other times of the year because of special product lines and holiday promotions. If the educational campaigns had been successful during holiday season, maybe they would have been successful at other times of year. It is possible that the campaign might have been more successful if conducted at another time.

Using a Supermarket for a Campaign

Conducting environmental shopping education campaigns in New York City supermarkets presents a challenge due to the cramped nature of the stores and the harried quality of New York City shoppers and supermarket managers. While there is a potential benefit to be gained by educating shoppers right at the point of decision-making or purchase, it may be asking too much to get the shoppers to focus on a brochure, sign, or video amidst other competing promotions, to learn new information *and* to transform their shopping habits, while at the same time remembering their list of groceries to buy, balancing their grocery budget, and getting home in time to cook dinner. On the other hand, too few environmental shopping campaigns have attempted to innovate a sufficiently large, sustained, panoply of approaches and educational devices to determine for sure that most shoppers cannot be reached by environmental shopping campaigns. Product advertising employs billions of dollars annually to impart messages in ever changing, innovative ways (e.g., using attractive images of landscapes and food, cartoon characters, movie stars, sports figures) to move people to consume. If there were a more level playing field between money spent for product advertising and money spent for environmental shopping education, or if the product manufacturer themselves were to

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tout the environmental aspects of their products, it is more likely that environmental attributes would have a more important role in consumer decision-making.

From the point-of-view of the educator, a city or state solid waste agency, whose mission is to instill waste prevention behaviors into as many of its citizens, using as few resources, and in as little time as possible, a supermarket-based environmental shopping campaign can be quite labor- and/or cost- intensive. In addition, it only reaches some of those who frequent the store. This study indicates that the shoppers' environmental knowledge came to a lesser extent from in-store sources such as posters, brochures, and videos, and that their recycling education came to a greater extent from TV, building management, and newspapers. Their environmental shopping knowledge came from newspapers, TV and their friends and neighbors. However, none of the educational devices used in the stores reached anywhere close to 100% of the shoppers. Since such saturation this is usually a goal of educational programs, utilizing a combination of educational devices and approaches (intrinsic and extrinsic motivations), including those that are store-based, seems warranted if sufficient human and monetary resources are available. Thus, a supermarket-based campaign, if designed to optimize the number and mixture of attention-riveting educational materials, displayed professionally with the assistance of store staff over a long enough period, can be a useful adjunct to a large-scale program like San Francisco's with intensive media advertising and news coverage. Clearly, it is also necessary to have a supermarket that has room enough, and staff that is supportive enough, to provide a suitable location for display and dissemination of the educational materials.

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Recommendations

There are two main avenues that those responsible for managing solid waste can follow in achieving the objectives of reducing consumer-generated supermarket packaging and product wastes. The first involves designing and implementing an environmental shopping educational program, as discussed in this study. It is unlikely that any entity has carried out the "perfect" campaign to date, because it would probably be prohibitively expensive to do so. After all, environmental shopping campaigns are attempting to undo the behavioral changes and habits created by decades of expensive, targeted product advertising. If any environmental shopping campaign could be successful, it would have to mirror product advertising (i.e., take place continuously over a long period of time, would involve market research into effective ways of imparting information and motivation, frequently varying the educational materials, intensive media and print advertising, all store personnel cooperating enthusiastically, and in-store saturation with lots of volunteers handing out leaflets, etc. (see specific recommendations, below)).

The other approach to reducing consumer-generated supermarket wastes, which may ultimately prove to be more fruitful and cost-effective, is to pursue legislation, incentives/disincentives, and education directed at the packaging and product designers, manufacturers and retailers. Such approaches would encourage those that create and market products to provide more environmentally desirable alternatives (and to discontinue less environmentally desirable alternatives).

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For greatest effect, both approaches should be implemented simultaneously. The statistical basis for this recommendation is that the results from this and similar environmental shopping campaigns were equivocal insofar as the effectiveness of such campaigns at changing consumer shopping behavior. If shoppers are to purchase fewer disposables, overly packaged products, and non-recyclable packaging, a more substantial, ongoing campaign would be needed to raise awareness, break down barriers, and provide positive feedback, etc. But environmental shopping campaigns will never reach 100% of the shopping population (recalling the Roper Poll and the categorization of people's environmental predispositions, with some as openly hostile towards environmental values). So a campaign to motivate product and packaging designers (via intrinsic and extrinsic means), if successful, would provide fewer environmentally undesirable choices and more environmentally desirable products and packaging. The end result would be the same: greater purchase of environmentally desirable products and packaging and greater avoidance of unrecyclable, overly packaged, and/or disposable goods.

Implement Optimized Store-Based Environmental Shopping Campaigns

If the policy decision is made to design and carry out the optimal environmental shopping campaign, there are still constraints that will require a modification of expectations. Designing an environmental shopping education program for a city cannot involve personalized instruction for everyone, since monetary and practical constraints are too great.

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A successful program requires an adequate number and diversity of educational devices (including a media campaign), delivered to the shopper via a variety of means, since the most successful campaigns are likely to be those utilizing a diverse set of strategies to induce and promote desired behaviors. It is important to employ a sufficient mixture of quickly read, easy-to-understand, attention-riveting messages via flyers, small bright signs, strategically placed, which cover all the campaign messages. Designing educational materials to deliver short, informative, and persuasive messages is critical to having the messages remembered by the most shoppers. Since some people only have time or interest for the short messages, some may be influenced by monetary messages, but others might need to be persuaded more (recall the Roper Poll's categorization of people by their environmental predisposition), it is important to deploy as large a variety of educational materials as possible.

In order that the shoppers not be overwhelmed by too many messages (i.e., demands for different changes in behavior), the campaign materials should focus on a limited number of environmentally friendly behaviors at one time. Addressing not only the intrinsic reasons for adopting an environmental shopping behavior (i.e., it's the right thing to do), but also extrinsic reasons (e.g., it's cheaper) in the educational messages, is important for maximizing the effect of the educational materials. It is also important to dispel common misconceptions about any barriers to implementing the desired behavior, and to demonstrate how easy it is to implement the new behaviors.

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It is important to distribute enough educational materials and conduct sufficient media advertising to saturate the intended population to ensure that a sufficient percentage of shoppers see the information, many times, if possible. The precise quantity of materials would depend on the venue (i.e., supermarkets configured such that all shoppers would have to see certain posters, signs, videos at some point during their shopping visit would be more effective, and require less materials). Similarly, with media advertising, some TV and radio spots are much more effective at grabbing attention than others, so well-designed, innovative advertisements would be a part of an optimal supermarket-based campaign, and would require less investment.

Designing an environmental shopping educational campaign to take place continuously and intensively is recommended, since it was clear from this and other studies that only a fraction of shoppers are exposed to, or remember, the educational materials when the campaigns last for only a few weeks to a few months. Product advertisers realize that campaigns cannot be finite. New consumers are always being born and others moving on; and as other societal factors change over time, campaigns must be redesigned to retain effectiveness. Similarly, if environmental shopping campaigns were to employ more of the methods of product advertisers, they may reach and convince more shoppers.

The fact that 60 to 95% of the Gristede's survey respondents did not immediately recall one or more of the seven educational features, requiring prompting to remember them, indicates that it is of utmost importance to have eye-catching designs, to place them in displays that look like the store supports the campaign, and to locate the displays where

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the shoppers will have the opportunity to see the display and receive the message. Having brochures available in sturdy, official-looking holders and given out by volunteers at tables or at the checkout area will also facilitate their distribution to and examination by shoppers. Having large store-front posters with a project logo and message at all times also demonstrates the supermarket's commitment to environmental shopping, and can generate more interest in the message.

In order to more accurately measure the impact of an educational campaign on shopper behavior, so that future campaigns can be more effective, it is necessary to have access to computerized purchasing information, and preferably Club Cards, to track purchases of individuals over time. Having to depend on delivery invoices or inventory to estimate customer purchases over short periods of time produces inaccurate information and can be impractical. In order to reduce unwanted effects on the data, agreements must be made, in advance, with the store chain to keep prices and store locations of target products stable throughout the experimental period.

One of the most important findings of this study was that the degree of support the store chain, store management and personnel are able to provide can seriously affect the success of an environmental shopping campaign, so not every store can be a candidate for such a voluntary campaign. In recruiting a store or store chain, it is important, not only to have verbal agreements but it is essential to have the enthusiastic support for each and every aspect of the campaign very early in the planning process from the highest levels of

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the organization, and from all who will be involved, from President to data managers, store managers, and cashiers.

In order to optimize the effectiveness of supermarket-based environmental shopping programs further, future research should investigate the barriers that prevent shoppers from receiving educational treatments in stores and from putting new behaviors into practice, and how consumers can overcome them.

Encourage the Marketing of More Environmentally Desirable Products

Since changing shoppers' behavior depends only partly on how well they are educated to be environmental shoppers, approaches need to be innovated to encourage or require designers, manufacturers, and retailers to create more environmentally friendly packaging and products, so that consumers don't have to think about making the right choices. In many cases shoppers have no choice but to buy products in non-recyclable packaging or that are excessively packaged. The same is true for disposable items; shelf space is often not provided for the durable alternative.

Retailers should be encouraged to devote more shelf space to environmentally preferable products, to label these products as such, use circulars to educate consumers about environmentally preferable products, and to locate pairs of products (e.g., concentrates with non-concentrates, recyclable packaging with non-recyclable packaging) in close proximity in the store.

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Retailers could be encouraged or required to sell cloth bags and to charge for each disposable bag given, to redirect shoppers' habits towards the more environmentally preferable alternative.

So that those responsible for designing and marketing disposable products, overly packaged products, or those packaged in non-recyclable packaging could be discouraged from marketing such environmentally undesirable products and packaging, advance disposal fees could be levied on designers and manufacturers. Tax credits on environmentally preferable products, such as those with little packaging or great durability, could be used to encourage marketing of environmentally preferable products.

This investigation, and comparison with others like it, shows that in order for environmental shopping campaigns to have even moderate success, there must be considerable planning, expenditure of funds and effort, and cooperative retailers. Such campaigns are complex, and fraught with the potential for problems in execution. Though it is undoubtedly true that further research and experience with supermarket-based campaigns could produce advances in the optimization of educational materials and strategies, and eventually provide significant positive changes in shopping behavior by a majority of the subjects, this is not the case at present.

Though it is also true that incentives, legislation, and other measures to persuade or require manufacturers of grocery products are not used on a widespread basis, it is clear that the potential for success (significantly more environmental shopping by consumers)

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would be great if manufacturers provided consumers with only environmentally-sound choices. Over the last decade or so, governments and businesses have just been starting to seriously evaluate manufacturing processes to minimize waste generated, and at the same time save money. Lifecycle investigations, comparing the environmental impacts of producing and disposing of alternative products and processes, are creating a wealth of information from which designers are innovating environmentally sound products and packaging. The more that the design and manufacturing industry can be encouraged to move towards creating more packaging from recycled materials, more packaging that itself is commonly, easily, and cheaply recycled, and reduced packaging, as well as fewer disposable goods and more reusable ones, the greater will be the positive impact on waste prevention and recycling.

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TESTING THE EFFECTIVENESS OF SUPERMARKET-BASED ENVIRONMENTAL SHOPPING CAMPAIGNS IN CHANGING CONSUMER BEHAVIOR IN NEW YORK CITY

by

MARJORIE J. CLARKE

VOLUME II

A dissertation submitted to the Graduate Faculty in Earth and Environmental Sciences in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York

1999

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Appendix A

Supermarket Surveys

Survey at Associated Supermarket

Commodities Packaged Both in Recyclable and Nonrecyclable Packaging

Conducted at Broadway & Dyckman Street Store: July 10, 1992

Product Type	Recyclable Packaging*	Nonrecyclable Packaging*
Mouthwash	Scope 1, Listermint 1, Plax 1 Act 3, Listerine's cardbox, Cepacol 1, Viadent 1, Listerine glass	
Shampoo	Prell 2, Head & Shoulders 2, Helene Curtis - Salon 2, Pantene 2, Rave 2, Ivory 2	Agree 5, VO5 3, Finesse 3, Suave 3, Johnson's Baby 3
Conditioner	Suave 2, Ivory 2, Rave 2, Vidal Sasoon 2, Pantene 2, VO5 2	Finesse 3, Agree 5
Glass cleaner	White Rose 2, Glass-mates 2, Spic n span 2, Glass plus 2	Windex 3 and aerosol, SOS 3
Cleaner	Fantastik, Ajax, 409, Direct, Pine Sol – 2	Murphy Oil Soap 5
Pine Cleaner	Pine Sol, Lysol Pine Action, Real Pine, Spruce Pine, Spic n Span Pine – 1	King Pine, Lestoil, Breath Pine, Pine Xtra – 3
Syrup	Maple Orchards, Camp, Alaga, Mrs. Butterworth's – glass	Log Cabin, Country Kitchen, Aunt Jemima, Pioneer, Golden Griddle – 5
Ketchup	Heinz, Super A, White Rose – glass	Del Monte, Hunts, Super A- 7
Squeeze Mustard	Gulden's, French's creamy – 1	French's – 4
Vegetable Oil	Mazola Corn, Hollywood Canola, lg. Wesson canola, Crisco corn, Super A – 1	sm. Wesson Sunflower – 3, Planter's peanut –3, Pam, Mazola aerosols
Water	Great Bear, Farmland, Deer Park, Poland Spring, and Wissahickon – 2	Appalachian Spring – 3
Yogurt	Brown Cow qt., Columbo – 2	Axelrod 6, La Yogurt and Dannon 5
Grape Jam, Jelly	Welch's – glass	Welch's squeezable – 7
Cat feeder	Cat Chow - holder - 2	Cat Chow dish – 5, Deli-cat – 3

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Antacid	Maalox 2, Phillips MOM 2, Pepto glass, Mylanta 2, Pepto 1	Alka-Seltzer - box/wrap, Pepto overwrap
Seasoning	Marian 1, McCormick 1	Lawry's 5, Criolo 5, Iberia 5, Adobo 5, Goya unsp. Plastic, Vitarroz unsp. Plastic, Accent cardboard
Parmesan cheese	Ronzoni, 4C glass	Kraft -- cardboard/plastic/metal
Bullion	Vitarroz 1, Swanson – tin, College Inn - tin, Knorr glass	Herb-Ox unsp plastic, Maggi – unspecified plastic, MBT - indiv. paper pkgs, Knorr – paper
Soup	Campbells – tin	Campbells - box & paper, Knorr box & paper, Nissin, Lipton cup & board
Cocoa mix	Hershey's 2, Ovaltine – tin, Nestle Quick 2 and tin, Hershey's syrup - 2, tin	Ovaltine, Swiss Miss, Super A, Carnation, and Nestle – paper, Bosco unspecified plastic
Coffee	Many brands glass or tin	Chock Full o Nuts, Folgers, Maxwell, Cafe Bustelo, El Pico, Cafe Pilon - paper/aluminum wrap
Macaroni & Cheese	Chef BoyarDee – tin	Velveeta, Kraft, Super A, Golden Grain - paper & ?
Metal polish	Noxon, Cameo, Forster – 2	Twinkle - box & ?, Royal Sterling – unspecified plastic
Softener	Downy – 2	Downy refill – cardboard
Scrub cleaner	Soft Scrub, Scrub Free, Dow, Bon Ami, Ajax, Comet, Zud, and Comet – 2	and Spic n Span – cardboard
Stain remover	Shout - 2	Shout – aerosol
Tile cleaner	Lysol, Dow – 2	Lysol, Dow – aerosol
Mildew cleaner	Easy-off - 2	Easy-off - aerosol
Pesticide	Raid Roach & Ant Killer – 2	Raid Roach & Ant - aerosol
Laundry Detergent	Many brands – 2	Many powders - box
Dishwashing Detergent		Cascade, Palmolive, Sunlight, Cascade, All, Sunlight- paper
Bleach	Vivid, Super A, White Rose, Miracle White, Chlorox – 2	Borateem, Borax, Chlorox, and Snowy – paper

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Dog Food	Cycle, Alpo, Skippy, Super A, Pedigree, Recipe, Friskies, King Kuts, Ken L Ration, and Mighty Dog – tin	Cycle (bulk) - paper, Alpo, Puppy Chow, Gravy Train, Dog Chow, Chuck Wagon – box
Cat Food	Purina, Sheba, Super A, Kitty, Friskies - small tin	Whiskas, 9 Lives, Purina, Cat Chow – box
Orange Juice	Tropicana – glass	Orange Plus, Citrus Hill, Tropicana, and Minute Maid - concentrate. Many brands - paper carton
Apple juice	Cider - 2, Tropicana – glass	Apple & Eve - paper, many brands – concentrate
Prunes	Sunsweet – glass	Sunsweet – paper, Del Monte - plastic bag
Iced Tea	4C – tin	4C box
Milk	Farmland – 2	Farmland - carton
Processed Cheese	Cheez Whiz – glass	Velveeta – paper
Popcorn	Orville Redenbacher – 1, Paul Newman's – glass, Jiffy Pop - aluminum/cardboard	Goya (bulk) - plastic bag; Microwave Orville, Newman, White Rose, and Betty Crocker – paper
Ice Cream (pt.)	Sweet n Low, Tofutti, and Frusen Gladje – 2	Heidi's, Elan, American Glace, Ben & Jerry's, Steve's, and Haagen Dazs – paper

* Numbers refer to plastic resins - PET is 1, HDPE is 2; these are the preferred resins by NYCDOS in its recycling program, however DOS' educational materials stress bottles and jugs seemingly of any resin. Strictly speaking, most of the plastic resins listed as non-recyclable will be accepted by DOS, though they are contaminants, and could be considered recyclable. If this is the case, most of the first page of product types listed are ***not*** packaged in a choice of recyclable and non-recyclable packaging. Product types not listed are packaged entirely in either recyclable or non-recyclable packaging. (This accounts for the vast majority of commodities in the grocery store.)

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SURVEY OF TRACKABLE PRODUCTS AT GRISTEDE'S

conducted at East 86th and West 86th Street stores: 7/13/93

POPCORN

Item	Recyclable/ Nonrecyclable	Location Aisle East	Location Aisle West
Orville Redenbacher's popcorn	R 1	1	Rt back
Newman's own popcorn	R g	1	Rt back
Orville Redenbacher microwave* (3)	N	1	Rt back
Newman's own microwave	N	1	-

NUTS

Item	Recyclable / Nonrecyclable	Location Aisle East	Location Aisle West
Fowder's Famous Roasted Peanuts (whole)	N (bag)	Produce	Produce
Planter's Dry Roasted (salt/unsalt)	R g	1	bk prod
Planter's Cocktail peanuts	N ppr	1	bk prod
White Rose dry roasted peanuts	R g	1	bk prod
White Rose cocktail / unsalted	N ppr	1	bk prod
Planter's cashews	N ppr	1	---
White Rose cashews	R g	1	bk prod
Bazzini's nut club cashews	N bag	1	bk prod
Dole pistachios	R 1	1	---
Bazzini's nut club pistachios	N bag	1	bk prod

COFFEE

Item	Recyclable / Nonrecyclable	Location Aisle East	Location Aisle West
DECAFFEINATED			
Medalglia D'Oro Choc Full o Nuts, Sanka, Savarin	R tin	2	1
Sanka decaf	R g	2	1
Sanka decaf	N ppr	2	--
REGULAR			
Folgers, 3 Maxwell Hse, 2 Martinson, 2 Cafe Bustelo, 2 Savarin| Cafe Goya	R tin	2	1
3 Maxwell Hse, Yuban, Savarin, Folgers, Brim, Choc FulloNuts|	R g	2	1
Folgers, Maxwell Hse, Pilon, Cafe Bustelo, Cafe Goya	N ppr	2	1
Folgers Cafe singles	N ppr	2	1

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BLEACH

Item	Recyclable / Nonrecyclable	Location Aisle East	Location Aisle West
Chlorox	N box	7	6
Chlorox (7)	R 2	7	6
Snowy	N box	7	6
Borateem	N box	7	6
20 Mule Team Borax	N box	7	6

WRAP

Item	Recyclable / Nonrecyclable	Location Aisle East	Location Aisle West
Reynolds, White Rose, Diamond Foil	R al	6	5
Saran, Glad, Handi-Wrap (2)	N plastic	6	5

JUICE

Item	Recyclable / Nonrecyclable	Refill/ Concentrate	Location Aisle East	Location Aisle West
Speas Farm, Motts Apple Juice	R g		3	back L
Speas Farm, Ocean Spray Apple Juice	N box		3	1
Motts Apple Juice	R al		3	1
Welch's Orchard Grape Juice	R g		3	1
Welch's Grape Juice	N box		3	1
Hawaiian Punch	R tin		3	1
Hawaiian Punch	N box		3	1
Ocean Spray Cranapple	R tin		3	--
Ocean Spray Cranapple	N box		3	1
Minute Maid Pineapple juice	N box		3	1
Dole, Del Monte, White Rose pineapple juice	R tin		3	1
Minute Maid, Tropicana, White Rose OJ		Conc	5	1
Minute Maid, Seneca, White Rose Apple Juice		Conc	5	1
Minute Maid Grapefruit Juice		Conc	5	1
Tropicana Orange juice (96 oz)	R 7		6	back L
Minute Maid Orange juice (96 oz)	R 2		6	back L
Tropicana (64/32 oz) (4 flavors/2 fl)	N ppr		6	back L
Minute Maid (64/32 oz)	N ppr		6	back L
Old South Grapefruit juice	N ppr		6	back L
Apple & Eve Apple Cranberry Juice (64oz)	N ppr		6	--
Tropicana OJ, AJ, Grapefruit juice	R g		back	back L

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MILK

Item	Recyclable / Nonrecyclable	Location Aisle East	Location Aisle West
Tuscan Nonfat milk (1 gal)	R 2	6	back
Tuscan skim milk (64/32 oz)	N ppr	6	back
Tuscan 1% lowfat	R 2	6	back
Tuscan 1% diet time (64/32 oz)	N ppr	6	back
Tuscan 2%	R 2	6	back
Tuscan 2% (64/32 oz)	N ppr	6	back
Tuscan regular	R 2	6	back
Tuscan regular (64/32 oz)	N ppr	6	back

SOUP

Item	Recyclable / Nonrecyclable	Refill/ Concentrate	Location Aisle East	Location Aisle West
Campbells Chicken Noodle**	R tin		4	3
Campbells Chicken Noodle	N box		4	3
Lipton Chicken Noodle (5 varieties)	N box		4	3
Progresso Chicken Noodle	R tin		4	3
Oodles of Noddles Oriental Noodle soup, chicken, chicken and mushroom	N wrap		4	3
Ramen Pride oriental noodles (chicken)	N wrap		4	3
Campbell's tomato	R tin		4	3
Lipton Cup o soup tomato	N box		4	3
Progresso tomato	R tin		4	3

DISHWASHING DETERGENT

Item	Recyclable / Nonrecyclable	Location Aisle East	Location Aisle West
Cascade Liquid Gel (2)	R 2	7	6
Cascade powder (4)	N box	7	6

GLASS CLEANER

Item	Recyclable / Nonrecyclable	Location Aisle East	Location Aisle West
Windex (4)	R 2	7	6
Windex	N aerosol	7	6

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FABRIC SOFTENER

Item	Recyclable / Nonrecyclable	Refill/ Concentrate	Location Aisle East	Location Aisle West
Ultra Snuggle refill		refill	7	6
Ultra Downy refill		refill	7	6
Purex Sta Puf refill		refill	7	--
Downy refill		refill	7	--
Snuggle (5)	R 2		7	6
Ultra Downy (3E, 4W)	R 2		7	6
Miracle White	R 2		7	--
Bounce sheets (3)	N box		7	6
Snuggle sheets (2)	N box		7	6
Downy sheets	N box		7	6

GELATIN

Item	Recyclable / Nonrecyclable	Location Aisle East	Location Aisle West
Jello (5 flavors) snack pack	N plastic	6	back
Jello (many flavors) instant	N box	front	4

LAUNDRY DETERGENT

Item	Recyclable / Nonrecyclable	Refill/ Concentrate	Location Aisle East	Location Aisle West
Tide Refill / Tide-free refill	R 2	refill	7	6
Bold refill	R 2	refill	7	6
Cheer refill (1E, 2W)	R 2	refill	7	6
Wisk-free refill (1E, 2W)	R 2	refill	7	6
Tide liquid (1E, 4W)	R 2			
Bold liquid	R 2		7	6
Cheer free liquid (1E,2W)	R 2		7	6
Wisk liquid (3E, 2W)	R 2		7	6
Tide powder	N box		7	6
Bold powder	N box		7	6
Cheer powder (2)	N box		7	6
Wisk (2)	N box		7	6

DOG FOOD

Item	Recyclable / Nonrecyclable	Location Aisle East	Location Aisle West
Alpo (many flavors)	R tin	7	6
Skippy, Recipe, Pedigree, Friskies	R tin	7	6
Cycle Adult, Puppy	R tin	7	6
Cycle (Senior, Puppy E; Adult , Life W)	N ppr	7	6

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CAT LITTER

Item	Recyclable / Nonrecyclable	Location Aisle East	Location Aisle West
Scoop Away	R 2	7	6
Jonny Cat, Hartz	N box	7	6
Double Fresh, Tidy Cat, Fresh Step, Control	N pprbg	7	6

SALAD DRESSING

Item	Recyclable / Nonrecyclable	Refill/ Concentrate	Location Aisle East	Location Aisle West
Hidden Valley mix (2)	N ppr	Conc	8	--
Good Seasons (8)	N ppr	Conc	8	4
Good Seasons Italian	R g/mix	Conc	8	4
Wish Bone Italian	R g		8	4
Seven Seas Italian Light	R g		8	4
Kraft Italian	R g		8	4

CAT FOOD

Item	Recyclable / Nonrecyclable	Location Aisle East	Location Aisle West
Whiskas seafood	N box	7	6
Whiskas liver, etc...	R tin	7	6
Friskies beef & liver	N box	7	6
Friskies all flavors	R tin	7	6

PUDDING

Item	Recyclable / Nonrecyclable	Refill/ Concentrate	Location Aisle East	Location Aisle West
My-T-Fine Instant Chocolate	N ppr	conc	front	4
Jello Instant Chocolate (2)	N ppr	conc	front	4
Sweet Pretenders instant chocolate	N ppr	conc	8	?
Weight Watchers instant chocolate	N ppr	conc	8	?
Hunts Chocolate nonrefrigerated snack pack (2)	N plastic/ppr		front	4
Jello chocolate refrigerated snack pack (2)	N plastic/ppr		6	Back
Axelrod chocolate refrigerated snack pack	N plastic/ppr		6	back
Swiss Miss chocolate refrigerated snack pack	N plastic/ppr		6	back
Hershey's chocolate refrigerated snack pack	N plastic/ppr		6	back

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DISPOSABLE DIAPERS

Item	Recyclable / Nonrecyclable	Location Aisle East	Location Aisle West
Huggies XL (>30)	N wrap	6	--
Pampers (>26) walker 3	N wrap	6	--
Huggies (22-35)	N wrap	6	--
Pampers (22-35) walker 2	N wrap	6	2
Luv's walker 2	N wrap	6	---
Huggies (16-24) M	N wrap	6	2
Luv's Crawler (16-24)	N wrap	6	--
Pampers (16-24) Crawler	N wrap	6	2
Thick Luv's (18-25)	N wrap	6	--
Huggies SM (12-18)	N wrap	6	2
Luv's (12-18) Infant 2	N wrap	6	--
Pampers (8-14) Infant 1	N wrap	6	2
Luv's (8-14) Infant 1	N wrap	6	--
Luv's (6-14) Deluxe	N wrap	6	--
Ultra Pampers Plus (6-14)	N wrap	6	--
Huggies (<14) S	N wrap	6	2
Luv's (<10)	N wrap	6	--
Huggies S	N wrap	6	2

* Value pack, butter light, salt free

**regular, home style, stars, alphabet

Abbreviations:

N: Non-recyclable. R: Recyclable Conc: Concentrate

g (glass); ppr (paper); al (aluminum); box (paperboard); wrap (plastic wrap); tin (ferrous metal); bag (plastic film).

In Recyclable/Non-Recyclable column: 1 (PET), 2 (HDPE), 3 (PVC), 4 (LDPE), 5 (PP), 6 (PS), 7 Misc. plastic

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Appendix D

Cost of Diapers

Calculation of Cost of Diaper Service vs. Disposables Over a Two-Year Period

Summary of the Methodologies used for the Comparison:

1. Assume that diapering period is two-years in total for babies wearing disposables or diaper service cloth diapers, and that the number of diapers (and the size of disposable diapers) used is different in each of five successive time periods of equal length (24 / 5 = 4.8 months). This actually gives an advantage to disposables in this calculation, since the diaper service has calculated that toilet training of babies using cloth diapers is about six months faster than those using disposables, since disposables are more comfortable when soiled.

2. Use General Health Care Corp's figures for the number of diaper service diapers used (60/week)[146] and disposables used by their customers per day (0.7/day)[147] and their cost.

3. Use figures in the A.D. Little Study for Procter and Gamble for the number of diaper changes per day (6.4) [148]

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146 Personal Communication, Christine Hardison, VP GHCC, September, 1993.

147 Lehrburger, Carl, et. al., "Summary: Diapers: Environmental Impacts and Lifecycle Analysis", Report to the National Association of Diaper Services, Philadelphia, PA, January 1991.

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4. Use average costs for each of five sizes of disposable diapers at the two Gristede's stores used in the study. (Average is calculated by assuming that each product in each of the five size categories is purchased in quantities equal to the others in the same size category.)

5. Where there is more than one price for the same product, either at the same store or at the other store, it is assumed that the lower price represents either a sale price or is a price that is in the process of being raised; therefore, the lower price is not considered in the average.

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[148] "Disposable vs. Reusable Diapers: Health, Environmental and Economic Comparisons" Report to Procter and Gamble, by A.D. Little and Company, March 16, 1990.

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Calculation of Costs of Using Diaper Service

1. The number of diaper service (DS) diapers used for diapering (not other uses) by the typical baby per week averages 60 according to Jack Mogavero, President of GHCC. This is called the "packout" rate or the number of soiled cloth diapers removed from the household. Thus, over 2 years, the number of cloth diapers used totals 6240. (Another figure used by the industry -- from the Lehrburger study -- is 7.2 cloth diapers per day, which totals to 50.4/week, and 5242 per 2 years. To make the estimate conservative, the 6240 figure is used.)

2. In addition to using cloth diapers, diaper service customers also use some disposables. In the Lehrburger study, done for the diaper service industry, this figure averages 0.7 disposable diapers per day. Over a 2-year period, the number of disposables used by diaper service customers totals 511.

3. The cost of DS diapers, according to Mogavero, falls into five size categories -- that is, the larger the baby, the fewer the number of changes needed. These are:

	Cost per week	Cost per diaper
1.	$14.45 / 80 diapers	.180
2.	$13.95 / 70 diapers	.200
3.	$13.45 / 60 diapers	.224
4.	$12.95 / 50 diapers	.260
5.	$12.45 / 40 diapers	.311

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4. One-fifth of the 2 years is 20.8 weeks, so the total cost for diaper service for each of the five time periods is:

1.	$14.45 x 20.8	=	$300.56
2.	$13.95 x 20.8	=	$290.16
3.	$13.45 x 20.8	=	$279.76
4.	$12.95 x 20.8	=	$269.36
5.	$12.45 x 20.8	=	$258.96
Total			$1398.80

2-year Cost for Diaper service is: $1398.80

5. The cost of disposables used by diaper service customers involves calculating an average cost per diaper and multiplying by the number of diapers in each size category, and then summing the five products.

   The number of diapers used during each of the five size categories / time periods is 102.2 (511/5).

6. The calculation of the cost per diaper for each size of diaper is presented in the following table:

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Table I. Cost of disposable diapers at Gristede's in 1993

	Count	West price	East price	$/diaper
Size 1 -- Less than 14 lbs				
Huggies Ultra Steps 1 < 14 lbs	50	9.99*	10.99	.2198
Pampers Infant 1 8-14 lbs	50	10.99	10.99	.2198
Pampers Ultra	54		9.99	.185
Luv's Infant 1, 8-14 lbs	54	13.99	12.99**	.2591
Luv's Deluxe small	54		10.99	.2035
Luv's newborn birth - 10 lbs	28		12.99	.4639
Size 1 average cost per diaper: .2585				

	Count	West price	East price	$/diaper
Size 2 12 → 18 (or 24) lbs				
Huggies Ultra Steps 2	40	9.99*	10.99	.2746
Pampers Infant 2	40	10.99		.2746
Pampers Infant 2	44	12.99	12.99	.2952
Luv's Infant 2	44		12.99	.2952
Luv's thick (12-24 lbs)	40		12.99	.3248
Size 2 average cost per diaper: .2929				

	Count	West price	East price	$/diaper
Size 3 16 → 24 lbs				
Huggies #3	36	10.99*	12.99	.3608
Huggies Ultra 3	36		10.99	.3053
Pampers Crawler	40	10.99		.2748
Pampers Crawler	36	12.99		.3608
Pampers Crawler	14		4.99	.3564
Luv's Crawler	36	13.99		.3886
Luv's Crawler	40	12.99		.3248
Luv's Walker 1	36	12.99	12.99***	.3608
Size 3 average cost per diaper: .3415				

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	Count	West price	East price	$/diaper
Size 4 – 22 → 35 lbs				
Huggies Large #4	27	12.49		.4626
Huggies Large Ultra or Steps 4	27		13.99***	.5182
Pampers Walker 2	26		9.99	.3842
Pampers Walker 2	30		10.99	.3663
Luv's Walker 2	30		13.99	.4663
Size 4 average cost per diaper: .4395				

	Count	West price	East price	$/diaper
Size 5 – over 26 lbs				
Huggies XL #5	24	9.99 sale		.4163
Huggies XL ultra #5	24	9.99 sale		.4163
Pampers Walker 3	24		10.99	.4579
Size 5 average cost per diaper: .4302				

* Not included in average (see point 5 in assumptions)
** Other prices seen for this product: 10.99, 9.99
*** Other price for this item: 10.99

7. Calculation of cost of disposables for those using diaper service:

Cost/diaper x 102.2 (number of diapers per period)

Size 1.	.2585 x 102.2	=	$26.42
Size 2.	.2929 x 102.2	=	$29.93
Size 3.	.3415 x 102.2	=	$34.90
Size 4.	.4395 x 102.2	=	$44.92
Size 5.	.4302 x 102.2	=	$43.97
Total cost for disposables for diaper service customers:			$180.14

8. **Thus, the total cost for parents using diaper service diapers over a two-year period is:**

$1398.80 for the service
$ 180.14 for the disposables

$1578.94 Total

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Calculation of Cost of Using Disposable Diapers Exclusively

1. The number of disposable diapers used is taken from the A. D. Little study. This number is 6.4 per day, or 4672 over 2 years. For purposes of calculating the cost of disposable diapers that come in five sizes, one-fifth of the total number of diapers is: 934.4
2. Calculation of the cost per disposable diaper purchased at Gristede's is presented in Table I.
3. Calculation of the cost of using disposables:

Cost/diaper * # diapers over the period = Total cost over the period

Size 1.	.2585 x 934.4	=	$241.54
Size 2.	.2929 x 934.4	=	$273.69
Size 3.	.3415 x 934.4	=	$319.10
Size 4.	.4395 x 934.4	=	$410.67
Size 5.	.4302 x 934.4	=	$401.98
Total cost for disposables:	**$1646.98**		

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Final Cost Comparison: Disposable vs. Diaper Service over two years:

Total Cost of using disposables only:	$1646.98
Total number of disposable diapers used:	4672
Total Cost of using diaper service primarily:	$1578.94
Total number of disposable diapers used:	511
Total number of reusable diapers used:	80

Difference in cost of using disposables vs. diaper service: $68.04, or 4%, using the more conservative assumption for diaper service changes needed as well as the assumption that toilet training takes place in two years regardless of diapering method.

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Diaper Facts

Some interesting quotes regarding the use and impacts of disposable vs. cloth diapers are contained in the following:

The Record, "Diaper War: the latest bottom line", May 6, 1993 C1
Average child goes through 6000 diapers. Disposable diapers do not decompose in landfill for 500 years. By the late 1980s 90% of US residents under 2 1/2 were routinely popped in and out of disposables. But by 1990 the Earth day boom caused an increase in use of diaper services to 15%. Proctor & Gamble now dominates close to half of the US disposable diaper market with Pampers and Luvs.

Warmer Bulletin, Feb 1993 pullout; Babies need on average 2500 nappies each year, and use a total of 6200 napppies in an average two and a half years.

Rhode Island Solid Waste Management Corporation, 1986 Annual report; "About 5 million tons of dirty disposable diapers are buried in landfills throughout the US ever year. A dirty disposable plastic diaper can take 500 years to decompose, as compared to a cotton diaper, which disintegrates in only 1 to 6 months.

Carl Lehrberger, Diapers in the Wste Stream, 1989. "Each family that chooses natural, recyclable cotton diapers for their child prevents 1 ton of waste from entering the solid waste stream each year" Also, disposal charges are calculated (1988) to be about $300 million a year.

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Dr. David Wiles, director of the National Research Council of Canada's Division of Chemistry, suspects that plastic breakdown [from biodegradable diapers] will worsen the 'already serious problem of gas and leachate production, possibly adding [[to the environment]] toxic chemicals [[that are]] much more damaging... than the plastic wastes themselves'" quoted in "Biodegradable Diapers: a Pseudo Solution" Ann Beaudry, in Mothering Magazine, Vol 53. quoting Colin Issacs, Probe Post (Fall 1988): 42

Mary Chernesky, Hillsborough County Cooperative Extension; "One of the best ways to reduce municipal solid waste is to cut down on packaging, which comprises about 30% of the solid waste stream, according to a 1988 Franklin Associates study for EPA. Containers and packaging accounts for 41% of all paper produced in the US, 90% of all glass, 39% of the plastic, 24% of the steel, and 59% of all the aluminum. One dollar out of every $11 spent for groceries in the US pays for packaging."

"It is estimated that 75,000 metric tons of plastic and 1,265,000 tons of wood pulp are used every year to make disposable diapers in the US. About 5 million tons of dirty diapers are buried in landfills in the US each year and consumers spend at least $100 million annually to dispose of these items."

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Appendix DG

Survey Data Gathering Effort

Forays into Stores for Surveys -- Progress Report

August 29, 1993

Day, Date	East	West	Volunteers	Time Period
Friday, June 26	30 (Pretest)		4 people**	4:30 → 6pm
Tuesday, June 29	90		4 people	4 → 6:30 or 7pm
Wednesday, June 30	51		2 people	4 → 6:30 or 7pm
Thursday, July 1		63	5 people	4 → 6:30 or 7pm
Tuesday, July 6		50	2 people	4 → 6:30 or 7pm
Tuesday, July 6	55		2 people	4 → 6:30 or 7pm
Wednesday, July 7	52		2.5 people	4 → 6:30 or 7pm
Thursday, July 8	55		2 people	4 → 6:30 or 7pm
Thursday, July 8		26	2 people**	5 → 6:30
Monday, July 12		16	2 people	12 → 2 pm
Wednesday, July 14		21	2 people	2 → 4 pm
Monday, July 19		38	2 people	4 → 6 pm
Tuesday, July 20		40	2 people	6 → 8 pm
Thursday, July 22	11		2 people	2:30 → 4:30pm
Saturday, July 24		20	1 person**	7:30 → 8:30pm
Monday, July 26	19		3 people	6 → 8p
Monday, July 26		39	2 people	6 → 8p
Tuesday, July 27	21		2 people	4 → 6pm
Wednesday, July 28		15	1 person	6 → 7:30p
Monday, August 2		16	1 person	1 → 3:30p
Friday, August 6		18	2 people	4 → 7pm
Monday, August 9	15		2 people	5 → 7pm
Wednesday, August 11	14		1 person	3:30 → 6:30pm
Tuesday, August 17	16		2 people	3 → 6pm
Wednesday, August 18		17	1 person	4 → 6pm
Thursday, August 19		14	1 person	4 → 6pm
Thursday, August 26		8	2 people	4:30 → 5:15pm
Running Totals	399	401	(not counting pretest)	

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Breakdown of Baseline Respondents Providing Name and Phone

Early surveys	East				West	
	Yes*	No			Yes	No
June 29-30	66	75				
July 1, 6-8	75	87		7/1,6	53	60
Subtotals	141	162			53	60
Percents	46.5	53.5			46.9	53.1

* "Yes" indicates respondents gave name and phone number for followup

Later surveys	East				West		
	Yes		No		Yes		No
July 8					20		6
July 12					10		6
July 14					18		3
July 19					19		19
July 20					21		19
July 22	2		9				
July 24					11		9
July 26	8		11		24		15
July 27	11		10				
July 28					8		7
August 2					1		15
August 6					8		10
August 9	1		14				
August 11	4		10				
August 17	5		11				
August 18					2		15
August 19					2		12
August 26					5		3
Subtotals (#s)	31		65		149		139
Percents	32.3		67.7		51.7		48.3

Entire Effort	East			West			
	Yes	no	tot	yes	no		tot
Running totals	172	227	399	202	199		401
Percents	43.1	56.9		50.4	49.6		
Overall % yes:	46.75%						

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Summary of activity regarding the follow-up phone surveys

January 28, 1994

The follow-up telephone survey began the week immediately following the end of the active educational phase (January 24) and continued into March. Volunteers were provided with a set of detailed instructions on how to ask the questions (some questions were open ended; others required prompting; and still others required rankings). (See Appendix ST for background on the testing and refinement of the follow-up surveys, Appendix Q for the final surveys, and Appendix V regarding the volunteer solicitation and the guidelines for the surveying process.)

EAC had two volunteer nights with about three volunteers attending each night. In addition EAC has had perhaps one daytime person once or twice. In all they have done 16 surveys the week of January 28, 1994. Extrapolating that, we wouldn't finish for more than twenty weeks. By the end of the week of February 11, attempts to reach 150 baseline survey respondents had been made, however only 20 surveys had been completed. We must figure out a way to get more volunteers fast; maybe the project will have to pay -- maybe a dollar per completed survey. More volunteers were sought at NYPIRG, Council on the Environment, the Citywide Recycling Advisory Board, EDF, and the League of Women Voters.

By the end of February less than 60 surveys had been completed; New Yorkers are never home! Also, since the phone numbers were at least six months old, a number of them

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had been disconnected, and other respondents had moved out of the City. A professional phone bank was employed at this time to speed the data collection process; 175 more surveys were completed in less than a week. The data encoding process for the follow-up survey was begun in March, 1993.

Week ending 1/28/94	16 surveys finished
Week ending 2/6/94	4 surveys finished
Week ending 2/11/94	20 surveys finished
End of 2/94	Less than 60 surveys finished

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Appendix DM

Display of Educational Materials

Talk with East Side Store Manager – basic educational effort

1. Brief him about project; that we are working with Damita Johnson on a storefront poster.

2. Ask whether it would be OK to place posters on walls and hang some from the ceiling. (Would he have someone who could assist in installation?)

3. Could we place one of DOS' 'Bring Your own Bag' signs on each checkout register?

4. Ask if we could put shelf labels on the shelves.

5. Ask if Red Apple might have some brochure holders (racks) which we could borrow and place in strategic locations attached to shelving.

6. Ask whether we could get the cashiers to give diaper brochures to each person who purchases disposable diapers.

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Talk with West Side Store Manager – more extensive educational effort

1. Brief him about project; that we are working with Damita Johnson on a storefront poster; describe special Cadillac efforts

2. Ask whether it would be OK to place posters on walls and hang some from the ceiling. (Would he have someone who could assist in installation?)

3. Could we place one of DOS' 'Bring Your own Bag' signs on each checkout register?

4. Ask if we could put shelf labels on the shelves.

5. Ask whether we could get the cashiers to give diaper brochures to each person who purchases disposable diapers and to ask whether they need a bag for small purchases (or if they need a double-bag).

6. Ask if Red Apple might have some brochure holders (racks) which we could borrow and place in strategic locations attached to shelving.

7. Ask whether volunteers could hand out pamphlets near the checkout line.

8. Ask whether it would be OK to put up a table on the first floor

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9. Ask whether it would be OK

   - to position 2 video installations on posts near cashiers,
   - whether to improve visibility we could temporarily remove the large cigarette ad signs, and
   - whether there is someone there who could help install video.

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Appendix E

Survey Objectives, Designs, Questions and Findings: A Review of 28 articles from the literature

Spano, Nicholas A., "The Greening of the Marketplace", New York State Legislative Commission on Solid Waste Management, September, 1991.

Quoting: The Roper Organization Inc., The Environment: Public Attitudes and Individual Behavior, July, 1990.

Survey Objectives:

Who are the green consumers? How do you categorize them? (Other questions raised but not answered: 1) Is environmental behavior inextricably linked to the fortunes of the economy and how does that bode for the future of changing New York's consuming and disposal habits?

Survey Questions and Findings

In the 1990 Roper poll, people are divided into five "greenness" categories:

a. True-blue greens, 11% of the population, are most concerned about the environment, and do most for it in terms of their actual behavior. They are also willing to spend more for green products. The average True-Blue greens are well educated with a high percentage having a college education. They have the highest median household income of the five groups. They engage in more pro-environmental activities than any

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other segment. For example, more than half regularly recycle newspapers, close to 55% sort their trash and almost 60% avoid buying products in aerosol cans.

b. Greenback greens, representing 11% of the population, are one of the primary reasons for the increasing number of green products being marketed today. They typify a double income family with more disposable income than free time. Therefore, they are more likely to spend extra on a product they perceive to be environmentally beneficial than they are to take the time to recycle. While they favor regulations banning environmentally harmful products and support government actions to require industry and individual compliance, they are not likely to engage in individual activities such as recycling, car-pooling or home-composting. The average Greenback is characterized as follows: youngest median age, high income level per household, highly educated and likely to be parents (busy working parents).

c. The Sprouts, 26%, the next to the largest group, are concerned about the environment and support government regulation, but to a lesser degree than the previous two. They are the second most willing group to participate in pro-environmental activities. Most Sprouts recycle and a fairly large percentage (42%) believe that individuals can do a lot about air pollution. They are average middle class Americans. They are quite well educated, having higher than average household incomes, and are likely to be professionals. They are a pivotal group in terms of consumer and electoral politics.

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d. The Grousers (24%), have a lack of involvement in pro-environmental activities and tend to blame everyone else but themselves for the state of the environment. They are included in the more than 80% of the population who say that industrial pollution is the cause of environmental problems, and they are among the 70% of consumers that are swayed more by convenience than by environmental compatibility. The Grousers represent 35% of the population which rarely looks for green labelling on a product, and rationale inaction by claiming that all environmental claims are misleading. Seventy percent never graduate from high school, they have below average household incomes and are employed in blue collar positions. They are unwilling to pay higher prices for green products.

e. The Basic Browns (28%), the largest category, are characterized by a lack of any pro-environmental activity. They are thoroughly disenfranchised, do not believe that their consuming choices make a difference, stemming from the belief that individuals cannot have any impact on the environment. They are not willing to pay more or support governmental environmental regulations. They have the lowest average household income and lowest average educational level, the highest percentages of blue collar workers, and of men.

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"Environmental Behavior, North America: Canada, Mexico, United States," The Roper Organization, commissioned by S.C. Johnson & Son, 1992 (in Ottman, J. Green Marketing: Challenges and Opportunities for the New Marketing Age, NTC Business Books, Lincolnwood, IL, 1992.)

Survey Objectives:

- Demographic Profile of Most Environmentally Active U.S. Consumers.
- 1992 Update of five segments of population vis a vis "green"
- Activities that Different Segments Participate in Regularly to Protect the Environment
- Reasons why people say they are not doing more for the environment

Survey Questions and Findings

1992 Update of Green Categories (vs. 1990 above)

	1992	1990
True-Blue Greens	20%	11%
Greenback Greens	5%	11%
Sprouts	31%	26%
Grousers	9%	24%
Basic Browns	35%	28%

Summary of 1992 findings regarding five population segments.

True-Blue greens (summarized in table above)

Greenback greens: Are most willing to spend considerably more for green products -- a 15% price increase is acceptable to them for a representative sample of eight kinds of

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products. 52% are men. Median age is 35. They are the best educated (63% have some college). They are also more likely to be employed full time and to live on the West Coast.

Sprouts: They are relatively affluent and well-educated, and reflect a balance of middle America with sex, age, and urban/rural. splits close to the national norms.

Grousers: They have slightly below-average educations and incomes.

Basic Browns: They are half as likely as average American to recycle bottles or cans (25% vs. the 58% average), and only a fraction read product labels for their environmental information (3% vs. the 24% average). This group is disproportionately male, Southern, blue-collar, and economically downscale.

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The Environment: Public Attitudes and Individual Behavior, commissioned by S. C. Johnson, Inc., 1990 (in Ottman, J. Green Marketing: Challenges and Opportunities for the New Marketing Age, NTC Business Books, Lincolnwood, IL, 1992.)

Survey Objectives:

- Major sources of information on environmental issues (1990)
- How much can individuals do about solving environmental problems?

Some Survey Questions and Findings

Major sources of information on environmental issues	
TV News	75%
Newspapers	65
TV news magazine	61
Radio	39
Magazines	35
Environmental groups	32
Federal government	31
State and local government	27
Friends and other people	26
Local Schools	18
Your children	18
Local civic groups	14
Business in community	12
Large corporations	11

How Much Can Individuals Do About Solving Environmental Problems

	A lot	A little	Nothing
Litter	79%	17%	3%
Solid waste from disposal of garbage and trash	49%	37%	12%
Water pollution from disposal of waste by manufacturers	24%	40%	33%
Environmental contamination from chemical waste	23%	39%	34%

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"Findings on Environmental Issues", Decision Research, March, 1991, and Warwick, Baker, & Fiore Advertising, May, 1990 (in Ottman, J. Green Marketing: Challenges and Opportunities for the New Marketing Age, NTC Business Books, Lincolnwood, IL, 1992.)

Survey Objectives:

- Importance of Environmental Factors in the purchase decision
- How do consumers rate the contribution of different products and packaging to environmental ills

Some Survey Questions and Findings

The Importance of Environmental Factors in the Purchase Decision	
Non-polluting	77
Recyclable	75
Ozone safe	72
Pesticide free	69
Biodegradable	67
Non-aerosol	63
All natural	62
Environmentally friendly	62
Low fume	59
"Made from recycled content"	58

Ratings of Products and Packaging Contributing to Environmental Ills	
Aerosol sprays	70
Disposable diapers	69
Fast food Styrofoam packaging	67
Plastic 6-pack rings for soda/beer cans	64
Styrofoam cups	63
Plastic soda bottles	59
Plastic packaging	56
Plastic grocery bags	55
Fast food paper packaging	37
Aluminum foil	29

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"The Kaagen Environmental Monitor", 4th Quarter, 1990. (in Ottman, J.

Green Marketing: Challenges and Opportunities for the New Marketing Age,

NTC Business Books, Lincolnwood, IL, 1992.)

Survey Objectives:
How Societal groups rate on protecting the environment

Survey Questions and Findings

How Societal Groups Rate on Protecting the Environment				
	Excellent	Good	Fair	Poor
Environmental groups	14%	46%	30%	7%
Individual Americans	4	26	38	30
Local Government	3	25	44	25
State Government	3	22	45	27
Private Industry	3	17	34	44
Federal Government	2	16	40	39

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Environment U.S.A., The Angus Reid Group, 1991 (in Ottman, J. Green Marketing: Challenges and Opportunities for the New Marketing Age, NTC Business Books, Lincolnwood, IL, 1992.)

Survey Objectives:

- How high is the environment placed on the Public Agenda?
- Credibility of Environmental information sources

Survey Questions and Findings

Credibility of Environmental Information Sources		
	Believe Most of What they say	Believe Some of What they say
Environmental Groups	40%	39%
Public Television	25%	53%
Scientists/Professors	48%	28%
Newspapers	16%	59%
Network TV News	16%	56%
Your City/Town	16%	53%
Your County	12%	57%
EPA	20%	48%
State Government	11%	53%
Your Senator	11%	51%
Your Congressional Rep.	11%	50%
Your Governor	11%	50%
George Bush	15%	45%
Secretary of the Interior	10%	45%
Business/Industry	6%	31%

Environment's Placement on the Public Agenda

U.S. Adults Naming Each Issue as the most important facing U.S.	
The Economy	22%
Homelessness	18%
Education	16%
The Environment	15%
The Drug Problem	13%
International Issues	13%
Unemployment	12%

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New York Times/CBS News Poll, April 1990, (in Ottman, J. Green Marketing: Challenges and Opportunities for the New Marketing Age, NTC Business Books, Lincolnwood, IL, 1992.)

Survey Objectives:

U.S. Consumers' Concerns about Environmental Issues

Survey Questions and Findings

U.S. Consumers' Concerns about Environmental Issues

For the country as a whole, is pollution:	
A serious problem that is getting worse	84%
Not so serious	11%
Not much of a problem	3%
Don't know, no answer	2%
Compared to 20 years ago, is the air you breathe:	
Cleaner	6%
More polluted	75%
About the same	17%
Don't know, no answer	2%
Compared to 20 years ago, are U.S. lakes, rivers and streams:	
Cleaner	8%
More polluted	80%
About the same	10%
Don't know, no answer	3%
In 20 years, do you think the air and water will be:	
Cleaner	28%
More polluted	41%
About the same	23%
Don't know, no answer	7%

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"Greenwatch", No. 3, J. Walter Thompson, Spring/Summer 1991 (in Ottman, J. Green Marketing: Challenges and Opportunities for the New Marketing Age, NTC Business Books, Lincolnwood, IL, 1992.)

Survey Objectives:

Americans' understanding of environmental issues

Survey Questions and Findings

Americans' understanding of environmental issues

Understanding of environmental issues -- very good	20%
Not confident about the term, biodegradable	64%
Not confident about the term, recyclable	34%

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Ottman, J. Green Marketing: Challenges and Opportunities for the New Marketing Age, NTC Business Books, Lincolnwood, IL, 1992.

Survey Objectives:

Consumers' perception of the severity of environmental issues

Survey Questions and Findings

80% of consumers believe too much packaging is used

50% say they will reject products that appear overpackaged.

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Franklin Associates, Gerstman & Meters, (adjusted for 1991) as cited in Food & Beverage Marketing, Sept. 1990, p. 34, (in Ottman, J. Green Marketing: Challenges and Opportunities for the New Marketing Age, NTC Business Books, Lincolnwood, IL, 1992.)

Survey Objectives:

Consumer perceptions of plastic in the Solid Waste Stream

Survey Questions and Findings

Consumer Perceptions of Plastic in MSW Packaging

	Perception	Reality
Plastic	69%	13%
Paper	8%	48%
Glass	5%	25%
Steel/Tin plus Aluminum	6%	9%
Other	12%	5%

(Perception: What packaging materials consumers think contribute most to solid waste)

(Reality: What is the actual breakdown of packaging and solid waste)

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Consumer Solid Waste: Awareness, Attitude and Behavior Study III, Gerstman and Meyers, July, 1991 (in Ottman, J. Green Marketing: Challenges and Opportunities for the New Marketing Age, NTC Business Books, Lincolnwood, IL, 1992.)

Survey Objectives:
What are consumers currently doing about solid waste management?

Experimental Designs:

Three surveys, 1989 (292 respondents), 1990 (313 respondents), and 1991 (318 respondents)

Survey Questions and Findings

What Consumers are Currently Doing About Solid Waste Management			
	1989	1990	1991
	total	total	total
	(292)	(313)	(318)
Doing something	61%	78%	85%
Recycling	54%	70%	78%
Buy in recyclable containers	22%	36%	36%
Buy in recycled containers	9%	19%	23%
Use paper bags instead of plastic	11%	24%	22%
Buy in biodegradable containers	9%	18%	18%
Crush large items to take up less room	4%	11%	13%
Buy in large sizes	1%	7%	7%
Buy products with less/minimal pkg	2%	10%	11%
Composting	4%	9%	12%
Use refillable containers	--	9%	10%
Use fewer disposable items	--	17%	13%
Buy fewer products in individual sizes	NA	NA	
Not doing anything	39%	22%	15%

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INFOCUS, Princeton, NJ, as reported in *Newark Star-Ledger*, Jan. 8, 1992, (in Ottman, J. Green Marketing: Challenges and Opportunities for the New Marketing Age, NTC Business Books, Lincolnwood, IL, 1992.)

Survey Objectives:
How do children influence adult environmental purchasing habits?

Survey Questions and Findings

- >33% of parents have changed their shopping behavior because of what they learned about the environment from their children.

- 17% of all households with children have avoided a product they ordinarily would have purchased because of influence from a child

- 20% of parents report having purchased a product specifically because their children told them it was better for the environment.

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"Pay as You Throw" Final Report, for the Environmental and Conservation Services Department by NuStats, Inc., Austin, TX, June 1992.

Survey Objectives:

How can the City of Austin be responsive to public concerns, and determine the importance of its waste disposal strategies to the citizens.

Experimental Designs:

Distributed baseline and follow-up surveys in four representative neighborhoods, each one containing approximately 700 households. The random list of 200 households actually receiving the surveys were generated using a database provided by the DSWS. The objective was to complete at least 500 interviews. Telephone interviews were conducted except among non-telephone households. To ensure adequate representation of these households, 106 personal surveys were conducted. The baseline survey was conducted in June 1991 after the distribution of the Pay-as-you-throw program information and the recycling bin, but before delivery of the garbage cart and implementation of the variable rate. The follow-up survey was conducted in June, 1992. The follow-up survey was conducted entirely by telephone and the list was randomly generated with a target of 500 interviews distributed equally among the four neighborhoods. 521 interviews were completed.

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Kok, Gerjo and Sjef Siero, "Tin Recycling: Awareness, Comprehension, Attitude, Intention and Behavior", Journal of Economic Psychology, 6(1985) 1985, pp. 157-173.

Survey Objectives:

Which factors inhibit or facilitate participation in a tin-recycling program?

Experimental Designs:

Questionnaires were mailed to 1508 female inhabitants of a middle-sized town in the Netherlands equal to 10% of the population of that age group in the town. A total of 837 (56%) returned a completed questionnaire. Of these 837 respondents, 715 were willing to respond to a second questionnaire, and a total of 586 (39%) did actually respond. The first questionnaire divided respondents into three groups: (1) not aware of the existence of the program, (2) aware but not participating, and (3) participating. More specific information was elicited on the second questionnaire.

Survey Questions and Findings

The second questionnaires were different for each of the three groups (not aware, aware/not participating, participating). Questions were divided into 4 categories:

1. Awareness and comprehension: Did respondents know of a tin-recycling program, how did they become aware of it, and with which potential source of information they had been in contact. Did they feel themselves to be sufficiently acquainted with the

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purpose of tin recycling -- answers divided into 6 aspects (scale). Also, 3 questions about the respondents' knowledge of tin recycling were asked.

2. Attitude: Participating in the tin-recycling program was evaluated by means of three five-point scales: good-bad, desirable-undesirable, and acceptable-unacceptable (direct attitude). 12 possible consequences of participating were evaluated on a 7-point good-bad scale, with scores from +3 to -3 (evaluations). Respondents indicated on a 6-point scale the extent to which they considered the consequences to be likely to happen (beliefs), with scores from 5 (very likely) to 0 (very unlikely). Acceptance of responsibility was measured by means of 4 questions about the usefulness of individual pro-ecological behavior, with scores ranging from 5 (agree) to 1 (disagree).

3. Behavioral intention: Did respondents intend to participate in the program in the future (intention)? Indicate on a 5-point (probable-improbable) scale if other people whose opinion they valued wanted them to participate (direct social norm). For eight reference persons and institutions the subjective normative belief was measured on a 6-point 'probable-improbable' scale, and the motivation to comply on a 6-point scale ranging from much compliance to little compliance. Both variables have scores ranging from 6 to 1.

4. Behavior and behavior-maintenance: The respondents were asked if they had participated in the program (behavior) i.e. selecting tins from their own household garbage and bringing them to the container, and how many times (behavior-

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maintenance). They could indicate the strength of six difficulties in participating. In addition, the respondents were asked how they spent their time during the week (housekeeping, work, leisure).

5. Age, education, and income were assessed.

Results: 23.5% of respondents report participation as compared with 11% of the population, as determined on the basis of tin use and quantity of tins actually delivered. So participators are strongly overrepresented in the 'sample'.

Of those aware of the program, 356 registered a positive comprehension vs. 57 negative; 311 registered a positive attitude vs. 102 negative; 228 registered a positive intention vs. 185 negative; and 131 registered a positive behavior vs. 282 negative.

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De Young, Raymond "Some Psychological Aspects of Recycling: The Structure of Conservation Satisfactions", Environment and Behavior, Vol 18, no. 4, July, 1986, pp. 435-449.

Survey Objectives:

Assess satisfactions derived from recycling activities that the residents were already carrying out (i.e., activities less convenient and less visible than the curbside collection service) prior to the start of curbside collection.

Experimental Designs:

300 questionnaires were mailed to randomly selected, single-family homes, 100 in each of three areas with no follow-up. Of the surveys, 112 were returned, though 5 were incomplete. The 107 remaining constitute 35.7% return rate. The survey instrument included a two-page questionnaire and a postage-paid envelope. A short introduction to the survey was given at the top of the questionnaire and respondents were provided with a phone number to call if they had any questions.

Survey Questions and Findings

Demographics: Roughly half of Ann Arbor's 100,000 population is associated with the university, the residents have more formal education and more residential stability than the national average. 69% of respondents were women, 12% under 30 years old, 58% in 30's or 40s, 14% in 50's, 16% in 60s or older. Over 75% had a college degree; 23% ear less than 20K, 60% earn between 20-50K, and 17% ear over 50K. Over 45% have lived

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in Ann Arbor for more than 20 years. Average household size is 2.9 and 81% live in households where all are related.

Questionnaire focused on satisfactions and conservation behaviors. Most items used a 5-point rating scale. The 18 satisfaction items covered include those for which data was distilled. Categories were chosen based on clusters of items having alpha values of 0.60 or more and an average correlation among items of at least 0.40; all categories with eigenvalues of at least 1.0. Items chosen for each category had loadings of at least 0.40 and don't load above this level on any other category.

A conclusion of the study is that people relate satisfaction derived from frugal activities with recycling and reusing behavior, and that they receive satisfaction from many of these environmental pursuits. This suggests that people might carry out conservation behavior not for the promise of a tangible external reward, but for the personal satisfaction they derive from the activity.

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Vining, Joanne, and Angela Ebreo. "What Makes a Recycler? A Comparison of Recyclers and Nonrecyclers", Environment and Behavior, Vol 22, No. 1, January 1990, pp. 55-73.

Survey Objectives:

Tested the following hypotheses:

1. Recyclers would have more accurate knowledge about locally recyclable materials and recycling programs.
2. In a community where recycling is a voluntary activity with few monetary incentives and rewards, altruistic reasons would be rated more important by recyclers than by nonrecyclers.
3. Because there were few opportunities to receive payment for recycling, monetary incentives and rewards would not be an important reason for recycling, and the nonrecyclers would perceive monetary incentives and financial rewards for recycling as more important than recyclers would.
4. Recyclers would perceive social influence as a more important reason to recycle than nonrecyclers would.
5. Nonrecyclers would rate issues related to convenience as more important reasons for not recycling than recyclers would.
6. Recyclers would be younger, better educated, and of higher socioeconomic status than nonrecyclers.

Experimental Designs:

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500 households were chosen randomly from telephone directories for the communities of Champaign and Urbana. Each selected household received a mailing containing a cover letter, a questionnaire, and a postage-paid return envelope. They were mailed in May of 1986; two additional mail follow-up contacts were made as was necessary. Recyclers were defined as those respondents who indicated they had recycled some material within the past year. The total sample of respondents consisted of 87 nonrecyclers and 110 recyclers.

Survey Questions and Findings

The questionnaire was in several parts including the following: (1) knowledge of recycling issues, residents' (2) ratings of the importance of reasons for and against recycling, and (3) demographic characteristics.

Knowledge and awareness of recycling were tested using the following:
Identify the kind and number of sources of information on recycling that you remember. (Respondents checked whether they had heard about recycling in their area from any of several sources.

Source	Nonrecyclers	Recyclers
Newspapers	63.1%	71.7%
Radio	32.9%	55.2%
TV	27.1%	26.9%
Posters	35.3%	46.6%
Mailing	34.1%	41.3%
Friends	36.5%	59.4%
School	25.3%	18.6%
Work	33.3%	45.2%
Newsletters	15.3%	22.1%

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T-test indicated that recyclers reported that they had heard about recycling from more sources (M=3.68) than had nonrecyclers (M=2.94).

Recyclers were older (M=42) than nonrecyclers, and reported slightly higher income levels. No differences in gender, household size, occupation, or educational level. Highly educated respondents were more likely to receive information on recycling from newspapers, and less educated respondents from TV. Higher income respondents (above 30K) were more likely to receive information from newspapers, and lower and middle income respondents (below $14K) were more likely to have heard about recycling from school programs. Recyclers were familiar with more local programs and sources of information than nonrecyclers.

The hypothesis that recyclers would endorse altruistic environmental reasons for recycling more than nonrecyclers was not supported. There must be another reason why nonrecyclers did not remember the information. The self-selection nature of the respondents might be an explanation. Social influences on recycling behavior were not reported as important factors, but possibly because appearing to be influenced may have been viewed negatively, and underreported. The hypotheses that nonrecyclers would find convenience and monetary issues more important reasons for not recycling than would recyclers, were upheld. These are probably the reasons that nonrecyclers did not recycle.

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Foulke, Sally, "Environmental Supermarket Shopping -- Final Report", Cornell Cooperative Extension, Riverhead, NY

Survey Objectives:

To investigate consumer behavior in the selection of reduced packaging. Specifically, shoppers would

- increase their awareness and knowledge of waste reduction practices while shopping
- identify choices that produce less waste
- understand the principle of and begin to employ the concept of "precycling"
- identify barriers to selecting products with less packaging
- identify what items are recycled in their community
- share their new knowledge with others.

Experimental Designs:

Two hundred twenty-one randomly selected individuals in front of six preselected supermarkets in Suffolk County, NY were interviewed using a 27-item questionnaire during the summer of 1991. 50 families were recruited and given two hours of training on how to evaluate and select packaging that is friendlier to the environment. They kept diaries of purchases, documented by register tapes, over an eight-week period. A 40-item self-administered questionnaire was completed. Three individuals were trained to conduct face-to-face interviews outside of the supermarkets. One week before the

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interviews were to begin a flyer announcing the program and explaining that interviews would take place, appeared in the shopping bags of customers in the targeted stores. Posters were also used. At the end of the interview, respondents were given a recruitment brochure offering the opportunity to become an environmental shopper. Other methods to recruit the 50-family sample included an article in local papers, a notice in LILCO bulletin, and leaders of 4-H were contacted. The diaries were supplemented with register receipts for documentation. Focus groups were held with participants four weeks into the study. At the end of eight weeks participants returned the diaries. Those filling out diaries were called "environmental shoppers" and those interviewed outside the stores were "general shoppers". The environmental shoppers received a shopping bag with the project's logo and were encouraged to use the bag.

Survey Questions and Findings

- Environmental shoppers more frequently than general shoppers purchased a product or selected packaging because it could be recycled, was reusable as opposed to disposable, was made of recycled material or had less packaging.

- Environmental shoppers were more likely to obtain information about packaging by examining packaging in the store than general shoppers who relied on articles from newspapers and magazines as their major source of information.

- Females more than males use the print media to gain information about packaging.

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- Information about products or packaging provided in advertisements was viewed with skepticism by environmental shoppers.

- Price was the major barrier to purchasing products with reduced or minimal packaging.

- Except for partially prepared or convenience foods, environmental shoppers identified lack of choice as the major barrier to purchasing products in recyclable packaging. This barrier was one of the following choices: brand, time, price, effort, no program, and lack of information. Sample size ranged from 34-39.

- No choice was also given as the primary reason for not purchasing packaging made from recycled materials. However, for paper goods price was an equal consideration.

- Ninety-eight percent of both general and environmental shoppers reported that they recycle, but environmental shoppers tended to recycle a higher percentage in each item category than general shoppers, with one exception: "other paper".

- The environmental shoppers were provided a shopping bag with the project logo, and 66% of the environmental shoppers brought their own grocery bag to the store. Ninety percent of the general shoppers never brought their own grocery bags to the store even though some of the stores offered a 2-cent incentive.

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"Precycling -- Final Report", City of Boulder, Environmental Affairs

Survey Objectives:

Primary goal of the pilot program was to:

- increase consumer awareness about ways to minimize waste when shopping

Two secondary goals were to:

- reduce the quantity of waste material actually purchased
- measure the effectiveness of the campaign

Two further goals were to:

- demonstrate the workability of a precycle campaign and share this information with other interested communities
- provide information about how to develop a long-term precycle program

Experimental Designs:

In September, 1990 the City of Boulder launched the pilot 3-month project in 10 stores, designed to develop a broad-based, highly visible source reduction campaign, identify those program features which are most effective and could be most easily duplicated in other communities, and to serve as a model program for the Rocky Mountain EPA Region. The project developed a logo: "Precycle: Reach for a Change". The education included on-shelf labeling, using a distinctive pink color for all labels, in-store signs,

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employee buttons, precycle information booths offering precycle brochures, and featuring a low-waste "product of the week", letter-writing campaigns, product tallies, and consumer surveys.

The consumer surveys were "distributed" via a "Boxx", a specially designed portable computer, placed under a sign at the front of the grocery store, encouraging people to answer a sixty-second questionnaire. It is recognized that this does not provide a truly random sample, but it offered a direct and relatively inexpensive way to reach people at the grocery store. One set of surveys was run in the two weeks before the program kickoff and another at the end of the program. Each survey had 16 questions. The purpose of the surveys was to give some indication of consumers' awareness of packaging waste issues before and after the precycle campaign. (The product tallies included a list for each store of about 10 sets of matched products -- high-waste and low-waste. They included such things as four-ounce yogurt containers vs. 8, 16, and 32 oz containers; ketchup in plastic vs. glass containers; and aseptic juice packs vs. large glass bottles of juice. Products were matched as closely as possible, using the same brand, close proximity to each other, and the same purpose/usage where possible -- although clearly many smaller packages serve a purpose of convenience that larger packages do not. Product tallies continued for one month after the 3-month pilot in-store educational program).

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Survey Questions and Findings

The preprogram surveys were set up to gauge the general level of awareness of environmental and recycling issues, and the post-program surveys repeated some of the same questions as well as asking more specifically about the precycle program.

Eighty-four percent of respondents said they were familiar with the program and 74% said it had helped them reduce packaging waste.

To test these assertions, multiple choice questions asked specifics about what precycling involved. Fifty-four percent of the total respondents said they were familiar with the program and were able to answer the multiple-choice questions correctly.

When asked to identify the color of the precycle tags, only 16% of the respondents correctly identified them as pink. Most guessed they were green.

The computer surveys also showed a slight (1-2%) increase in awareness in all the general environmental questions from the preprogram to postprogram surveys.

To double-check the results of the computer survey, an exit poll was conducted of 100 shoppers at each participating store during the last week of the program. Shoppers were asked only 2 questions: "Have you heard about the precycle program? and "What stands out in your mind about it?" Half the respondents said they had heard of the program, and a third were able to name a key element of precycling. This was viewed to fit with the

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computer survey results, since the latter posed multiple choice questions and permitted guessing.

Store ownership and involvement of the managers appeared to play an important role. Of five large chain stores in the program, four were clustered around 41% and one was at 47%. The highest recognition level 75% was recorded at the store where the program kickoff was held. It is speculated that having this event at their store gave the employees a strong sense of program ownership.

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De Young, Raymond, et. al., "Individual Source Reduction Behavior: A Study of the Effect of Environmental and Economic Motivational Information", Masters Project, University of Michigan School of Natural Resources, June 21, 1991.

Survey Objectives:

The SORED project sought to (1) evaluate the effectiveness of using environmental, economic, and combined rationales for enhancing source reduction behavior; (2) evaluate the role of other factors believed to influence this behavior, including: attitudes, motivation, barriers, and procedural knowledge; and (3) develop a technique for measuring source reduction behavior.

Experimental Designs:

The study took place over a period of 13 weeks from September through December, 1990. A total of 178 shoppers were recruited from a Chelsea, Michigan grocery store. All who agreed to participate were randomly assigned to one of four groups: (1) a group receiving an environmental rationale; (2) a group receiving an economic rationale; (3) a group receiving combined environmental and economic rationales; and (4) a control group, receiving neither rationale. All participants agreed to save their grocery store receipts for the duration of the study. After a 3-week baseline period, the first three groups all received a similar looking pamphlet. Each of these pamphlets contained an identical definition of source reduction, and identical "how to" information on carrying out simple source reduction activities through shopping or at home. However, the

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pamphlet for the environmental group justified source reduction as an activity to help protect the environment, while the economic group pamphlet justified source reduction as a way to save money. The combined group received both justifications. Weekly reminder postcards were sent to every participant. All groups except the control group received source reduction tips on the postcards during the 10-week "treatment" period. Data were gathered in two forms: direct shopping data from grocery store receipts, and survey data from three separate surveys. 510 chose not to participate.

Some Survey Questions and Findings

Questions comprising the overall behavior change variable: (1=no change; 5=great change) (overall behavior change: Grand Mean 2.62, Std Dev. 1.11)

- "How much *change* has occurred in your shopping and household habits due to your participation in the study?" Options: Save reusable containers, use more returnable bottles, reduce plastic wrap use, reuse aluminum foil, buy more durables, buy fewer aerosols, not buy over-packaged goods, use fewer paper towels, buy items packaged in reusable containers, buy fewer disposables, buy fewer toxics buy in bulk, reduce toxic cleaner use, use non-toxic cleaner use, use non-toxic pesticides, and use vinegar and baking soda for cleaning.

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De Young, Raymond. "Recycling as appropriate behavior: a review of survey data from selected recycling education programs in Michigan", Resources, Conservation and Recycling, 3 (1990) pp 253-266.

Survey Objectives:

Assess the degree to which several recycling education programs in Michigan are meeting the goals of increasing society's knowledge about reduction and recycling behaviors, developing positive attitudes about such behavior, and encouraging non-participating households to begin and participating households to increase their behavior.

Experimental Designs:

- Barry County: Telephone survey, sample size=95, community population = 46,300, surveyed at end of educational program only.
- Huntington Woods: Mail survey, sample = 286, population= 6700, end of program only.
- Jackson County: Telephone survey, sample = 86, population = 151,000, end of program only.
- Monroe County: Mail survey, sample = 36, population = 142,000, end of program only.
- Northern Michigan Recycling Coop: Mail survey, sample = 20 local officials, 37 recycling hotline callers -- neither sample random, population = 410,000, end of program only.
- Portage: Telephone survey, baseline sample=259, followup sample = 323, population 40,200.
- Publishers Paper Company Study -- 1984

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- Metropolitan areas (Portland, Seattle, SF, Denver, Salt Lake City, Vancouver): Telephone survey, sample = 1500 (250 from each city)
- Rural Oregon: Telephone survey, sample = 250

Some Survey Questions and Findings

- To assess respondents' attitudes towards recycling: How important is recycling to the preservation of the environment and conservation of natural resources? Also,... Please indicate how important you feel recycling is as a component of solid waste management. A five-point Likert response scale ranging from "not important" to "very important" plus a "don't know" response option was used.

  Result: 85% thought recycling extremely important to the preservation of the natural environment (chose 4 or 5 on scale). Mean score ranged from 4.22 to 4.65. In Portage baseline mean was 4.40 and followup was 4.21. This slight decline is explained by the very positive attitude to begin with (no room for improvement).

- To assess some of the motives for recycling: "Below are several reasons why people might recycle materials. Please indicate on a five-point scale the degree to which they apply to you." The scale had the lower tag of "not at all" and the upper tag of "very great deal" plus a "don't know" option. This stem question was followed by the following specific items which the respondents were asked to rate. The group of public officials were asked whether they thought the public would be motivated by these reasons.

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Result:	Mean
(1) "I recycle to help conserve natural resources",	3.88-4.41
(2) "I recycle to help support charity",	3.56-4.38
(3) "I recycle to earn money"	1.96-3.56
(4) "I recycle because it seems like the right thing to do"	3.47-4.32

Overall conclusions: The public holds a strong pro-recycling attitude, intends to increase their level of recycling behavior in the future, and is greatly influenced by non-monetary motives.

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"Trends 91: Consumer Attitudes and the Supermarket 1991", by Opinion Research Corporation, for Food Marketing Institute, Washington, DC, 1991.

Survey Objectives:

To identify the changing needs and priorities of the American supermarket shopper. (Questions and findings refer only to the portion on environmental issues.)

Experimental Designs:

Telephone interviews with a representative, nationwide, sample of 1,004 male and female supermarket shoppers were conducted in January, 1991. 74% of respondents were female; 26% were male.

Survey Questions and Findings

For the first time in the 20-year history of this survey, shoppers were asked about environmental issues, including participation in recycling programs, the role of recycled packaging in buying decisions, the likelihood of switching to a supermarket that encourages environmentally safe products and services, and whom shoppers believe should be responsible for ensuring that products are environmentally safe and friendly. Price is growing more important to shoppers; the importance of price to shoppers grew from 66 to 71% from 1990 to 1991.

It is interesting to note that the availability of unpackaged or bulk foods has declined according to 51%, and in answer to the question "How often do you use or purchase unpackaged or bulk food?", shoppers said "frequently" 21%, "occasionally" 39%,

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"rarely" 19%, and "never" 21%. In answer to the question "If your supermarket carried or had unpackaged or bulk food how often do you think you would use or purchase it?", the shoppers said "frequently" 12%, "occasionally" 29%, "rarely" 19%, and "never" 38%, indicating a definite disinterest in unpackaged and bulk foods.

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"The Green Shopping Revolution: How Solid Waste Issues are Affecting Consumer Behavior 1990", for Food Marketing Institute and Better Homes and Gardens Magazine by Marketing Research Services, Inc., Washington, DC 1990

Survey Objectives:

To address the expectations of the consumer, as they pertain to supermarkets and food packaging.

Experimental Designs:

750 completed telephone interviews and an additional 391 mall intercept interviews. Data were collected between November 14 and 18, 1989. Respondents were selected for the study by means of a national probability sample of telephone households in the continental US. The mall intercept survey was used to determine consumer preferences for various packaging alternatives and a ranking of effective ways to manage garbage. The mall surveys were done in Cincinnati, Des Moines, and Fredericksburg, VA in early January, 1990. For the sample of 750 interviews, the sampling variation is estimated to be +/- 4% at the 95% confidence level, or better.

Some Survey Questions and Findings

- Questions are grouped into two main categories:
- Respondents' attitudes towards waste disposal
- Respondents' practices in waste disposal

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Erickson, G., "Consumers Get Tough With Packaging", Packaging, June, 1988 in "Promoting Source Reduction and Recyclability in the Marketplace".

Survey Objectives:

Consumer attitudes towards packaging.

Experimental Designs:

1988 nationwide survey of 756 consumers who were asked 44 questions concerning packaging. One section dealt with recyclability of packaging.

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Erickson, Greg, "Will American Settle for Less Packaging?", Packaging, April, 1992, pp 42-44.

Survey Objectives:

Do Americans really want a lot less packaging? Will they vote with their pocketbook against unrestrained packaging "redundancy"?

Experimental Designs:

Mailed surveys to 1,000 consumers nationwide, demographically accurate sample group, 750 respondents, 3 dozen questions, conducted January, 1992. Conducted by National Family Opinion.

Survey Findings

For only the second time since 1986, package recyclability as a factor in product purchase decisions hit a plateau this year. Reasons: "Perhaps it's the prevalence of recycling: Consumers may have begun to think of everything as recyclable, so a search for recyclable containers is not necessary. Perhaps it was the recession, a time when consumers were more worried about being able to afford a product purchase than the trash that might result. The never-ending quest for top convenience may be significant too. To make recycling work, a consumer has to stay abreast of local government recycling requirements, examine specific packages with an eye toward their relative

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recyclability... and then go to the trouble of actually recycling them. This is not convenient"

Willingness to buy concentrated products, specifically as a strategy for minimizing waste jumped 11% 1991-1992. "The consumer may be buying concentrates because they are easy to carry, take up little space in the laundry room or cost less than competitive formulations. But the decision to buy concentrates has some bearing on the "overpackaging" issue also: All other things being equal, the more concentrated a product, the smaller and more responsible-looking its package".

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Spaulding, Mark, "Consumers Vote for Value", PACKAGING, June, 1992, pp. 30-34.

Survey Objectives:

How important are tamper-evidence and labeling in the purchase of packaging?

Experimental Designs:

Mailed surveys to 1,000 consumers nationwide, demographically accurate sample group, 750 respondents, 3 dozen questions, conducted January, 1992. Conducted by National Family Opinion.

Survey Questions and Findings

The move toward value shows itself most clearly in three areas: demands for more informative labeling, strong preferences for tried-and-true pharmaceutical packaging and a mandate for greater use of tamper-evident devices for both foods and OTC drugs.

- Of all those surveyed, young parents are the group which relies the least on food-label information. Retired older consumers place the greatest reliance on such information.

- Consumers are slightly less demanding of convenience features this year than previously.

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Modern Brewery Age, "Gallup poll shows Americans buy recyclable containers", July 4, 1988, p. 4.

Survey Objectives:

Behaviors regarding recyclable packaging.

Experimental Designs:

Conducted by Gallup for Glass Packaging Institute.

Survey Questions and Findings

50% of Americans said they would change their purchasing habits to buy foods and beverages solid in containers that are or can be recycled.

60% of Americans with incomes over $40,000 said that they would switch to a product in a recyclable container. No mention was made of price considerations.

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National Solid Wastes Management Association, "Public Attitudes Toward Garbage Disposal", 1988a.

Survey Objectives:

Attitudes towards garbage disposal

Experimental Designs:

Three surveys conducted by Cambridge Reports in 1988. These included a telephone poll of 1500 adults in February, telephone interviews with 500 "opinion leaders" in March, and face-to-face interviews with 1500 adults in July and August.

Some Survey Questions and Findings

Rank the importance of issues facing local officials. February and March polls: solid waste disposal was third behind improving education and providing affordable housing. July & August: solid waste disposal was second after education. In the northeast, solid waste disposal was ranked first.

- "What percentage of waste can be recycled?": median response: 44%.
- "How should recycling programs be paid for?",

Answer: taxes on packaging and nonrecyclable materials -- February: 24% of respondents, July/August: 41%.

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Public Response Associates, Inc., A Report of a Survey Conducted for: The California State Solid Waste Management Board, July, 1981.

Survey Objectives:

To test the effectiveness of a grocery store environmental shopping campaign

Experimental Designs:

600 customer interviews were conducted; 400 from two Von's stores participating in the program and 200 from a control store.

Some Survey Questions and Findings

- Where did customers obtain information about the environmental shopping campaign? In-store signs (38%), newspapers (35%), radio and TV spots (35%), grocery bag stuffers (16%).

- Recognized the recycle symbol: Program stores (49%), and Control stores (32%)

- Of those who had seen the recycle symbol before, how many understood its meaning? Program stores (87%), Control stores (77%).

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Appendix FA

Factor analysis

Knowledge Factors

Factor 1, ENVSHKNO, is associated with variables on which loadings over .5 deal with environmental shopping knowledge (e.g., the main question regarding environmental shopping knowledge HRDENVSP and most of the variables dealing with the source of environmental shopping knowldge (ie., those ending in SHOP or SHP) are over .5, and the loadings for all of the latter variables are higher than for the same variables relating to source of recycling knowledge in every case.

Factor 2, RECYCKNO, is clearly associated with correct answers to the questions asking about which materials are collected by the City for recycling. All the correct answers are over .5 and the one incorrect item, plastic bags, is near 0. All other variables are also much lower.

Attitude Factors

Factor 1, called "ENVIRATT", accounts for considerably more than Factor 2, and is also associated with the unarguably environmental attitude variables, with one glaring exception. Variables with loadings above 0.60 include: CHNGSTOR, PRESVENV, REDUCPKG, INFRING2, NATRESRC, and LANDFILL.

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Factor 2, called "NOTFAULT", loads at least 0.40 on TWOCENT, FIVECENT, GOVSOLVE, PRFDISP2, AND NOTDURAB. (Factor is externally-related including external incentives to behave environmentally (first two variables), external resolution of the problem (GOVSOLVE), external cause of the problem (PRFDISP2, which indicates lack of preference for using disposables, and NOTDURAB, products aren't made durably anymore -- indicating fault of the manufacturing industry.)

Factor 3, "MYWANTS", includes variables associated with external economic incentives to behave environmentally, or are non-environmental values, loading at least 0.40 on COST, 2CENT, 5 CENT, BRANDNAM, AND CONVENCE.

Behavior Factors

Factor 1, RECYCBEH, has three variables loading above .70, a rather high figure. These three, RECYCPKG, RECYCANS, and RECYMAGS, all are recycling-related. The next variable, scoring over .55, is DEPOSIT, which is also recycling related. All these behaviors imply a less sophisticated behavior pattern with respect to environmental shopping, since recycling has been a household environmental word for some time.

Factor 2, SOFISBEH, has two variables loading over .55: SINGLSV2 (not buying single serving packaging) and DISPRODS2 (not buying disposable products), both of which involve a person having a more sophisticated view of environmental shopping.

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Discussion

Using BEHAVIOR as a dependent variable, and KNOWLEDGE and ATTITUDE as independent variables, the goodness of fit of the regression equation is 0.32 (the value for R-square). This does not show tremendously good fit, but it could be worse. The significance test on R-square, the F test which shows an F value of 85.79, shows high statistical significance for the R-square value. The actual and standardized regression coefficients (b and beta values) show that attitude has about three times as much effect on behavior as knowledge does. The variability in the slopes for ATTITUDE and KNOWLEDG show greater certainty of the parameter estimate for ATTITUDE than for KNOWLEDG, since the standard error for KNOWLEDG is about two and a half times that for ATTITUDE. So not only does attitude affect behavior much more than knowledge, but there is greater certainty that this is so.

Explanation of significance: Since recycling violations go to building owners and not tenants, and since most respondents are tenants, there can be a disconnect between having received recycling knowledge from the City and implementing it. On the other hand, there are a number of people who do know a lot about recycling and environmental shopping because they care about the environment; these people would have recycling behaviors. This accounts for the variability in the slope for KNOWLEDG. With this variability in this slope, there is a high degree of uncertainty as evidenced by the results of the T test, in which Prob T is .12. With respect to ATTITUDE's contribution to BEHAVIOR, it is expected that once people have developed an attitude positively oriented towards the environment, the chances they would exhibit environmental

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behaviors would increase. This explains the much greater impact of ATTITUDE on BEHAVIOR as well as the reduced variability of ATTITUDE's slope. The significance of the slope is also great (with Prob T=.00001).

The goodness of fit of the regression equation for this factor variable run shows a 30% higher goodness of fit as compared with the composite variables analysis using ATTITUDE, KNOWLEDG, and BEHAVIOR. The F test for this analysis (73.4), is also significant, but not quite as high as for the previous analysis.

The actual and standardized regression coefficients (b and beta values) show that ENVIRATT has about the same effect on RECYCBEH as ATTITUDE did on BEHAVIOR, above. This is probably at least partly explained by the fact that ENVIRATT was such a good explanatory factor for many of the variables making it up. The standard error and the significance test (T) were also about the same for ENVIRATT. However, as contrasted with the earlier analysis, the new variable, RECYCKNO seems to have little if any effect on RECYCBEH, as evidenced by the regression coefficient for this variable being near zero. Though the standard error for this slope is about that same as for ENVIRATT, signifying that there is similar variability in the estimated slope, the significance T test showed that there is little confidence in the slope. Though it might have been expected that recycling knowledge would have an impact on recycling behavior, the discussion above, regarding the disconnect between the Sanitation Department's wide dissemination of knowledge, but restricted enforcement (to

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landlords), may explain why any cause and effect relationship between these two variables is difficult to demonstrate.

Using composite variables BEHAVIOR as the dependent variable and ATTITUDE and KNOWLEDG as continuous independent variables, SEX2 as a dummy variable, and the interaction variables, stepwise regression results show that the overwhelmingly significant variable is ATTITUDE, as shown by an R^2 of .325 and the huge F number (over 150).

Using factor analysis-generated variables, RECYCBEH as the dependent variable, and ENVIRATT, RECYCKNO, and ENVSHKNO as continuous independent variables, with SEX2 as the dummy variable, and INTER1 (ENVIRATT*SEX2), INTER2 (RECYCKNO*SEX2), and INTER3 (ENVSHKNO*SEX2) as interaction variables, the stepwise regression results show that ENVIRATT accounts for the vast majority of the independent variables' contribution to the model, with a R^2 of .417 and it is highly significant, with an F number of 142.

The results show that the total (=direct) impact of ATTITUDE on BEHAVIOR (.623) is greater than the total (=direct plus indirect) impacts of KNOWLEDG on BEHAVIOR combined (.507). (BEHAVIOR is the dependent variable)

The results also show that most of the total impact on RECYCBEH or recycling behavior comes from ENVIRATT, at 63%, and the next greatest impact comes from

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ENVSHKNO, or the effect of environmental shopping knowledge, at 21%. Oddly enough, it appears that RECYCKNO, or recycling knowledge, has a slightly negative contribution to the model at -3.5%. (RECYCBEH is the dependent variable)

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Appendix G

Evaluation and Selection of Educational Foci

Within the realms of waste prevention and recycling there are a number of foci for the educational campaign. For example, the shoppers could be informed and motivated to buy products in recyclable packaging, bulk packaging, and fewer disposable goods. If the educational materials attempt to educate consumers on too many new behaviors at one time, it is likely to be counter-productive, so the list should be limited.

One basis on which to narrow the list is the degree to which the results of implementing this program on a larger scale, would have the potential for significant, tangible environmental benefits as a result of consumers adopting the desired behavior. Another basis is consumers' previous familiarity and/or participation in related behaviors. Finally, requirements imposed by Red Apple and the Environmental Action Coalition influenced the focus of the educational programs.

Evaluating recyclable packaging as a target focus:

As one means of determining whether it makes sense to select the purchase of recyclable packaging as an educational target for this project, it is necessary to know whether, if successfully implemented, an educational program to increase the purchase of recycled packaging has the potential to divert a significant quantity of recyclable material. For example, with orange juice, if the environmental shopping education drove people from orange juice in paper to orange juice in glass. Measuring an increase or decrease in soda,

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for example, is pointless, since there is no choice, since all soda is packaged in recyclable packaging, and increases or decreases in that commodity could be affected by factors such as the economy. [149]

To approximate the quantity of recyclable/nonrecyclable (R/N) pairs in a real grocery store, an informal survey of (R/N) pairs was conducted at the Associated supermarket at Dyckman St and Broadway, in Manhattan. (See survey in Appendix A.) Based on this information, and the definition of recycled packaging at the time of the study, as established by the NYCDOS, a vast majority of commodities in the supermarket are packaged either entirely in nonrecyclable packaging (e.g., everything in the meat and deli cases, chips, cereals, cookies, pastas, frozen foods, produce) or entirely in recyclable packaging (e.g., sodas, sauces, canned vegetables). This agrees with one of the major findings of the environmental shopping study recently completed by Cornell Cooperative Extension in Suffolk County, New York [150]: that environmental shoppers identified lack of choice as the major barrier to purchasing products in recyclable packaging.

The survey showed that the number of product categories for which there is a choice in packaging, or R/N pairs, is 31. In these 31 product categories there are roughly 110 products sold in nonrecyclable packaging. In a subsequent visit to the store, one of the store managers, Israel Rivera, estimated that there are six to seven thousand products sold in his store. Using these figures, only between 1 - 2% of the items in the store would be

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149 Notes from Meeting 1/9/92 with Dr. Chaim Mannheim, Rutgers Plastics and Packaging Institute

150. Foulke, Sally. "Environmental Supermarket Shopping -- Final Report", Cornell Cooperative Extension, Suffolk County, NY. June, 1992.

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targeted for substitution, and would not account for a large amount of packaging diverted from disposal.

Even if consumers were successfully educated to switch to recyclable packaging in those cases where it is possible, it is not likely that 100% of the recyclable packaging purchased would actually be recycled. In fact, the average capture rate in New York City is 40%, [151] meaning that 60% of recyclables end up in the landfill. With this in mind, changing consumer purchasing behavior to buy more recyclable packaging could have adverse impacts on the landfill in certain cases. For example, though detergent is sold in large HDPE bottles and in paperboard (not recyclable at the time of the study), the bottles take up much more room in a landfill, due to their actual volume as well as the entrapped air volume, and the fact that plastic doesn't degrade. By contrast, the cardboard boxes flatten, disintegrate into pore spaces, and ultimately, degrade.

The indicator of potential benefits of educating consumers to purchase recyclable packaging would be the quantity or volume of non-recyclable packaging avoided due to consumer purchase of recyclable packaging, minus the volume of recyclable packaging which is not actually delivered to a recycling program. This is necessary since an educational program that stimulated customers to purchase a commodity packaged in glass over the same commodity packaged in plastic or metal would not produce meaningful results. Only if a consumer switched from a commodity packaged in a nonrecyclable package to one in a recyclable package would there be a positive result.

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[151] Cipollina, Larry, "Residential Recycling Diversion Report for April, 1998", NYCDOS Memorandum. July 24, 1998.

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Thus, non-recyclable or recyclable packaging purchased where no choice was available (e.g., purchase of soda in recyclable cans or bottles), would not count towards the environmental benefit engendered by such an educational program.

In addition to the recyclables / nonrecyclables pairs survey mentioned above, the manager at this Associated store estimated the average weekly volume of business for a number of items (see Table 1, below). Based on this rough survey, paper towels stand out as a category worth further exploration because of the large number of packages sold per week. Also, 20,000 bags/week is certainly a large number of bags that could be reduced by use of reusable bags. Though diapers may appear to be a small category, each package is quite large, as indicated by the small number of packages per case, and New York City disposal figures do indicate that diapers constitute over 3% of residential waste disposal tonnage figures.[152] Thus, it appears that, from the point-of-view of waste prevention (i.e., minimizing the environmental costs of production and solid waste management), the optimal targets for an environmental education program in supermarkets would be those which maximize source reduction and reuse, first by reducing disposable products, and second by reducing packaging.

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152 "Wasteplan Generation Report for New York City Wastestreams", Tellus Institute, Inc., for NYC Department of Sanitation, 1/7/91

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Table I Estimated average weekly volume for selected commodities, Associated Supermarket, Upper Manhattan

Item	Cases per week	Avg. # pkgs/ case	Estimated # pkgs/week
Disposables			
Paper towels	40-50	12-30; avg 24	1080
Disposable diapers	10-12	4	45
Grocery bags	20	1000	20,000
Consumed items			
Frozen food	50	12	600
Laundry boxes	8-10	20	180
Laundry bottles	25	6	150
Tomato sauce	10	48	480
Juice	20-25	6-24; avg 12	270
Chips	40	12	480

Based on this information and the definition of recyclable packaging as of 1993, as established by the New York City Department of Sanitation (DOS), it was clear that only a very small number of products (1-2%) are packaged in such a way as to give consumers a choice in packaging. A vast majority of commodities in the supermarket are packaged either entirely in non-recyclable packaging (e.g., everything in the meat and deli cases, chips, cereals, cookies, pastas, frozen foods, produce) or entirely in recyclable packaging (e.g., sodas, sauces, canned vegetables). This agrees with one of the major findings of the environmental shopping study recently completed by Cornell Cooperative Extension in Suffolk County, New York [153]: that environmental shoppers identified lack of choice as a major barrier to purchasing products in recyclable packaging. Appendix A shows those product categories in which there is a choice. Many of the choices identified are between resins of plastic. However, because the DOS considers any bottle to be

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recyclable (even if made of PVC, which when mixed with other more recycled resins, contaminates them, making them unrecyclable) many of the categories listed has having a choice effectively dissolve into lack of choice.

A different angle proposed by Chaim Mannheim was to keep track of 5 cent deposit beverage containers. The store knows how many nickels it charges and how many containers come back. The questionnaire could ask how many purchases were made in this store generally, to help judge how many containers coming back might be from the store or from another store (or were picked up in the street). However, the recyclable/nonrecyclable pairs "choice" segment outlined above seems to have a tighter instrument of measurement, so this option was excluded from further consideration.

But there are other factors that should be considered in evaluating recyclable packaging as a focus for the educational program. First, because recycling is well known generally, it is a more familiar environmental behavior to the average person in New York City than waste prevention purchasing. Additionally, the City's basic curbside recycling program was in the process of expanding citywide for several materials typically sold as packaging in supermarkets (i.e., metal and glass containers, aluminum foil, and plastic bottles and jugs). In 1993 Department of Sanitation was collecting glass and metal containers, aluminum foil and foil containers, and plastic bottles and jugs in Manhattan, the Bronx, and Staten Island, as well as parts of Queens and Brooklyn. While the program was expanding to all boroughs, the NYC Dept. of Sanitation conducted a public

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[153] Foulke, Sally. "Environmental Supermarket Shopping -- Final Report", Cornell Cooperative Extension, Suffolk County, NY. June, 1992.

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education campaign to increase public awareness of recycling. The potential for this study to utilize, indirectly, the DOS' public educational efforts to determine if a greater exposure of residents to education about the virtues of recycling, thereby increasing their purchase (and hopefully their separation) of recyclable packaging, was considered to be an advantage. Also the selection of recyclable packaging or any of the waste-prevention targets, such as reduced packaging and the substitution of reusable products for disposable ones, are all worthwhile in fulfilling the purpose of determining successful methods of motivating consumer behavior.

In addition to the fact that recycling is a familiar behavior (more, at least, than other aspects of environmental shopping, studies have shown that it is the idealistic or intrinsic motivations (e.g., satisfaction from such frugal conservation activities as recycling and reuse) which more frequently induce people to perform conservationist behaviors and maintain them over longer periods of time[154],[155],[156].) Thus, encouraging purchase of products in recyclable packaging appeals both to a familiar behavior and to one that is intrinsically motivated.

Perhaps the most important consideration in evaluating recycling as an educational focus is that the Environmental Action Coalition, as the fiscal conduit for the EPA funding for

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[154] De Young, Raymond. "Some Psychological Aspects of Recycling: The Structure of Conservation Satisfactions" Environment and Behavior, Vol. 18, No. 4, July, 1986, pp. 435-449.

[155] De Young, R. "Encouraging environmentally appropriate behavior: the role of intrinsic motivation", Journal of Environmental Systems, 1985-6, Vol. 15, pp. 281-292.

[156] Israel, Lena, "Reasoning Out Recycling Reluctance", Waste Age, March 1991, pp. 226-230.

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this project, established a few specific, substantive requirements for the project design. Foremost, EAC insisted that one of the educational foci must be recyclable packaging. Since it had been decided that the number of foci should be limited so that shoppers would not be muddled by too many, this choice of focus necessitated exclusion of other worthy prevention-related alternatives (e.g., buying in bulk, buying less toxic products).

Evaluating prevention alternatives as target foci:

Once it was decided that waste prevention should be one focus of the environmental shopping education, a further narrowing of focus was necessary. Buying fewer products containing toxics, buying fewer disposables in favor of reusable products, buying in bulk, more refills and concentrates to minimize packaging were all possibilities. One important criterion for choosing a target focus was measurability. The ability to select a single product pair (e.g., reusable / disposable diapers; reusable / disposable bags, bulk packaging vs. single-serving) makes measurement of project impact possible. Another criterion for selection was the impact of the item on the waste stream.

Amongst these possibilities, those that reduce or reuse packaging would have less of a positive impact on the waste stream as compared with substitution of disposable products with reusable ones. For example, if the target focus of the educational program were the reduction of the purchase of disposable diapers (to be replaced with reusable diapers), the volume of the diaper package as well as the disposable diapers themselves would be counted towards the potential for avoided solid waste management since both the package and contents are disposed. Likewise, fewer natural resources are consumed in

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the production of the small amount of reusable products that would serve the same purpose as the greater number of disposable products.

Diapers

Though diapers appeared to be a small category (45 pkgs/week – see Table I), the volume of waste represented by each package is quite large, and New York City disposal figures do indicate that diapers constitute over 3% of residential waste disposal tonnage figures, or almost 400 tons per day.[157] Other rationales for choosing diapers as a focus include that diapers deplete natural resources (petroleum, wood), diapers introduce possibly deleterious microbes into the landfill, and making reusable diapers available to supermarket shoppers would provide the consumer a clear choice. One advantage to consumers of changing to reusable diapers is the increased convenience of many fewer trips to the grocery store to buy diapers, as well as easier handling of the groceries without the bulky diaper packages. This advantage of convenience should be especially large for New Yorkers, almost all of whom do not use a car when grocery shopping, and do not own washers and dryers.

But there are logistical and practical issues to be addressed in order to test a hypothesis that consumers might choose reusable diapers over disposables. Three methods of providing reusable diapers in a grocery store are possible:

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157. "Wasteplan Generation Report for New York City Wastestreams", Tellus Institute, Inc., for NYC Department of Sanitation, 1/7/91

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- Stocking cloth diapers and outer garments, pails and other associated equipment. A major drawback of this method is the perceived lack of convenience -- especially in New York City, where most families do not have easy access to laundry facilities. The benefit of this option is reduced cost.

- Stocking cloth diapers provided by and linked to subsequent use of a diaper service. This option eliminates the major drawback of having to wash the diapers, and is purported to be no more expensive than buying disposables. Specifically, the first week's worth of diapers in the service (or some other logical quantity) could be bundled with the application form for starting the diaper service and either a coupon or another form of proof of purchase (e.g., numbered forms) could be used to get the service started. The display would have descriptive and attractive signs and brochures containing information on the environmental benefits, as well as the conveniences (as noted above), of switching to reusables. In order for this to work, the diaper service association, to which the application forms would be sent, would have to ensure that diaper services are actually available in every location.

- A variation on the previous idea is making available offers of diaper service with information about the comparison of reusables to disposables. This option would be more acceptable by stores, since almost no shelf space would need to be reallocated. It also is more convenient from the consumer side, since the consumer would not have to bring home even the first load of cloth diapers from the store.

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Knowing that stores are typically not eager to change what is stocked on their shelves willy-nilly, a successful strategy to encourage them to stock cloth diapers would have to be economically attractive. One means of doing this would be for the diaper service association to pay the stores a fee (monthly basis or similar) based on the amount of shelf area used. Another would be to give the store a commission on the quantity of reusable diapers sold; this would have the added impetus of encouraging greater sales. The amount of fee or commission could be based on the amount of profits sacrificed by the store by not carrying disposables.

Bags

Reusable bags were considered as an educational focus because this is seen as a symbol of the environmental shopper, and because, based on the survey shown in Table I, the number of disposable bags given away is about 20,000/week. Also, the majority of purchases in Manhattan supermarkets take place on weekdays on shoppers' treks home from work (according to store managers at Gristede's. Another factor that influenced the decision to have this as a focus was an initial agreement by Red Apple that it would supply some leftover heavy-duty canvas bags, which it had used in earlier promotional efforts, for sale to shoppers as an alternative to plastic and paper disposable grocery bags. However, as the time approached for the start of the educational campaign, and it was infeasible to develop an alternative project design, it was learned that none of the heavy-duty bags were left over, so a new design was devised.

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The project's goal was not only to monitor the number of bags shoppers would buy, but also any changes in the number of disposables given away. Thus, it seemed logical to dispense with the idea of a heavy-duty canvas bag, since New Yorkers would find it too bulky to carry around, particularly in these neighborhoods where no one uses a car to go grocery shopping, and most of the stores' business is from those on their way home from work. String bags were considered, but rejected because they break too easily, and can "leak" small items, and it would be difficult to display an attractive logo. The optimal bag was modeled after a thin, unbleached cotton bag, used by shoppers in Germany. A cotton bag with the project logo and slogan, which can be carried compactly in a purse or briefcase, was marketed and sales monitored. The plan was to monitor the number of disposable produce bags given away.

A purveyor of cloth bags, Compak Products, was hired to produce 500 bags, of roughly the same size as typical disposable grocery bags. These bags were chosen because of their track record (the California Integrated Waste Management Board used them in a similar campaign), recommendation by another vendor, price ($3-4 @ depending on quantity), free printing, unbleached strong cotton. Another attractive selling point was the unique pouch feature; the bag could stuff into its own pouch.

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Appendix I

Incineration Technology and Impacts

Historical Use of Control Technology and Changing Emissions

Incinerators or municipal waste combustors (MWCs) were originally designed solely for the purpose of reducing the volume of municipal solid waste (MSW) left for disposal. An ancillary purpose was to accomplish this reduction of volume in an efficient and sanitary manner (that is, to destroy breeding places and propagating causes of vermin and disease).[158] In the past, before the advent of recycling and waste prevention which has modified the waste stream, incinerators were fed a heterogeneous mix of unprocessed or raw garbage, trash, and other wastes from different sources (e.g., medical wastes). The combustion itself was unregulated, for the most part, in terms of temperature and oxygen control, and consequently, the waste was often not completely burned to carbon dioxide, water vapor and ash, and there were considerable emissions of air pollutants.

Since the early days of municipal incineration, plant design has evolved considerably to include more complex systems for

1. waste preparation and stoking (screening, processing, and feeding into the incinerator)

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158 "The Truth About Garbage Incineration", pamphlet by Nye Odorless Crematory Co., Macon, GA, circa 1917.

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2. waste incineration and emissions mitigation via efficient combustion
3. energy extraction
4. emissions mitigation via neutralization and/or capture in control devices
5. ash handling

Each of these major steps are critical to the optimal design and operation of a waste-to-energy system to maximize environmental performance. Also important are continuous monitors of emissions and process parameters, called Continuous Emissions Monitoring Systems (CEMS) and Continuous Process Monitoring Systems (CPMS). Careful maintenance and scrutiny of these instruments can show if action is necessary to signal the operators to change equipment settings or repair or maintain devices.

Incinerator emissions of concern are divided into the following categories:

1. Particulate matter (including a number of heavy metals, such as lead and cadmium),
2. Acid gases (which include HCl, SOx, H_2SO_4 and HF), which contribute to acid rain,
3. Mercury, which is now a global contaminant,
4. Products of incomplete combustion (PICs), including carbon monoxide, and such toxic organic compounds as dioxins and furans and their precursors chlorobenzenes and chlorophenols), and
5. Oxides of Nitrogen (NO_2, NO), usually referred to as NOx, which contribute to acid rain and ozone.

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There are, in reality, three methods of minimizing these emissions from MWCs: Pollution Prevention, Furnace Design, and Emissions Control.

Pollution Prevention

The first method of minimizing emissions is to prevent their creation in the incinerator in the first place. These measures are considered pollution prevention -- that is, reducing the pollutant precursors in the waste stream (e.g., metals, chlorine, sulfur, and nitrogen). Many of the most problematic emissions and constituents in ash from incinerators are caused by such pollutant precursors in the waste as chlorine, sulfur, heavy metals, organics, and nitrogen, all of which are normally present in MSW in varying quantities. In the normal process of combustion these substances can combine with other products of combustion to produce such incinerator emissions as HCl, SOx, H_2SO_4, NOx, various metal chlorides, oxides, and other compounds, and chlorinated and unchlorinated organics. If reduction of the initial waste stream contaminants or precursors could be achieved, then reduction of emissions and ash would also be obtained.

The technology, variously referred to as toxics source reduction or fuel cleaning, can be accomplished by means of product and packaging redesign using non- or less-toxic substitutes, reuse of products or packaging containing toxic precursors, and recycling products and packaging containing toxic precursors before they get to the incinerator. Toxic source reduction is often overlooked as a method for reducing emissions. With fewer pollutants entering an incinerator, there are fewer available to be transformed into

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air pollutants and ash in the incinerator; but with greater quantity of pollutants entering the incinerator the greater the chance they will escape capture in the control devices and become emissions.

Pollutant precursors are elements or compounds in waste items, which when they are incinerated are not destroyed by furnace conditions, but instead are transformed into either emissions or ash; alternatively, when they are landfilled contribute to leachate, possibly contaminating drinking water. Examples of precursors are heavy metals, chlorine, fluorine, sulfur, and nitrogen; these are found in batteries, pigments, leather, solder, cans (heavy metals), PVC plastics, bleached paper (chlorine), CFC-based polystyrenes (fluorine), tires (sulfur), and food and yard waste (nitrogen). Emissions produced by these precursors include acid gases (HCl, SO_2, NO_x, HF), chlorinated organics, such as dioxin, and heavy metal compounds. Precursors contained in consumer products are also responsible for heavy metal toxicity in incinerator ash residue and in leachate from landfills.

Research is continuing to determine how much reduction in emissions can be achieved through pollution prevention measures vis a vis reduction due to combustion controls and emissions control devices. It has also not been clearly determined how the pollutants partition into emissions and ash under different conditions in MWCs. In addition, designing pollution prevention measures for MWCs is not straightforward because MSW is so characteristically heterogeneous. A single precursor, for example, chlorine, can have a number of diverse sources including PVC plastics, bleached paper products, and

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food waste (which contains salt). Fortunately, in the case of chlorine, substitutes are often available which use little or no chlorine. In the case of certain heavy metals the sources are also diverse, and new technologies are under development now to minimize the use of metals in products and packaging, and develop less toxic alternatives. In addition, recycling and household hazardous waste programs are increasingly diverting materials containing concentrated amounts of precursors (e.g., batteries, paint, etc...). Thus, pollution prevention measures are beginning to be explored, and the potential for reductions is high.

Data from the Swedish EPA from the 1980s illustrates that toxic precursors exist in both expected and unexpected parts of the waste stream. It is expected that most of the metals in the waste stream is contained in metallic items, such as cans. But 26% of the cadmium in the solid waste stream is found in plastics, 10% of total mercury is found in plastics, 13% of the mercury goes into paper, and 18% of manganese goes into paper.[159] Heavy metals content in plastics and paper is especially relevant in a discussion of source reduction because plastic and paper are now two of the fastest increasing materials used in nondurables and packaging. Clearly, development of products and packaging which do not require any metals and other pollutant precursors, or which use fewer types or less quantity of toxic precursors (e.g., less toxic substitutes for metals used as pigments in plastics), would reduce the toxic composition of the waste stream.

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159 "Energy From Waste", Summary of a Study by the National Energy Administration and the National Swedish Environment Protection Board, Stockholm, Sweden. 1987.

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Research by Franklin Associates for EPA showed that after 80% recycling of lead acid car batteries (the current level), such batteries still make up 66% of the lead in the waste stream. Electronics are also quite high in lead because of the solder that is used. There is also a certain amount of leaded glass and ceramics and leaded plastics in the waste stream. Similarly for cadmium, after nickel/cadmium battery recycling, batteries still contribute 54% of the cadmium in the waste stream. The second major contributor of cadmium in the waste stream is plastics. Cadmium is also found in electronics, appliances, and pigments.[160] Similar results were found for mercury, with batteries again the major contributor, with fluorescent tubes, thermometers, thermostats, and a few other categories contributing most of the rest of the mercury. [161]

Thus, it is clear that minimizing the use of precursors in consumer products via design changes (and maximizing recycling materials containing precursors) would reduce the environmental effects of solid waste disposal by incineration and landfilling. In communities where landfilling and incineration are predominant near-term solutions for waste management, toxic waste prevention takes on greater importance, though it is a relevant issue everywhere.

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160 Franklin Associates, Ltd. "Characterization of Products Containing Lead and Cadmium in Municipal Solid Waste in the United States, 1970 to 2000". U.S. Environmental Protection Agency. EPA/530-SW-89-015A. NTIS PB89-151039/WEP. January 1989.

161 Franklin Associates, Ltd. "Characterization of Products Containing Mercury in Municipal Solid Waste in the United States, 1970 to 2000". U.S. Environmental Protection Agency. EPA/530-R-92-013. April, 1992.

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Waste Preparation

Before the incineration process, the MSW can undergo a number of preparation steps. The first can happen outside the MWC plant and/or in an adjacent part of the plant: separation of recyclables, separation of reusable products, and reduction in generation of products in the waste stream due to source reduction. This step reduces both the volume and typically alters the composition of the waste, which can affect the quality of combustion and the quantity and toxicity of emissions and ash produced. Since it is important to minimize the entry of hazardous, flammable, explosive, and toxic materials and other items which are not suitable for incineration, MSW incinerators should also be designed and operated to maximize the opportunity for inspection and screening out of undesirable wastes. Two consequences of not removing unsuitable items include (1) explosions in the furnace of flammable/explosive materials and (2) contribution of pollutant precursors, such as heavy metals (in batteries, large kitchen appliances, and automotive parts), chlorine (in PVC and bleached paper), and organics (in solvents) resulting in higher emissions.

Adequate screening is best accomplished by designing the screening area so that waste can be closely inspected, rejected, and removed if the need arises, before it is fed into the furnace. Two designs are currently in general use for this purpose. For the most part the screening is performed visually. At the larger plants, trucks dump their loads directly into sizable pits that are below grade; this prohibits screening. At smaller plants tipping floors are typically used. In this design trucks dump their loads onto the floor in a large room in which wastes can be spread out and inspected. If inappropriate wastes are

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spotted, the plant management can order the truck that dumped the offending load to remove it.

In addition to routine screening for unacceptable items in the waste stream, at some incineration plants further preparation and/or pretreatment of the wastes takes place prior to incineration. Because mass burn plants are designed to burn unprocessed solid waste, hence the name mass burn, the waste processing stage is minimal, and involves only mixing and drying of wastes. This takes place above the pit as a crane operator captures as much as a ton of waste at a time in the jaws of the grapple and moves it within the pit and to the waste charging chute leading to the furnace.

Though the style most often used has been mass burn in the past fifteen years or so, preprocessing of solid waste has resulted in the need for incinerator designs capable of burning RDF efficiently. Refuse Derived Fuel or RDF plants are distinguished from mass burn plants by the presence in the plant design of waste processing devices. Refuse derived fuel is the name given both to the residual end product created by the processing and to the plant which burns the material. In RDF plants the truck usually dumps unprocessed MSW onto a conveyor which leads into a facility separate from the incinerator for preprocessing and sorting into resource streams. Though RDF plant designs differ according to the types of resources recovered and the degree of resource purity achieved in the end product, RDF is generally derived by removing noncombustible metals, glass and grit, and subsequently processing the remaining combustible waste to a uniform size. The RDF is a highly combustible and versatile

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feedstock, that can be burned either as-is (a fluffy material) or in a dense, easily transported pelletized form. It can be burned either alone in a dedicated furnace/boiler attached to the processing facility (as most RDF plants are configured) or commingled with another fuel (e.g. sewage sludge, wood, coal) and shipped off-site to another facility.

Pollution prevention measures which can be (have been) taken to reduce mercury emissions include two innovative pieces of legislation passed by the New Jersey legislature. New Jersey's first two pollution prevention measures to reduce mercury emissions are 1991 state laws which reduce the mercury coming from batteries, and which reduce over a four-year period ending 1996, the concentration of mercury in packaging. New Jersey is exploring legislation to address the mercury in fluorescent tubes. New Jersey's MWC mercury regulations specifies pollution prevention measures as an equal partner to add-on emission controls in the reduction of mercury. In the supporting volumes, NJ DEPE specified that by 2000 mercury emissions must be reduced by 96%, to be achieved by an 80% reduction in mercury emissions due to the pollution prevention measures and 80% due to control devices. New Jersey has indicated that pollution prevention measures alone could mount to as much as 95% mercury reduction.

Impacts of Prevention and Recycling on Incineration

Given the realities of a future with a large variety of local integrated waste management systems, the composition of the incoming waste stream for incinerators will certainly change from that of the present. These will undoubtedly have consequences on the design of waste-to-energy plants and the quantity and quality of emissions and ash

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produced by them. If mainly non-combustibles and lesser combustibles such as glass, metals, and yard wastes are selected for separation, the BTU content of the waste remaining to be burned would rise considerably necessitating a furnace with larger volume for combustion. If this modified waste composition is not characterized and taken into account during the design for a new or retrofited plant, the facility would have a lower throughput capacity than expected. This, in turn, would have a negative effect on the tip fees and the economic viability of the plant. If, on the other hand, a large percentage of paper and plastics are chosen for separation, the boiler design would need to reflect this also. Incorrect sizing can also affect steady-state operations as described below.

Though in some cases more than one cause can contribute to the formation of individual pollutants, emissions from incineration of municipal solid waste are usually due to trace contaminants in the waste stream and/or poor efficiency of combustion. Both of these causes suggest imperfections in the incineration process (i.e., imperfect fuel and imperfect burning). As is the case with any combustion source, incinerators operate best when they convert relatively clean organic fuel to carbon dioxide and water vapor. In the next section the variables governing this conversion are explored.

Furnace Design

The Three T's temperature, turbulence, and time

The second method of minimizing emissions is creation and maintenance of steady-state combustion. Complete combustion optimally involves a transformation of fuel, in this

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case solid waste, into the less deleterious of CO_2 and water vapor. It is important to note that emissions of these two compounds contribute to global warming. The quality of the combustion process, and therefore incineration, is characterized by the "three T's": temperature, time, and turbulence. To achieve the temperature requirement, an adequately high and uniform temperature profile must be maintained throughout the furnace volume at all times in order to destroy PICs reliably. In order to optimize combustion of these gases, it is generally considered that the temperature profile across the furnace in the "mixing zone" should not fall outside the range of about 1800-2000°F. This means that the temperature should be uniform with no cool spots or short cuts for the gases to exit. Cool spots can occur adjacent to the furnace's walls, since it is here where heat is first extracted from the combustion process. The furnace's "waterwalls" consist of banks of steel tubes which contain boiler water circulated from the boiler, which is then heated by the high temperatures in the furnace, and is subsequently returned to the boiler. Minimization of cool spots is achieved by increasing the time and turbulence factors.

If combustion is not optimal, or if it is unstable, products of incomplete combustion (PICs) will be created. Such instability can be caused by insufficient oxygen to react with the carbon in the combustion gases, or too much oxygen, which causes the combustion gases to flow out of the furnace too quickly -- also referred to as insufficient residence time. Insufficient furnace temperature is another problem that can occur due to variation in refuse moisture. Such conditions are typical in furnace startup, shutdown, and when the waste moisture or BTU content varies suddenly (causing combustion

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upsets). Products of incomplete combustion (PICs) include carbon monoxide and trace, though not insignificant quantities, of a wide variety of organic compounds (e.g., dioxin and furan), many of which are toxic and/or carcinogenic at very low concentrations. Thus, designing the furnace and combustion-related equipment to optimize steady-state combustion and having vigilant and well-trained operators run the equipment to minimize upsets in combustion efficiency decrease the creation and emission of products of incomplete combustion.

Another consequence of suboptimal combustion is creation of oxides of nitrogen. This occurs as a result of the combustion of air (which is mostly nitrogen and oxygen) and the combustion of a waste stream containing nitrogen. Food and yard waste, which make up at least one-fourth of typical MSW, is high in nitrogen content. Municipal Waste Combustors (MWCs) tend to create the most NOx when furnace temperatures are higher than necessary to destroy products of incomplete combustion. There are a variety of furnace designs that can be operated to minimize NOx formation. Thus, to minimize both NOx formation and PIC formation, the furnace should be operated within a fairly narrow range of temperature and oxygen, with well-mixed (turbulent) conditions.

There are a growing number of design features that have been developed to improve combustion efficiency and reduce generation of PICs and NOx in the combustion zone. These are discussed below.

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Designs to Optimize Steady-State Combustion

Furnace Size

Before discussing particular combustor designs, it is important to recognize the need to size the incinerator to promote steady-state combustion. The more that a plant is started up and shut down (for maintenance, inadequate or varying waste stream volume, or whatever reason), the more uneven is the combustion, and the greater the potential for unwanted emissions. For example, very small-scale incinerators -- on the order of 1 - 50 tons per day -- such as apartment and hospital incinerators, may only operate for a few hours per day. Some small municipal incinerators which are rated to burn as much as 250 tons per day are sometimes underfed (or were originally designed to be oversized) and operate on one or two shifts per day. In these situations, the time spent starting up and burning down, producing great concentrations of emissions, may be as long or longer than the time spent at more optimal combustion conditions. Thus, to minimize overall emissions due to incomplete combustion, it is necessary to charge waste in uniform volumes, to operate the incinerator 24 hours per day, and to match the size of the incinerator's furnace capacity to the waste that actually will be charged over a 24-hour period.

Waste Charging

Continuous feed chutes for charging the incinerator with waste, is currently the preferred method over charging in batches using a stoker which periodically charges a mass of waste at one time. The former preserves steady-state combustion conditions, whereas the

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latter disturbs the equilibrium by introducing cold air into the combustion zone every so often, increasing the likelihood of PIC formation.

In the first, drying, stage of combustion, as solid waste is fed onto the grate system, it encounters the high temperatures of the furnace, the box in which the heat and combustion gases are contained. The MSW is heated and dried, and then eventually ignites. At this stage the burning solid waste gives off volatile gases (e.g., mercury) and incompletely burned carbon-based compounds (e.g. organic products of incomplete combustion (PICs) such as carbon monoxide, PAH's, and the more toxic dioxins and furans). Simultaneously, the unburned solid waste is transformed into bottom ash or char. In order to maximize the combustion efficiency, it is preferable to design MWCs with grate systems are designed to have speed adjustments so that combustion efficiency can be maintained as the composition (moisture and BTU content, most importantly) varies.

Grate Systems

In the older incinerator systems, travelling grates simply transported the refuse into the combustion zone without also agitating it for improved mixing with combustion air. Newer grate systems employ a three-zone system, with a drying zone to remove excess moisture from the MSW, the burning zone, and the burnout zone. Rather than simply a conveyor belt, the newer designs employ reciprocating grates, for example, which are designed to agitate the waste in various ways, and cause it to be broken down into smaller pieces as combustion proceeds. This process, in which the waste disintegrates on the

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grate, permits exposure of a larger surface area of the waste to the oxygen present in the furnace, and is thus, preferable in terms of maximizing combustion efficiency.

Air Injection Systems

"Turbulence", one of the 3 T's, actually refers to adequate mixing of the proper ratio of combustion gases with oxygen. In order to maximize the turbulence factor, there must be sufficient (but not excessive) oxygen present in the furnace in order for the organic matter in solid waste to be burned completely. Both residence time and turbulence or mixing are maximized by designing the furnace so that the proper amount of air is introduced at the appropriate location. Turbulence is also aided by optimizing the direction of the secondary air jets. The air used for injection may either be fresh, from the outside, or recirculated utilizing combustion gases from a location downstream from the furnace.

In order for complete combustion to occur it is necessary for air to be injected into the furnace in two locations: from underneath the grates to the burning waste (primary or underfire air), and above the grate to mix oxygen with the combustion gases (secondary or overfire air). In more advanced systems, primary air is injected into the drying, burning and burnout zones separately from secondary air. This is done either via manual adjustments to dampers or automatic combustion controls. The latter is a more advanced system that senses, via continuous monitoring devices, the temperature and oxygen needs of the furnace, and then adjusts the quantity of primary and secondary air entering the furnace. In the most of these advanced systems each of the three primary air zones is subdivided into a number of sections, each of which can be individually controlled. This

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type of system optimizes the placement, velocity, and flow of air to all parts of the grate area, thus maximizing combustion. The zonal design also mitigates entrainment of particulate matter from the burning waste on the grate into the flue gases.

Overfire air injection is accomplished via nozzles situated in the furnace walls and directed to maximize the turbulence and reduce the upward velocity of the combustion gases. There is a great variation in the sophistication of overfire air designs in operation today, ranging from minimal to computer-designed with many nozzles aimed specifically for maximum efficiency.

Furnace Design

The sizing of the furnace to match the quantity of waste fed to the incinerator is of critical importance in maximizing the three "T's". If the furnace volume is too large for the quantity of waste fed, the temperature in the furnace may drop to such an extent that combustion is hampered. On the other hand, if the furnace volume is too small for the quantity of waste fed, the temperature will be high and combustion will be enhanced in the short run. However, there is a risk that so much oxygen will be consumed that the oxygen available for combustion of future wastes charged is depleted to such an extent that combustion is hampered. Thus, furnaces must be both designed and operated so that the quantity of waste actually fed to the incinerator closely matches the rated capacity of the furnace over time.

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The shape of the furnace is also critical to optimal combustion design. The older designs involving four straight walls resulted in combustion gases quickly roaring up, through, and out of the furnace. Along the furnace's vertical walls, the temperature was typically lower than in the center, so some of the combustion gases never achieved the proper temperature. Further, those gases which did achieve adequate combustion temperatures of 1800°F, did not always dwell even as long as two seconds, a residence time considered to be the minimum necessary for combustion gases in MWCs. The older designs also did not promote much turbulence or mixing of oxygen with the combustion gases. In order for optimal combustion efficiency, oxygen must be present in sufficient quantities and mix with the products of incomplete combustion produced by incineration in order for combustion to be completed (i.e., for carbon dioxide to be produced). Before furnaces were designed to control the airflow, it was difficult to achieve high combustion efficiency.

Newer designs include bull noses, which jut out of the furnace walls, and arches, located above the burning and burnout zones to contain and funnel the combustion gases into the furnace proper, both of which retard combustion gases and fly ash from rising quickly off the grates. These design features increase turbulence and mixing, increase residence time, and promote a more uniform distribution of temperature across the furnace (wall-to-wall). A superior furnace design includes careful placement of these features in such a way that semi-permanent eddy currents are established.

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Auxiliary Burners

In order to maintain adequate temperature in the furnace during startup, shutdown, and upsets, an auxiliary burner, which burns fossil fuels, is a necessary design feature. This equipment is installed at the top of the furnace and can be set to come on at whatever temperature is desired. Prior to the advent of this design, high combustion efficiency was difficult to stabilize.

Automatic Combustion Controls

Air injection is controlled either via manual adjustments to dampers or automatic combustion controls. The latter is a more advanced system to maximize combustion efficiency, which senses the temperature and oxygen needs of the furnace, via continuous monitoring devices, and then adjusts the quantity of primary and secondary air entering the furnace accordingly. In most of these advanced systems each of the three primary air zones is subdivided into a number of sections, each of which can be individually controlled. This type of system is designed to optimize the placement, velocity, and flow of air to all parts of the grate area, thus maximizing combustion efficiency and reducing particulate generation.

Effects of Poor Combustor Design and Operations on PIC emissions

Poor combustor design can cause an inability to achieve stable, optimal combustion conditions. For example, older incinerator designs involved furnaces in which the combustion gases quickly come off the grate and pass quickly out of the furnace. More recent designs have modified the furnace walls with "bull noses" and arches, which retard

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quick movement of the combustion gases, and therefore enhance combustion efficiency by increasing residence time and turbulence. Older grate systems did not allow for variation in grate speed with variation in changes in the waste stream. Older designs did not have sophisticated controls for optimizing the quantity and location of air injection. In fact, some older designs are also poorly maintained, and there can be holes in the furnace walls allowing cold air into the furnace in an uncontrolled fashion. When this occurs, products of incomplete combustion can form and not be destroyed before they exit the furnace, due to insufficient temperature. Lack or improper operation of an auxiliary burner to maintain temperature can also permit PICs to escape the furnace.

Poor combustion conditions can also occur due to suboptimal operation of the combustion equipment. Instances in which the temperature and combustion efficiency fall are called upsets. These usually occur upon furnace start up, shut down, and when the BTU value of the wastes burning at any given point in time falls or rises precipitously, either due to moisture content or inherent incombustibility. Upsets can also occur due to maladjustment of the air distribution system, improper grate speed, blockages in the waste charging chute, malfunction in the auxiliary burner, combinations of these, and other combustion problems. Studies undertaken by the New York State Department of Environmental Conservation in the 1980s on MWCs [162] showed that it is precisely during startup, and presumably shutdown, that the emissions of products of incomplete combustion and certain other pollutants are at their highest. The quantities of

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[162] Combustion and Emissions Testing at the Westchester County Solid Waste Incinerator, Volume I, Final Report. New York State Energy Research and Development Authority, Report 89-4; January 1989.

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dioxin and furan generated during start up are striking. "The testing results show that the average CDD and CDF concentrations measured at the superheater exit during the first cold starts are two to three times higher than the average of the other 12 runs that were at steady operating conditions. For the ESP inlet, the increase in dioxins from normal operations to normal cold start is between 18 and 51 times, and these increase further to between 40 and 96 times at the ESP outlet." [163] The considerable increases in dioxin concentrations, as the flue gases moved downstream, were caused by allowing the flue gases to dwell in the temperature danger zone for secondary dioxin formation, around 300°C.[164] Thus, poor operator control either of the furnace (e.g., permitting temperature or oxygen to drop) or of the stoking operation (e.g., permitting poorly mixed wastes to be fed into the furnace), can cause reduced combustion efficiency. Also, batch-fed incinerators have inferior combustor design, and as such, should not be considered capable of good combustion practice over the long term unless they are fitted with sophisticated automatic combustion controls. And Medical Waste Incinerators, with intermittent charging design, typically have a 12-hour cycle, having two startups and shutdowns per day with poor combustion efficiency during those times.

Combustion Design Modifications to Minimize NO_x

Oxides of nitrogen emissions from solid waste incinerators can be reduced by minimizing the amount of oxygen available for combustion with available nitrogen at the point of

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163 Combustion and Emissions Testing at the Westchester County Solid Waste Incinerator, Volume I, Final Report. New York State Energy Research and Development Authority, Report 89-4; January 1989.

164 Stieglitz, L. and H. Vogg. "New Aspects of PCDD/PCDF Formation in Incineration Processes." Preliminary Proceedings, Municipal Waste Incineration, October 1-2, 1987, Montreal, Quebec.

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combustion and operating techniques to enhance the effectiveness of combustion design modifications. Combustion designs which effect control of fuel and thermal NO_X are: grate and furnace design for staging of combustion, bubbling and circulating fluidizing bed boilers, and overall boiler design to permit flue gas recirculation (and automatic controls for each).

Low Oxygen Conditions in the Furnace / Staged Combustion / Flue Gas Recirculation

A lower excess air (or starved air) condition in the furnace at the point of combustion of MSW minimizes the potential for NO_X formation by reducing the oxygen available for reaction with the available nitrogen and by limiting the temperature that can be achieved in the primary combustion chamber. The staging of combustion in a dual-chambered incinerator is the typical incinerator design to accomplish a low stoichiometric oxygen condition to minimize NO_X formation. In this arrangement, the primary chamber usually operates in a starved air mode (i.e., slightly insufficient oxygen for complete combustion) with excess air (i.e., more than enough oxygen for complete combustion) in the secondary chamber. Since a low oxygen condition is maintained in the primary chamber, less NO_X is created, though PICs are not thoroughly destroyed. The excess air in the secondary chamber is designed to complete the combustion process and destroy PICs.

Another means of reducing NOx is controlling oxygen in the furnace via zone control (i.e., optimizing the quantity of air injected in the drying, burning, and burnout zones under the grate). Still another method of controlling oxygen and temperature level in the

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furnace, but using a much different design is flue gas recirculation. Flue gas recirculation systems involve recycling of relatively cool flue gas containing combustion products and lower oxygen concentrations into the furnace, thereby lowering NO_X formation by limiting the flame temperature and slightly diluting the flame oxygen concentrations.

Fluidized Bed Technology

Two types of combustor, much different from the typical single-chambered and dual-chambered furnace arrangements are the "bubbling" and "circulating" fluidized bed combustors. This type of combustor bubbles or circulates air through beds of limestone mixed with refuse derived fuel, wood, or similarly prepared, uniformly sized wastes. Air is bubbled through the turbulent bed, enhancing the movement of sufficient quantities of oxygen through the furnace and promoting reaction with the RDF and its incomplete combustion products. Since the bed consists largely of sand and limestone, it behaves like a thermal flywheel, retaining its heat despite continuing fluctuations in the BTU value of the waste input. Other features of this kind of furnace include more intimate mixing of combustion gases with the fuel, and in-situ scrubbing of acid gases via the abundance of limestone in the bed material. The effect of these features is to allow efficient combustion of a more heterogeneous mixture of wastes. Both types of fluidized bed technology have produced relatively lower levels of NO_X emissions because the residence time for combustion gases can be as high as five seconds, and the temperature required to destroy PICs at that residence time is far less than in other designs (e.g., 1600°F).

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Emission Controls [165]

The third major strategy for minimizing emissions is the design and optimal operation of air pollution control devices to capture the emissions before they are released to the atmosphere. Since there are several categories of pollutants typically released from MWCs, no single emission control device can be used to control all of them.

The emission control devices, sometimes referred to as the pollution control train, are arranged in various combinations and sequences after the economizer (the last part of the heat recovery equipment or boiler), and are connected to the boiler, each other, and the stack by ductwork. These devices employ a number of physical and chemical processes including absorption, adsorption, temperature reduction, condensation, neutralization, filtration, and electrostatic precipitation to remove pollutants from flue gases before they exit the stack. Some of these processes depend on, and the effectiveness of the emission control devices into which they are injected is increased, by the use of solvents and reagents such as water, lime, sodium hydroxide, activated carbon, sodium sulfide, ammonia, urea, and other, proprietary agents. The design of these devices, and of the entire pollution control train, including such details as choice of type of devices, sizing, choice of construction materials, methods, and reagents, and positioning of devices in the train, are critical to the emissions removal efficiency and longevity of the equipment. As important as design is to minimizing emissions, the quality of operation of the emission controls is also important, since the best equipment can function poorly and emit high

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quantities of pollutants if the operations are not ideal. Suboptimal operations can be caused by poorly trained and/or inattentive operators (i.e. operator error), faulty procedures, incorrect optimization of reagents, and equipment failure. Optimal operating techniques are discussed later.

The following list summarizes most of the major types of emissions and the associated emissions control equipment used on MWCs today.

Particulate matter	Particulate matter control devices (fabric filters or baghouses; electrostatic precipitators)
Lead and Cadmium	Particulate control devices
Mercury	Particulate control devices, scrubbers, AND activated carbon systems
Acid Gases	Scrubbers -- wet, spray dryer absorber, dry sorbent injection activated carbon systems)
Oxides of Nitrogen	Selective Non-catalytic Reduction - SNCR, such as Exxon Thermal DeNOx or NOxOUT), Selective Catalytic Reduction - SCR -, wet scrubbing)
Dioxin/Furan	Particulate control devices, scrubbers AND activated carbon systems

Scrubbers

To decrease acid gas emissions and increase condensation of metals and organics onto the surfaces of particulate in the flue gases, scrubbers of various designs have been employed. Usually only one scrubber is included in a MWC emissions control train, but

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[165] Clarke, Marjorie. "Improving Environmental Performance of MSW Incinerators", Industrial Gas

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in other instances as many as three different scrubbers have been incorporated into a single train.

Wet scrubbers, into which water is injected as the primary solvent for absorption of acid gases, have been used for decades, primarily in Europe. Wet scrubbers can discharge a wet, salty effluent containing the acids, organics, metals, and other pollutants impacted by the water droplets in the scrubber. Newer, multi-stage designs in Europe employ techniques to precipitate out certain metallic and other fractions so that the water can be evaporated and the captured materials recycled. An advantage of wet scrubber technology is that it can lower the flue gas temperature further than other types of scrubbers, resulting in more condensation and a greater emissions reduction potential. Dual-stage wet scrubbing, used in Europe to optimize the mix of reagents and water for removal of specific acid gases, mercury, and organics, such as dioxin/furan, approaches 99% removal efficiency.

In North America spray dry absorbers (SDA), in which both water and an alkaline reagent, such as lime, are injected as a slurry for absorption and neutralization of acid gases have gained the most favor for new MWCs. The technology, also called wet-dry or semi-dry scrubbing, is derived from the fact that the reagent enters the scrubber in wet (slurry) form, and exits as a dry residue, with the water having been evaporated completely in the scrubber. Removal efficiencies tend to be superior to older-style wet scrubbers, and approach the efficiencies of the dual-stage wet scrubbers.

Cleaning Institute, Forum '88 conference, Washington, DC. November, 1988.

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Dry injection scrubbers (SDI), that use an alkaline reagent without water, have also been utilized in recent years. These scrubbers can be as efficient as SDA for removal of HCl and SO_2, [166] but would not be as efficient as wet or SDA scrubbers for mercury and dioxin removal, as they are operated at higher flue gas temperatures. EPA has considered this technology to be capable of 50% acid gas removal efficiency. SDI produces a dry salty residue containing a combination of alkaline and acidic agents.

Considered in the same category with scrubbers since the general mechanism by which the devices remove pollutants from flue gas is similar to scrubbers, are direct and indirect heat exchangers. These devices have been used to reduce the temperature of acid gases, metals and organics, aiding in condensation. Direct heat exchangers, or humidifiers, reduce the temperature of the gases via fine water droplets. Heat exchangers have been used in Europe, sometimes in tandem with scrubbers, particularly in Sweden, and in a few installations in the U.S.

Particulate Control Devices -- Fabric Filters and ESP's

To reduce emissions of solid particulate matter, including carbonaceous and metallic particles, and condensed matter such as metals, organics, and acids, two main types of particulate removal devices have been used. In the 1970s electrostatic precipitators, or ESP's, became more common. In these devices the particulate matter is electrically charged and then passes between the surfaces of parallel plates containing an opposite charge, where it is collected. The efficiency of ESP's is determined by the relationship of

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[166] Environment Canada, "the National Incinerator Testing and Evaluation Program: Air Pollution Control Technology, (Quebec City) Report EPS 3/U/2, September, 1986.

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the surface area of the plates to the volume and speed of polluted flue gas passing between them. Early ESP designs featured one or two pairs of parallel plates or fields. More recent designs have three, four, and five fields for greater efficiency. The ESP plates are cleaned by rapping devices that cause the accumulated particulate to fall into a fly ash hopper, situated at the bottom of the ESP.

In the 1980s fabric filters, also known as baghouses, started to replace, or be used in tandem with, ESP's as the preferred design for particulate removal, due to their improved capacity for filtering finer particles. (It is important to filter the fine particulate since these are able to penetrate more deeply into the lungs, and when coated with metal, organic, and acidic compounds pose a greater health threat.) Baghouses filter the flue gases in much the same way that a vacuum cleaner does, using a finely woven cloth and the dust cake, which accumulates on it, as the filtration medium. Finer particles are entrapped in the dust cake, increasing the baghouse's efficiency. The greater the surface area of cloth to the volume of air requiring filtration, the greater the baghouse's efficiency in removing particulate matter.

NO_X Emission Control Devices

As described above, source separation and combustion modifications help to reduce production of NO_X during the combustion process, but formation of some NO_X from whatever nitrogen remains in the fuel post-separation and from atmospheric nitrogen is inevitable, necessitating use of flue gas controls to achieve further reduction of these emissions. Three of the most promising NO_X flue gas control systems under

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development at present are selective catalytic reduction (SCR), selective non-catalytic reduction (SNCR), and wet flue gas denitrification (FGD_n). Test results on MWCs indicate removal efficiencies of 50 to 90%, particularly when used in combination with combustion design modifications discussed above.

Selective Non-Catalytic Reduction -- SNCR

Selective Non-Catalytic Reduction, of which Exxon's Thermal $DeNO_X$ is one type, achieves NO_X reduction by injection of ammonia (NH_3) into the furnace at about a 2:1 to 3:1 ratio of NH_3 to NO. This is accomplished via large jets positioned on the furnace walls at a location where the temperature is in the vicinity of 1600 to 1800°F. (Other forms of SNCR, such as NOxOUT, may use a urea solution or aqueous ammonia in place of ammonia as the chemical agent). In the proper temperature range for Thermal $DeNO_X$ the injected ammonia combines with NO to form water vapor and elemental nitrogen. Above 2000°F injection of ammonia becomes counterproductive, causing additional amounts of NO to be formed, and below 1600°F ammonia breakthrough (a visible ammonium chloride plume) can occur.

Selective Catalytic Reduction (SCR)

Selective catalytic reduction also achieves reduction of NO_X emissions by injection of ammonia, but at a different location and by different means. Instead of simple injection of ammonia into the flue gas, SCR injects and mixes the ammonia with the flue gas and a catalyst bed situated downstream of the emissions control devices after the flue gas stream has been cooled by passing through an economizer and a particulate collection

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device. SCR is positioned downstream because it operates most efficiently at flue gas temperatures of roughly 570 to 750°F and when the flue gas is relatively free of particulate matter, (this, due to the poisoning effect on the catalyst of particulate in the flue gas). The catalyst material can be shaped into a variety of forms (honeycomb plates, parallel ridged plates, rings, tubes, pellets, etc...) and can consist of a variety of base metals (e.g. copper, iron, chromium, nickel, molybdenum, cobalt, and vanadium). Each of these combinations has advantages and disadvantages with respect to catalyst/NO_X contact, fouling of the catalyst, and pressure drop through the catalyst. SCR technology is capable of achieving similar NO_X removal efficiencies to Thermal DeNO_X with use of half the ammonia due to the positive effects of the much lower temperature of reaction and the selective catalyst. SCR is currently being used on two solid waste incinerators in Japan, including the Iwatsuki plant which also has a baghouse. This plant achieves 50-60% removal of NO_X with less than 10 ppm ammonia slip (the threshold for visibility of the plume).

Wet Scrubbing/Condensation

Although the mechanism for NOx reduction from wet scrubbing is not as well understood, some plants have achieved significant NOx removal from wet scrubbers. The Rutland MWC employed a condenser/wet caustic scrubber which achieved a 33% reduction (down to 60 ppm), aside from the reductions gained by staged combustion and flue gas recirculation. Hitatchi Zozen, a Japanese vendor has guaranteed NO_X emissions between 62 and 93 ppm.

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Mercury control

Wet scrubbers, by reducing the flue gas temperature at the inlet to particulate control devices to even lower levels than that achieved in spray dryer absorbers, were shown in the 1980s to reduce emissions of mercury to a considerable extent (up to well over 90% reduction) in wet scrubber/ESP-equipped MWCs for several European plants.[167] More recently, it was shown that ten additional MWC units equipped only with wet scrubbers (usually dual-stage) and a particulate control device reduced mercury emissions to levels under the common European mercury emission standard of 65 ug/dscm (significantly below U.S. requirements).[168]

In a memo to EPA[169], Radian discusses a few of the many activated carbon pilots and permanent installations in the US and abroad, and the incremental polishing effect which activated carbon has already achieved on MWCs equipped with scrubber/ESP and scrubber/FF. This information demonstrated that activated carbon achieves close to an additional order of magnitude polishing effect over the reduction achieved by the conventional emission control system. It was also shown that injecting activated carbon along with lime to such wet scrubber-equipped plants further reduces mercury emissions

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167 Clarke, Marjorie J., "Emission Control Technologies For Resource Recovery", presented at and published in the Proceedings of the Air Pollution Control Association's 79th Annual Meeting, June 22-27, 1986, Minneapolis, MN.

168 "The Development of New Jersey's Mercury Emissions Standards for Municipal Waste Combustors", presented at and published in the Proceedings of the Third International Conference on Municipal Waste Combustion, Williamsburg, VA. March 30 - April 2, 1993.

169 Kane, Colleen, "Activated Carbon Injection for Supplemental Dioxin/Furan Control at Municipal Waste Combustors", Memorandum from Radian Corp. to Walt Stevenson, EPA/SDB. August 17, 1994.

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to levels as low as 1.43 ug/dscm, from inlet levels less than 400 ug/dscm, representing a mercury reduction of 99.6% for an average of six tests.[170]

Assembling an Emissions Control Train

Typically, if the systems are designed properly, it has only been necessary to select one particulate control device, with one scrubber, and one activated carbon system to produce good reduction of mercury and dioxins, two of the most difficult pollutants to remove. There are a number of instances in European plants, where increasingly stringent regulations over time has resulted in more than one particulate control device and/or more than one type of scrubber being installed on one MWC, with greatly reduced emissions.

Ash and Ash Management

Ash residue is produced as a result of incomplete combustion of a heterogeneous, imperfect fuel containing non-combustible items (municipal solid waste). There are two types of ash produced by incinerators: bottom ash and fly ash. Solid waste that is not completely burned on the grate is called bottom ash. Solid and condensable particulate matter which leaves the furnace suspended in the combustion gases and which is subsequently collected in emission control devices, is called fly ash. The unburned materials contained in bottom ash include a heterogeneous mixture of unburned organic material, or char, large pieces of metal, glass, and ceramics. Bottom ash is collected in a

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[170] Nethe, Lutz-Peter, Maerker Umweltechnik, Harburg, Germany, personal communication, February, 1993.

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quench pit beneath the burnout section of the grate. Fly ash is generated in the combustion zone as particles from waste are entrained in the flue gases and carried out of the furnace. Fly ash consists of a more homogeneous mixture of fine ash particles composed of metals, organics, and acids condensed onto the surfaces of the ash particles. Fly ash also contains the residues from reagents, such as lime and activated carbon, which have been injected for emissions control purposes. Fly ash is collected in hoppers beneath the emissions control devices (e.g., fabric filters, ESPs, and also, in some cases, scrubbers). Since fly ash characteristically contains more toxic pollutants than bottom ash, it can be kept separate within the MWC plant, and the bottom ash can be reused as aggregate or in construction. Fly ash is typically disposed of as hazardous waste in some European countries. In the US fly ash and bottom ash are usually combined and mixed within the MWC and disposed of in landfill or ash monofill. Fly ash has frequently failed and combined ash has sometimes been found to fail toxicity tests (EP Tox and TCLP) and contain excessive amounts of lead and/or cadmium. A 1994 US Supreme Court ruling and subsequent negotiations found that any MWC ash found to be toxic (under RCRA definitions), must be disposed of as a special waste, and not commingled with MSW.

Two concerns of ash management on-site are the safety of the workers and the possibility of fugitive ash escaping into the environment during handling or removal of the ash for disposal. Both concerns require that the ash be contained at all times both inside and outside the plant. In the plant, water is used to quench the ash, minimizing the dispersal of ash dust, that is so easily inhaled or ingested by the workers. A closed system of

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conveyors, which transport the ash from the furnace to the trucks, also helps to minimize exposure to the workers. While some facilities have partially enclosed ash removal systems, few facilities have a completely enclosed system for transporting ash through the plant.[171]

Ash containment off site seems best achieved through the use of covered, leakproof trucks for ash transport, to prevent ash from escaping into the environment through wind dispersal or leaching of the quench water. The most common method of ash management is disposal in landfill, either commingled with MSW or alone in an ash monofill. Here, ash must be wetted down frequently to avoid dispersal. Other methods of ash management involve reuse, either in construction materials (e.g. bricks), roadbeds, or in experimental reefs. The long-term environmental effects of these practices has not been determined.

Fugitive Emissions Control

In most state-of-the-art incinerators fugitive emissions (mainly dust and odor) from the waste tipping, charging, incineration, and ash handling processes are mitigated by building designs which draw air from the tip floor/pit areas into the combustion chamber where it is incinerated with the combustion gases. In this type of design, the building is said to be under negative pressure. Fugitive emissions created in an incinerator and drawn through the combustion chamber and the emission control devices, then leave the plant with the odors virtually destroyed in the combustion process, and the dust removed

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[171] Clarke, Marjorie J., et. al., Burning Garbage in the US -- Practice vs. State of the Art, INFORM, New York, NY 1991.

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by the particulate control devices. Care must be taken that fugitive dusts created in the bottom ash pits and the fly ash hoppers also remain within the plant. Enclosed ash handling areas are now being designed into state-of-the-art MWCs. It is also important that the fugitive emissions created in the ash handling area are drawn through the emissions control devices so that the workers are not unnecessarily exposed to ash dust, which typically consists of or is coated with metals, acid gases, and condensed organic matter.

Combustion and emissions monitoring

Continuous process and emission monitors (CPMS and CEMS) have been developed over the years to assist plant operators in monitoring the process parameters which determine the efficiency of combustion as well as the emissions. The CPMS and CEMS used in the U.S. include: furnace temperature, flue gas temperature at the air pollution controls, oxygen, carbon dioxide, steam pressure, steam flow, flue gas flow rate, carbon monoxide, SO_2, NOx, HCl, and opacity (a crude measure for particulate matter). In addition to these, continuous emission monitors for mercury and particulate matter are used in Europe.

These continuous monitors are commonly used to track the environmental performance of incinerators so that in the event of combustion irregularities (upsets) or high emissions of one or more pollutants, corrective measures can be implemented in a timely fashion. For example, the four process parameters (CO, O_2, CO_2, and furnace temperature) though

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measures of combustion efficiency, are generally used as surrogates for direct measurement of PICs. This is necessary because no direct continuous monitors have yet been invented to measure certain complex PICs, such as dioxin/furan and their precursors, polynuclear aromatic hydrocarbons (PAHs), and others, though research in this area continues. The only means of determining the level of these pollutants is stack tests, which are time-consuming, cost tens to hundreds of thousands of dollars, and can consume months in sampling and analysis. Such tests cannot be used to pinpoint high emissions of metals or complex chlorinated organic compounds in time to correct the immediate cause of an upset condition, and are hence only useful for assessing the general capability of an incinerator design for achieving desired emission limits. Thus, measurement of dioxin and furan, and heavy metals are typically undertaken only for periodic compliance tests.

Optimal Operations

As indicated, the three means by which emissions can be reduced from incinerators are pollution prevention, optimizing furnace design, and capturing pollutants in emission control devices. Key to achieving these ends efficiently is choosing state-of-the-art equipment designed for implementing prevention, combustion, and emissions control. But just as important, optimizing operations and maintenance of the equipment is critical to achieving the greatest reductions in emissions, since even brand new, perfectly installed equipment employing the most advanced designs will produce poor results if operated poorly, as will antiquated designs operated as effectively as possible. Poor operations can result if the operators are not well trained and/or if, for whatever reason,

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they do not operate the plant in optimal fashion. Additionally, it is important to document the extent to which all of the operating conditions at the fuel preparation, combustion, and emissions control sections of plants are optimized.

The following include some of the major elements of optimal operations:

1. Screen incoming wastes at the plant to reduce incineration of pollutant precursor-bearing items,
2. Optimize mixing of waste in the pit or on the tipping floor (to homogenize moisture and BTU content),
3. Optimize furnace operation (e.g., optimized grate speeds, underfire and overfire air injection rates, locations, and directions, and operation of auxiliary burner),
4. Survey furnace and related equipment regularly to ensure they continue to be properly sealed and operative,
5. Optimize type of nitrogen reducing reagent used,
6. Optimize injection location and rate for nitrogen-reducing reagent,
7. Control water injection rate to optimize flue gas temperature in control devices (to maximize condensation and capture of pollutants on particulate and reagent),
8. Optimize type of alkaline reagent used (to maximize absorptive capacity)
9. Optimize injection location and rate for alkaline reagent,
10. Optimize type of carbon used (to maximize adsorptive capacity),
11. Optimize injection location and rate for carbon,

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12. Optimize voltage and other electrical parameters of an ESP (to maximize capture of particulate),
13. Control Induced Draft fan speed to optimize residence time of flue gases within combustor and control devices (e.g., fabric filters, scrubbers, furnace),
14. Inspect and calibrate CEMS frequently,
15. Survey Emission Control Devices to ensure they are and continue to be properly sealed, insulated, and operative, and
16. Operate the plant using certified operators.

In order to operate incinerators to achieve optimal results, it is absolutely necessary to have well-trained, attentive operators. Though some of the most modern equipment has been automated, for example, reagent injection rates for scrubbers tied to CEM value for SO_2, there are others which are not yet automated. Moreover, the automated equipment, for example, a CEMS, can fall out of calibration and must be maintained frequently. Some parts eventually wear out (e.g., fabric filter bags develop holes, allowing pollutant-laden particulates to escape unabated), and others malfunction (e.g., ESPs can lose power, resulting in lower emissions control). So operators must not only be capable of optimizing the many interacting systems simultaneously, at all times, they must also be vigilant to discover equipment problems and remediate these before performance begins to suffer.

Operators have several key roles in optimizing combustion efficiency in a MWC, which reduces the emissions of PICs and NOx. For example, it has been shown that to optimize

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combustion efficiency and stability, the incoming waste must be mixed well in the pit or on the tipping floor to distribute the moisture and BTU content as evenly as possible. The amount of air injected into the furnace must vary as the composition of the waste being burned at any point in time varies. If this is not done, insufficient or excess air in the combustion zone to burn the waste passing through at that time will result in combustion upset and formation of products of incomplete combustion. In most incinerators such features as mixing and stoking of waste into the incinerator, grate speed, overfire and underfire air injection rates, and selection of the temperature setpoint for the auxiliary burner are entirely or partially controlled by plant personnel.

The level of emissions control achieved by a given collection of post-combustion emissions control devices is greatly dependent on how these devices are operated and the degree to which they are optimized. For example, almost ten years of research has shown that emissions control devices such as scrubbers and particulate control device combinations achieve the highest degree of reduction of mercury, dioxin/furan, and acid gases when the flue gas temperatures are as low as possible. Operators can adjust the amount of water injected into scrubbers and the rate of flue gas flow through the emission control devices, via adjusting the induction fan speed, and thereby improve or inhibit optimal emission control performance of the devices. The rate at which reagents (e.g., activated carbon, lime, and ammonia) are injected into emission control devices (e.g., scrubbers and NOx control devices) have been shown to influence emissions control. This is also controllable by operators.

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Good Combustion Practice

In a 1989 policy document, USEPA states that the first goal of good combustion practice (maximization of in-furnace destruction of trace organics) is accomplished by optimizing waste feeding procedures, achieving adequate combustion temperatures, providing the proper amount and distribution of combustion air, and optimizing the mixing process.[172] A failure in any one of these components will be accompanied by spikes or bulk increases in flue gas CO concentrations. The Pittsfield research [173] demonstrated the importance of minimizing the number, intensity, and duration of CO spikes, and thus, of limiting the length of the averaging period for CO. Thus, to minimize the opportunity for formation of PICs, it would be necessary to require an average limit for CO which would reflect a severe limitation on the frequency, intensity, and duration of excursions.

Further, EPA states, "Failure to achieve the necessary temperatures and residence times will result in the escape of organics from the furnace, which will lead to elevated concentrations of CO in flue gases". "CO emissions typically increase when insufficient O_2 is available to complete combustion". "Failure to distribute combustion air in the correct proportions to primary and secondary supplies can result in elevated organics and CO emissions". CO level is an indicator of good/bad combustion. Good operating practice should be defined by specific measures of good circulation of air, residence time, proper air distribution, adequate quantity of air, and correct temperature distribution,

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172 "Municipal Waste Combustion Assessment: Technical Basis for Good Combustion Practice", EPA-600/8-89-063, August, 1989.

173 "Results of the Combustion and Emissions Research Project at the Vicon Incinerator Facility in Pittsfield, Massachusetts -- Final Report", #87-16, prepared for New York State Energy Research and Development Authority by Midwest Research Institute, June 1987.

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etc..., a method used to some extent in EPA's original guidance. Based on information relating combustion efficiency and emissions of PICs to a number of incinerator performance criteria, EPA, in 1987 issued its first good combustion practice guidelines[174], which flatly stipulated one CO limit, an O_2 limit, and other firm limitations for all plants. Since temperature is an important factor governing operations, EPA recommended that good combustion practices for all incinerators should require a minimum temperature of 1800°F across the furnace to ensure destruction of PICs. [175] (A maximum temperature of 2000°F at fully mixed height would minimize formation of NOx.) The 1987 guidance, advising the states regarding good combustion practices, indicated that carbon monoxide emissions of 50 ppm for all plants, over a four-hour averaging time, along with 6-12% oxygen after combustion, among other requirements, were indicators of good combustion practice in a municipal waste combustor. Further, since it is during times of startup, shutdown, and upsets that extremely poor emissions occur, it is especially important for operators to be careful, ensuring that the auxiliary burner is maintained and set at the correct set-point, and that the quantity of oxygen supplied is correct at all times.

Environment Canada also later adopted the 50 ppm CO standard in its standards for good combustion.[176] New regulations issued by the Netherlands are also quite stringent at 44

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174 "Operational Guidance on Control Technology for New and Modified Municipal Waste Combustors", USEPA Office of Air Quality Planning and Standards, Research Triangle Park, NC, June 26, 1987.

175 "Municipal Waste Combustors Assessment: Combustion Control at New Facilities", USEPA, August, 1989

176 Waste on Municipal Waste Combustion, Volume I, Hollywood, FL, Hay, David J. "Incineration of Municipal Solid Regulatory Initiatives in Canada", International Conference April 11-14, 1989.

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ppm (corrected from 50 mg/Nm^3).[177] Since then, EPA has backed away from a single measure of good combustion practice in favor of three and five different CO standards, ranging from 50 to 250 ppm for different plant types and sizes (new and existing, respectively).

Flue Gas Temperature

Flue gas temperature may be the single most important operating parameter affecting environmental performance at many MWCs operating today. Maintaining low flue gas temperature will have the dual effects of improving reagent (lime) utilization and increase removal of volatile trace elements, such as mercury and dioxin/furan as well as acid gas emissions (HCl and SO_2) as described below. EPA has recommended a temperature of 300°F as the most effective emissions control option.[178] Data produced by Environment Canada[179] showed that temperatures around 285°F were optimal for plants using both spray dryers and dry sorbent injection. Wet scrubbers operate at far lower temperatures, with as good or better results. In fact, MWCs can be successfully operated at outlet temperatures of 240-260°F. In pilot plant tests, spray dryer absorber outlet temperatures as low as 200°F have been tested while maintaining a free flowing residue product according to Joy/NIRO. During start-up and testing of the Zurich SDA system (Zurich

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177 "Air Pollution Aspects of Incineration Facilities for Household Waste and Comparable Commercial Waste", Ministry of Public Housing, Urban Planning and Environmental Management, Kingdom of the Netherlands, July 14, 1989.

178 "Municipal Waste Combustors -- Background Information for Proposed Guidelines for Existing Facilities" USEPA, EPA-450/3-89-27e, August, 1989. p. 3-2

179 The National Incinerator Testing and Evaluation Program: Air Pollution Control Technology", Report EPS 3/UP/2, Environment Canada, September, 1986.

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also has a large ESP), long-term tests were performed at outlet temperatures as low as 220°F without drying problems. In Germany, Switzerland, Sweden, and Austria, among other countries, dual-stage and other wet scrubbers, condensers, and heat exchangers operate at much lower temperatures with good environmental performance. EPA's consultants, Radian, [180] state that reduction in flue gas temperature (below 250°F), using activated carbon injection, is associated with an even greater polishing effect for dioxins (96% reduction) than use of activated carbon injection at a higher flue gas temperature of 284°F (41-58% reduction). This salutary effect of lowered flue gas temperature has also been shown to apply to reducing emissions of acid gases and mercury as shown by Environment Canada on the Quebec MWC[181] and by Brown and Felsvang[182].

Some vendors claim that lower flue gas temperatures can cause corrosion and operating problems, but there is convincing evidence, presented by Donnelly and Felsvang [183] that these problems can be avoided by proper design and operation. Four methods, which are inexpensive and easy to implement, are employed to minimize adverse effects on ESP's: insulation, control of air inleakage, hopper heating, and operating procedures to minimize

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180 Kane, Colleen, "Activated Carbon Injection for Supplemental Dioxin/Furan Control at Municipal Waste Combustors", Memorandum from Radian Corp. to Walt Stevenson, EPA/SDB. August 17, 1994.

181 The National Incinerator Testing and Evaluation Program: Air Pollution Control Technology", Report EPS 3/UP/2, Environment Canada, September, 1986.

182 Brown, B. and K. Felsvang, "Control of Mercury and Dioxin Emissions from United States and European Municipal Solid Waste Incinerators by Spray Dryer Absorption Systems", Conference Papers and Abstracts from the Second Annual International Specialty Conference, Tampa, FL. April 15-19, 1991.

183 Donnelly, James R., and Karsten Felsvang, "Low Outlet Temperature Operation for Resource Recovery SDA Emission Control Systems", Proceedings of the 82nd Annual Meeting and Exhibition, Anaheim, CA. June 25-30, 1989.

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ESP corrosion (rapping (cleaning) continued long enough to remove all collected residue from the walls of the ESP).

Reagent Injection Rates

In addition to optimizing flue gas temperature, there are also significant improvements to be gained by optimizing the injection rate for activated carbon[184]. At the Kassel, Germany MWC the polishing effect of the activated carbon for decreasing dioxin emissions increased from 78% to 98% as carbon feed rate increased from 25 mg/dscm to 137 mg/dscm while holding flue gas temperature constant at 275°F. This effect was also shown at the Zurich MWC and the Borgess Medical Waste Incinerator.

At several European plants[185], the same effect was shown for mercury. For example, at the Kassel MWC, an increase in carbon injection rate from 9 to 64 mg/m^3, while temperature was held constant at 279°F, resulted in an increase in removal from 48% to 82%. At the Amager MWC in Denmark an increase in carbon injection rate from 19 to 70 mg/m^3, at a flue gas temperature of 260°F, resulted in an increase in average mercury removal from 88% to 97%. At the Zurich MWC as temperature remained constant at 248°F, and the carbon injection rate was increased from 7 mg/m^3 to 30 mg/m^3, the

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184 Brown, B. and K. Felsvang, "Control of Mercury and Dioxin Emissions from United States and European Municipal Solid Waste Incinerators by Spray Dryer Absorption Systems", Conference Papers and Abstracts from the Second Annual International Specialty Conference, Tampa, FL. April 15-19, 1991.

185 Donnelly, James R., and Karsten Felsvang, "Low Outlet Temperature Operation for Resource Recovery SDA Emission Control Systems", Proceedings of the 82nd Annual Meeting and Exhibition, Anaheim, CA. June 25-30, 1989.

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average mercury removal efficiency increased from 85% to 92%. Similarly, the injection rate for alkaline reagents affects the emission of acid gases[186]

[186] Felsvang, Karsten and O. Helvind, "Results of Full Scale Dry Injection Tests at MSW-Incinerators Using a New Active Absorbent" Municipal Waste Combustion, Conference Papers and Abstracts from the Second Annual International Specialty Conference, Tampa, FL April 15-19, 1992.

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Appendix L

Landfill Technology and Impacts

Background

Land disposal is one of the oldest methods of solid waste management in human communities, and it is still the predominant method used in the US. Globally, approximately 1,000 x 10^6 metric tons of organic waste are placed in landfills every year.[187]

The technology of landfilling has progressed since early in the century when waste was simply dumped in wetlands or other geologically unsuitable areas, without regard to proper safeguards for drinking water supplies in underlying groundwater aquifers. Since numerous MSW landfills accepted toxic materials in the past, and even the normal chemical processes of degradation of MSW in landfills produce acidic leachates which leach metals, sulfides, chlorides and organic compounds from the garbage deposited there, contamination of groundwater and surface waters has occurred, and people understandably worry about its threat to their health and the cost of cleaning it up.

Over the last decade or so, landfill engineering techniques have advanced to include federal and state requirements to improve the siting of landfills as well as designs to mitigate contamination of groundwater by leachate. In addition to these, the regulations improve landfill operations, provide for groundwater monitoring and corrective action,

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[187] Hutchinson, Peter J., "An Energy Perspective on Landfill Gas", The Future of Energy Gases: U.S. Geological Survey Professional Paper 1570.

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closure and post-closure care, and financial assurance in the event of contamination. Specifically, new and expanding landfills may not be located near airports, flood plains, wetlands, fault areas and seismic zones, and unstable areas. Landfills must be operated to keep out hazardous or liquid wastes and covered on a daily basis to prevent the spread of disease by rats, flies, mosquitoes, birds, and other animals. Since landfills are an important contributor to global greenhouse gas emissions, methane gas releases must be monitored routinely, and if there are excessive releases of this explosive gas, which could endanger public welfare, plans must be developed to solve the problem. Landfills must be designed with ditches and levees to retard the escape of storm water into ground- and surface-waters. Landfills must be operated so they do not violate state and federal clean air laws and regulations, which means that the burning of waste is generally prohibited at landfills.

For the last several years, the EPA has been working on New Source Performance Standards specifically to address the release of methane and a multitude of volatile organic compounds, some of which are highly toxic, from landfills. Studies are beginning to show that landfills, in the aggregate, contribute considerably to global greenhouse gases, that individual landfills can be the largest single source of VOC's (which is a prime contributor to ground-level ozone), in even large metropolitan areas like New York City and that emissions of certain organics such as benzene, toluene, and vinyl chloride can be significant contributors to ambient air near landfills.

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Landfilling Trends

From 1960 to 1985 discards sent to landfills has grown steadily, peaking in 1985 to 1990, and declining slightly thereafter. The tonnage sent to landfills increased from 55 to 133 million tons from 1960 to 1990 (a 142% increase) and in 1993 stands at 129 million tons. As a percent of overall waste generation, the discards sent to landfills increased from 62.6% in 1960 to 81.4% in 1980, but have declined back to 62.4% in 1993.

A landfill capacity shortage developed in the 1980s for two reasons:

1. The old incinerators which burned a large percentage of the waste stream in the 1960s and 1970s (30.8% in 1960 and 20.6% in 1970), were closed down as Clean Air Act standards came into being, and by 1980 the percentage of waste combusted was down to 9%. Landfills had to take up the slack.

2. The landfills into which waste was put in the 1960s and 1970s were also not as well designed for environmental protection as is the case currently. Most landfills were just dumps; waste was not compacted or buried in cells with cover added daily, and some was burned on-site. In the 1980s landfills became more difficult and expensive to site as suitable land near communities became hard to find and later, as improved landfill designs for reducing leachate contamination were required.

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According to Franklin Associates, although discards to landfill have fallen, from 129 to 118 million tons just from 1993 to 1995, a decrease of 8% in real terms, and as a percent of total generation,
it fell from 62.4% to 59.9%, landfilling is expected to increase once again (to 125 million tons in 2010) as waste generation rates continue to rise, and incineration stabilizes. The percentage of the waste stream represented by the 125 million tons will be only 50% at that point since recycling and composting are both expected to continue to rise.

New York State has undergone extensive landfill consolidation, where older, smaller landfills are being closed and new disposal capacity is developed. Since 1986, when there were 294 landfills in New York State, there was a net decrease of 257 landfills to 39 in 1995. There has been a commensurate increase in landfill disposal costs, and as a result, export has become more of a chosen option. Since 1988 the percentage of the waste stream handled by landfilling in New York State has dropped from 80% to 47% in 1995.[188]

As regulation of landfilling increases in the future, costs of siting new landfills should also increase. This should have the effect of making it more costly for large urban centers to export wastes long distances, as is currently done because the economics for doing so is so favorable. However, at the same time, the size of new landfills is growing, working to offset these higher costs. If there is a major shift in the economics of landfilling, this could change the impetus for developing new MWCs as well as the

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188 "Where Will the Garbage Go? 1995", New York State Assembly Legislative Commission on Solid Waste Management, Assemblymember Susan V. John, Chair. April, 1995.

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emphasis on the 3 R's, especially in those parts of the densely populated eastern US which still largely depend on landfilling for waste management.

MSW in Landfills

About three-fourths of MSW by weight is organic waste (e.g. paper, yard waste, and food waste) and about one-fourth is inorganic (e.g., metals and glass). Organic wastes are biodegradable and can decompose under proper landfill conditions to produce carbon dioxide, methane, organic acids, ammonia, water, and other chemicals. Overall moisture content of as-placed MSW usually falls in the range of 20-25% of wet weight. Most of the moisture in as-placed MSW is in food and yard wastes. Biodegradable components are assumed to be paper products, food waste, and 60% of the yard waste (grass and leaves). Plastics, rubber, leather, wood, and about 40% of the yard waste (assumed to be woody portions) are not categorized as biodegradable. Volatile solids content has traditionally been used to estimate the biodegradability of MSW. This measure can be misleading because some waste components are volatile but have low biodegradability. For example, lignin is a compound found in plant materials that is measured as a volatile solid but is not biodegradable in the landfill environment. Thus, estimating landfill gas emissions without adjusting biodegradability for lignin content can result in a major overestimate of landfill gas production. [189]

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[189] Moore, Rick "Impact Analysis of Municipal Solid Waste Recovery on Landfill Gas Generation", Journal of Resource Management and Technology, Vol 22., No. 2, June 1994.

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Landfill Decomposition Processes

Decomposition refers to the breakdown of organic materials into different compounds as a result of microbial activity. When organic wastes are put in a landfill, some aerobic decomposition occurs initially as aerobic bacteria (i.e., bacteria that function in the presence of oxygen) begin to break down the complex organic molecules in the waste into lower molecular weight compounds, by enzymes produced by bacteria and fungi. Naturally occurring polysaccharides, proteins, lipids, and other components of solid waste are broken down, as are many man-made organic compounds. The breakdown of halogenated hydrocarbons, herbicides, and insecticides, phenols, and polynuclear aromatics in the composting process are utilized in part by the bacteria and fungi, but portions also escape in the process exhaust. The elevated temperature and aeration of the composting material are both factors increasing the escape of these compounds. Many of the breakdown products in composting are highly odorous even in extremely low concentrations. In particular, the organosulfides, amines, fatty acids, and terpenes. The bacteria also quickly consume the available oxygen. Anaerobic decomposition (i.e. decomposition caused by bacteria that function without oxygen) then begins and is the dominant mode of decomposition. Aerobic and anaerobic decomposition generate different byproducts. Aerobic bacteria break down the waste materials into organic acids and other chemicals, and the bacteria themselves produce carbon dioxide as a byproduct of their metabolism. Anaerobic bacteria produce methane as a result of their metabolic activity (i.e. methanogenesis). Decomposition can continue for many years, as long as some organic material is available for bacterial activity. The rate depends on many

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factors, including moisture content, pH, temperature, degree of compaction, and MSW age, composition, and size.

There are three major phases in the decomposition of solid waste:

Phase I

Aerobic decomposition occurs rapidly, typically for a duration of less than one month. Once the available oxygen within the waste is used up (except in the vicinity of the surface), this phase of decomposition dies out. Phase I is brief, lasting perhaps only a few days or weeks. However, it may persist for longer periods and produce significant quantities of carbon dioxide in shallow (less than 3 m) deposits of waste where air can readily enter the waste or be drawn into the waste by landfill gas pumping. Significant quantities of hydrogen (up to about 20% by volume) can be produced, particularly if the site is dry.

Phase II

Anaerobic and facultative organisms (acetogenic bacteria) hydrolyze and ferment cellulose and other putrescible materials, producing simpler, soluble compounds such as volatile fatty acids (which produce a high BOD value) and ammonia. Phase II can last for years, or even decades. Leachates produced during this stage are characterized by high BOD values (commonly greater than 10,000 mg/L) and high ratios of BOD to COD (commonly greater than 0.7), indicating that a high proportion of soluble organic materials are readily biodegradable. Other typical characteristics of Phase II leachates are acidic pH levels (typically 5 to 6), strong, unpleasant smells, and high concentrations

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of ammonia (often 500-1000 mg/L). The aggressive chemical nature of this leachate assists in dissolution of other components of the waste, which typically translates into high levels of iron, manganese, zinc, calcium, and magnesium in the leachate. Gas production consists mainly of carbon dioxide with lesser quantities of methane and hydrogen.

Phase III

Slower-growing methanogenic bacteria gradually become established and start to consume simple organic compounds, producing the mixture of carbon dioxide and methane (plus various trace constituents) that constitute landfill gas. This phase is more sensitive than Phase II. The transition from Phase II to Phase III can take many years, and may not be completed for decades (and is sometimes never completed). However, wastes have been known to reach Phase III in a few months. Ultimately, the stable methane phase is reached, whereby gas composition and gas production rate remain approximately constant over a longer period of time under steady state. The distinct decrease in acetic acid concentration in the leachate, with a corresponding increase in methane production, are characteristic of this phase. Even though the BOD of the leachate is still relatively high, it continues to drop at a steady rate. PH is already neutral to weakly alkaline. In Phase III, bacteria gradually become established that are able to remove the soluble organic compounds (mainly fatty acids) which are largely responsible for the characteristics of phase II leachates. These bacteria thrive in the absence of oxygen and convert the soluble organic compounds into methane and carbon dioxide, which are then emitted as landfill gas. Leachates generated during Phase III are often referred to as "stabilized", but at this stage the landfill is biologically at its most active

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level. A dynamic equilibrium is eventually established between acetogenic and methanogenic bacteria, and wastes continue to decompose actively. This active production of gas can last several years at a relatively high rate. It may then continue at a gradually decreasing rate over a period of many decades before the landfilled wastes are largely decomposed, and the gas production slows to such an extent that atmospheric oxygen can once more diffuse into the fill. Leachates produced during Phase III are characterized by relatively low BOD values and low ratios of BOD to COD. However ammonia nitrogen continues to be released by the first-stage acetogenic process and is present at high levels in the leachate. Inorganic substances such as iron, sodium, potassium, sulfate, and chloride may continue to dissolve and leach from the landfill for many years.

After gas production ceases there remains a relatively high percentage of organic material, which consists primarily of hard-to-degrade organic materials. These are either already constituents of the waste material itself (e.g. lignins), or are newly generated (e.g., humic matter). It can be expected that approximately 12%DS in a municipal solid waste landfill will remain as carbon. Much is unknown about the performance, timing, and rate of degradation of biodegradable plastics. Little is known about additives in plastic products; for example, depending on conditions, metal additives could be released in soluble forms and become part of leachate. In contrast, nondegradable plastics are

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basically inert when landfilled and probably are not significant contributors of byproducts. [190]

Landfill Leachate

Leachate is generated in the landfill as a normal function of the hydrologic cycle. When rain falls on the landfill, it either evaporates into the atmosphere as water vapor, runs off into landfill drainage system, or soaks into the soil and becomes part of the groundwater flow. As the rainwater soaks into the landfill, it passes through the solid waste and becomes contaminated by various waste constituents. This contaminated water is known as leachate. Hydrogeological analyses on the Fresh Kills landfill indicate that approximately 312,800 gallons per day is generated within Section 6/7 and 595,000 gpd is generated within Section 1/9. [191]

Leachate's quality reflects the diverse and complex nature of its sources. Constituents of the waste material are either dissolved immediately as precipitation enters the landfill, or go into solution as intermediate or final products of the degradation processes that take place within the reactor landfill.

The high concentrations of organic and inorganic constituents vary temporally and spatially. The fractions themselves are complex. The organics (1) contain volatile

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[190] Lechner, P., T. Lahner, and E. Binner. "Reactor Landfill Experiences Gained at the Breitnenau Research Landfill in Austria", 16th International Madison Waste Conference, Madison, WI. September 22-23, 1993.

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intermediates, (2) contain acid and base neutral extractable compounds which can be dissolved or associated with particulates, (3) are biologically assimilative, refractory, inhibitory or toxic, and (4) are soluble or highly adsorbable. The inorganic fraction contains ammonia, sulfur compounds, total dissolved solids, and metals such as iron, zinc, cadmium, nickel, and arsenic, which can be dissolved, particulate or bound in organic-metallic complexes.[192] "Since leachate is a source of food for the methanogens and a medium of transport, leachate collection and removal (as well as the prevention of intrusion of other liquids, including rain), will slow down the biodegradation process of the landfill, altering the rate of gas generation and lengthening its active life".[193]

Increases in the size of individual sites, improvements in the compaction of wastes, and use of cover materials to exclude air and minimize water infiltration alter the manner in which deposited wastes decompose. Rapidly established anaerobic conditions generate very high concentrations of BOD compounds such as volatile fatty acids, which, as decomposition proceeds, become efficiently converted to large quantities of landfill gas. The organic acids formed during aerobic decomposition can increase the mobility, solubility, and sometimes the potential toxicity of metals in the leachate. In contrast, under anaerobic conditions, metals are less soluble and instead may precipitate out as, for example, metallic sulfides.

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[191] Executive Summary, Project Information and Site Assessment Document – Fresh Kills Landfill, NYCDOS, September 23, 1994.

[192] "Leachate Management", Wehran EnviroTech Fact Sheet.

[193] Bader, Charles D., "Dealing with Groundwater Contamination", MSW Management, Nov/Dec. 1994

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The quantity of leachate generated depends on factors such as rainfall, temperature, humidity, surface runoff, and subsurface water migration, all of which affect the rate of anaerobic bacterial activity. Factors affecting the composition of leachates include: solid waste composition, age of the refuse, operation of the landfill, climate, hydrogeologic conditions in the vicinity of the landfill site, conditions within the landfill such as chemical and biological activities, moisture content, temperature, pH, and the degree of stabilization.

The most important components of landfill design and operation that significantly affect leachate composition are:

- **Refuse composition.** Waste streams vary with geography (urban, suburban, rural) and sector (residential, institutional, commercial). Thus, the types of wastes present in the landfill can vary considerably (e.g., waste from rural farms vs. commercial offices vs. construction and demolition).

- **Pretreatment.** If certain elements are removed from the waste stream prior to disposal (e.g., via recycling or toxic source reduction / product redesign, then there are fewer available for leaching.

- **Placement sequence.** Placement of certain wastes near each other, or on top of one another, can make certain chemical reactions possible or less likely.

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- **Moisture addition.** Rainfall varies considerably in different parts of the country. Landfills in south Florida are known to decompose rapidly due to heavy rainfall, whereas landfills in the desert Southwest barely decay at all.

- **Microbial decay.** This is affected by the types of wastes disposed. Food wastes and sewage sludge are naturally high in microbes; construction wastes and office paper are not.

- **Infiltration rate / Refuse Density.** At low infiltration rates, anaerobic microbial activity is thought to be a significant factor in governing leachate organic strength, but a high flow rates, soluble organic and even microbial cells may be flushed from the refuse.

- **Depth of refuse.** Increases in refuse depth allow the percolate to approach its solubility limit, thereby reducing its leaching potential for the lower depths of refuse. Thus, to the solubility limit, increased depths result in a stronger percolate as the contact time between the solid and liquid phase increases. This can increase leachate strength, but also increases the time for refuse stabilization.

- **Refuse Temperature**. Temperature affects bacterial growth and refuse composition. Optimum mesophyllic temperature for methanogenesis is between 30 and 40oC. Elevated temperatures also favor the solubility of most salts and the kinetics of most chemically-driven reactions.

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- **Sorption and complexation** of metals in the leachate are important processes influencing the attenuation of trace metals. In general, complexation acts to increase metal solubility. Ligands such as chloride, ammonia, phosphate, and sulfide, as well as a n array of organic compounds, provide conditions ideal for the complexing of metal ions. Sulfides effectively compete with most complexing agents, however heavier metals will precipitate as sulfides."

- **Landfill Age.** The concentrations of various leachate constituents vary considerably from landfill to landfill. Landfill age is one of the most relevant factors affecting leachate composition.

"Based on NYSDEC's permit conditions for Fresh Kills landfill, the principal contaminants of concern found in the leachate were ammonia, organic matter and several metals.... The treatment process removes the ammonia from the leachate by pumping it to the sequencing batch reactors where naturally occurring bacteria feed on the ammonia and other organic wastes in the leachate. These bacteria convert the ammonia to a more benign form of nitrogen and decompose the organic matter.[194]"

The following compounds were frequently detected in landfills of all kinds: arsenic-dissolved compounds, lead-dissolved compounds, benzene, cadmium-dissolved

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[194] DOS Report, Projects and Developments at Fresh Kills Landfill, Feb. 1994.

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compounds, chlorobenzene, ethylbenzene, methylene chloride, toluene, and Trans- 1,2-Dichloroethene. [195]

Landfill Gas Emissions

Landfill gas (LFG) is a natural byproduct of the decomposition of organic solid waste in sanitary landfills. The initial aerobic phase of decomposition begins soon after the waste is placed in the landfill and continues until most of the entrained oxygen in the waste is depleted within anywhere from 6 to 18 months. When the oxygen is depleted, decomposition enters an anaerobic phase in which typical LFG is produced, with a composition of 45 to 57 percent methane and 40 to 50 percent carbon dioxide. The incremental rate at which the gas is generated is primarily a function of the type of wastes involved (e.g., food wastes versus paper or cardboard). The overall generation rate is also believe to be influenced by a number of other factors, such as refuse age, moisture content, compaction, and pH." [196] Up to 5% of the LFG is typically comprised of hydrogen, nitrogen, oxygen, moisture, and a group of several dozen trace contaminants, primarily consisting of non-methane organic compounds. The total volume of gas generated over the life of a landfill is a direct function of the total volume of organic waste in the landfill. [197] It is estimated that if the organic wastes placed in landfills across

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[195] Gibbons, Robert D., et. al., "A Comparison of Chemical Constituents in Leachate from Industrial Hazardous Waste and Municipal Solid Waste Landfills", 15th Annual Madison Waste Conference, September 23-24, 1992, Madison, WI.

[196] Roy F. Weston of New York, "Project Information and Site Assessment Document: Fresh Kills Landfill", Executive Summary, The City of New York Department of Sanitation, September, 23, 1994.

[197] Executive Summary, Project Information and Site Assessment Document – Fresh Kills Landfill, NYCDOS, September 23, 1994.

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the world are completely biodegraded at a rate of 0.28 m^3 of biogas per kg, this MSW has the potential to produce approximately 2.8 x 10^{11} m3 of biogas.[198]

The two primary pathways for production of gaseous emissions are: Volatilization of materials in the waste stream (many products containing hazardous VOC's are discarded in municipal solid waste), and production of new compounds through the biological decomposition of the higher molecular weight compounds in waste (composting and landfilling are both biological processes in which complex molecules are broken down into lighter and more volatile intermediate compounds such as organic acids, amines, and organosulfides). Production of toxics in the landfill can occur by chemical reactions or the co-metabolism of toxics by microorganisms. Perchlorethylene and trichlorethane are readily converted into vinyl chloride and a wide variety of other similar compounds by microorganisms. Enzymes produced by microorganisms to consume hydrocarbons also happen to dehalogenate many halogenated organics. While this process, carried to completion, would detoxify a landfill relative to more highly halogenated organics, it produces some toxics such as vinyl chloride and vinylidene chloride during the process.[199]

A large number of toxic compounds are found in municipal waste landfills, and as a result of normal processes, landfill gas can impact the surrounding area by two modes of

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198 Hutchinson, Peter J., "An Energy Perspective on Landfill Gas", The Future of Energy Gases: U.S. Geological Survey Professional Paper 1570.

199 Wood, John A., Michael L. Porter, and Margil W. Wadley. "Hazardous Pollutants in Class II Landfills", South Coast Air Quality Management District, Laboratory Services Branch, Technical Services Division. 1986.

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transport: airborne (escape of gas through the landfill surface), and gas migration (subsurface escape of gas). Subsurface migration allows landfill gas to emerge wherever the surface layer is cracked or penetrated by pipes, such as in water-meter boxes and in kitchens and bathrooms of nearby homes. There is no dilution prior to arrival, so concentrations tend to be very high and localized. Compounds with low boiling points, such as vinyl chloride, arrive in homes at hgh relative concentrations than do compounds with higher boiling points, such as perchlorethylene. Methane, which is light and very mobile precedes heavier components. Therefore, subsurface migration can produce explosive levels of methane in confined spaces without the presence of tell-tale odors, and has resulted in explosions and fires. Vinyl chloride can also precede odorous compounds during subsurface gas migration, and one study showed an in-home 24-hour average concentration of this substance of 30 to 50 ppb without a trace of odor. The South Coast AQMD in California found relatively high concentrations of vinyl chloride in the 20 California landfills surveyed, and it was found in 8 of the 15 inactive landfills, indicating that vinyl chloride can be produced in a landfill long after it has ceased to accept trash. They concluded, based on the information just presented, that the rate of biodehalogenation of vinyl chloride may proceed at a rate significantly slower than the rates of the reactions that produce it. The data also showed that a majority of municipal landfills contain enough toxic compounds to be a potential problem. [200]

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[200] Wood, John A., Michael L. Porter, and Margil W. Wadley. "Hazardous Pollutants in Class II Landfills", South Coast Air Quality Management District, Laboratory Services Branch, Technical Services Division. 1986.

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In another part of the country, of the eleven tests conducted at six randomly chosen sampling locations in the Sycamore Landfill, only two showed measurable VOC concentrations. For these two tests, the primary VOC present was vinyl chloride. This carcinogen provided a greater contribution of the VOC in the blower emissions, approximately 70%, compared to the other constituents. Of the six target VOCs, vinyl chloride was least likely to be affected by biodegradation. This may explain its greater contribution compared to the in-situ samples. For those samples in selected landfill surface samples, where there are no known cap fractures, and where values greater than the detection limit were measured, vinyl chloride contributed greater than 80% of the measured VOC. Xylene was the second least biodegradable species present. This data strongly suggests that benzene, toluene, ethylbenzene, and DCM can be biologically degraded in the landfill cap and are not emitted directly to the atmosphere.[201]

A study in Canada showed that vinyl chloride emissions from exposed refuse are predicted to exceed the standards up to 100 m from the edge of the exposed areas. A study of potential off-site excursions from exposed areas show that exceedance of standards and criteria would occur when refuse is exposed. The additional impact of vinyl chloride emissions from the cut areas to the overall emission of vinyl chloride from the site implies that vinyl chloride levels could be potentially exceeded several hundred meters off-site during exposure of existing refuse areas. The results of the dispersion modeling indicate that passive venting produces off-site vinyl chloride levels that exceed

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201 Klafka, Steve, et. Al., "Composition of VOC Emissions from the Sycamore Landfill", Proceedings of the 87th Annual Meeting & Exhibition, Air and Waste Management Association, Cincinnati, Ohio, June 19-24, 1994.

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provincial standards and criteria up to 175 m from the landfill site. In addition to exceeding standards adjacent to the landfill, a proposed expansion is expected to result in vinyl chloride emissions exceeding the provincial standard above the landfill. This would present a problem if the site is to be used as a golf course after the closure of the landfill.... The results suggest that a gas collection and destruction system should be implemented at the site. Further analysis, assuming a 50% reduction of gaseous emissions from the landfill as the result of such a system (as well as the implementation of other recommendations), indicated that vinyl chloride levels would be reduced to a level that would generally meet the provincial standards and criteria off-site, but levels would still exceed the standards above the landfill."[202]

The rate of landfill gas production is dependent on environmental conditions within the landfill and the time required for complete waste stabilization can vary between 10 and 80 or more years. Typical durations for complete decomposition of the biodegradable fraction of landfilled waste have been estimated at 15-50 years and 30-50 years.[203] In addition to prevalence in the waste stream, there are other physical factors affecting the relative concentration of organic compounds in the emissions from landfilled waste. a. Vapor pressure, b. Solubility, c. Adsorption, d. Biological processes. Compounds with relatively high vapor pressure and low solubility in water are more likely to volatilize in the landfill.

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202 Britannia Landfill Expansion Study, Volume 2: Air Quality and Odour, Chapter 4.0 Landfill Gas Impact Assessment. RWDI.

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"The EPA Landfill Air Emissions Estimation Model is based on the assumption that all gas generated by the covered refuse is released over time to the ambient air. ... The model does not take into account any attenuation that the soil cover may produce as the landfill gas migrates through it. Furthermore, the soil cover inhibits gas migration from the refuse resulting in a pressure build up within the refuse mounds. ... Hence, it is possible that pressure build-up within the refuse mounds may actually inhibit anaerobic processes, thereby, reducing gas production and possibly attenuate the gas as it migrates through the cover."[204]

Another factor that seriously affects predictions of landfill gas generation is the impact of recycling and composting activities on a landfill. By targeting non-biodegradable MSW components for recovery, a 50% recovery rate from EPA projected MSW generated in 1995 can be achieved without decreasing the specific yield of methane. However, a 50% recovery rate that is achieved by targeting biodegradable MSW components will result in a drastic decline in the specific yield of methane. In the event that 50% recovery occurs, the composition of the recovered waste stream significantly affects potential landfill gas volumes. However, to achieve 50% recovery of generated MSW, it is necessary to increase the recovery rate of organic waste components. Even a high non-biodegradable recovery scenario involves increased recovery rates of organic MSW components to reach a 50% recovery level. A high biodegradable recovery scenario is an example of

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203 Moore, Rick "Impact Analysis of Municipal Solid Waste Recovery on Landfill Gas Generation", Journal of Resource Management and Technology, Vol 22., No. 2, June 1994.

204 Britannia Landfill Expansion Study, Volume 2: Air Quality and Odour, Chapter 4.0 Landfill Gas Impact Assessment. RWDI.

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achieving a 50% recovery rate by targeting the paper, paperboard and yard waste. The subsequent decrease in the biodegradable fraction as well as amount of landfilled waste results in a significant reduction in methane potential relative to 1988. Failure to adjust biodegradability for lignin content results in an overestimation of landfill gas production of 62%.[205]

Landfill gas has been shown to migrate through liners and caps. Some laboratory experiments suggest that volatile organic chemicals (e.g. trichloroethylene or TCE, toluene and xylene) can migrate rapidly through synthetic liners. In different tests conducted by EPA, most synthetic liners were eventually destroyed when exposed to methylene chloride in full strength concentrations. In addition to biological and chemical processes that may attenuate VOC, there are a variety of physical parameters that may affect emissions, such as the integrity of the cap. Cap parameters of interest are the amount of cracking, health of cover vegetation, and air permeability. Moisture content can greatly reduce methane emissions from a landfill. If methane emissions are reduced, then the emission of all landfill gas components will likely be attenuated.

Fresh Kills landfill celebrated its 50th anniversary in 1998, and in recent years has been accepting anywhere from 10,000 to 15,000 tons per day of New York City's residential and institutional wastes, amounting to roughly four million tons per year. The estimated

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205 Moore, Rick "Impact Analysis of Municipal Solid Waste Recovery on Landfill Gas Generation", Journal of Resource Management and Technology, Vol 22., No. 2, June 1994.

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emissions rates of pollutants from Fresh Kills landfill and its associated activities have been estimated [206] as follows:

VOC	4,600 tons per year	Landfill gas
Hazardous Air Pollutants	608 tons per year	Landfill gas
NOx	935 tons per year	Bulldozers, etc.
CO	217 tons per year	Bulldozers, etc.

Results show that, even presuming EPA's currently-proposed control requirements are implemented at the Fresh Kills Landfill, the landfill would continue to emit hundreds to thousands of tons per year of pollutants (VOC, NOx) that contribute to the existing violations of the ambient standard for ozone, and would continue to emit hundreds of tons per year of hazardous air pollutants associated with health risks. Furthermore, these annual emissions levels would continue to migrate through or around the cap for decades into the future. [207]

Case Study: Degradation of Diapers, Newspapers and other Cellulose-Containing Materials [208]

A study of landfills in Florida, Pennsylvania and Wisconsin was undertaken to determine differences in degradation of different kinds of diapers, newspapers and other organic materials. Cellulose has been reported as the major, chemically identifiable,

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206 Minott, David H., "Air Pollutant Emissions from MSW Landfills – The "Sleeper Issue for Landfill Design and Regulation", 10th Conference on Solid Waste Management and Materials Policy, sponsored by New York State Legislative Commission on Solid Waste Management, New York, NY. February 19-22, 1995.

207 Minott, David, "Air Pollutant Emissions from MSW Landfills -- The "Sleeper" issue for Landfill Design and Regulation", presented at the Tenth Conference on Solid Waste Management & Materials Policy, sponsored by New York State Legislative Commission on Solid Waste Management, New York, NY Feb. 19-22, 1995.

208 Stinson, Jeffrey and Robert Ham, "Decomposition of Cellulose in Sanitary Landfills Located in Different Climates", Sixteenth International Madison Waste Conference, September 22-23, 1993.

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biodegradable fraction of MSW. Significant cellulose degradation was observed during the first year of burial in the Florida landfill; however, little if any, cellulose decomposition occurred during one year of burial in the Pennsylvania landfill or the first 2.5 years in the Wisconsin landfill. It appears that the most important factors contributing to these differences in degradation are the warmer temperatures and higher infiltration rates at the Florida landfill (due to higher rainfall rates and a more open sandy soil cover employed at this site which facilitated water infiltration). A comparison of cellulose losses in different materials indicates that cellulose present in newspaper is less degradable than cellulose present in a purified form such as the materials used in the construction of disposable diapers (not including the plastic lining). On the other hand, when degradation does occur in a landfill, it appears that cellulose and hemicellulose, the two major biodegradable components of MSW, degrade at essentially the same rate.

The type A diaper cores were constructed with pure cellulose while the others contained cellulose and either lignin (about 13% in the type B diaper cores) or an absorbent gel material designed to increase the water-holding capacity of the diapers (types C and D). As for the backsheets, the type C diapers were constructed with a standard plastic backsheet while the other three types of diapers, A, B & D, incorporated starch to facilitate the breakup of the backsheets.

The initial mean moisture contents of the pasta, newspaper, and peanut samples were all below 10%. Upon retrieval from the Florida landfill, the mean moisture contents ranged from 68.6% to 71.4%. Upon retrieval from the Pennsylvania and Wisconsin landfills, the

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mean moisture contents of these materials ranged from 32.2% to 38.1% and 36.0% to 58.0% respectively. Statistically, the mean moisture contents of all the retrieved samples were greater than their initial levels and the Florida samples were wetter than those recovered form the other two landfills.

Initial mean moisture contents of the soiled diapers were not measured, however, experience has shown that soiled diapers have an average moisture content of about 68%. Upon retrieval from the Florida landfill, the mean moisture contents of the diapers ranged from 59.2% to 80.0%. Upon retrieval from the Pennsylvania and Wisconsin landfills, the mean moisture contents of the diapers ranged from 55.4% to 65.1% and 55.1% to 71.9% respectively. Unlike the results found for the other materials, little, if any, difference in moisture contents were observed with the diapers recovered after one year from the three landfills.

The mean dry weights for the pasta samples recovered from the Florida landfill after one and two years of burial were only 1.4g and 0.6g respectively. In contrast to this, the mean dry weights for the pasta samples recovered from the Pennsylvania and Wisconsin landfills ranged from 49.2g (Wisconsin, clay-cap: 2.5 years) to 77.2g (Pennsylvania: 1 year). All of the mean dry weights for the recovered pasta samples from the three landfills were statistically less than the initial mean dry weight of 93.5g.
Dry weight losses were also observed with the peanut samples recovered from the Florida landfill. The total cellulose contents for the peanut samples recovered from these two landfills (PA, WI) are generally not statistically different from one another, nor are they

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statistically different from the initial value of 16.7 g. In fact, the only samples which statistically appear to have less cellulose are those from the Florida landfill.

In contrast to the results with the peanuts, which showed a 40-50% decrease in total cellulose, the Florida newspaper samples showed only a 15% decrease in total cellulose. None of the Wisconsin or Pennsylvania samples exhibited a statistically significant decrease in the mean amount of total cellulose in newspaper.

All of the diaper core samples showed significant dry weight and total cellulose losses in the Florida landfill. After one year of burial in this landfill, the mean losses in total cellulose for the four types of diapers ranged from 84% (type B) to 97% (type A). Hence, nearly all of the cellulose in the four types of diapers had degraded within two years of burial in the Florida landfill. In fact the amount of total cellulose remaining in the type A and C diapers after two years was not statistically significant, and that for the type B diapers was only slightly significant.

While cellulose and hemicellulose are the major, chemically identifiable, biodegradable components of MSW, lignin is the major non-degradable component of the wood and wood product (e.g. paper) portion of MSW. Therefore, previous investigators have suggested the use of celluose to lignin (C/L) ratios for tracking the anaerobic decomposition of municipal solid wastes because it avoids the impacts of extraneous materials (e.g. inorganics) in refuse samples. Chemical analysis revealed that the newspapers, peanuts, (shells) and type B diaper cores contained measurable amounts of

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lignin; hence, C/L ratios were determined for these materials. No significant changes were observed for the C/L ratios of the materials recovered from the Pennsylvania and Wisconsin landfills. However, significant changes in C/L ratios were observed for the materials recovered from the Florida landfill.

Results from the Pennsylvania and Wisconsin landfills show cellulose was not degrading at these two sites through one year and 2.5 years, respectively. On the other hand, significant decomposition was occurring at the Florida site, which is evident by the fact that less than 2% of the pasta was recovered from the Florida landfill after one year. In fact, losses in total cellulose from 72% to 82% were observed for the cellulosic diaper core materials after just one year.

The relative lack of cellulose degradation in the Pennsylvania and Wisconsin landfills may in part be a result of differences in temperature at the three landfills. Field measurements showed that the Florida samples could have been as much as 17°C warmer than the other two sites. However, considering the fact that biological reaction rates generally double for every 10°C increase in temperature, it appears that other factors, such as moisture movement, were controlling the rates of degradation in the three landfills. Previous investigators have shown that moisture movement is an important parameter influencing solid waste decomposition in sanitary landfills. The moisture contents of the pasta, newspaper, and peanut samples, which all had initial values <10%, were significantly greater upon recovery from the Florida landfill than from the other two which suggests that more infiltration occurred at the Florida site. The higher estimates of

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infiltration in Florida are essentially due to the significantly larger amounts of rainfall each year (about 70" compared to 33" to 43") and the relatively permeable sand-cap covering the test site.

It appears that climate and infiltration are not the only parameters controlling cellulose degradation in landfills. This is shown by comparing the results from the newspaper samples to results from other cellulose-containing materials. Newspapers recovered from the Florida landfill had an average moisture content similar to the other materials recovered from this landfill; however, they showed only a small decrease in their total cellulose content and C/L ratio. Therefore, it appears that the cellulose in newspaper is less degradable than cellulose present in a purified form such as the materials used in the construction of disposable diapers. These results suggest that the ability of microbes to degrade the cellulose in a material is not only affected by environmental factors, but is also affected by the structure (e.g. lignin content) of that material.

Environmental and Human Health Impacts from Landfills

The potentially most hazardous effects of uncrontrolled landfill gas emissions are [209]:

- Intensification of the greenhouse effect
- Damage to vegetation
- Danger of fire and explosion
- Unpleasant or annoying odors
- Cancer and other health risks

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[209] Lechner, P., T. Lahner, and E. Binner. "Reactor Landfill Experiences Gained at the Breitnenau Research Landfill in Austria", 16th International Madison Waste Conference, September 22-23, 1993.

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Greenhouse Effect

Methane is 20-30 times more potent as a greenhouse gas than carbon dioxide, molecule for molecule. EPA is concerned that landfill methane emissions contribute to global warming. EPA estimated methane emissions from MSW landfills nationally to be 12 million TPY in 1986, and is projecting 21 million TPY by 1997. EPA states that 'landfills are the single largest anthropogenic source of methane in the United States,' accounting for 37% of such emissions nationally. EPA also indicates that landfill emissions of methane account for 4% of all anthropogenic greenhouse gas emissions in this country.[210] Since methane traps about 25 times more infrared energy than does carbon dioxide, from a climate perspective it would be more desirable to convert methane to carbon dioxide in an energy recovery facility, rather than merely vent it. "A ton of MSW disposed of in a landfill without methane gas recovery contributes to the greenhouse effect about 25 times more than burning an equivalent ton in a modern WTE facility."[211]

Danger of fire and explosion

EPA notes that explosions and fires from landfill gas migration have caused severe injury and death. EPA examined 29 cases in which damages occurred because of methane

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[210] Minott, David, "Air Pollutant Emissions from MSW Landfills -- The "Sleeper" issue for Landfill Design and Regulation", presented at the Tenth Conference on Solid Waste Management & Materials Policy, sponsored by New York State Legislative Commission on Solid Waste Management, New York, NY Feb. 19-22, 1995.

[211] Kulik, Ann, "A Tale of Four Landfills", reprinted from MSW Management, September/October, 1993.

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migration from landfills. In 23 of the cases methane was detected away from the landfill at concentrations above the lower explosive level. Explosions and fires occurred at 21 of the surveyed sites, resulting in a loss of life on five occasions. EPA's statistics on deaths, injuries, and property damage resulting from landfill-gas explosions and fires nationally, during the 20-year period from 1967 to 1987 showed 20 incidents in 17 states in which gas migration resulted in explosions or fires offsite. Of these 20, eight incidents resulted in nine deaths and 20 injuries amongst the public. Many of the other incidents resulted in property damage.[212]

Cancer and other health risks

The Office of Technology Assessment suggests that natural anaerobic processes in MSW landfills can convert non-hazardous waste (e.g., the lignin in paper) into hazardous substances such as benzene and toluene. These compounds, which also are used to make ingredients in some common household products, are present in gas emissions from MSW landfills. [213]

EPA has identified over 100 air pollutants in landfill emissions that are associated with cancer and other diseases. The most common include benzene, vinyl chloride and trichloroethane, which are probable human carcinogens. Five other carcinogens have

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212 Minott, David, "Air Pollutant Emissions from MSW Landfills -- The "Sleeper" issue for Landfill Design and Regulation", presented at the Tenth Conference on Solid Waste Management & Materials Policy, sponsored by New York State Legislative Commission on Solid Waste Management, New York, NY Feb. 19-22, 1995.

213 "Facing America's Trash: What Next for Municipal Solid Waste?", Congress of the United States, Office of Technology Assessment, OTA-)-424 (Washington, DC: U.S. Government Printing Office, October, 1989).

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also been present in landfill gas: carbon tetrachloride, chloroform, ethylene dichloride, methylene dichloride, and perchloroethylene. EPA identified other emissions, associated with other diseases, in landfill gas: toluene and methylene chloride. Also, engines and flares used at landfills to control landfill gas, actually produce dioxin emissions while combusting the gas. Likewise, dioxin is emitted by the heavy-duty diesel equipment used to compact and cover MSW deposited at a landfill. [214]

EPA has determined that air pollutant emissions from landfills can pose a significant risk to human health and the environment. One group of air pollutants emitted from landfills (VOC) contributes to violations of the ambient standard for ozone. Also, EPA has identified over 100 air pollutants in landfill emissions (e.g., vinyl chloride, benzene) that are associated with cancer and other diseases. Furthermore, engines and flares used at landfills to control landfill gas, actually produce dioxin emissions while combusting the gas.[215]

EPA estimated Non-Methane Organic Compounds (NMOC) emissions from MSW landfills nationwide to be 283,000 tons per year in 1986, accounting for one percent of all NMOC emissions from stationary sources. EPA projected landfill NMOC emissions to

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214 Minott, David, "Air Pollutant Emissions from MSW Landfills -- The "Sleeper" issue for Landfill Design and Regulation", presented at the Tenth Conference on Solid Waste Management & Materials Policy, sponsored by New York State Legislative Commission on Solid Waste Management, New York, NY Feb. 19-22, 1995.

215 Minott, David, "Air Pollutant Emissions from MSW Landfills -- The "Sleeper" issue for Landfill Design and Regulation", presented at the Tenth Conference on Solid Waste Management & Materials Policy, sponsored by New York State Legislative Commission on Solid Waste Management, New York, NY Feb. 19-22, 1995.

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amount to 577,000 TPY by 1997.[216] NMOC and VOC contribute considerably to exceedances of ground-level ozone standards, which is particularly significant in urban areas such as New York City, which are in ozone non-attainment areas.

Only 25% of all MSW landfills monitored groundwater as of 1986. This lack of monitoring is alarming because downgradient drinking water wells exist within 1 mile of an estimated 46% of all MSW landfills. Even given the relative lack of monitoring, over 100 potentially harmful substances have been identified in MSW landfill leachate. To estimate human health risks posed by MSW landfills, EPA uses a model to predict the release, transport, fate, and impacts of eight pollutants (including vinyl chloride, tetrachloroethane, and methylene chloride) found in landfill leachate. Important variables that influence the magnitude of risks include distance to the nearest downgradient well, infiltration rate, landfill size, and aquifer characteristics. The model estimates, for example, that 5.5% of existing MSW landfills pose a lifetime cancer risk of 10^{-4} to 10^{-5} and that 11.6% pose a risk of 10^{-5} to 10^{-7}.

Microorganisms that can potentially spread disease also are present in landfills and have been detected in leachate and in the air (e.g. on dust particles) at landfills. They can originate from a number of sources, such as animal feces, human feces, in diapers, sewage sludge, and even from materials such as glass, metal, plastic, paper and yard wastes. Concentrations of pathogenic bacteria (e.g., fecal streptococci) vary substantially

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[216] Minott, David, "Air Pollutant Emissions from MSW Landfills -- The "Sleeper" issue for Landfill Design and Regulation", presented at the Tenth Conference on Solid Waste Management & Materials Policy, sponsored by New York State Legislative Commission on Solid Waste Management, New York, NY Feb. 19-22, 1995.

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with time but tend to decrease rapidly after 3 to 6 months of operation because they are destroyed by chemicals in the leachate. Viruses have not been found in the leachate.

In summarizing the findings from the three surface water bodies near Fresh Kills landfill, exceedances of the acceptable water quality criteria for fish consumption were noted for mercury, cadmium and arsenic. Based on these findings, consumption of fish caught from the Fresh Kills, Richmond or Main Creeks (assuming that the average daily intake of fish for a lifetime comes from this source) could cause a concern risk of greater than one in a million (cadmium, arsenic) or a noncancer hazard quotient of greater than one (mercury). The maximum 24-hour values for benzene and lead exceeded the short-term criteria in a few cases. [217]

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[217] Executive Summary, Project Information and Site Assessment Document – Fresh Kills Landfill, NYCDOS, September 23, 1994.

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Appendix M

Indoctrination Letters to Managers and Cashiers

Gristede's / EAC
Environmental Shopping Project

Marjorie J. Clarke, Principal Investigator

Welcome to the Project!

You, as a Gristede's cashier, are a crucial part of an innovative research program sponsored by the U.S. Environmental Protection Agency, the Environmental Action Coalition, City University of New York, and, of course, Gristede's, and which begins November 1. The purpose of the research is to educate your customers about how to become environmental shoppers, and to measure to what extent (if any) their knowledge, attitudes and shopping behavior changes after the education period. Only two stores have been chosen for this pilot project: Gristede's East 86th Street (1st avenue), and Gristede's West 86th Street (Broadway).

Between November 1 and early January, brochures describing environmental shopping will be given out to customers, posters will be hung, both in the storefront and inside the store, attractive, and reusable cotton shopping bags will be sold. Please do read the brochures as they come out; there is a lot of interesting information in them. And here is your part in the project:

1. The cotton bags will be sold for $4 and rung up by the cashiers (ask your store manager for the new code). In order to help sell the most bags, each cashier can help us tremendously by asking each customer whether they would like to purchase a cotton bag before bagging the groceries. If people bring their own bags, please pack the groceries in them. We are hoping to maximize the number of cotton bags sold and also to encourage people to use them every time they shop. We will attach a plastic sign to the side of the cash register encouraging customers to bring their own bag. Reducing the number of disposable bags given away helps the environment by reducing the number of bags manufactured and disposed in landfills and incinerators.

2. We will be offering to all customers who have babies the opportunity to enroll in diaper service. It is critical to the accuracy of the measurements we are going to make that every person who buys disposable diapers be given an invitation to purchase this service. These invitations are contained in envelopes with yellow labels. Please hand an envelope (with yellow label up) to customers who buy disposables. The store managers have quantities of these invitations.

3. We will have our three project brochures occupy part of the magazine rack next to each cash register. Please check the rack now and then to make sure it is stocked with the brochures.

Again, thanks, in advance, for your active participation.

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Gristede's / EAC

Environmental Shopping Project

Memorandum

TO: Store Managers, Department Heads, Staff
Gristede's Supermarkets (East 86th and West 86th)

FROM: Marjorie J. Clarke, Principal Investigator
212-567-8272

SUBJECT: Introduction to Environmental Shopping Project

Date: October 30, 1993

Starting November 1, an important, innovative environmental education and research program will be started at the two Gristede's stores on 86th Street. Red Apple Headquarters has given its blessing to this program, the educational portion of which will last two months, and has been working with the other project sponsors, the Environmental Action Coalition and City University of New York to complete preparations.

There will be a number of educational materials used in the stores to educate and motivate shoppers to choose reusable items and those items with recyclable and reduced packaging. Headquarters has made some storefront posters, announcing the program, and also smaller signs to be used inside the stores. Other posters will be attached to pillars and/or hung from the ceiling. Display racks will be used in different parts of each store for three environmental shopping brochures developed especially for this project. A special invitation for customers with babies to enroll in diaper service will be handed out to those purchasing diapers, and will be placed in display racks where diapers are sold. Cotton shopping bags which can be stuffed into their own compact pouches will be sold for $4 each. Shoppers will also be encouraged to bring their own shopping bags and produce bags via brochure, signs on the cash registers, and shelf-cards in the produce section. Additionally, in the West side store there will be (1) volunteers who hand out brochures and answer questions, (2) a continuously-running environmental shopping video set up at the checkout counters, and (3) a table with additional environmental shopping and recycling literature.

You can help make this research project a success in a number of ways. First, if any of the educational materials need replacement or restocking, please do this at the earliest opportunity. This would include keeping the brochure racks stocked, and making sure that posters and shelf-signs stay up. If more literature is needed, the store manager should have some stored away. If the "Environmental Shopper" bags are selling well and more are needed, please let the manager know right away so that I can get you more. Project volunteers may come around from time to time to check on whether everything is going according to plan.

Thanks for your support. It is critical to the success of this program. If you have any questions at any time, please give me a call.

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Environmental Shopping Project

GRISTEDE'S CASHIERS SURVEY

We at the Environmental Shopping Project are indebted to you for helping us with the educational portion of our research program. Now that the education portion of our research is over, we have asked your store manager if we could ask you a few questions to give us a more complete picture of how our environmental shopping campaign went from day to day in the stores. Please circle or fill in the appropriate answer and mail the survey back to me in the attached post-paid envelope. Your answers will be kept confidential. Thanks!

1. Did customers mention anything to you about any part of the environmental shopping campaign -- good or bad?

   _____

   _____

   _____

2. Roughly how many bags did you sell since the project began November 1?

   _____

3. Would you say you sold more or fewer bags per week during the last month vs. earlier in the campaign? _____

4. Roughly how many diaper offers did you give away every week? ___

5. Would you say you gave away more or fewer per week as time went on?

   yes no

6. Did the environmental shopping campaign interfere with your operations in any way? yes no

   If yes, how? _____

7. Do you have any thoughts about the project at all? Please tell us what you think.

   _____

   _____

Thanks for your help! ***Please return the survey in the envelope provided*** to

Maggie Clarke, 1795 Riverside Drive, New York, NY 10034

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Appendix Q

Questionnaires

USEPA / EAC / Gristede's Environmental Shopping Baseline Questionnaire

Thanks for your participation in this important environmental research.
Your **personal attitudes and opinions are important to us. Please answer every question.**

Please CIRCLE the most appropriate answer:

To your knowledge, does the City government *require* all Manhattan residents and businesses to separate materials for recycling?

Yes No Don't know

Which of the following materials are picked up from apartment buildings by the City for recycling?

Plastic bottles and jugs	yes	no	don't know
Plastic bags	yes	no	don't know
Aluminum cans	yes	no	don't know
Aluminum foil	yes	no	don't know
Tin cans	yes	no	don't know

Environmental shopping involves the purchase of fewer disposable items, fewer products containing toxics, more durable items, and more products in recyclable, reduced, and recycled packaging.

Have you heard about environmental shopping before? yes no

Where have you heard about ... RECYCLING ..... ENVIRONMENTAL SHOPPING

Mailings	yes	no	|	yes	no
TV or radio	yes	no	|	yes	no
Subway Ads or billboards	yes	no	|	yes	no
Videos in store displays	yes	no	|	yes	no
Posters or brochures in stores	yes	no	|	yes	no
Your building's management	yes	no	|	yes	no
Friends or neighbors	yes	no	|	yes	no
Newspapers and magazines	yes	no	|	yes	no

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If you were offered a small incentive, say 2 cents, to bring your own bag to the supermarket for your groceries, would you bring your own bag?

Definitely not Probably not Don't know Probably Definitely

If the incentive were five cents, would you bring your own bag?

Definitely not Probably not Don't know Probably Definitely

If a new store opened near you that encouraged environmentally safe products and practices, all other things being equal, would you be likely *to change* the supermarket where you do most of your shopping?

Definitely not *Probably not* *Don't know* *Probably* *Definitely*

Please indicate how you feel about the following statements using this rating scale:

1) strongly disagree 2) mildly disagree 3) neutral 4) mildly agree 5) strongly agree

People in the US buy/consume too much	1	2	3	4	5
Environmental shopping is important for preserving the natural environment	1	2	3	4	5
A person helps the environment by reducing the quantity of packaging and products they buy	1	2	3	4	5
Individuals must take the most active role in solving any trash disposal problems	1	2	3	4	5
Governments must take the most active role in solving any trash disposal problems	1	2	3	4	5
Mandatory recycling infringes on my rights	1	2	3	4	5
Technology alone will solve any trash problem	1	2	3	4	5
I like to repair things rather than discard them	1	2	3	4	5
I prefer to buy disposable products	1	2	3	4	5
Products are not made as durably as they were in the past	1	2	3	4	5
Using refills or concentrates is good for the environment	1	2	3	4	5

Please rank the following *in order of preference* from 1 to 4 in their importance to you when buying groceries (where 1 is most important).

Brand name _____
Economic value or cost _____
Product's convenience _____
Environmental impact _____

Is there an infant in your household, who uses diapers? yes no

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If yes, how does your household deal with soiled diapers? Do you

Throw them in the garbage? _____
Wash them at home or in your building? _____
Wash them at a nearby laundry? _____
Have them picked up by a diaper service? _____

How often do you, personally, *actually do* each of the following things?
(where 1 is never and 5 is always.

	Never Always				
Buy disposable products	1	2	3	4	5
Buy refills or concentrates	1	2	3	4	5
Buy items in single-serving packages	1	2	3	4	5
Select products in recyclable packaging	1	2	3	4	5
Avoid buying aerosols	1	2	3	4	5
Return beverage containers for deposit	1	2	3	4	5
Bring your own bag to the store	1	2	3	4	5
Patronize repair shops	1	2	3	4	5
Recycle cans and bottles	1	2	3	4	5
Recycle magazines	1	2	3	4	5

If you do recycle, please indicate how important each of the following is in inspiring you to recycle.
(where 1 is of no importance and 5 is extremely important)

I recycle to help conserve natural resources	1	2	3	4	5
I recycle to help conserve landfill space	1	2	3	4	5
I recycle because it's the law	1	2	3	4	5
I recycle because it seems like the right thing to do	1	2	3	4	5

Have you used one of Gristede's reusable canvas bags in the past month?

no yes can't remember

If yes, how often have you brought one with you when you go shopping?

Occasionally Sometimes Often Always

Which do you consider yourself to be? White African descent Asian Other

Are you of Spanish or Hispanic origin? yes no

Please check the highest level of education you have completed?

Some high school ____ College graduate or some college ____
High school graduate ____ Graduate work or advanced degree ____

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Are you Male _____ Female _____

Please check the range which reflects your total household income.

Less than $20,000	_____	$30,000 - $40,000	_____
$20,000 - $30,000	_____	$40,000 - $50,000	_____
		Over $50,000	_____

Please circle your age range. less than 30 30 - 44 45 – 60 over 60

To complete this important research on environmental shopping, we will need to ask you a few questions at the end of our educational campaign in the stores. Gristede's has offered to give coupon books to those who complete both survey interviews. We would be most appreciative if you would fill in the blanks below:

Name (please print)_____

Phone number _____

When is the best time of day to call you? _____

We're also conducting a more in-depth study with a group of select Gristede's customers in order to understand more about why people purchase the things they do. All volunteers in this group would simply be asked to keep track of their purchases at Gristede's over a 4 month period in diaries that we would provide you. As a token of our appreciation all volunteers in this special group will receive a reusable canvas shopping bag from Gristede's. Would you be willing to participate in this special study?

yes __ no ___

Thank you very much for participating in this study!
If you wish to learn more about this research, please call the Environmental Action Coalition at 212-677-1601

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Final Follow-up Questionnaire – East side

Name_____Phone _____ _____/
Code #

Hi! I am _____ from the Environmental Shopping Project at Gristede's. Last summer you completed one of our surveys, and we're calling now to follow up with another survey, to complete our study._Your honest answers are critical to the research. Could we please ask you a few questions now?

First, we'd like to know what you thought of the environmental shopping campaign we conducted in the Gristede's store. (We know your time is valuable, so short answers are best.)

A. Can you tell me, what features of the environmental campaign you noticed?

(Don't read these at first)	*Unprompted)*	*(Prompted)*
Three brochures (oat, gold, green)	_____	_____
DOS' Bring Your Own Bag signs	_____	_____
Environmental Shopper bags	_____	_____
Gristede's or Minnesota store posters	_____	_____
Shelf cards (bring back produce bags)	_____	_____

(ASK ONLY If they did notice the brochures:)

B. What 1 or 2 facts were most memorable in the brochures?

(DON'T READ THESE! -- CHECK OFF ANSWERS GIVEN)

Save resources	____	Recycling	____
Pollution from production	____	Disposal impacts	____
Amount of waste generated	____	Reuse	____

Other_____

(ASK ONLY If they noticed the bag signs:)

C. Did the signs at the checkout counter remind you to Bring Your Own Bag?__

YES NO DON'T KNOW

1. To your knowledge, does the City government *require* all Manhattan residents and businesses to separate materials for recycling?

YES NO DON'T KNOW

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2. **Which types of materials are picked up from apartment buildings for recycling?**

(DO NOT READ THESE)	*(CHECK OFF THOSE RECALLED UNPROMPTED)*
Plastic bottles and jugs	_____
Glass	_____
Plastic bags	_____
Newspaper	_____
Aluminum cans	_____
Aluminum foil	_____
Tin cans	_____

3. **Have you heard about environmental shopping before?** yes no

4. **Where have you heard about ..** RECYCLING ...ENVIRONMENTAL SHOPPING

	(DO NOT PROMPT)	
	(CHECK OFF)	*(CHECK OFF)*
Mailings	_____	_____
TV or radio	_____	_____
Subway Ads or billboards	_____	_____
Videos in store displays	_____	_____
Posters or brochures in stores	_____	_____
Your building's management	_____	_____
Friends or neighbors	_____	_____
Newspapers and magazines	_____	_____

5. **If you were offered an incentive, say 5 cents, to bring your own bag to the supermarket for your groceries, how likely would you be to do it -- using the following scale:**

(Circle answer given)

Definitely not Probably not Don't know Probably Definitely

6. **If a new store opened near you that encouraged environmentally safe products and practices, all other things being equal, would you be likely *to change* the supermarket where you do most of your shopping -- using the following scale:**

Definitely not Probably not Don't know Probably Definitely

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7. **Please rank the following *in order of preference* from 1 to 4 in their importance to you when buying groceries (where 1 is most important).**

(Fill in number, continue asking for next most important item, and reading remaining items on list)

Brand name	_____
Economic value or cost	_____
Product's convenience	_____
Environmental impact	_____

8. **How often do you, personally, *actually do* each of the following things on a scale of 1 to 5, where 1 is never and 5 is always.**

(Be Prepared to repeat this scale)

	Never				Always
Buy disposable products	1	2	3	4	5
Buy refills or concentrates	1	2	3	4	5
Buy items in single-serving packages	1	2	3	4	5
Select products in recyclable packaging	1	2	3	4	5
Avoid buying aerosols	1	2	3	4	5
Return beverage containers for deposit	1	2	3	4	5
Bring your own bag to the store	1	2	3	4	5
Patronize repair shops	1	2	3	4	5
Recycle cans and bottles	1	2	3	4	5

9. (*ASK ONLY If they recycle*) **Would you indicate how important each of the following is in inspiring you to recycle, where 1 is of no importance and 5 is extremely important.**

I recycle to help conserve natural resources	1	2	3	4	5
I recycle to help conserve landfill space	1	2	3	4	5
I recycle because it's the law	1	2	3	4	5
I recycle because it seems like the right thing to do	1	2	3	4	5

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10. **Here's the last question! Is there an infant in your household, who uses diapers?**

yes no *(If not, go to end.)*

If yes, **how does your household deal with soiled diapers?**

DON'T PROMPT -- CHECK OFF THEIR ANSWER)

Throw them in the garbage _____

Wash them at home or in your building? _____

Wash them at a nearby laundry? _____
Have them picked up by a diaper service? _____

10a. Did you receive an offer for diaper service at the store? yes no

If yes,
Did you get it from a cashier?_____
Did you get it at the diaper shelves?_____

10b. Did you register for diaper service? _____

If not, why not? *(Prompt only if necessary)*

Too Expensive _____
Incovenient _____
Like disposables _____
Health reasons _____

Other_____

Thank you very much for your time! We promised you a small gift, which will be $2, for participating in this study. A project volunteer will be stationed near the courtesy counter at the East 86th Street Gristede's store the next two Saturdays, between 4 and 5:30 so you can come either time.... Thanks again!

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Final Follow-up Questionnaire – West side

Name_____Phone _____ _____/
Code #

I am from the Environmental Shopping Project at Gristede's. Last summer you completed one of our surveys, and we're calling now to follow up with another survey, to complete our study._Your honest answers are critical to the research. Could we please ask you a few questions now?

First, we'd like to know what you thought of the environmental shopping campaign we conducted in the Gristede's store. (We know your time is valuable, so short answers are best.)

A. Can you tell me, what features of the environmental campaign you noticed?

(Don't read these at first)	*(Unprompted)*	*(Prompted)*
Three brochures (oat, gold, green)	_____	_____
DOS' Bring Your Own Bag signs	_____	_____
Environmental Shopper bags	_____	_____
Gristede's or Minnesota store posters	_____	_____
Shelf cards (bring back produce bags)	_____	_____
Video	_____	_____
Volunteers distributing literature	_____	_____

(ASK ONLY If they did notice the brochures:)

B. What 1 or 2 facts were most memorable in the brochures?

(DON'T READ THESE! -- CHECK OFF ANSWERS GIVEN)

Save resources	____	Recycling	____
Pollution from production	____	Disposal impacts	____
Amount of waste generated	____	Reuse	____

Other_____

(ASK ONLY If they noticed the bag signs:)

C. Did the signs at the checkout counter remind you to Bring Your Own Bag?__

YES NO DON'T KNOW

(ASK ONLY If they noticed the video:)

D. What 1 or 2 things did you find most memorable in the videos? (Facts)

The 3 R's	____	Recycling packaging	____
Reduced packaging	____	Reuse	____

Other _____

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1. **To your knowledge, does the City government *require* all Manhattan residents and businesses to separate materials for recycling?**

   YES NO DON'T KNOW

2. **Which types of materials are picked up from apartment buildings for recycling?**

(DO NOT READ THESE)	*(CHECK OFF THOSE RECALLED UNPROMPTED)*
Plastic bottles and jugs	_____
Glass	_____
Plastic bags	_____
Newspaper	_____
Aluminum cans	_____
Tin cans	_____
Aluminum foil	_____

3. **Have you heard about environmental shopping before?** yes no

4. **Where have you heard about ....** RECYCLING ....ENVIRONMENTAL SHOPPING

(DO NOT PROMPT)	*(CHECK OFF)*	*(CHECK OFF)*
Mailings	_____	_____
TV or radio	_____	_____
Subway Ads or billboards	_____	_____
Videos in store displays	_____	_____
Posters or brochures in stores	_____	_____
Your building's management	_____	_____
Friends or neighbors	_____	_____
Newspapers and magazines	_____	_____

5. **If you were offered an incentive, say 5 cents, to bring your own bag to the supermarket for your groceries, how likely would you be to do it -- using the following scale:**
   (Circle answer given)

   Definitely not Probably not Don't know Probably Definitely

6. **If a new store opened near you that encouraged environmentally safe products and practices, all other things being equal, would you be likely *to change* the supermarket where you do most of your shopping -- using the following scale:**

   Definitely not Probably not Don't know Probably Definitely

7. **Please rank the following *in order of preference* from 1 to 4 in their importance to you when buying groceries (where 1 is most important).**

   (Fill in number, continue asking for next most important item and reading remaining items on list)

Brand name	_____
Economic value or cost	_____
Product's convenience	_____
Environmental impact	_____

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8. **How often do you, personally, *actually do* each of the following things on a scale of 1 to 5, where 1 is never and 5 is always.** *(Be Prepared to repeat this scale)*

(READ THESE)	Never				Always
Buy disposable products	1	2	3	4	5
Buy refills or concentrates	1	2	3	4	5
Buy items in single-serving packages	1	2	3	4	5
Select products in recyclable packaging	1	2	3	4	5
Avoid buying aerosols	1	2	3	4	5
Return beverage containers for deposit	1	2	3	4	5
Bring your own bag to the store	1	2	3	4	5
Patronize repair shops	1	2	3	4	5
Recycle cans and bottles	1	2	3	4	5

9. **If you do recycle, please indicate how important each of the following is in inspiring you to recycle, where 1 is of no importance and 5 is extremely important.**

I recycle to help conserve natural resources	1	2	3	4	5
I recycle to help conserve landfill space	1	2	3	4	5
I recycle because it's the law	1	2	3	4	5
I recycle because it seems like the right thing to do	1	2	3	4	5

10. **Here's the last question! Is there an infant in your household, who uses diapers?**

yes no *(If not, go to the end.)*

If yes, how does your household deal with soiled diapers?

DON'T PROMPT -- CHECK OFF THEIR ANSWER)

Throw them in the garbage? _____
Wash them at home or in your building? _____
Wash them at a nearby laundry? _____
Have them picked up by a diaper service? _____

10a. Did you receive an offer for diaper service at the store? yes no

If yes,
Did you get it from a cashier? _____
Did you get it at the diaper shelves? _____

10b. Did you register for diaper service?_____

If not, why not? *(Prompt only if necessary)*
Too Expensive _____
Incovenient _____
Like disposables _____
Health reasons _____
Other_____

Thank you very much for your time! We promised you a small gift, which will be $2, for participating in this study. A project volunteer will be stationed at the top of the escalator at the West 86th Street Gristede's store the next two Saturdays, between 2 and 3:30 so you can come either time.... Thanks again.

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Appendix R

Waste Generation and The Hierarchy: Reduction, Reuse, and Recycling

Amount of Waste Generation

In North America our current waste management systems are not sustainable because each person is generating more solid waste every year. This rate of increase in waste generation has been estimated to be anywhere from one to two percent per year. According to figures from Franklin Associates/USEPA, in the U.S. the amount of waste generated due to the increase in per capita generation rate was about 65%, or about 1.5% per year in the 33 years from 1960 to 1993, increasing from 2.7 pounds per person per day to 4.4 pounds per person per day. This growth rate was found to correlate extremely well (r=0.99) with the growth in Gross Domestic Product, which, on a per capita basis, increased 82% during the same period. The population has increased over 40% in the same time period with an annual average growth rate of 1.1%. The Bureau of the Census has projected the population to grow at an annual rate of 1% until 2000. The annual amount of waste generated due to both population and per capita effects has increased 135%, from 88 million tons in 1960 to 207 million tons in 1993, reflecting a MSW average annual growth rate of almost 2.7%. Were trends like this to continue for the next 100 years, the waste stream would increase by 1335% due to compounding effects.

However, Franklin Associates have predicted a 0.1% drop in per capita waste generation rates between 1993 and 2000, and a waste stream growth rate of 1% during this time

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(matching population growth), this largely due to a shift from landfilling of yard waste to backyard composting. (By 1996 23 states including more than 50% of the US population will have legislation in effect banning yard waste from landfills.) But yard waste makes up only 15.9% of waste generation, having fallen from 22.8% in 1960. And non-durable products have been increasing rapidly (212% from 1960 to 1993, and 0.5% per year in the last few years) as have durable products (238% over the same period), and packaging (158% over the same period). So, at the time all the yard waste were to "disappear" from the waste stream due to backyard composting, the annual increase in production and consumption of non-durable and durable products and packaging would, if they continued to occur at current rates, in the long run eradicate any reversals in per capita waste generation rate growth due to onsite composting. Thus, the long term outlook for waste management systems is likely to involve a further strain on municipal and natural resources due to increasing amounts of products and packaging if waste prevention and population stabilization measures are not enacted to reverse or at least stop these increases. Certainly, looking over the next hundred or thousand years, we can't continue to generate more and more waste every year and hope to have a sustainable system.

Many of today's waste management systems are also not sustainable from a different point-of-view. Because of the already large, and increasing amount of solid waste created, those methods that depend on final disposal, such as landfilling and incineration, result in the impoverishment of renewable natural resources. Because landfilling and incineration do not recover the intrinsic value of resources, as in contrast, reuse, recycling, and composting do, if present rates of growth in waste generation continue,

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these disposal methods eventually deplete even renewable resources, such as the wood in our forest trees. Wood in the waste stream has doubled from 3.4% to 6.6% in the last thirty years, and is projected to rise to 7.4% of the total in 2000. And paper has risen from 34% to 37% of the solid waste generated from 1960 to 1993, reflecting overall paper generation from 30 to almost 80 million tons per year during the same time. Thus, most of the wood taken from the forest is used to manufacture disposable goods such as packaging and non-durable products, such as paper. Should the increase in wood (paper) consumption continue to increase as it has, we will, at some point exceed the rate of forest replenishment. But increasing paper consumption not only affects forests. As a result of our present methods of forestry, we also consume the soil resource. Massive erosion caused by clear-cutting without soil stabilization or replacement has its own impacts on streams and their ecosystems. In addition to trees and soil, we are mining water in some locations to support manufacturing processes for products and packaging, such as paper pulping, from deep Western aquifers which were accumulated during the ice ages. The rate of demand for nonrenewable resources such as metals has been rising exponentially, but in the case of copper, increasing at double of that of the exploding population growth rate since the early 1800s. [218] In fact, paper and paperboard products, plastics, metals and wood are all projected to increase faster than population until 2000 while glass and food wastes are projected to show almost no increase. Petroleum, another nonrenewable resource, is also drained by increases in production of plastics. Thus, in the long term, increases in waste generation rates will strain the ability of renewable resources, such as wood, soil, and water, to regenerate themselves on a

[218] Dott, Robert and Roger Batten, Evolution of the Earth , McGraw-Hill Book Company, New York, NY. 1971, p. 589.

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sustainable basis, and in the case of nonrenewable resources, such as oil and metal resources, increases in consumption will contribute towards resource depletion. We clearly cannot sustain this depletion of natural resources nor these waste generation rates indefinitely if we want to maintain anything resembling our current lifestyle, or even a livable world.

The scenario described above has implications for society's choice for waste management today and into the future. An integrated waste management system which is truly sustainable for the very long term would need to focus primarily on reducing the amount of waste generated, secondarily on maximizing the recycling and composting of waste generated, and simultaneously on minimizing adverse environmental impacts from all waste management methods. The use of incinerators would be used for those wastes which are (hopefully in the short-term) difficult to reduce, reuse, recycle or compost, and landfills would be used only for residues from recycling, composting and incineration processes.

Accomplishing the objectives of a sustainable integrated waste management system would depend on a number of steps:

I To reduce waste generated:

a. The population must be stabilized, and if possible reduced, to allow it to come more into balance with the resources required to provide people with

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material goods. This would also permit a greater degree of reduction in environmental impacts associated with landfilling and incineration.

b. At the same time we need to continue to develop programs, policies, legislation, educational techniques, and technology to reduce to a much greater extent the volume and toxicity of product and packaging waste generated and increase the products reused by individuals, businesses, and institutions.

II To maximize recycling and composting there is a need to

a. conduct research into improved educational techniques to increase the public participation rates both for separation of recyclable materials and for purchases of recycled and recyclable products and packaging. We need to capture all the recyclables *and* to increase the numbers of materials recycled.

b. improve recyclables and compostables processing techniques to improve the quality of the materials sold to manufacturing markets, and to accommodate even the difficult-to-recycle materials.

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c. develop new technologies to permit the substitution of more kinds of secondary materials in place of virgin materials in products and packaging manufacturing processes.

III To minimize adverse environmental impacts from waste management methods there is a need to continue and expand research to:

a. develop new ways to reduce the amount of toxic constituents in products and packaging (e.g., by substituting nontoxic alternative pigments and stabilizers)

b. determine how the modification and separation of products and packaging containing toxic constituents from the waste stream can reduce the amount and toxicity of solid waste generated and improve the environmental performance of solid waste management processes (e.g., composting, incineration, ash management, landfilling).

c. reduce the amount and toxicity of emissions, effluents, and solid wastes produced by recycling, composting, incineration, and landfilling processes (e.g. by applying pollution prevention principles to these processes, developing and using the more efficient pollution control devices, improving operating and maintenance techniques, improving operator training and oversight, and improving monitoring).

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IV Establishing a sustainable integrated waste management system depends on the will of the solid waste managers, the industry, and the public. Industry must take a more active role in researching and marketing fewer disposable products and less packaging, and take final responsibility for the products and packaging it produces. In Germany, this is a requirement of industry. Those mayors, governors, and legislators who control which programs are developed and implemented need to recognize the necessity of more attention to education, legislation, and economic incentive to implement the 3 R's. The public must realize that it is an integral, indispensable part of any sustainable integrated waste management system. If all involved continue to focus narrowly on the immediate economic issues in waste management, such as cost and convenience, and ignore the long-term environmental consequences, then resource depletion, habitat and species destruction, pollution, and land consumption will continue, and the eventual end result insofar as our lifestyle, and maybe our species, and certainly other species is concerned, may be extremely serious in the long run.

Volume Source Reduction

Volume source reduction is the collection of methodologies by which waste generation is reduced. It is accomplished by means of

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1. changes in design of products and packaging (e.g., elimination, reduction, and reuse of packaging; increasing the durability of products; eliminating disposables),

2. modifications in purchasing habits by consumers -- individuals and businesses alike (e.g., purchasing fewer disposables and more durables, products in less packaging, and products which have been pre-owned or repaired), and by borrowing (e.g., using libraries and rental shops) rather than purchasing new items,

Very important to this discussion is the issue of today's throwaway society. There is almost an order of magnitude of disparity between the amount of waste generated per capita in the poorer societies compared to parts of North America. The generation rates are roughly one pound per person per day in poorer parts of the third world, whereas in New York, the Legislative Commission on Solid Waste Management recently estimated the generation rate to be 6.5 pounds per person per day.[219] The generation rates in parts of Europe and Japan are typically closer to 2 pounds per person per day, quite low compared with the U.S. [220] As the poorer societies improve their economic outlook they are likely to start catching up with us in waste generation even if they stabilize their populations. Those countries which don't stabilize population will be generating more

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219 "Where Will the Garbage Go? A Status Report on Solid Waste Management and Disposal in New York State", Legislative Commission on Solid Waste Management, Assemblyman Maurice Hinchey, Chairman, January 1990.

220 Underwood, Joanna, et.al., "Garbage: Practices, Problems & Remedies", INFORM, New York, NY. 1988.

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solid waste over time just because more people generate more waste. The impact on the Earth and exceeding of Earth's carrying capacity will grow worse in either case.

When the waste stream is viewed in terms of the types of goods and packaging discarded, it is useful in showing the promise of reducing the volume of garbage produced. Durables (that is, consumer products which are designed and manufactured to have a useful life of at least three years, and which are easily maintained, repaired, and reused) made up about 15% of the waste stream in 1995. Nondurables and throwaways contributed 27%; containers and packaging contribute about 35%, and yard waste and food waste, both of which are compostable, make up about 22%.[221] All of these fractions except the food and yard waste will rise over the coming decades.

The nondurables plus the containers and packaging segments, make up roughly 62% of the waste stream, and are considered the main targets for volume source reduction. Packaging has risen four percentage points since 1960, despite the replacement of packages consisting of heavier materials such as glass and metal containers, with packages using lighter, but more voluminous plastic and paper materials. (The increased volume of packaging that this has engendered has a significant impact on landfill capacity.) Nondurables have been increasing as a percentage of the waste stream since 1960, from almost 20% to over 27% in 1995, accounting for much of the overall increase in total and per capita generation rates. Much of this increase is doubtless due to the continuing replacement of durables with single-use, disposable products. The purchase

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221 "Characterization of Municipal Solid Waste in the United States, 1996 Update, Franklin Associates Ltd., for USEPA Report # 530-S-94-042, June, 1997.

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of diaper service, for example, entails a contribution of 50 reusable diapers to the waste stream over the two-year diapering life of a baby, versus the purchase of thousands of disposable diapers, which has a lifetime cost about the same as diaper service, entails disposal of that same number of diapers.[222] See Appendix D for further discussion.

Nondurables -- descriptions

It is significant that the fastest growth rate from the 1970s to the year 2000 is not in packaging, but in the nondurable goods category. This being the case, nondurables would logically merit special attention.

Some nondurables are consumer products which have a very short life span (e.g. single-use products) and are created to replace durable products for the sake of convenience: the product of today's throwaway society. Examples of these are disposable diapers, shavers, pens, plastic eating utensils, bags, and dishes. EPA figured in the 1980s that each year Americans threw away 1.6 billion disposable pens, 2 billion disposable razors, and 16 billion disposable diapers (all of which could be avoided by using their reusable/refillable durable counterparts). These take up quite a bit of room in a solid waste disposal system. For example, in 1995 disposable diapers accounted for 2.96 million tons nationwide, up from 1.93 million in 1980 and up from .35 tons in 1970.

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222 Personal communication, General Health Care Corporation, Piscataway, NJ. 1992.

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Trash bags account annually for about three-quarters of a million tons nationally over the last few decades (roughly .4% of the waste stream).[223]

The use of disposable plastic grocery sacks has grown dramatically in recent years. They were introduced in the 1970s and began to have measurable market share in the early 1980s. These bags are made from a variety of plastics (HDPE, LDPE, LLDPE), none of which are typically recycled. In 1985, an estimated 132 million pounds of polyethylene were used in the U.S. in the fabrication of grocery sacks. This grew to 461 million pounds in 1990 and to 686 million pounds in 1995. These figures might have been higher had the industry not started reducing the thickness of the bags. In 1985 the typical plastic grocery bag weighed 9.2 grams; by 1990 it was down to 7.5 grams, and 5.8 grams in 1995, a 37% weight reduction. It is not clear whether the same number of bags were used throughout the period, or whether the lightweighting of bags prevented the use of almost 400 million pounds of plastic resin during the period, as Franklin argues. The lightweighting may have resulted in more double-bagging, which might partially explain the increase in the total pounds used.[224]

Disposable diapers make up to 3% of New York City's residential solid waste stream, according to their 1990 waste composition study, and have a life cycle cost per baby of over $4,000. The proposed flushable diaper has a life cycle cost of about $3,000. In terms of source reduction, the cotton diaper which is reused is preferable to either the

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223 "Characterization of Municipal Solid Waste in the United States, 1996 Update, Franklin Associates Ltd, for USEPA Report # 530-S-94-042, June, 1997.

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disposable or flushable diaper, has a life cycle cost of $227 if washed in the home. Diaper service has a similar cost to disposables. As the reusable diaper industry has caught on to the environmental importance of its product and competes with disposables, new developments have arrived to enhance the attractiveness of the product (e.g., velcro closures instead of pins, soft fabrics with wicking properties, like some of the disposables use, and designing diapers to look more like an article of durable clothing).

Other nondurable items are added to the waste stream because they are either designed and manufactured to be shoddy (e.g., furniture with stapled rather than dovetailed joints and toys made of thin, fragile, breakable (but inexpensive) plastics rather than wood) or because they are not designed to be repaired or reconditioned very easily either by consumers or by repairmen (e.g., electronics, appliances, furniture). This is compounded by the fact that the repair industry itself is declining, perhaps due, in part, to the rapidly increasing diversity of product designs, which are more difficult to repair, and to the increasingly prevalent decisions by manufacturers not to make spare parts, or to charge exorbitantly for them.

Still other nondurables are durables (e.g., computers, electronics) which become obsolete or unfashionable in a short period of time due to evolution of technology. Others (e.g., clothing, automobiles) are designed from the start to become obsolete or unfashionable: planned obsolescence. Such products may actually be considered as durables, since they are in categories that were traditionally designed to last more than three years. These

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224 "Characterization of Municipal Solid Waste in the United States, 1996 Update, Franklin Associates Ltd, for USEPA Report # 530-S-94-042, June, 1997.

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products may be contributing to the continued rise in the production and percentage contributed to the waste stream by durable products. In order to maximize revenues and profits, more business sectors are getting into the habit of changing designs every year. Consumers in our increasingly affluent society are responding to advertising that new/fashionable items are most desirable by purchasing new products before the old ones wear out (or before attempting to repair them). The flaws in this logic are:

1. Natural and mineral resources depletion. The materials needed to manufacture limitless quantities of nondurables just for the sake of convenience or fashion are limited and/or in decline (e.g., petroleum → plastics; trees/soil/space → wood products/paper; and bauxite → aluminum),

2. Environmental impacts. The air, water, and land resources required to absorb the impacts of the mining and transportation of virgin materials, and disposal of mining residues as well as solid waste disposal (incineration, ash/garbage landfilling) are also limited and/or in decline, and

3. Needless investment of considerable amounts of human and economic resources as a result of mining and transporting the raw natural resources and producing the nondurables themselves, as well as the resources needed for planning and implementing solid waste solutions.

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Thus, in order to achieve actual source reduction, the growth rate in MSW generation must be stopped and reversed. Waste prevention solutions are many and varied. Some of the non-durable products can be replaced in the marketplace with durable products, and some of the excessive packaging replaced with packaging styles which use less material to contain the same quantity of product (e.g., bulk packaging, and concentrates and refills). Economic incentives, such as unit-based pricing for disposal of garbage or "per-bag" charges (rather than a flat fee for any quantity of garbage disposed), have been shown in over 4,000 U.S. municipalities to have a significant effect on waste generation rates, since consumers have an impetus to create less waste. Such "Pay-As-You-Throw" programs have been shown to be the single largest factor in increasing recycling rates, since such programs typically do not require consumers to pay anything to dispose of recyclables. Advance disposal fees or taxes on the marketing of products and packaging which are waste-generating (e.g., single-serving packaging, disposable products) also have the potential to change consumer purchasing habits to reduce waste generation rates. Government research and development programs can provide an incentive for industry to create new minimum-waste designs for products and packaging. Legislative requirements can influence industry to reduce its marketing of wasteful product and packaging designs and increase development and marketing of waste-reducing products and packaging. Other programs can educate and motivate individuals and businesses to adopt a variety of practices to reduce use of certain nondurables (e.g., email to reduce paper use).

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Reuse

The durables component of MSW is the prime target for reuse programs. In 1995 this component was 15% of the waste stream, and it has been increasing since 1960 when durables contributed 11.3% to the waste stream. Economic prosperity is tied closely to generation (and therefore, disposal) of durable goods, though there is a lag time between the purchase and disposal of durable goods. Reuse strategies for reducing disposal of durable products include:

1. Changes in consumer habits as regards the repair, cleaning, and other means of extending the life span of products already purchased, and

2. Creative disposition (e.g., resale at thrift shops, yard sales, classified ads, etc.., donation to charity, bartering or exchanges, and lending) of products which would otherwise have been thrown away.

Reuse strategies can involve the reinvigoration of the declining repair industries for such durable products as appliances, electronics, tires, and furniture which together comprise about 7% of the waste stream [225] via vocational training programs, consumer education measures, and improved advertising. Other strategies can improve the viability of other facets of the private reuse industry, such as thrift shops, rental shops, libraries, and diaper services via consumer educational programs and public service ads. Other programs can

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225 "Characterization of Municipal Solid Waste in the United States, 1996 Update, Franklin Associates Ltd, for USEPA Report # 530-S-94-042, June, 1997.

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introduce new reuse opportunities such as permanent swap shops, urban yard sales, and communal borrowing arrangements.

Still other reuse strategies can be directed at the nondurable and packaging sectors. Examples of life span extension for packaging would include wood pallet repair and reuse of shipping containers. Examples for nondurables would include refillable glass and plastic bottles and paper reuse strategies.

Recycling and Composting

Recycling and composting both involve the recovery of the substantive value of materials discarded in MSW. Recycling entails processing and/or refining of materials in the waste stream to create new products and packaging. In the case of recycling, recyclable materials generated in 1995 include paper and paperboard (39.2%) up 5% as a fraction of MSW since 1960, glass (6.2%) down 1.5%, several metals (7.6%) down almost 5%, several resins of plastics (9.1%) negligible in 1960, and wood (7.1%) up almost 4% since 1960, among other items.

Recovery for recycling has been on the rise for over a decade, and is projected to rise further between 1993 and 2000, from 38.5 to 54 million tons per year, representing an increase as percent of total waste generation from 18.6% to 24.9%. By 2010 recycling is expected to account for almost 74 million tons and over 29% of the waste stream. Recovery for centralized composting of food and yard wastes is projected to rise from 6.5 to 11.6 million tons between 1993 and 2000, representing an increase as a percent of total

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waste generation from 3.1% to 5.3%. By 2010 composting is expected to rise to almost 15 million tons and account for 5.9% of the waste stream. [226]

Recycling is often seen as simply collecting source separated recyclables. However, in order to complete the recycling process, materials must not only be collected (either via consumers dropping off recyclables to a central collection location or via curbside collection), but the materials must also be sorted into material sub-categories (such as types of metal, plastic, paper, and glass color), used as feedstock in the manufacture of new products and packaging, and finally, sold as new products and packaging. The processing (sorting) stage can be partially undertaken at the source of generation, but it often accomplished centrally in Material Recovery Facilities (MRFs). Such facilities utilize manual laborers as well as mechanical devices to sort the recyclable materials into sub-categories, and to separate contaminants (non-recyclables) away from the recyclables. Initial preparation for sale of these commodities (such as baling) and transportation to the manufacturing plants are also usually organized by MRFs.

Composting involves conversion of the organic materials in MSW to compost, a soil conditioner, via thermal, chemical and physical decomposition processes and bacterial action. The quality, and therefore use of compost is limited by the types of materials used in the composting process. Composting can take place outdoors in windrows (piles of organic materials which are mechanically turned periodically to permit sufficient oxygen and water to complete the decomposition process) or in "in-vessel" facilities,

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226 "Characterization of Municipal Solid Waste in the United States, 1996 Update", Franklin Associates, Ltd / USEPA Report # EPA530-R-97-015, June 1997.

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which typically remove non-organic, recyclable materials such as glass, plastic, and metals prior to an artificially accelerated composting process. Compostable materials have been decreasing significantly as a portion of the MSW stream since 1960. Food wastes have dropped from 13.8% to 6.7% nationally, and yard wastes have dropped from 22.7% to 14.3%. This is due entirely to the significant increases in goods and packaging; food wastes have actually risen 15% in real terms since then and yard wastes have risen nearly 50%, due to increases in population and per capita increases. Paper and wood waste, if chipped, are also compostable, so there is considerable overlap between the materials that are recyclable and those that are also compostable. But the higher use for these materials is recycling. (This relationship is also true for reduction and reuse, as all the recyclable categories are candidates for these preferred methods.)

Compost processing odors may be reduced in part by effective process control. The most control parameters are the following:

(1) Maintaining temperatures in the correct range.

(2) Avoiding anaerobic conditions through correct moisture content, adequate mixing, and aeration,

(3) Maintaining the correct range of carbon/nitrogen ratio. Biofilters, beds of moist mature compost wood and bark chip mixtures, remove VOC's and odorous compounds through a combination of absorption and adsorption followed by biological oxidation.

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Biofilters are effective in removing the following classes of compounds: organosulfides and hydrogen sulfide, nitrogenous organics and ammonia, volatile fatty acids, and ketones." [227]

Some methods for increasing recycling and composting rates include:

- Changes in Packaging Design to increase the availability recyclable packaging as well as recyclable products.

- Consumer Education (of both individuals and businesses) to separate products and packaging for recycling, and organics for composting, to purchase products and packaging made from recycled materials and purchase products and packaging which are, themselves, recyclable.

- Mandatory Recycling Requirements (for residential, institutional and commercial sectors).

- Economic Incentives (paying individuals and businesses for recyclables and compostables; or in the case of unit-based pricing for garbage collection, no charge for collection of recyclables and compostables).

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227 Gould, Mark and Nerissa Wu, "Factors Affecting Gaseous Emissions from Solid Waste Composting, Tipping, and Landfilling", 86th Annual Meeting & Exhibition, Air and Waste Management Association, Denver, CO, June 13-18, 1993.

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- Provision of composters and tools free to residents and businesses that would compost food and yard waste on-site, rather than rely on municipal collections. (This strategy can actually be considered source reduction, since collection and centralized processing is avoided.)

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Appendix SA
Summary of Analyses

Changes in Knowledge and Extent of Educational Intervention

West Side

		Controls				Intervention				
Answer Measured		Didn't see Brochures		Sample Size(s)	Diff. After-before	Saw Brochures		Diff. After - before	Sample Size(s)	Diff. from Control
		Before	After			Before	After			
	Knowledge Questions									
Yes:	Government Requires Separating Materials	85.90%	91.90%	71/74	6.00%	81.50%	85.20%	3.70%	54./54.	-2.30%
Yes:	NYC Picks up Plastic Bottles	96.00%	84.00%	75/75	-12.00%	94.40%	70.40%	-24.00%	54./54.	-12.00%
Yes:	NYC Picks up Plastic Bags	39.10%	45.30%	69/75	6.20%	43.10%	48.10%	5.00%	51./54.	-1.20%
Yes:	NYC Picks up Aluminum Cans	95.90%	54.70%	74/75	-41.20%	92.50%	55.60%	-36.90%	53./54.	4.30%
Yes:	NYC Picks up Aluminum Foil	75.30%	37.30%	73/75	-38.00%	82.70%	48.10%	-34.60%	52./54.	3.40%
Yes:	NYC Picks up Tin Cans	89.00%	38.70%	73/75	-50.30%	87.00%	42.60%	-44.40%	54./54.	5.90%
Yes:	Heard of Environmental Shopping Before?	62.20%	50.70%	74/73	-11.50%	71.70%	58.80%	-12.90%	53./51.	-1.40%
	Source of Knowledge Questions									
Yes:	Mailings – Recycling	72.70%	22.70%	66/75	-50.00%	78.40%	33.30%	-45.10%	51./54.	4.90%
Yes:	Mailings – Env shopping	17.90%	2.70%	56/75	-15.20%	11.40%	3.70%	-7.70%	44./54.	7.50%
Yes:	TV – Recycling	82.60%	52.00%	69/75	-30.60%	88.50%	55.60%	-32.90%	52./54.	-2.30%
Yes.:	TV – Env shopping	35.60%	9.30%	59/75	-26.30%	29.50%	13.00%	-16.50%	44./54.	9.80%
Yes:	Subway – Recycling	75.80%	37.30%	66/75	-38.50%	85.70%	24.10%	-61.60%	49./54.	-23.10%
Yes:	Subway – Env shopping	14.00%	5.30%	57/75	-8.70%	13.60%	9.30%	-4.30%	44./54.	4.40%
Yes:	Store videos – Recycling	12.10%	8.00%	58/75	-4.10%	24.50%	9.30%	-15.20%	49./54.	-11.10%
Yes:	Store videos – Env shopping	7.10%	5.30%	56/75	-1.80%	4.50%	7.40%	2.90%	44./54.	4.70%
Yes:	Post/Broch- Recycling	41.00%	13.30%	61/75	-27.70%	47.90%	14.80%	-33.10%	48./54.	-5.40%
Yes:	Post/Broch- Env shopping	17.50%	14.70%	57/75	-2.80%	13.60%	24.10%	10.50%	44./54.	13.30%
Yes:	Bldg Mgmt – Recycling	82.40%	18.70%	68/75	-63.70%	82.00%	20.40%	-61.60%	50./54.	2.10%
Yes:	Bldg Mgmt – Env shopping	9.10%	0.00%	55/75	-9.10%	6.80%	0%	-6.80%	44./54.	2.30%
Yes:	Friends – Recycling	72.10%	26.70%	61/75	-45.40%	71.40%	24.10%	-47.30%	49./54.	-1.90%
Yes:	Friends – Env shopping	35.10%	5.30%	57/75	-29.80%	26.10%	13.00%	-13.10%	46./54.	16.70%
Yes:	Nsp/Mag – Recycling	91.70%	58.70%	72/75	-33.00%	94.20%	55.60%	-38.60%	52./54.	-5.60%
Yes:	Nsp/Mag – Env shopping	37.70%	16.00%	61/75	-21.70%	39.10%	9.30%	-29.80%	46./54.	-8.10%

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Changes in Knowledge and Extent of Educational Intervention

East Side

		Controls				Intervention				
Answer Measured		Didn't see Brochures		Diff. After-before	Sample Size(s)	Saw Brochures		Diff. After - before	Diff. from Control	Sample Size(s)
		Before	After			Before	After			
	Knowledge Questions									
Yes:	Govt Require Separation of Materials	75.40%	80.00%	4.60%	61/60	75.00%	84.60%	9.60%	5.00%	40./39.
Yes:	NYC Pick up Plastic Bottles	95.10%	82.00%	-13.10%	61/61	85.00%	72.50%	-12.50%	0.60%	40./40.
Yes:	NYC Pick up Plastic Bags	51.80%	47.50%	-4.30%	56/61	33.30%	60.00%	26.70%	31.00%	39./40.
Yes:	NYC Pick up Aluminum Cans	83.30%	68.90%	-14.40%	60/61	80.00%	82.50%	2.50%	16.90%	40./40.
Yes:	NYC Pick up Aluminum Foil	67.80%	39.30%	-28.50%	59/61	57.50%	45.00%	-12.50%	16.00%	40./40.
Yes:	NYC Pick up Tin Cans	66.70%	41.00%	-25.70%	60/61	65.00%	40.00%	-25.00%	0.70%	40./40.
Yes:	Heard of Environmental Shopping Before?	67.20%	58.90%	-8.30%	61/56	59.00%	62.20%	3.20%	11.50%	39./37.
	Source of Knowledge									
Yes:	Mailings - Recycling	72.40%	21.30%	-51.10%	58/61	67.50%	37.50%	-30.00%	21.10%	40./40.
Yes:	Mailings – Env shopping	16.70%	4.90%	-11.80%	54/61	5.60%	2.50%	-3.10%	8.70%	36./40.
Yes:	TV - Recycling	82.50%	49.20%	-33.30%	57/61	75.00%	60.00%	-15.00%	18.30%	40./40.
Yes.:	TV – Env shopping	32.10%	9.80%	-22.30%	53/61	25.00%	7.50%	-17.50%	4.80%	36./40.
Yes:	Subway - Recycling	81.80%	29.50%	-52.30%	55/61	67.50%	27.50%	-40.00%	12.30%	40./40.
Yes:	Subway – Env shopping	5.80%	3.30%	-2.50%	52/61	2.90%	7.50%	4.60%	7.10%	35./40.
Yes:	Store videos - Recycling	28.30%	0.00%	-28.30%	53/61	5.40%	2.50%	-2.90%	25.40%	37./40.
Yes:	Store videos – Env shop	0.00%	4.90%	4.90%	52/61	0.00%	2.50%	2.50%	-2.40%	36./40.
Yes:	Posters/Brochures – Recycling	50.90%	18.00%	-32.90%	55/61	39.50%	30.00%	-9.50%	23.40%	38./40.
Yes:	Posters/Brochures-Environmental shopping	15.40%	18.00%	2.60%	52/61	8.60%	10.00%	1.40%	-1.20%	35./40.
Yes:	Bldg Mgmt – Recycling	79.30%	29.50%	-49.80%	58/61	83.80%	30.00%	-53.80%	-4.00%	37./40.
Yes:	Bldg Mgmt – Env. shopping	5.70%	0.00%	-5.70%	53/61	2.90%	10.00%	7.10%	12.80%	35./40.
Yes:	Friends – Recycling	67.90%	24.60%	-43.30%	56/61	81.60%	35.00%	-46.60%	-3.30%	38./40.
Yes:	Friends – Env shopping	35.80%	9.80%	-26.00%	53/61	37.80%	20.00%	-17.80%	8.20%	37./40.
Yes:	Newspapers/Magazine – Recycling	86.20%	62.30%	-23.90%	58/61	79.50%	65.00%	-14.50%	9.40%	39./40.
Yes:	Newspapers/Magazine – Env shopping	43.60%	21.30%	-22.30%	55/61	19.40%	22.50%	3.10%	25.40%	36./40.

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Relationship between Amount of Educational Intervention and Changes in Knowledge

West Side

		More Intervention									
		Saw Brochures & Recycling message					Saw Brochures & Video				
Answer Measured		Before	After	Sample Size(s)	Diff. After-before	Diff. from Control	Before	After	Sample Size(s)	Diff. After-before	Diff. From Control
	Knowledge Questions										
Yes:	Govt Require Separate Materials?	80.80%	76.90%	26/26	-3.90%	-9.90%	81.80%	95.50%	22./22.	13.70%	7.70%
Yes:	NYC pick up Plastic Bottles	96.20%	73.10%	26/26	-23.10%	-11.10%	95.50%	77.30%	22./22.	-18.20%	-6.20%
Yes:	NYC pick up Plastic Bags	44.00%	53.80%	25/26	9.80%	3.60%	23.80%	54.50%	21./22.	30.70%	24.50%
Yes:	NYC pick up Aluminum Cans	88.50%	61.50%	26/26	-27.00%	14.20%	95.20%	77.30%	21./22.	-17.90%	23.30%
Yes:	NYC pick up Aluminum Foil	73.10%	38.50%	26/26	-34.60%	3.40%	85.00%	68.20%	20./22.	-16.80%	21.20%
Yes:	NYC pick up Tin Cans	88.50%	38.50%	26/26	-50.00%	0.30%	77.30%	59.10%	22./22.	-18.20%	32.10%
Yes:	Heard of Env Shopping Before?	76.90%	48.00%	26/25	-28.90%	-17.40%	68.20%	81.00%	22./21.	12.80%	24.30%
	Source of Knowledge										
Yes:	Mailings – Recycling	76.00%	34.60%	25/26	-41.40%	8.60%	76.20%	36.40%	21./22.	-39.80%	10.20%
Yes:	Mailings – Env shopping	19.00%	0%	21/26	-19.00%	-3.80%	11.80%	4.50%	17./22.	-7.30%	7.90%
Yes:	TV – Recycling	92.30%	61.50%	26/26	-30.80%	-0.20%	95.50%	59.10%	22./22.	-36.40%	-5.80%
Yes.:	TV – Env shop	33.30%	11.50%	21/26	-21.80%	4.50%	47.10%	18.20%	17./22.	-28.90%	-2.60%
Yes:	Subway – Recycling	91.30%	30.80%	23/26	-60.50%	-22.00%	90.00%	22.70%	20./22.	-67.30%	-28.80%
Yes:	Subway – Env shopping	19.00%	11.50%	21/26	-7.50%	1.20%	17.60%	18.20%	17./22.	0.60%	9.30%
Yes:	Store videos – Recycling	30.40%	11.50%	23/26	-18.90%	-14.80%	30.00%	18.20%	20./22.	-11.80%	-7.70%
Yes:	Store videos – Env shop'g	9.50%	7.70%	21/26	-1.80%	0.00%	0%	18.20%	17./22.	18.20%	20.00%
Yes:	Post/Brochure Recycling	60.90%	11.50%	23/26	-49.40%	-21.70%	50.00%	22.70%	20./22.	-27.30%	0.40%
Yes:	Post/Brochure Env shop	19.00%	15.40%	21/26	-3.60%	-0.80%	5.90%	27.30%	17./22.	21.40%	24.20%
Yes:	Bldg Mgmt – Recycling	76.00%	11.50%	25/26	-64.50%	-0.80%	80.00%	22.70%	20./22.	-57.30%	6.40%
Yes:	Bldg Mgmt – Env shopping	14.30%	0.00%	21/26	-14.30%	-5.20%	0%	0%	17./22.	0.00%	9.10%
Yes:	Friends – Recycling	78.30%	30.80%	23/26	-47.50%	-2.10%	70.00%	27.30%	20./22.	-42.70%	2.70%
Yes:	Friends – Env shopping	28.60%	15.40%	21/26	-13.20%	16.60%	16.70%	27.30%	18./22.	10.60%	40.40%
Yes:	Nsp/Mag – Recycling	92.30%	57.70%	26/26	-34.60%	-1.60%	100%	50%	21/22	-50.00%	-17.00%
Yes:	Nsp/Mag – Env shopping	33.30%	7.70%	21/26	-25.60%	-3.90%	52.60%	9.10%	19/22	-43.50%	-21.80%

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Relationship between Amount of Educational Intervention and Changes in Knowledge

East Side

		More Intervention									
		Saw Brochures & Recycling message					Saw Brochures & either save resources, reuse or pollution message				
Answer Measured		Before	After	Diff. After-before	Diff from Control	Sample size(s)	Before	After	Diff. After-before	Diff. From Control	Sample Size(s)
	Knowledge Questions										
Yes:	Govt Require Separation of Materials	76.00%	83.30%	7.30%	2.70%	25/24	79.30%	82.10%	2.80%	-1.80%	29/28
Yes:	NYC Pick up Plastic Bottles	88.00%	64.00%	-24.00%	-10.90%	25/25	89.70%	65.50%	-24.20%	-11.10%	29/29
Yes:	NYC Pick up Plastic Bags	41.70%	68.00%	26.30%	30.60%	24/25	35.70%	65.50%	29.80%	34.10%	28/29
Yes:	NYC Pick up Aluminum Cans	84.00%	84.00%	0.00%	14.40%	25/25	86.20%	82.80%	-3.40%	11.00%	29/29
Yes:	NYC Pick up Aluminum Foil	52.00%	44.00%	-8.00%	20.50%	25/25	62.10%	41.40%	-20.70%	7.80%	29/29
Yes:	NYC Pick up Tin Cans	64.00%	40.00%	-24.00%	1.70%	25/25	69.00%	39.70%	-29.30%	-3.60%	29/29
Yes:	Heard of Env Shop'g Before?	52.00%	54.20%	2.20%	10.50%	25/24	57.10%	59.30%	2.20%	10.50%	28/27
	Source of Knowledge										
Yes:	Mailings – Recycling	60.00%	40.00%	-20.00%	31.10%	25/25	58.60%	48.30%	-10.30%	40.80%	29/29
Yes:	Mailings – Env shopping	4.80%	4.00%	-0.80%	11.00%	21/25	7.40%	3.40%	-4.00%	7.80%	27/29
Yes:	TV – Recycling	72.00%	64.00%	-8.00%	25.30%	25/25	69.00%	65.50%	-3.50%	29.80%	29/29
Yes.:	TV – Env shop	23.80%	8.00%	-15.80%	6.50%	21/25	18.50%	10.30%	-8.20%	14.10%	27/29
Yes:	Subway – Recycling	60.00%	36.00%	-24.00%	28.30%	25/25	69.00%	17.20%	-51.80%	0.50%	29/29
Yes:	Subway – Env shopping	0.00%	8.00%	8.00%	10.50%	20/25	3.80%	6.90%	3.10%	5.60%	26/29
Yes:	Store videos – Recycling	8.70%	4.00%	-4.70%	23.60%	23/25	7.40%	3.40%	-4.00%	24.30%	27/29
Yes:	Store videos – Env shopping	0.00%	0.00%	0.00%	-4.90%	21/25	0.00%	0.00%	0.00%	-4.90%	27/29
Yes:	Posters /Broch-Recycling	33.30%	32.00%	-1.30%	31.60%	24/25	37.00%	27.60%	-9.40%	23.50%	27/29
Yes:	Posters /Broch-Envshop	4.80%	16.00%	11.20%	8.60%	21/25	3.80%	10.30%	6.50%	3.90%	26/29
Yes:	Bldg Mgmt – Recycing	82.60%	32.00%	-50.60%	-0.80%	23/25	88.90%	27.60%	-61.30%	-11.50%	27/29
Yes:	Bldg Mgmt – Env shopping	4.80%	12.00%	7.20%	12.90%	21/25	3.80%	6.90%	3.10%	8.80%	26/29
Yes:	Friends – Recycling	79.20%	28.00%	-51.20%	-7.90%	24/25	82.10%	34.50%	-47.60%	-4.30%	28/29
Yes:	Friends – Env shopping	27.30%	20.00%	-7.30%	18.70%	22/25	37.10%	20.70%	-16.40%	9.60%	27/29
Yes:	News/Mags – Recycling	83.30%	68.00%	-15.30%	8.60%	24/25	79.30%	69.00%	-10.30%	13.60%	29/29
Yes:	News/Mags – Env shopping	18.20%	20.00%	1.80%	24.10%	22/25	11.50%	24.10%	12.60%	34.90%	26/29

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Changes in Attitudes and Extent of Educational Intervention

West Side

		Controls				Intervention				
		Didn't see Brochures				Saw Brochures				
Answer(s) Measured	Attitude questions	Before	After	Sample Size(s)	Diff. After – Before	Before	After	Difference After – Before	Sample Size(s)	Difference From Control
4+5	BYOBAG 5 cents	51.30%	60.00%	74/75	8.70%	64.80%	55.60%	-9.20%	54./54.	-17.90%
1+2		33.80%	33.30%		-0.50%	27.80%	31.50%	3.70%		4.20%
4+5	Change Store	68.90%	64.00%	74/75	-4.90%	83.30%	75.90%	-7.40%	54./54.	-2.50%
1+2		10.80%	17.30%		6.50%	11.20%	13.00%	1.80%		-4.70%
first	Brand Name	26.50%	31.10%	68/74	4.60%	18.80%	27.50%	8.70%	48./51.	4.10%
first	Cost	65.70%	52.10%	67/75	-13.60%	60.00%	46.20%	-13.80%	50./52.	-0.20%
first	Convenience	6.20%	12.30%	65/73	6.10%	10.60%	13.50%	2.90%	47./52.	-3.20%
first	Env. Impact	7.70%	8.20%	65/73	0.50%	12.50%	17.30%	4.80%	48./52.	4.30%
last	Brand Name	35.30%	29.70%		-5.60%	35.40%	29.40%	-6.00%		-0.40%
last	Cost	1.50%	5.50%		4.00%	10.00%	7.70%	-2.30%		-6.30%
last	Convenience	21.50%	24.70%		3.20%	21.30%	30.80%	9.50%		6.30%
last	Env. Impact	35.40%	37.00%		1.60%	27.10%	34.60%	7.50%		5.90%
4+5	Conserve Nat Resources	83.50%	77.10%	73/74	-6.40%	94.30%	70.40%	-23.90%	53./54.	-17.50%
1+2		2.80%	12.20%		9.40%	3.80%	11.10%	7.30%		-2.10%
4+5	Conserve Landfill	82.20%	72.60%	73/73	-9.60%	79.20%	68.50%	-10.70%	53./54.	-1.10%
1+2		4.10%	9.60%		5.50%	5.70%	14.90%	9.20%		3.70%
4+5	It's the Law	54.00%	36.50%	74/74	-17.50%	63.50%	59.30%	-4.20%	52./54.	13.30%
1+2		32.50%	44.60%		12.10%	21.20%	24.10%	2.90%		-9.20%
4+5	Right Thing to do	90.70%	71.70%	75/74	-19.00%	90.60%	76.00%	-14.60%	53./54.	4.40%
1+2		4.00%	13.50%		9.50%	5.70%	11.10%	5.40%		-4.10%

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Changes in Attitudes and Extent of Educational Intervention

East Side

		Controls				Intervention				
		Didn't see Brochures				Saw Brochures				
Answers Measured	Attitude questions	Before	After	Diff. After – Before	Sample Size(s)	Before	After	Difference After – Before	Difference From Control	Sample Size(s)
4+5	BYOBAG 5 cents	60.60%	57.40%	-3.20%	61/61	72.50%	37.50%	-35.00%	-31.80%	40./40.
1+2		19.60%	29.50%	9.90%		20.00%	35.00%	15.00%	5.10%	
4+5	Change Store	78.70%	73.80%	-4.90%	61/61	85.00%	51.30%	-33.70%	-28.80%	40./39.
1+2		14.70%	18.00%	3.30%		5.00%	28.20%	23.20%	19.90%	
First	Brand Name	18.20%	19.70%	1.50%	55/61	19.40%	37.50%	18.10%	16.60%	36./40.
first	Cost	73.70%	60.00%	-13.70%	57/60	61.80%	27.50%	-34.30%	-20.60%	34./40.
first	Convenience	7.10%	20.70%	13.60%	56/58	26.70%	22.50%	-4.20%	-17.80%	30./40.
first	Env. Impact	3.80%	10.30%	6.50%	53/58	3.00%	12.50%	9.50%	3.00%	33./40.
last	Brand Name	47.30%	26.20%	-21.10%		33.30%	27.50%	-5.80%	15.30%	
last	Cost	3.50%	8.30%	4.80%		11.80%	15.00%	3.20%	-1.60%	
last	Convenience	14.30%	19.00%	4.70%		20.00%	22.50%	2.50%	-2.20%	
last	Env. Impact	32.10%	41.40%	9.30%		24.20%	45.00%	20.80%	11.50%	
4+5	Conserve Natural Resources	82.40%	66.70%	-15.70%	57/57	91.90%	45.00%	-46.90%	-31.20%	37./40.
1+2		1.80%	6.10%	4.30%		0%	25.00%	25.00%	20.70%	
4+5	Conserve Landfill	78.90%	64.90%	-14.00%	57/57	73.30%	47.50%	-25.80%	-11.80%	36./40.
1+2		1.80%	17.50%	15.70%		5.60%	30.00%	24.40%	8.70%	
4+5	It's the Law	44.80%	57.90%	13.10%	58/57	44.70%	57.50%	12.80%	-0.30%	38./40.
1+2		34.50%	21.10%	-13.40%		26.30%	12.50%	-13.80%	-0.40%	
4+5	Right Thing to do	86.20%	80.80%	-5.40%	58/57	89.20%	67.50%	-21.70%	-16.30%	37./40.
1+2		5.10%	14.00%	8.90%		10.80%	12.50%	1.70%	-7.20%	

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Changes in Attitudes and Extent of Educational Intervention

West Side

		More Intervention									
		Saw Brochures & Recycling Message					Saw Brochures & Video				
Answers measured	Attitude questions	Before	After	Sample Size(s)	Diff. After – before	Diff. from Control	Before	After	Sample Size(s)	Diff. After - before	Diff from Control
4+5	BYOBAG 5 cents	53.90%	73.10%	26/26	19.20%	10.50%	59.10%	40.90%	22/22	-18.20%	-26.90%
1+2		38.40%	19.20%		-19.20%	-18.70%	31.80%	40.90%		9.10%	9.60%
4+5	Change Store	77.00%	65.40%	26/26	-11.60%	-6.70%	81.80%	81.80%	22/22	0.00%	4.90%
1+2		15.30%	19.20%		3.90%	-2.60%	9.10%	4.50%		-4.60%	-11.10%
First	Brand Name	26.10%	26.90%	23/26	0.80%	-3.80%	30.00%	27.30%	20/22	-2.70%	-7.30%
First	Cost	58.30%	46.20%	24/26	-12.10%	1.50%	55.00%	40.90%	20/22	-14.10%	-0.50%
First	Convenience	9.10%	15.40%	22/26	6.30%	0.20%	5.30%	13.60%	19/22	8.30%	2.20%
First	Env. Impact	4.50%	15.40%	22/26	10.90%	10.40%	15.00%	22.70%	20/22	7.70%	7.20%
Last	Brand Name	39.10%	15.40%		-23.70%	-18.10%	20.00%	22.70%		2.70%	8.30%
Last	Cost	8.30%	11.50%	24/26	3.20%	-0.80%	5.00%	9.10%		4.10%	0.10%
Last	Convenience	22.70%	23.10%	22/26	0.40%	-2.80%	31.60%	50.00%		18.40%	15.20%
Last	Env. Impact	22.70%	53.80%	22/26	31.10%	29.50%	30.00%	22.70%		-7.30%	-8.90%
4+5	Conserve Natural Resources	88.00%	73.10%	25/26	-14.90%	-8.50%	90.90%	59.10%	22/22	-31.80%	-25.40%
1+2		8.00%	7.60%		-0.40%	-9.80%	9.10%	13.60%		4.50%	-4.90%
4+5	Conserve Landfill space	80.00%	73.10%	25/26	-6.90%	2.70%	86.40%	68.20%	22/22	-18.20%	-8.60%
1+2		12.00%	15.40%		3.40%	-2.10%	9.10%	13.60%		4.50%	-1.00%
4+5	It's the Law	72.00%	53.90%	25/26	-18.10%	-0.60%	61.90%	50.00%	21/22	-11.90%	5.60%
1+2		16.00%	18.20%		2.20%	-9.90%	33.40%	22.70%		-10.70%	-22.80%
4+5	Right Thing to do	88.00%	65.40%	25/26	-22.60%	-3.60%	86.30%	72.70%	22/22	-13.60%	5.40%
1+2		12.00%	11.50%		-0.50%	-10.00%	13.60%	9.10%		-4.50%	-14.00%

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Changes in Attitudes and Extent of Educational Intervention

East Side

		More Intervention									
		Saw Brochures & Recycling Message					Saw Brochures & either save resources, reuse or pollution message				
Answers measured	Attitude questions	Before	After	Diff. After – before	Diff. from Control	Sample Size(s)	Before	After	Difference After - before	Difference from Control	Sample Size(s)
4+5	BYOBAG 5 cents	68.00%	32.00%	-36.00%	-32.80%	25/25	79.30%	34.40%	-44.90%	-41.70%	29/29
1+2		28.00%	40.00%	12.00%	2.10%	25/25	17.20%	41.30%	24.10%	14.20%	
4+5	Change Store	92.00%	40.00%	-52.00%	-47.10%	25/25	82.70%	41.40%	-41.30%	-36.40%	29/29
1+2		0.00%	40.00%	40.00%	36.70%		6.90%	37.90%	31.00%	27.70%	
first	Brand Name	17.40%	40.00%	22.60%	21.10%	23/25	15.40%	37.90%	22.50%	21.00%	26/29
first	Cost	65.20%	28.00%	-37.20%	-23.50%	23/25	68.00%	24.10%	-43.90%	-30.20%	25/29
first	Convenience	33.30%	24.00%	-9.30%	-22.90%	21/25	27.30%	27.60%	0.30%	-13.30%	22/29
first	Env. Impact	4.30%	12.00%	7.70%	1.20%	23/25	0.00%	13.80%	13.80%	7.30%	24/29
last	Brand Name	34.80%	28.00%	-6.80%	14.30%	23/25	30.80%	24.10%	-6.70%	14.40%	
last	Cost	4.30%	8.00%	3.70%	-1.10%	23/25	12.00%	13.80%	1.80%	-3.00%	
last	Convenience	19.00%	24.00%	5.00%	0.30%	21/25	13.60%	13.80%	0.20%	-4.50%	
last	Env. Impact	30.40%	48.00%	17.60%	8.30%	23/25	25.00%	55.20%	30.20%	20.90%	
4+5	Conserve Natural Resources	95.60%	40.00%	-55.60%	-39.90%	23/25	92.60%	41.30%	-51.30%	-35.60%	27/29
1+2		0.00%	24.00%	24.00%	19.70%		0.00%	27.60%	27.60%	23.30%	
4+5	Conserve Landfill	86.90%	44.00%	-42.90%	-28.90%	23/25	80.80%	48.20%	-32.60%	-18.60%	26/29
1+2		4.30%	28.00%	23.70%	8.00%		7.60%	31.00%	23.40%	7.70%	
4+5	It's the Law	45.90%	60.00%	14.10%	1.00%	24/25	50.00%	62.10%	12.10%	-1.00%	28/29
1+2		20.90%	12.00%	-8.90%	4.50%		25.00%	6.80%	-18.20%	-4.80%	
4+5	Right Thing to do	95.60%	64.00%	-31.60%	-26.20%	23/25	88.90%	72.40%	-16.50%	-11.10%	27/29
1+2		4.30%	12.00%	7.70%	-1.20%		11.10%	6.80%	-4.30%	-13.20%	

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Changes in Behavior and Extent of Educational Intervention

West Side

		Controls				Intervention				
		Didn't see Brochures				Saw Brochures				
Answers Measured	Behavior questions	Before	After	Sample Size(s)	Diff. After – Before	Before	After	Diff. After – Before	Sample Size(s)	Difference From Control
4+5	Buy Disposable Products	30.00%	42.60%	70/75	12.60%	32.70%	42.60%	9.90%	52./54.	-2.70%
1+2		14.30%	18.60%		4.30%	17.30%	20.40%	3.10%		-1.20%
4+5	Buy Refills/ Concentrates	44.60%	45.40%	72/75	0.80%	41.50%	51.90%	10.40%	53./54.	9.60%
1+2		25.00%	41.40%		16.40%	20.70%	29.70%	9.00%		-7.40%
4+5	Buy single-servings	19.40%	12.50%	72/72	-6.90%	18.50%	30.20%	11.70%	54./53.	18.60%
1+2		54.20%	59.70%		5.50%	51.80%	45.30%	-6.50%		-12.00%
4+5	Buy Recyclable Packaging	49.30%	38.90%	71/72	-10.40%	66.70%	29.60%	-37.10%	54./54.	-26.70%
1+2		15.50%	30.60%		15.10%	5.60%	33.30%	27.70%		12.60%
4+5	Avoid aerosols	59.10%	60.30%	71/73	1.20%	60.40%	59.30%	-1.10%	53./54.	-2.30%
1+2		17.00%	28.70%		11.70%	20.70%	31.50%	10.80%		-0.90%
4+5	Return deposit containers	51.60%	54.70%	74/75	3.10%	46.20%	57.70%	11.50%	52./52.	8.40%
1+2		41.90%	41.30%		-0.60%	38.50%	30.70%	-7.80%		-7.20%
4+5	Bring Bag	10.90%	13.30%	74/75	2.40%	9.30%	9.50%	0.20%	54./53.	-2.20%
1+2		74.30%	78.60%		4.30%	77.80%	68.00%	-9.80%		-14.10%
4+5	Patronize repair shops	29.60%	29.40%	71/75	-0.20%	41.60%	29.80%	-11.80%	53./52.	-11.60%
1+2		35.20%	49.40%		14.20%	20.80%	50.00%	29.20%		15.00%
4+5	Recycle cans/bottles	90.40%	91.60%	73/71	1.20%	88.90%	84.90%	-4.00%	54./53.	-5.20%
1+2		6.80%	7.00%		0.20%	5.60%	11.30%	5.70%		5.50%

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Changes in Behavior and Extent of Educational Intervention

East Side

		Controls				Intervention				
		Didn't see Brochures				Saw Brochures				
Answer(s) Measured	Behavior Questions	Before	After	Diff. After – Before	Sample Size(s)	Before	After	Diff. After – Before	Diff. From Control	Sample Size(s)
4+5	Buy Disposable Products	20.60%	55.00%	34.40%	58/60	43.20%	55.00%	11.80%	-22.60%	37./40.
1+2		10.30%	16.60%	6.30%		18.90%	22.50%	3.60%	-2.70%	
4+5	Buy Refills/Concentrates	43.30%	49.10%	5.80%	60/59	38.50%	62.50%	24.00%	18.20%	39./40.
1+2		21.60%	32.20%	10.60%		25.70%	20.00%	-5.70%	-16.30%	
4+5	Buy single-serving packaging	20.00%	27.10%	7.10%	60/59	20.50%	32.50%	12.00%	4.90%	39./40.
1+2		50.00%	55.90%	5.90%		43.60%	25.00%	-18.60%	-24.50%	
4+5	Buy Recyclable Packaging	56.70%	35.00%	-21.70%	60/60	60.60%	40.00%	-20.60%	1.10%	38./40.
1+2		6.70%	30.00%	23.30%		5.20%	17.50%	12.30%	-11.00%	
4+5	Avoid aerosols	66.70%	67.70%	1.00%	60/59	76.90%	70.00%	-6.90%	-7.90%	39./40.
1+2		13.30%	17.00%	3.70%		12.80%	12.50%	-0.30%	-4.00%	
4+5	Return deposit containers	41.60%	57.60%	16.00%	60/58	36.90%	65.00%	28.10%	12.10%	38./40.
1+2		46.70%	39.60%	-7.10%		42.10%	27.50%	-14.60%	-7.50%	
4+5	Bring Bag	6.70%	13.60%	6.90%	60/59	20.50%	22.50%	2.00%	-4.90%	39./40.
1+2		70.00%	61.00%	-9.00%		66.70%	70.00%	3.30%	12.30%	
4+5	Patronize repair shops	35.60%	31.70%	-3.90%	59/60	28.20%	15.00%	-13.20%	-9.30%	39./40.
1+2		28.90%	45.00%	16.10%		33.30%	37.50%	4.20%	-11.90%	
4+5	Recycle cans/bottles	83.30%	81.70%	-1.60%	60/60	89.70%	80.00%	-9.70%	-8.10%	39./40.
1+2		10.00%	10.00%	0.00%		5.20%	15.00%	9.80%	9.80%	

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Changes in Behavior and Extent of Educational Intervention

West Side

		More Intervention									
		Saw Brochures & Recycling Message					Saw Brochures & Video				
Answers Measured	Behavior questions	Before	After	Sample Size(s)	Diff. After – before	Diff. from Control	Before	After	Sample Size(s)	Diff. After - before	Difference from Control
4+5	Buy Disposable Products	24.00%	57.70%	25/26	33.70%	21.10%	42.80%	40.90%	21/22	-1.90%	-14.50%
1+2		16.00%	7.70%		-8.30%	-12.60%	23.80%	13.60%		-10.20%	-14.50%
4+5	Buy Refills/ Concentrates	30.80%	57.60%	26/26	26.80%	26.00%	52.40%	54.60%	21/22	2.20%	1.40%
1+2		19.20%	30.70%			-16.40%	19.00%	24.70%		5.70%	-10.70%
4+5	Buy single-serving pkg	11.50%	34.60%	26/26	23.10%	30.00%	22.70%	38.10%	22/21	15.40%	22.30%
1+2		46.20%	30.80%		-15.40%	-20.90%	59.10%	38.10%		-21.00%	-26.50%
4+5	Buy Recyclable Packaging	57.70%	26.90%	26/26	-30.80%	-20.40%	63.60%	40.90%	22/22	-22.70%	-12.30%
1+2		7.70%	46.10%		38.40%	23.30%	13.60%	22.70%		9.10%	-6.00%
4+5	Avoid aerosols	48.00%	65.40%	25/26	17.40%	16.20%	54.50%	59.10%	22/22	4.60%	3.40%
1+2		28.00%	23.00%		-5.00%	-16.70%	27.30%	31.80%		4.50%	-7.20%
4+5	Return deposit containers	34.60%	68.00%	26/25	33.40%	30.30%	47.60%	50.00%	21/22	2.40%	-0.70%
1+2		46.20%	16.00%		-30.20%	-29.60%	42.90%	36.30%		-6.60%	-6.00%
4+5	Bring Bag	3.80%	12.00%	26/25	8.20%	5.80%	18.10%	14.30%	22/21	-3.80%	-6.20%
1+2		76.90%	68.00%		-8.90%	-13.20%	77.30%	76.10%		-1.20%	-5.50%
4+5	Patronize repair shops	34.60%	24.00%	26/25	-10.60%	-10.40%	40.90%	19.10%	22/21	-21.80%	-21.60%
1+2		19.20%	60.00%		40.80%	26.60%	27.20%	47.60%		20.40%	6.20%
4+5	Recycle cans/bottles	80.80%	84.60%	26/26	3.80%	2.60%	86.30%	81.80%	22/22	-4.50%	-5.70%
1+2		11.50%	7.70%		-3.80%	-4.00%	4.50%	13.60%		9.10%	8.90%

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Changes in Behavior and Extent of Educational Intervention

East Side

		More Intervention									
		Saw Brochures & Recycling Message					Saw Brochures & either save resources, reuse or pollution message				
Answers Measured	Behavior questions	Before	After	Diff. After - before	Diff. from Control	Sample Size(s)	Before	After	Diff. After – before	Diff. from Control	Sample Size(s)
4+5	Buy Disposable Products	54.20%	52.00%	-2.20%	32.20%	24/25	48.10%	62.00%	13.90%	20.50%	27/29
1+2		8.40%	20.00%	11.60%	5.30%		18.50%	17.20%	-1.30%	-7.60%	
4+5	Buy Refills / Concentrates	48.00%	60.00%	12.00%	6.20%	25/25	31.00%	62.10%	31.10%	25.30%	29/29
1+2		28.00%	20.00%	-8.00%	-18.60%		34.50%	17.20%	-17.30%	-27.90%	
4+5	Buy single-svgs	20.00%	40.00%	20.00%	12.90%	25/25	20.60%	37.90%	17.30%	10.20%	29/29
1+2		36.00%	28.00%	-8.00%	-13.90%		44.80%	17.20%	-27.60%	-33.50%	
4+5	Buy Recyclable Packaging	58.30%	36.00%	-22.30%	-0.60%	24/25	55.10%	37.90%	-17.20%	4.50%	29/29
1+2		4.20%	16.00%	11.80%	-11.50%		6.80%	24.10%	17.30%	-6.00%	
4+5	Avoid aerosols	76.00%	64.00%	-12.00%	-13.00%	25/25	72.40%	69.00%	-3.40%	-4.40%	29/29
1+2		12.00%	12.00%	0.00%	-3.70%		13.80%	10.30%	-3.50%	-7.20%	
4+5	Return deposit containers	28.00%	68.00%	40.00%	24.00%	25/25	35.70%	72.40%	36.70%	20.70%	28/29
1+2		52.00%	24.00%	-28.00%	-20.90%		46.50%	17.20%	-29.30%	-22.20%	
4+5	Bring Bag	16.00%	24.00%	8.00%	1.10%	25/25	20.60%	24.10%	3.50%	-3.40%	29/29
1+2		68.00%	72.00%	4.00%	13.00%		69.00%	65.50%	-3.50%	5.50%	
4+5	Patronize repair shops	32.00%	24.00%	-8.00%	-4.10%	25/25	24.10%	13.80%	-10.30%	-6.40%	29/29
1+2		36.00%	32.00%	-4.00%	-20.10%		44.80%	41.40%	-3.40%	-19.50%	
4+5	Recycle cans/bottles	84.00%	76.00%	-8.00%	-6.40%	25/25	89.60%	79.30%	-10.30%	-8.70%	29/29
1+2		8.00%	16.00%	8.00%	8.00%		6.80%	13.80%	7.00%	7.00%	

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Changes in Attittudes and Behavior Between Stores

Differences in Means – Baseline surveys

	Means		Number of pairs	Difference East - West	t value	2 tail sig
	East	West				
Attitude Questions						
BYOBAG 2 cents	3.3401	3.3098	397	.0302	.32	.749
BYOBAG 5 cents	3.6045	3.5819	397	.0227	.23	.820
Change Store	4.0151	3.9068	397	.1083	1.38	.169
People Buy/Consume too much	4.5793	4.5793	397	.0000	.00	1.000
Env Shop Important to Preserve the Natural Environment	4.8010	4.7683	397	.0327	.31	.757
Person Helps by Reducing Packaging and Products	4.7985	4.7582	397	.0403	.37	.710
Individuals should take active role in solving trash problems	4.6675	4.5164	397	.1511	1.30	.195
Govt should take active role in solving trash problems	4.5642	4.4912	397	.0730	.59	.553
Mandatory recycling infringes on my rights	2.5945	2.4332	397	.1612	.93	.352
Technology alone will solve trash problems	2.5013	2.2040	397	.2972	1.79	.075
I prefer to repair over discarding	4.1612	3.9345	397	.2267	1.72	.087
I prefer to buy disposable products	3.4383	3.3526	397	.0856	.58	.565
Products are not made as durably as in the past	4.4761	4.3526	397	.1234	1.00	.316
Refills and Concentrates are good for the environment	4.6725	4.5945	397	.0781	.65	.515
Brand Name	3.5264	3.3577	397	.1688	1.05	.296
Cost	2.4257	2.3426	397	.0831	.48	.631
Convenience	3.3023	3.1461	397	.1562	.95	.341
Environmental Impact	3.6020	3.5617	397	.0403	.26	.793
Conserve Natural Resources	5.0327	4.8665	397	.1662	1.33	.185
Conserve Landfill	4.8690	4.6776	397	.1914	1.45	.148
It's the Law	4.0655	4.1990	397	-.1335	-.84	.402
Right Thing to do	4.9395	4.8741	397	.0655	.51	.607
Behavior questions						
Buy Disposable Products	3.8212	3.8514	397	-.0302	-.20	.841
Buy Refills/Concentrates	3.8715	3.6549	397	.2166	1.40	.161
Buy single-serving pkg	3.2771	3.0957	397	.1814	1.13	.260
Buy Recyclable Packaging	4.1058	3.9849	397	.1209	.84	.401
Avoid aerosols	4.2645	4.1612	397	.1033	.70	.485
Return deposit containers	3.7305	3.6322	397	.0982	.58	.563
Bring Bag	2.6322	2.4484	397	.1839	1.08	.281
Patronize repair shops	3.8186	3.7154	397	.1033	.65	.516
Recycle cans/bottles	4.7758	4.8589	397	-.0831	-.69	.493
Recycle Magazines	4.6045	4.4786	397	.1259	.90	.370

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Relationship between Amount of Educational Intervention and Changes in Behavior and Attitude Regarding Bags in the Supermarket

West Side

Controls						Intervention				
		Didn't see Brochures				Saw Brochures				
Answer(s) Measured		Before	After	Diff. After – Before	Sample Size(s)	Before	After	Diff. After – Before	Diff. from Control	Sample Size(s)
	Attitude									
4+5	BYOBAG 5 cents	51.30%	60.00%	8.70%	74 / 75	64.80%	55.60%	-9.20%	-17.90%	54
1+2		33.80%	33.30%	-0.50%		27.80%	31.50%	3.70%	4.20%	
	Behavior									
4+5	Bring Bag	10.90%	13.30%	2.40%	74 / 75	9.30%	9.50%	0.20%	-2.20%	54 / 53
1+2		74.30%	78.60%	4.30%		77.80%	68.00%	-9.80%	-14.10%	

		More Intervention									
		Saw Brochures & Recycling message					Saw Brochures and Video				
		Before	After	Diff. After – Before	Differenc e. from Control	Sample Size(s)	Before	After	Diff. After – Before	Diff. from Control	Sample Size(s)
	Attitude										
4+5	BYOBAG 5 cents	53.90%	73.10%	19.20%	10.50%	26/26	59.10%	40.90%	-18.20%	-26.90%	22/22
1+2		38.40%	19.20%	-19.20%	-18.70%		31.80%	40.90%	9.10%	9.60%	
	Behavior										
4+5	Bring Bag	3.80%	12.00%	8.20%	5.80%	26/25	18.10%	14.30%	-3.80%	-6.20%	22/21
1+2		76.90%	68.00%	-8.90%	-13.20%		77.30%	76.10%	-1.20%	-5.50%	
		Saw Bag Signs					Saw bag signs & brochures				
		Before	After	Diff. After – Before	Diff. From Control	Sample Size(s)	Before	After	Diff. After – Before	Diff. From Control	Sample Size(s)
	Attitude										
4+5	BYOBAG 5 cents	64.90%	66.60%	1.70%	-7.00%	57	68.00%	76.00%	8.00%	-0.70%	25
1+2		24.50%	26.30%	1.80%	2.30%		28.00%	16.00%	-12.00%	-11.50%	
	Behavior										
4+5	Bring Bag	9.00%	10.50%	1.50%	-0.90%	56 / 57	8.00%	12.00%	4.00%	1.60%	25
1+2		71.40%	77.20%	5.80%	1.50%		68.00%	68.00%	0.00%	-4.30%	

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Relationship between Amount of Educational Intervention and Changes in Behavior and Attitude Regarding Bags in the Supermarket

West Side
Continued

More Intervention -- continued

Answers Measured		Saw bag signs and Bags					Saw Bags & Brochures				
		Before	After	Diff. After – Before	Diff. From Control	Sample Size(s)	Before	After	Diff. After – Before	Diff. From Control	Sample Size(s)
	Attitude										
4+5	BYOBAG 5 cents	53.20%	38.20%	-15.00%	-23.70%	25./25.	55.50%	33.30%	-22.20%	-30.90%	27/27
1+2		34.10%	38.30%	4.20%	4.70%		33.30%	44.40%	11.10%	11.60%	
	Behavior										
4+5	Bring Bag	13.00%	10.80%	-2.20%	-4.60%		3.70%	3.80%	0.10%	-2.30%	27/26
1+2		76.00%	76.10%	0.10%	-4.20%		88.90%	76.90%	-12.00%	-16.30%	

		Saw Bags or Bag signs					Saw Bags				
		Before	After	Diff. After – Before	Diff. From Control	Sample Size(s)	Before	After	Diff. After – Before	Diff. From Control	Sample Size(s)
	Attitude										
4+5	BYOBAG 5 cents	57.50%	57.00%	-0.50%	-9.20%	106/ 107	48.10%	50.60%	2.50%	-6.20%	74/75
1+2		31.20%	31.80%	0.60%	1.10%		31.10%	33.30%	2.20%	2.70%	
	Behavior										
4+5	Bring Bag	10.30%	11.40%	1.10%	-1.30%	106/ 106	10.80%	12.20%	1.40%	-1.00%	74/74
1+2		74.60%	74.50%	-0.10%	-4.40%		77.10%	70.30%	-6.80%	-11.10%	

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Relationship between Amount of Educational Intervention and Changes in Behavior and Attitude Regarding Bags in the Supermarket

East side

Controls						Intervention				
		Didn't see Brochures				Saw Brochures				
Answer(s) Measured		Before	After	Diff. After – Before	Sample Size(s)	Before	After	Difference After – Before	Difference from Control	Sample Size(s)
	Attitude									
4+5	BYOBAG 5 cents	60.60%	57.40%	-3.20%	61/61	72.50%	37.50%	-35.00%	-31.80%	40./40.
1+2		19.60%	29.50%	9.90%		20.00%	35.00%	15.00%	5.10%	
	Behavior									
4+5	Bring Bag	6.70%	13.60%	6.90%	60/59	20.50%	22.50%	2.00%	-4.90%	39./40.
1+2		70.00%	61.00%	-9.00%		66.70%	70.00%	3.30%	12.30%	

		More Intervention									
		Saw Brochures & Recycling message					Saw Brochures & Resource message				
		Before	After	Diff. After - before	Diff. From Control	Sample Size(s)	Before	After	Diff. After - before	Difference from Control	Sample Size(s)
	Attitude										
4+5	BYOBAG 5 cents	68.00%	32.00%	-36.00%	-32.80%	25/25	79.30%	34.40%	-44.90%	-41.70%	29/29
1+2		28.00%	40.00%	12.00%	2.10%	25/25	17.20%	41.30%	24.10%	14.20%	
	Behavior										
4+5	Bring Bag	16.00%	24.00%	8.00%	1.10%	25/25	20.60%	24.10%	3.50%	-3.40%	29/29
1+2		68.00%	72.00%	4.00%	13.00%		69.00%	65.50%	-3.50%	5.50%	

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Relationship between Amount of Educational Intervention and Changes in Behavior and Attitude Regarding Bags in the Supermarket

East side

Continued

		More Intervention									
		Saw Bag Signs					Saw bag signs & brochures				
		Before	After	Difference After - before	Diff. From Control	Sample Size(s)	Before	After	Diff. After – before	Diff. From Control	Sample Size(s)
	Attitude										
4+5	BYOBAG 5 cents	79.20%	54.20%	-25.00%	-21.80%	48./48	78.30%	43.40%	-34.90%	-31.70%	23./23.
1+2		14.60%	25.00%	10.40%	0.50%		17.30%	26.10%	8.80%	-1.10%	
	Behavior										
4+5	Bring Bag	17.00%	25.60%	8.60%	1.70%	47./47.	18.20%	26.10%	7.90%	1.00%	22./23.
1+2		66.00%	59.60%	-6.40%	2.60%		68.20%	69.60%	1.40%	10.40%	
		Saw bag signs and Bags					Saw Bags & Brochures				
		Before	After	Difference After - before	Diff. From Control	Sample Size(s)	Before	After	Difference After - before	Diff. From Control	Sample Size(s)
	Attitude										
4+5	BYOBAG 5 cents	61.80%	61.80%	0.00%	3.20%	34/34	66.60%	44.40%	-22.20%	-19.00%	9//9
1+2		14.70%	26.50%	11.80%	1.90%		33.30%	44.40%	11.10%	1.20%	
	Behavior										
4+5	Bring Bag	12.10%	18.80%	6.70%	-0.20%	33/32	25.00%	11.10%	-13.90%	-20.80%	8//9
1+2		66.60%	62.60%	-4.00%	5.00%		62.50%	88.80%	26.30%	35.30%	
		Saw Bags or Bag signs					Saw Bags				
		Before	After	Difference After - before	Diff. From Control	Sample Size	Before	After	Difference After - before	Diff. From Control	Sample Size
	Attitude										
4+5	BYOBAG 5 cents	67.10%	56.60%	-10.50%	-7.30%	76/76	52.10%	58.70%	6.60%	9.80%	46/46
1+2		17.10%	26.30%	9.20%	-0.70%		19.60%	28.30%	8.70%	-1.20%	
	Behavior										
4+5	Bring Bag	12.00%	20.30%	8.30%	1.40%	76/75	8.90%	15.90%	7.00%	0.10%	45/44
1+2		66.70%	62.10%	-4.60%	4.40%		66.60%	65.90%	-0.70%	8.30%	

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Appendix SP

Methodology for Tracking Storewide Purchases

In order to determine which products to track in the storewide purchasing (as well as the diaries) a list was assembled, based on surveys of products carried in the two stores, including product categories sold in both recyclable and nonrecyclable packaging, and/or sold in refill and concentrate form as well as other forms.

The following list shows the items to be tracked.

Storewide Purchase Tracking System

List of specific products to track
(all sizes and flavors)
November 19, 1993

1. **Orange juice**

   a. **Concentrates**
   Minute Maid (4 sizes), White Rose (2 sizes), Tropicana (2 sizes)

   b. **Glass**
   Tropicana

   c. **Plastic containers**
   Tropicana 96 oz, Minute Maid 96 oz

   d. **Paper wax cartons**
   Tropicana (4 flavors) -- 64 oz, 32 oz, Minute Maid 64 oz (3 flavors),

2. **Apple juice**

   a. **Concentrates**
   Minute Maid, White Rose, Seneca (2 sizes)

   b. **Glass**
   Tropicana, Speas Farm, Motts

   c. **6-pak**
   Motts

   d. **Juice boxes**
   Speas Farm, Ocean Spray

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3. **Regular Coffee**

   a. **Tins, 10-13 ounce -- all flavors**
   Brands: Maxwell House (3 flavors), Cafe Goya, Yuban, Folgers (3 flavors), Savarin (2 flavors), Martinson (2 flavors), Cafe Bustelo (2 flavors)

   b. **Glass**
   Maxwell House (3 flavors), Yuban, Savarin, Folgers, Brim, Choc Full o Nuts

   c. **vaccum packed (paper, foil),**
   Maxwell House, Folgers, Pilon, Cafe Bustelo, Cafe Goya

   d. **singles**
   Folgers

4. **Detergent**

   a. **Plastic containers (non-refill)**
   Tide (all 4 sizes), Bold (all sizes). Cheer Free (all 2 sizes), Wisk (all 3 sizes)

   b. **Refills**
   Tide, Tide Free, Bold, Cheer, Wisk Free

   c. **Powder concentrates in box**
   Tide, Bold, Cheer, Wisk

   d. **box (non-concentrate)**
   Tide, Bold, Cheer (all 2 sizes), Wisk (2 sizes)

5. **Fabric Softener**

   a. **Plastic containers**
   Snuggle (5 sizes/styles), Ultra Downy (3 sizes/styles), Miracle White

   b. **Refills**
   Snuggle, Ultra Downy, Downy, Purex Sta Puf

   c. **sheets (box)**
   Bounce sheets (3 sizes/styles), Snuggle singles (2 sizes/styles), Downy sheets

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6. **Chocolate Pudding**

   a. **mix (box)-- concentrate**
   Weight Watchers, My-T-Fine, Jello (2 sizes/styles), Sweet Pretenders

   b. **snack pack (refrigerated and nonrefrigerated)**
   Hunts (non-refrig. -- 2 sizes/styles), Jello (refrig - 2 sizes/styles), Axelrod (refrig.), Swiss Miss (refrig.), Hershey's (refrig.)

7. **Chicken noodle soup**

   a. **can**
   Campbell's (regular, homestyle, stars, alphabet), Progresso

   b. ***plastic wrap, cups***
   Campbell's, Lipton (5 styles), Ooodles of Noodles oriental, Nissin, Ramen Pride

8. **Milk**

   a. **plastic jugs**
   Tuscan (nonfat, lowfat 1%, lowfat 2%, regular)

   b. **paper cartons**
   Tuscan 32 oz and 64 oz (skim, 1%, 2% and regular)

9. **Diapers -- List sales of all brands and sizes separately**

   Huggies L (22-35 lb), XL (>30 lb), S (<14 lb), SM (12-18 lb), M (16-24 lb), S Him, Her

   Luv's (<10 lb.), (6-14 lb. Deluxe), (8-14 lb. Infant 1), (12-18 lb. Infant 2), (16-24 lbs Crawler), (18-25 lb Walker 1), (Walker 2)

   Pampers (Ultra Pampers Plus -- 6-14 lbs), (Infant 1, 8-14 lbs), (16-24 Crawler), (22-35 lbs -- Walker 2), (>26 lbs. Walker 3)

10. **Cloth Environmental shopping bags -- all sold per week/month**

11. **Paper and plastic grocery bags given out at checkout (per week, month)**

12. **Plastic bags given out in produce/bakery/deli sections (per week/month)**

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Appendix ST

Baseline and Follow-up Survey Testing and Refinement

Results of the Survey Pretest -- Discussion

On the afternoon of Friday, June 25, 1993, between the hours of 4:30 pm and 5:50 pm three EAC volunteers/staff and I pretested the baseline questionnaire at the East 86th Street Gristedes store. Thirty copies of the three-page questionnaire were handed out to shoppers on clipboards.* Two of the volunteers (Peter and Alicia) approached shoppers as they entered the store; the other two (Maggie and Larry) were stationed near the checkout lines. The volunteers informed the shoppers that they were conducting research for USEPA on environmental shopping to encourage participation. Half the copies were completed by those near the checkout; the other 15 by those near the entrance. This indicates that both locations are viable and should be used in the experiment.

Reports from the two volunteers near the entrance indicated that half the respondents thought the questionnaire to be too long; my experience at the checkout area showed far less dissatisfaction with the length. I will nonetheless attempt to shorten the questionnaire.

Two people could not read the questionnaire (one because of illiteracy, the other due to vision problems), and I had to read it to them. This cost a great deal of time and made certain questions harder to answer. I advised the volunteers to avoid this unless there were few people in the store.

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One question seemed to pose some problems in understanding. Where they were asked to rank brand name, cost, convenience, and environmental impact, some didn't understand that each blank should have a different number. Some even checked the ones they liked and left others blank. Only 18 of 30 correctly filled this one out. This will have to be addressed in the revision. Perhaps the statement "rank the following in order from 1 to 4 in order of preference" would suffice.

Since some people didn't answer every question, the interviewer and instructions should encourage people to do so.

I'm not sure whether we need to keep the questions about primary shopper and percentage of shopping at Gristedes. Taking these out will save some space; I'm inclined to do it since the vast majority were the primary shopper.

Note: I asked EAC to buy long clipboards to go with the 8 x 14 paper, but got short ones. This may have caused some irritation.

In the knowledge questions, the first two, regarding the City's recycling program, produced similar results. Perhaps one (glass bottles and jars) should be dropped to save space.

It is of some note that the grocery bag incentive questions produced rather similar results.

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There were four homes using diapers out of 30; not a bad percentage. Only three said what they do with the diapers. The question can probably be changed to be a check-off to make it quicker.

We could probably do with fewer questions about recycling behavior, since most answers did not change when people were asked about recycling newspapers vs. magazines vs. cans and bottles. I'll drop the one on newspapers.

We could probably do without one of the questions regarding what motivates people to recycle, since the first three seem to have similar results (I'd probably take out the one about incineration).

The demographics were interesting. The respondents were very highly educated with high incomes; ages were evenly split amongst the categories. Racial demographics were as expected. I hope that the incomes and education levels don't skew the results. Perhaps sampling at different times of day will produce different demographics.

Our ability to call back for a follow-up survey appears to be limited to about a 50% response rate, assuming people who have given us phone numbers are actually going to be reachable and agreeable when the time comes. I'm not sure why this is; perhaps this questionnaire was too long. Maybe they don't want to see it twice. If we will get only 50%, we may have to do many more initial surveys. On the other hand, the number volunteering for the diary group was significant. (one-third!)

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Note: In the following tabulation of pretest results, the total figures are followed by the figures for the "at door" group, followed by the "at checkout" group, for purposes of comparison of the groups. In many cases the groups results were similar, but in other cases they were not. Some of the questions have been abbreviated.

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Results of the Baseline Survey Pretest

Pretest tabulation figures are presented as follows: (Total / At Door / At Checkout)

Are you the primary shopper in your household?
yes 26/13/13 no 2/1/1 no answer 2/1/1

What percent of your grocery shopping is done at Gristede's?

20% or less	21-40%	41-60%	61-80%	> 80%	didn't answer
5/2/3	6/4/2	13/4/9	2/2/0	3/2/1	1/1/0

To your knowledge, does the City government require all Manhattan residents and businesses to separate materials for recycling?

Yes 23/10/13 No 3/2/1 Don't know 4/3/1

Which of the following materials are picked up from apartment buildings by the City for recycling?

Glass bottles/ jars	yes 28/13/15	no 0/0/0	don't know 2/2/0
Plastic bottles/ jugs	yes 28/13/15	no 0/0/0	don't know 2/2/0
Plastic bags	yes 11/3/8	no 10/6/4	don't know 6/5/1 no ans 3/1/2
Aluminum cans	yes 23/8/15	no 1/1/0	don't know 5/5/1 no ans 1/1/0
Aluminum foil	yes 18/7/11	no 3/2/1	don't know 7/5/2 no ans 2/1/1
Tin cans	yes 18/7/11	no 3/2/1	don't know 8/5/3 no ans 1/1/0

Environmental shopping involves the purchase of fewer disposable items, fewer products containing toxics, more durable items, and more products in recyclable, reduced, and recycled packaging.

Have you heard about environmental shopping before? yes 18/9/11 no 10/6/4

Where have you heard about	RECYCLING			ENVIRONMENTAL SHOPPING		
Mailings	yes 16/8/8	no 9/4/5	NA 5/3/2	yes 2/1/1	no 16/9/7	NA 12/5/7
TV or radio	yes 24/12/12	no 3/1/2	NA 3/2/1	yes 10/3/7	no 10/7/3	NA 10/5/5
Subway Ads, Billboards	yes 19/11/8	no 7/2/5	NA 4/2/2	yes 2/1/1	no 15/8/7	NA 14/6/8
Videos / stores	yes 4/2/2	no 16/9/7	NA 10/4/6	yes 0/0/0	no 17/10/7	NA 13/5/8
Posters/stores	yes 7/4/3	no 13/7/6	NA 10/4/6	yes 1/1/0	no 16/9/7	NA 13/5/8
Your building's management	yes 10/0/10	no 14/11/3	NA 6/4/2	yes 0/0/0	no 17/10/7	NA 13/5/8

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Friends/neighbor	yes 14/9/5	no 9/3/6	NA 7/3/4	yes 7/3/4	no 11/7/4	NA 12/5/7
Nsp/magazines	yes 22/11/11	no 5/2/3	NA 3/2/1	yes 10/4/6	no 10/6/4	NA 10/5/5

Indicate how you feel about the following statements using this rating scale:

1) strongly disagree 2) mildly disagree 3) neutral 4) mildly agree 5) strongly agree

People in the US buy/consume too much

1	2	3	4	5	NA
2/0/2	4/3/1	3/3/0	5/1/4	15/7/8	1/1/0

Environmental shopping is important for preserving the natural environment

1	2	3	4	5
1/0/1	1/1/0	3/1/2	5/3/2	20/10/10

A person helps the environment by reducing the quantity of packaging and products they buy

1	2	3	4	5
1/0/1	0/0/0	1/1/0	8/4/4	20/10/10

Individuals must take the most active role in solving any trash disposal problems

1	2	3	4	5
1/0/1	2/2/0	2/1/1	4/1/3	21/11/10

Governments must take the most active role in solving any trash disposal problems

1	2	3	4	5	NA
0/0/0	0/0/0	5/3/2	10/5/5	14/7/7	1/0/1

Mandatory recycling infringes on rights

1	2	3	4	5	NA
17/10/7	5/2/3	2/1/1	3/2/1	2/0/2	1/0/1

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Technology will solve any trash problem

1	2	3	4	5	NA
19/9/10	4/2/2	4/3/1	0/0/0	2/1/1	1/0/1

I like to repair things

1	2	3	4	5	NA
0/0/0	2/0/2	15/9/6	7/4/3	5/2/3	1/0/1

I prefer to buy disposable products

1	2	3	4	5	NA
6/3/3	6/2/4	8/5/3	4/3/1	4/2/2	2/0/2

Products are not made as durably as they were

1	2	3	4	5	NA
2/1/1	4/2/2	8/6/2	4/1/3	11/5/6	1/0/1

Using refills or concentrates are good for the environment

1	2	3	4	5	NA
1/0/1	1/1/0	2/1/1	10/4/6	15/9/6	1/0/1

If you were offered a small incentive, say 2 cents, to bring your own bag to the supermarket for your groceries, would you bring your own bag?

Definitely not	Probably not	Don't know	Probably	Definitely
2/0/2	10/6/4	3/2/1	7/3/4	8/4/4

If the incentive were five cents, would you bring your own bag?

Definitely not	Probably not	Don't know	Probably	Definitely	NA
0/0/0	10/5/5	5/3/2	6/3/3	8/4/4	1/0/1

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If a new store opened near you that encouraged environmentally safe products and practices, all other things being equal, would you be likely to change the supermarket where you do most of your shopping?

Definitely not	Probably not	Don't know	Probably	Definitely
1/0/1	2/0/3	4/3/1	12/5/7	9/7/2

Please rank the following from 1 to 4 in their importance to you when buying groceries.

(of those properly completed)

	Rank 1	Rank 2	Rank 3	Rank 4
Brand name	2/1/1	3/3/0	4/2/2	9/4/5
Economic value/cost	14/9/5	3/1/2	1/0/1	0/0/0
Product's convenience	1/0/1	6/2/4	7/4/3	4/4/0
Environmental impact	1/0/1	6/4/2	6/4/2	5/2/3

Is there an infant in your household, who uses diapers?

yes	no	NA
4/3/1	24/11/13	2/1/1

If yes, how does your household deal with soiled diapers? Do you

Throw them in the garbage?	yes 2/2/0
Wash them at home or in your building?	yes 1/0/1
Wash them at a nearby laundry?	yes
Have them picked up by a diaper service?	yes

How often do you actually do each of the following things?
(where 1 is never and 5 is always.

	Never				Always	
	1	2	3	4	5	NA
Buy disposable products	1/0/1	4/3/1	14/6/8	5/3/2	4/2/2	2/1/1
Buy refills or concentrates	3/2/1	4/3/1	12/5/7	6/2/4	4/2/2	2/1/1
Buy items in single-serving packages	9/6/3	8/3/5	6/2/4	5/2/3	1/1/0	2/1/1
Select products in recyclable packaging	3/0/3	4/2/2	5/2/3	12/7/5	5/3/2	2/1/1
Avoid buying aerosols	4/0/4	3/2/1	7/4/3	4/3/1	11/5/6	2/1/1

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Return beverage containers for deposit	12/5/7	5/2/3	2/1/1	3/2/1	6/3/3	2/1/1
Bring your own bag to the store	16/9/7	4/1/3	3/3/0	5/1/4	1/0/1	1/0/1
Patronize repair shops	4/1/3	4/2/2	12/5/7	6/3/3	3/3/0	1/0/1
Recycle newspapers	0/0/0	2/1/1	0/0/0	3/1/2	25/13/12	1/0/1
Recycle cans and bottles	0/0/0	2/1/1	1/1/0	3/1/2	24/12/12	1/0/1
Recycle magazines	1/1/0	1/0/1	0/0/0	3/1/2	25/13/12	1/0/1

If you do recycle, please indicate how important each of the following is in inspiring you to recycle. (where 1 is of no importance and 5 is extremely important)

Note: 1 person from the D list didn't answer any of these

	1	2	3	4	5
I recycle to help conserve natural resources	0/0/0	0/0/0	8/4/4	3/2/1	18/8/10
I recycle to help conserve landfill space	0/0/0	1/0/1	7/3/4	5/3/2	16/8/8
I recycle to help avoid garbage incineration	0/0/0	2/1/1	6/1/5	6/3/3	15/9/6
I recycle because it's the law	5/4/1	2/0/2	3/1/2	1/0/1	18/9/9
I recycle ..it seems like the right thing to do	1/1/0	0/0/0	4/1/3	4/1/3	20/11/9

Have you used one of Gristede's reusable canvas bags in the past month?

no	yes	can't remember	na
29/14/15	0/0/0	0/0/0	1/1/0

If yes, how often have you brought one with you when you go shopping?

Occasionally	Sometimes	Often	Always
2/1/1	0	0	1/0/1 (brings her own)

Which do you consider yourself to be?

White	African descent	Asian	Other	na
22/9/13	2/2/0	2/1/1	1/0/1	2/2/0

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Are you of Spanish or Hispanic origin?

Yes	No	na
3/2/1	20/11/9	6/2/4

One from the checkout group was half Irish half Spanish; she is not classified here

Please check the highest level of education you have completed.
One at the door did not answer

Some high school	2/0/2
High school graduate	1/1/0
College graduate or some college	16/10/6
Graduate work or advanced degree	10/3/7

Are you

Male	Female
9/4/5	20/10/10

Please check the range which reflects your total household income.
One from door group didn't answer

Less than $20,000	4/1/3
$20,000 - $30,000	4/2/2
$30,000 - $40,000	6/4/2
$40,000 - $50,000	1/0/1
Over $50,000	14/7/7

Please circle your age range.
One from EACH group didn't answer

Less than 30	8/5/3
30 – 44	8/3/5
45 – 60	9/4/5
over 60	3/2/1

May we please call you in about two months?

Yes: 16/7/9

Note: one who answered no gave name and answered yes to next question; another who answered no gave her name and address

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Name (please print)	18/8/10
Phone number	17/7/10
Street Address	12/6/6
When is the best time of day to call you?	16/6/10
Would you be willing to participate in this special study? (answered yes)	10/4/6

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Environmental Shopping Project
Beta-Testing of Follow-up Questionnaire

January 23, 1994

Summary

In the initial stages of the follow-up survey design, pre-testing showed that the length of time needed to finish the survey would be critical to the number of surveys completed. It was anticipated that busy New Yorkers would not want to spend more than five to seven minutes answering questions by telephone, even though they had already agreed to do so. With regret, the series of attitude questions at the top of page 2 of the baseline survey had to be removed. Other, less critical, or slightly redundant questions were also taken out to streamline the survey.

Beta-Testing

The pre-testing of the follow-up (after education) survey took place over two days -- January 22 and 23, 1994. The survey was designed to look as much like the before education survey as possible, so as to maximize the number of questions which could be compared for each individual answering both surveys. The demographic questions in the baseline survey were eliminated for the follow-up survey, and replaced with a few questions to determine how well, or poorly, the shoppers noticed and learned from the educational program. In order to keep the follow-up survey to less than about seven minutes in most cases, it was necessary to remove a few additional questions from the baseline survey (see below). Four of these questions were actually somewhat repetitive of other questions (two asking about bag use, one asking about the effect of incentives for

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reusing bags, and another asking whether magazines were recycled). Another long question, designed to elicit detailed information about the shoppers' environmental attitudes regrettably had to be dropped, again, to make the survey shorter.

The pre-test consisted of two parts. The survey was initially read to two people who were familiar with the research, but who had not been part of the initial survey respondents. The questionnaires took about nine minutes to administer in both cases. As a result of this step it was decided that a question asking if there was anything about the campaign that could have been better, should be removed to save time. It was also decided that to assist the interviewers and save time, some possible answer categories should be listed for the open-ended questions. In order to help the interviewers prompt respondents, a question asking respondents to rank four priorities in purchasing now includes some prompts. Other minor wording changes to speed interviewing also resulted from this initial pretest.

I conducted the second phase of the pretest between 8 and 9:20 pm on Sunday, January 23, 1994. Twenty-two of the initial respondents from the East side store were phoned in order to finish with five completed surveys. Two of the phones were disconnected, 9 asked that we call back at another time, for 4 of the calls no one was at home, 1 had weekday hours, and wasn't called, 1 was the answering machine of someone else. Time was measured for four of the five completed surveys; two took 7 minutes, 1 took six minutes, and 1 took five minutes. Since this fell into the desired time range, it was decided that no additional questions had to be removed, and the questionnaires were

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finalized in nearly the same form as the pretest surveys. Both the east and west side final surveys fit on two sides of one 8.5 x 11 inch page. An "Tips for Survey Volunteers" page was drawn up to assist the interns who are new to surveying.

List of Initial Respondents Dialed in Pretest 1/23 -- East siders

Lori Pisano	finished survey 1/23
David Friedman	finished survey 1/23
Darlyne Bermudez	finished survey 1/23
Ana Schrank	finished survey 1/23
John Papas	finished survey 1/23
Richard Seyferlich	phone disconnected
Linda Parsons	phone disconnected
Joseph Cabalquinto	call after 1/30
Florette Kupfer	call during the week
Jennifer Olayos	call tomorrow (NEW NUMBER: 988-9036)
Patricia Jontow	call again
Ruth Jacobson	call weekdays
Alex Friedman	call later (spoke to wife)
Michael Ross	call later (spoke to wife)
Larry Chadwick	call later
Willie Hirsch	call tomorrow evening
Wendy Pratt	call weekdays (got answering machine)
Mr. H. Goldberg	call back
Erin Finkel	not home
Anne Rouquette	not home
Sandy Eng	not home
J. Geoffrey Arada	not home

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Beta East Side Follow-Up Survey
1/23/94 version

Name_____ Phone _____

I am from the Environmental Shopping Project at Gristede's. We're calling to follow up the survey you answered last summer, to complete our research. Could we please ask you a few questions?

First, we'd like to know what you thought of the environmental shopping campaign we conducted in the Gristede's store. Short answers will do.

A. Can you tell me, what parts of the environmental campaign you noticed?

(Don't read these at first)	(Unprompted)	(Prompted)
Three brochures (oat, gold, green)	_____	_____
DOS' Bring Your Own Bag signs	_____	_____
Environmental Shopper bags	_____	_____
Gristede's or Minnesota store posters	_____	_____
Shelf cards (bring back produce bags)	_____	_____

(ASK ONLY If they did notice the brochures:)

B. What 1 or 2 facts were most memorable in the brochures?

(DON'T READ THESE! -- CHECK OFF ANSWERS GIVEN)

Save resources	____	Recycling	____
Pollution from production	____	Disposal impacts	____
Amount of waste generated	____		

Other_____

(ASK ONLY If they noticed the bag signs:)

C. Did the signs at the checkout counter remind you to Bring Your Own Bag?__

YES NO DON'T KNOW

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1. To your knowledge, does the City government require all Manhattan residents and businesses to separate materials for recycling?

   Yes No Don't know

2. Which types of materials are picked up from apartment buildings for recycling?

(DO NOT READ THESE) UNPROMPTED)	(CHECK OFF THOSE RECALLED
Plastic bottles and jugs	_____
Glass	_____
Plastic bags	_____
Newspaper	_____
Aluminum cans	_____
Aluminum foil	_____
Tin cans	_____

3. Have you heard about environmental shopping before? yes no

4. Where have you heard about ...**RECYCLING** ..**ENVIRONMENTAL SHOPPING**

(DO NOT PROMPT)	(CHECK OFF)	(CHECK OFF)
Mailings	_____	_____
TV or radio	_____	_____
Subway Ads or billboards	_____	_____
Videos in store displays	_____	_____
Posters or brochures in stores	_____	_____
Your building's management	_____	_____
Friends or neighbors	_____	_____
Newspapers and magazines	_____	_____

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5. If you were offered an incentive, say 5 cents, to bring your own bag to the supermarket for your groceries, how likely would you be to do it -- using the following scale: (Circle answer given)

Definitely not Probably not Don't know Probably Definitely

6. If a new store opened near you that encouraged environmentally safe products and practices, all other things being equal, would you be likely to change the supermarket where you do most of your shopping using the following scale:

Definitely not Probably not Don't know Probably Definitely

7. Please rank the following in order of preference from 1 to 4 in their importance to you when buying groceries (where 1 is most important).

(Fill in number, continue asking for next most important item and reading remaining items on list)

Brand name _____
Economic value or cost _____
Product's convenience _____
Environmental impact _____

8. How often do you, personally, actually do each of the following things on a scale of 1 to 5, (where 1 is never and 5 is always).

(Be Prepared to repeat this scale)

	Never				Always
Buy disposable products	1	2	3	4	5
Buy refills or concentrates	1	2	3	4	5
Buy items in single-serving packages	1	2	3	4	5
Select products in recyclable packaging	1	2	3	4	5
Avoid buying aerosols	1	2	3	4	5
Return beverage containers for deposit	1	2	3	4	5
Bring your own bag to the store	1	2	3	4	5
Patronize repair shops	1	2	3	4	5
Recycle cans and bottles	1	2	3	4	5

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9. If you do recycle, please indicate how important each of the following is in inspiring you to recycle. (where 1 is of no importance and 5 is extremely important)

I recycle to help conserve natural resources	1	2	3	4	5
I recycle to help conserve landfill space	1	2	3	4	5
I recycle because it's the law	1	2	3	4	5
I recycle because it seems like the right thing to do	1	2	3	4	5

10. Here's the last question! Is there an infant in your household, who uses diapers?

yes no

If yes, how does your household deal with soiled diapers?

DON'T PROMPT -- CHECK OFF THEIR ANSWER)

Throw them in the garbage? _____
Wash them at home or in your building? _____
Wash them at a nearby laundry? _____
Have them picked up by a diaper service? _____

10a. Did you receive an offer for diaper service? yes no

If yes,
Did you get it from a cashier? _____
Did you get it at the diaper shelves? _____

10b. Did you register for diaper service? _____

If not, why not? (Prompt only if necessary)
Too Expensive _____
Incovenient _____
Like disposables _____
Health reasons _____

Other _____

Thank you very much for your time! We promised you a small gift, which will be $2, for participating in this study. A project volunteer will be stationed near the courtesy counter at the East 86th Street Gristede's store the next two Saturdays, between 4 pm and 5:30 pm so you can come either time.... Thanks again.

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Beta West Side Follow-up Survey

Name_____ Phone _____

I am from the Environmental Shopping Project at Gristede's. Last summer you completed one of our surveys, and we're calling now to follow up with another survey, to complete our study. Your honest answers are critical to our research. Could we please ask you a few questions?

First, we'd like to know what you thought of the environmental shopping campaign we conducted in the Gristede's store. We know your time is valuable. Short answers are best.

A. Can you tell me, what parts of the environmental campaign you noticed?

(Don't read these at first)	(Unprompted)	(Prompted)
Three brochures (oat, gold, green)	_____	_____
DOS' Bring Your Own Bag signs	_____	_____
Environmental Shopper bags	_____	_____
Gristede's or Minnesota store posters	_____	_____
Shelf cards (bring back produce bags)	_____	_____
Video	_____	_____
Volunteers distributing literature	_____	_____

(ASK ONLY If they did notice the brochures:)

B. What 1 or 2 facts were most memorable in the brochures?

(DON'T READ THESE! -- CHECK OFF ANSWERS GIVEN)

Save resources	____	Recycling	____
Pollution from production	____	Disposal impacts	____
Amount of waste generated	____		

Other_____

(ASK ONLY If they noticed the bag signs:)

C. Did the signs at the checkout counter remind you to Bring Your Own Bag?__

YES NO DON'T KNOW

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(ASK ONLY If they noticed the video:)

D. What 1 or 2 things did you find most memorable in the videos? (Facts)

The 3 R's	____	Recycling packaging	____
Reduced packaging	____	Reuse	____

Other _____

1. To your knowledge, does the City government require all Manhattan residents and businesses to separate materials for recycling?

Yes No Don't know

2. Which types of materials are picked up from apartment buildings for recycling?

(DO NOT READ THESE) (CHECK OFF THOSE RECALLED UNPROMPTED)

Plastic bottles and jugs	_____
Glass	_____
Plastic bags	_____
Newspaper	_____
Aluminum cans	_____
Aluminum foil	_____
Tin cans	_____

3. Have you heard about environmental shopping before? yes no

4. Where have you heard about ..... RECYCLING ..... ENVIRONMENTAL SHOPPING

	(DO NOT PROMPT) (CHECK OFF)	(CHECK OFF)
Mailings	_____	_____
TV or radio	_____	_____
Subway Ads or billboards	_____	_____
Videos in store displays	_____	_____
Posters or brochures in stores	_____	_____
Your building's management	_____	_____
Friends or neighbors	_____	_____
Newspapers and magazines	_____	_____

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5. If you were offered an incentive, say 5 cents, to bring your own bag to the supermarket for your groceries, how likely would you be to do it -- using the following scale: (Circle answer given)

Definitely not Probably not Don't know Probably Definitely

6. If a new store opened near you that encouraged environmentally safe products and practices, all other things being equal, would you be likely to change the supermarket where you do most of your shopping using the following scale:

Definitely not Probably not Don't know Probably Definitely

7. Please rank the following in order of preference from 1 to 4 in their importance to you when buying groceries (where 1 is most important).

(Fill in number, continue asking for next most important item and reading remaining items on list)

Brand name _____
Economic value or cost _____
Product's convenience _____
Environmental impact _____

8. How often do you, personally, actually do each of the following things on a scale of 1 to 5, (where 1 is never and 5 is always).

(Be Prepared to repeat this scale)

	Never				Always
Buy disposable products	1	2	3	4	5
Buy refills or concentrates	1	2	3	4	5
Buy items in single-serving packages	1	2	3	4	5
Select products in recyclable packaging	1	2	3	4	5
Avoid buying aerosols	1	2	3	4	5
Return beverage containers for deposit	1	2	3	4	5
Bring your own bag to the store	1	2	3	4	5
Patronize repair shops	1	2	3	4	5
Recycle cans and bottles	1	2	3	4	5

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9. If you do recycle, please indicate how important each of the following is in inspiring you to recycle. (where 1 is of no importance and 5 is extremely important)

I recycle to help conserve natural resources	1	2	3	4	5
I recycle to help conserve landfill space	1	2	3	4	5
I recycle because it's the law	1	2	3	4	5
I recycle because it seems like the right thing to do	1	2	3	4	5

10. Here's the last question! Is there an infant in your household, who uses diapers?
yes no

If yes, how does your household deal with soiled diapers?

DON'T PROMPT -- CHECK OFF THEIR ANSWER)

Throw them in the garbage? _____
Wash them at home or in your building? _____
Wash them at a nearby laundry? _____
Have them picked up by a diaper service? _____

10a. Did you receive an offer for diaper service? yes no

If yes,
Did you get it from a cashier? _____
Did you get it at the diaper shelves? _____

10b. Did you register for diaper service? _____

If not, why not? (Prompt only if necessary)
Too Expensive _____
Incovenient _____
Like disposables _____
Health reasons _____

Other _____

Thank you very much for your time! We promised you a small gift, which will be $2, for participating in this study. A project volunteer will be stationed near the courtesy counter at the West 86th Street Gristede's store the next two Saturdays, between 2 pm and 3:30 pm so you can come either time.... Thanks again.

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Questions that had to be excluded due to space constraints

Attitude Questions

Please indicate how you feel about the following statements using this rating scale:

1) strongly disagree 2) mildly disagree 3) neutral 4) mildly agree 5) strongly agree

People in the US buy/consume too much	1	2	3	4	5
Environmental shopping is important for preserving the natural environment	1	2	3	4	5
A person helps the environment by reducing the quantity of packaging and products they buy	1	2	3	4	5
Individuals must take the most active role in solving any trash disposal problems	1	2	3	4	5
Governments must take the most active role in solving any trash disposal problems	1	2	3	4	5
Mandatory recycling infringes on my rights	1	2	3	4	5
Technology alone will solve any trash problem	1	2	3	4	5
I like to repair things rather than discard them	1	2	3	4	5
I prefer to buy disposable products	1	2	3	4	5
Products are not made as durably as they were in the past	1	2	3	4	5
Using refills or concentrates is good for the environment	1	2	3	4	5

Behavior Questions

Do you use the Environmental Shopper bags?

no yes can't remember

If yes, how often have you brought it with you when you go shopping?

Occasionally Sometimes Often Always

Miscellaneous

Was there anything about the campaign that could have been better?

_____

_____

_____

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Appendix VD

Volunteer Diaries

The Diary Design and Process -- Summary

The second measurement device employed in this study was record-keeping by a volunteer group of shoppers. During the summer, 1993 baseline surveying, 110 of the 800 baseline survey respondents (over 13%) indicated they would participate in the diary-keeping exercise. However, when the time came for mailing out the diaries, only 50 reaffirmed their interest in doing so when called in October.

The diaries themselves were designed to be easy to fill out by the volunteers, and were compact and inexpensive to mail (in both directions). Diaries from other studies [228],[229] were evaluated to determine those aspects that might be adapted for this study (see below for more detail). The diaries were contained in simple report holders, with a pocket for two project-addressed, stamped envelopes. The diary cover included the project logo and the co-sponsors. There was a one-page letter of introduction thanking the volunteers for their participation and encouraging them to call with any questions. (Several did during the first two weeks.) Following this letter was a page of instructions for completing the diary. Each page of the diary was coded for each week of the active and passive educational phases -- 18 weeks in all. It was feared that too long or complex a reporting requirement would reduce participation, and it was anticipated that the volunteers would

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[228] "Individual Source Reduction Behavior: A Study of the Effect of Environmental and Economic Motivational Information -- The SORED" Master's Project", University of Michigan, Raymond De Young, et. al., June 21, 1991

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not want to expend the time and energy to list information about *everything* they purchased every week. In addition, having them do so would have involved a much larger and more complex record-keeping arrangement on our part. So instead, a list of target items for the diary-keepers to report on was assembled. These included products that were available in either recycled or nonrecycled packaging, or in refills, concentrates, or their alternatives. The target items chosen were: milk, juice, detergent, softener, nuts, pudding, soup, and coffee. For each of these items, the volunteers were asked to fill in or check off the size, whether in refill or concentrate form, and what type of packaging from a list (i.e., glass, tin can, plastic bottle, aluminum, paper carton, juice box, cardboard box, plastic bag, and other (specify)). There were a number of other questions regarding the number of product and grocery bags taken or purchased, and the number of disposable diapers purchased. To permit cross-checking, volunteers were asked to attach store receipts, not only for the Gristede's store, but also for any other shopping they did during the period. In exchange for their participation, these volunteers were promised an Environmental Shopper cotton bag.

In order to increase the chance that more diary information would be returned, diary volunteers were asked to send their diary pages back in two stages of nine weeks each. At the half-way point in the diary-keeping exercise, eight returned their diary sheets, and one of these simply apologized that she could not continue beyond the first week. At the end of the diary-keeping period, four returned the second half of their diary sheets. The eight who returned surveys received environmental shopper bags.

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[229] "Environmental Supermarket Shopping -- Final Report", Sally Foulke, Cornell Cooperative Extension, et. al, 1991-2.

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Diary Design Methodology

One method of measuring the impact of environmental shopping education on the behavior of grocery shoppers is the customer diary. The two studies referred to above of environmental shopping behavior (SORED, Suffolk, NY) have used this device and were relied upon for pointers in approaching prospective diary volunteers and in designing the diary packages. The following provides more detail on the aspects of these studies that we found useful.

The Michigan SORED Study

Chelsea, MI (DeYoung, SORED) Participants were randomly assigned to one of four groups: (1) a group receiving an environmental rationale; (2) a group receiving an economic rationale; (3) a group receiving combined environmental and economic rationales; and (4) a control group, receiving neither rationale. All participants agreed to save their grocery store receipts for the duration of the study. After a 3-week baseline period, the first three groups all received a similar looking pamphlet. Each of these pamphlets contained an identical definition of source reduction, and identical "how to" information on carrying out simple source reduction activities through shopping or at home. However, the pamphlet for the environmental group justified source reduction as an activity to help protect the environment, while the economic group pamphlet justified source reduction as a way to save money. The combined group received both justifications. Weekly reminder postcards were sent to every participant. All groups except the control group received source reduction tips on the postcards during the 10-week "treatment" period. Data were gathered in two forms: direct shopping data from

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grocery store receipts, and survey data *from* three separate surveys. Five hundred ten chose not to participate.

All of the education groups were asked to collect grocery receipts for the period of the study. Cash register receipts at the test store, Polly's, identify individual products by a descriptive code name, providing a means of tracking items purchased by each participant during the baseline period (3 weeks) and the study (intervention) period (10 weeks). Participants were provided with stamped, self-addressed envelopes in which to send receipts to the researchers. All groups received reminder postcards weekly. The participants were asked to indicate if the mailing included all, some, or none of their receipts for the week, or if they had no receipts for that week. Additionally, all participants were promised a canvas tote bag if they completed the study.

The receipt evaluation process was conducted according to two methods. The first method tracked the number of source reducing or non-source reducing items purchased in three broadly-defined categories: durable vs. disposable, non-toxic vs. toxic, and well-packaged vs. over-packaged. Each item on the receipt was evaluated according to these criteria using a point system; points were tallied weekly.

The second scoring method was based on 19 target items, common household products, such as paper plates, chosen for analysis because they are readily identifiable on itemized grocery receipts and their purchase suggests that a source reduction option had been elected or dismissed. The number of purchases of each target item by each participant

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was then tallied on a weekly basis. Because of missing data, totals were normalized into a "purchases per week for which receipts were received" score. Because of scoring discrepancies among researchers tallying the results using the source reduction criteria method, this second method was primarily used for final analysis.

Receipts were sent by shoppers to researchers in numbered, stamped, pre-addressed envelopes on a weekly basis. Envelopes and participants were matched by the number written in the lower left corner on each envelope. As envelopes were received, the date was recorded on each envelope. In most cases, there were a number of receipts in each envelope. Receipts and the postcard stayed with the envelope during the study. Many participants had at least some receipts from other grocery stores, which were analyzed to the extent possible. When a product fitting one of the three categories was found on a receipt, it was marked with a colored pen. A different color was used for each of the three groups. For each item found a tick mark was also made on a score sheet. Each participant had one score sheet for the 13-week study period.

The following supermarket items were selected by the researchers in indicating either pro- or antisource reduction behavior. Paper towels, paper plates, paper napkins, paper tissues, miscellaneous paper products (coffee filters, cups, lunch bags, etc..), sponges, plastic wraps, aluminum/tin foil, miscellaneous wraps (freezer paper, wax paper), garbage and kitchen bags, plastic sandwich bags, bleach products, toxic oven cleaners, toxic drain cleaners, baking soda, borax/boric acid, vinegar, lunchables, bulk purchases.

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Problems with the data collection included:

- that shoppers did not send in all receipts
- some receipts from other stores were non-itemized
- even some itemized receipts did not provide full information
- thirteen weeks was not long enough since these products are not purchased frequently
- since there was no control experiment, the researchers wonder if changes in purchasing was due to intervention
- instructions to source reduce can be confusing and conflicting

Suggested solutions to these problems included:

- a longer study period
- direct intervention to a limited number of items, making tracking easier
- give periodic rewards for participation
- choose a study location where all (or nearly all) stores use itemized receipts.

The Suffolk County study

Two hundred twenty-one randomly selected individuals in front of six pre-selected supermarkets in Suffolk County, NY were interviewed using a 27-item questionnaire during the summer of 1991. One week before the interviews were to begin a flyer announcing the program and explaining that interviews would take place, appeared in the shopping bags of customers in the targeted stores. Posters were also used. At the end of

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the interviews, respondents were given a recruitment brochure offering the opportunity to become an environmental shopper. A "purposeful" sample of 50 families was recruited and given two hours of training on how to evaluate and select packaging friendlier to the environment. These were selected from individuals who filled out questionnaires given out at six supermarkets, from those responding to a LILCO volunteer opportunity bulletin and a 4-H Clubs appeal.

After an introductory class, participants kept diaries for eight weeks and documented by register receipts of weekly purchases of five target categories (beverages, partially prepared/convenience foods, luncheon meats/cheeses, paper goods and single-use items). Focus groups were held with participants four weeks into the study. At the end of the eight weeks participants returned the diaries. Data collected from the environmental shoppers (diary keepers) were compared to the general shoppers (interviewed outside of supermarkets). The environmental shoppers received a shopping bag with the project's logo and were encouraged to use the bag, and a gift certificate to the grocery store.

The diary included a number of features:

- A letter from Sarah Foulke congratulating and welcoming the participants into the program, and giving them the objectives of the project. General instructions and an invitation to ask questions were also offered. Finally the letter thanked the participants for their efforts.
- An attractive cover for the diary book including the project logo, the title, and the Cornell Cooperative Extension name and logo.

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- A seven-step list of directions for keeping the diary
- A glossary of terms
- A list showing the packaging hierarchy
- A list of types of packaging materials
- Sheets for each of the 5 target categories listing, in matrix form, the following items to check off or fill in the blank:
    - items from receipt
    - packaging
    - reason
        - brand
        - saves prep time
        - price
        - size
        - packaging
        - rushed
        - no choice

There was a space for comments on the bottom, a blank for which week of the study, and a space for attaching the receipt on the back.

A number of other educational articles and fact sheets were included in the back of the diary.

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Lessons learned from these studies -- Suggested Adaptations for NYC study

1. It makes sense (and should save money) to have the diary participants fill out the diaries and send them back all at once (or perhaps in two stages, rather than weekly). This should also reduce the hassle factor for participants.

2. Having a well-laid out, attractive diary should make the participants recognize the importance of their role in collecting diary information, and should hopefully improve their performance. The cover letter (with an invitation to ask questions to resolve problems), attractive diary cover, simple instruction sheet, and check-off sheets should be included here.

3. Since Gristede's doesn't have elaborate receipts, and we can't expect that other supermarkets nearby do, the structure of the diaries will have to require the participants to write down and/or check off certain attributes of their purchases (e.g., packaging, concentrate/refill), and whether the purchase is one of the specific target items being tracked (e.g., reusable bag, disposable bag, diapers).

4. Having a space to staple a receipt is a good idea, just as a verification of the written account (for the researchers) and as a reminder of the items to be accounted for (for the shopper).

5. If possible, mailing reminders would be a good idea to keep people interested. Perhaps interim gift coupons could be offered.

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6. A free shopping bag with the project logo as well as a coupon book has been offered to those who keep diaries.

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Instructions for calls to Diary Groups

August 26, 1993

General background:

The purpose of the diary group is to see, more specifically, the impact of our education on the purchasing behavior of the customers. We will be tracking this using two other methods: 1) self-reported data from the questionnaires (e.g., how often do you actually recycle this or buy that), and 2) storewide purchase data. Self-reported data may not be reliable; that's why we want a subset of the original survey group to keep track of more specific purchases. We will want specific information about the purchases, not just that they bought coffee, but the brand, size, price, and container material. We will want them to keep track for four months.

1. When calling, there are a few objectives:

   - Reaffirm their interest in the project. Take your time with the call and answer any questions to the best of your ability. If you don't know the answer, say you will get back to them with it later.

   - If they are no longer interested, don't pressure them to remain in the diary group.

   - Get their address.

   Say "We are calling to reaffirm your interest in the project". Don't say 'we want to know IF you are still interested'. Don't give them the easy out.

2. We will be sending them a notebook with instructions on how to keep track of the information we want. They will also receive a postage-paid envelope in which to mail back the notebook at the end of the record-keeping time.

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Environmental Shopping Project Diary
Project ID _____

Name _____ Week 1 (November 1-7)

Items from Receipt	Size	Packaging							Refill	Concentrate
	Glass	Tin	Paper	Juice Carton	Cardboard Box	Plastic Box	Plastic bottle	Aluminum wrap/bag	Other (specify)	
Milk										
Juice										
Detergent										
Fabric Softener										
Nuts										
Pudding										
Soup										
Coffee										

Disposable Diapers bought_____ number of packages bought_____ quantity in package_____ brand___

Plastic Produce Bags Taken _____ Paper Grocery Bags Taken _____

Plastic Grocery Bags Taken _____ Cloth Shopping Bags Bought_____

Number of times you went shopping this week _____

Number of Times You Brought your own bag (or reused one) _____

Comments:_____

Please staple store receipts along lower left edge

Environmental Action Coalition

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November, 1993

Congratulations, you are one of a select group of volunteers participating in the Gristede's Environmental Shopping Project, conducted by the Environmental Action Coalition in cooperation with the City University of New York. Your diary of purchases will help us, and others including the project funder, US Environmental Protection Agency, design and implement effective environmental shopping education programs around the country. Your sustained participation in this research is crucial, not only to ensuring meaningful results for the study, but also to being part of the solution to our garbage crisis. We hope you will feel proud of your contribution.

During the next two months we will be mounting an environmental shopping education campaign at your Gristede's supermarket. There will be a number of brochures, posters, and other educational materials to convey specific, practical ways you can become an environmental shopper.

During this two-month educational period, and for two months after that, you will be keeping a diary of your purchases on the forms included in this notebook. We have designed the forms to be easy to understand and complete. There is also a very brief set of directions; please read them before beginning. ***Please keep all your receipts***, not only from Gristede's, but also from all grocery stores you shop during this time. Should you have any questions please feel free to call me at 212-567-8272. If I am not in, please leave your name, telephone number, and a brief message, and I will return your call. *It is important to us that you understand and complete all the forms.* Upon returning your final diary pages, you will receive the free gift coupons and cotton shopping bag with our project logo we promised you.

Again, thank you for your participation.

Sincerely,

Marjorie J. Clarke
Principal Investigator

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Directions for Diary

General note: To make it easier for you to keep up your diary, we have designed the form so that you only need to keep track of a limited number of grocery items. If, at ANY time, you have a question about how to use the diary, please call right away: Marjorie Clarke 212-567-8272. It is of great importance that all your grocery shopping for the period from November through February be included.

1. Each form should include a week's grocery shopping. We have printed the date and the week number on the top of each form for your convenience. ***Please note that there are forms are on both sides of the page (odd-numbered weeks on the front, and even-numbered weeks on reverse).***

2. Each time you go grocery shopping, update the information in your diary. As you unpack your groceries, write in the items purchased, the size, check off the packaging type, and whether it was a refill or concentrate.

3. If you bought diapers, fill in the blanks in the appropriate space.

4. Fill in the number of grocery and produce bags you got for free from the store.

5. Fill in whether you purchased one or more of the Environmental Shopping Project's cotton shopping bags, and how many shopping bags you brought back for reuse.

6. Staple your store receipt on the lower left corner of the form.

7. If it applies, make a notation of an exceptional event in the comments section. Such an event could be house guests, special occasions, or emergency situations.

8. We have provided two mailers for your convenience. After two months, please mail us the first 9 weeks of forms. Feel free to write any comments on the back of the 9th weekly form.

9. At the end of the 18th week, please mail us the rest of the forms, and you will receive your free Environmental Shopping Project cotton bag.

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Appendix W

Selection and Adaptation of the Survey Questions

The following groups of questions were the "short-list" from which the final baseline and follow-up survey questions were drawn. Where the question has been used before, either verbatim or in similar form, the source is referenced. "Adapted from" indicates that the question has been reworded. Sources refer to the 28 references in Appendix E: Other surveys: Objectives, Designs, Questions, and Findings. Adaptations have been made where it made sense (e.g. to make the question more relevant to Manhattan, to New York City's recycling program, to the in-store program we are conducting at Gristedes, and to this project's research objectives). In certain cases similar questions came from different sources. Since some actual questions have numerous subquestions, some of which may not be as pertinent to this study, those parts considered to be expendable (not as applicable to this study) are asterisked. Other comments are in brackets.

Demographic Information

1. Which of the following best describes your ethnic background? Do you consider yourself..

   White
   Hispanic
   African American
   Asian
   Other/Refused

   (Source 15)
   [Mixing race and ethnicity in one question should be avoided]

2. How many years of education have you completed?

   Less than high school
   High school graduate
   College graduate or some college
   Graduate work / degree
   Refused

   (Source 15)

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3. Please tell me which of the following groups includes your total household income. Is it

< 10,000	30,000 - 40,000
10,000 - 20,000	40,000 - 50,000
20,000 - 30,000	> 50,000
	refused

(Source 15)

4. Are you male or female?

5. On what date were you born?
[This seems a bit too personal; less precision would be better received]

ENVIRONMENTAL AWARENESS AND KNOWLEDGE

Level of Awareness, Knowledge

1. In Manhattan, is _____ mandatory, voluntary or not available to you? (Mandatory, voluntary, not available, don't know)

Sorting recyclables from trash
Recycling newspaper
Recycling Tin cans
Recycling batteries
Recycling food waste
Recycling magazines
Recycling corrugated cardboard
Recycling aluminum foil
Recycling plastic bags
Recycling wax paper cartons
Recycling aluminum cans
Recycling glass containers

(Adapted from source 22)

2. As you may know, recycling is becoming more common in many places. To your knowledge, does the City government require that all Manhattan residents and businesses separate materials for recycling, or not? Yes/ No / Don't know

3. Do you happen to know, which of the following materials are picked up from residential buildings by the City for recycling? Yes/ No/ Don't know

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glass containers
newspaper
plastic bags
corrugated cardboard
food
motor oil
aluminum cans
magazines
office paper
rubber tires
aluminum foil
tin cans
plastic bottles and jugs

(Adapted from source 18)

4. When your supermarket bags your groceries at the checkout counter, can you recall, offhand, if they use paper, plastic or both?

(Source 22)

5. What do you feel is the single best solution to the garbage problem?

(Recycling, reducing the amount we produce, burning the garbage, more landfills, don't know)

(Source 22)

6. Please evaluate the following statement: Recycling is the same as source reduction. (Definitely no, probably no, don't know, probably yes, definitely yes, don't know)

Sources of Environmental Knowledge

1. Where do {have} you learn{ed} about environmental issues? yes no

TV News
Newspapers
TV news magazine
Radio
Magazines
Environmental groups
Federal government
State and local government

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Friends and other people
Local schools
Your supermarket
Other businesses
Your children
Local civic groups
Large corporations

(Adapted from source 5)

2. Please tell me the kind and number of sources of information on recycling that you remember. (yes/no)

Newspapers
Radio
TV
Posters
Mailings
Friends
School
Work
Newsletters

[alternative to question 1]

Environmental Attitudes

OPINIONS/CONCERNS ABOUT ENVIRONMENTAL ISSUES

1. Tell me how serious each of these problems are.
(1=very minor, 10= extremely severe)

Drugs
Crime
Cost of Health Care
Homelessness and poverty
Federal deficit
Air and Water Pollution
Garbage and Solid Waste Disposal
Education
Nuclear Safety
Food Pesticides and Residues
National Defense

(Source 22)

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2. For the country as a whole, is pollution:
Not much of a problem
Not so serious
A serious problem that is getting worse
Don't know, no answer

(Source 9)

3. How much can individuals do about solving each of the following environmental problems? nothing, a little, A lot,

(Adapted from Source 5)

Litter
Indoor air pollution
Solid waste from disposal of garbage
Air pollution from autos
Pesticide residues on food
Destruction of the ozone layer
Contaminated drinking water
Water pollution from disposal of waste by manufacturers
Environmental contamination from chemical waste
The greenhouse effect

4. Environmental shopping is considered to include the purchase of more durable items, fewer disposable items, fewer products containing toxics, and more products in recyclable packaging, less packaging, and recycled packaging.

How important would you say that environmental shopping is to the preservation of the natural environment?

(Answer Scale: of no importance, of little importance, somewhat important, very important, and extremely important)

(Adapted from source 21)

5. Which of the following do you believe would be the best source of environmental information? Which would be the worst? Could you please rank the other three?

Consumer or Environmental Groups
Media
Grocers/Retailers
Product Manufacturers
Government Agencies

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(Adapted from source 22)

6. Which do you prefer?

Grocery bags: Paper, plastic, both, cloth or leather
Beverage containers: Glass, plastic, juice box, cans

(Adapted from source 22)

7. How effective are each of the following methods of managing garbage? (scale of 1 to 10, where 1 = least effective, 10 = most effective)

Mandatory Recycling
Degradable products
Voluntary recycling
Education Programs
Paying Consumers to Recycle
Composting
Require Minimal Packaging
Bans or Taxes on Products
Incinerating Garbage
Fines for Non-Participating Consumers

8. How do you feel about the following items? (Scale: 1=not convinced to 5=quite convinced)

Trash disposal is a serious problem
People in the US consume too much
A person helps the environment by reducing the quantity of packaging and products they buy
Individuals must take the most active role in solving any trash disposal problems
I think my actions make a difference
A person saves money by reducing the quantity of packaging and products they buy
I will explore other forms of reducing the amount of waste I generate
Items are not made as durably as they were in the past
Governments must take the most active role in solving any trash disposal problems
Technology alone will solve any trash problem
I feel uncomfortable reusing bags at the grocery store
Reducing consumption will lower everyone's quality of life
Mandatory recycling infringes on my rights
I really like to throw things away
People who take bags with them to the grocery store are going overboard
I don't reuse items because I can afford new ones

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(Adapated from source 28)

9. How convincing do you find the following reasons to recycle and reduce the amount of disposable products and packaging you buy? (Scale= not at all convincing, a little convincing, somewhat convincing, convincing, very convincing)

It saves landfill space
It saves natural resources
It reduces the volume of waste to manage
It reduces the toxicity of waste
It saves the City money
It saves me money
I'm participating in a study
My neighbors are doing it
It reduces the need for new incinerators

Environmental Satisfactions

1. I'd like to ask a few questions about what kinds of activities gives you a feeling of satisfaction. In each case answer whether you feel no satisfaction, little satisfaction, some satisfaction, much satisfaction, or a great deal of satisfaction:

Finding ways to avoid waste
Repairing things rather than discarding
Saving items I may need someday
Bringing my own bag to the supermarket
Using fewer disposable items
Finding new ways to become self-sufficient
Rediscovering ways people used to do things
A chance to do things that make a difference
Participation in activities involving the community
Participation in bring a sense of order to the world
* Being a citizen of the richest country
* Having luxuries of civilized society

(Adapted from Source 17)

Extrinsic vs. Intrinsic Motivations

1. Please rank the following in order of their importance to you in buying groceries.

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Brand name
Economic value or cost
Convenience
Environmental value

2. How often does the recyclability of the package affect your decision to buy one product over another? (Source 1)
never, not very often, sometimes, often, very often

3a. If you were offered a small incentive, say 2 cents, to bring your own bag to the supermarket for your groceries or refuse a free bag when offered, would you bring your own bag/refuse a bag (never, not very often, sometimes, often, very often)?

(If very often, go to question 4)
(If not, go to 3b)

3b. If the incentive were five cents, would you bring your own bag/refuse a bag (never, not very often, sometimes, often, very often)?

4. Below are several reasons why people might recycle materials. Please indicate how important each of these reasons are to you (on a scale ranging from of no importance, of little importance, somewhat important, very important, extremely important)

I recycle to help conserve natural resources
* I recycle to earn money
I recycle to help conserve landfill space
I recycle to help avoid garbage incineration
I recycle because it's the law
I recycle because it seems like the right thing to do

(Adapted from source 21)

Attitudes Towards Participating in Environmental Activities (intentions)

1. How effective do you believe you personally can be in helping solve the garbage problem? (Scale: 1= very ineffective; 10= very effective)

(Source 22)

2. Would you reject products that appear to you to be overpackaged? reject/not reject/don't know

(Adapted from source 11)

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3. If you had the choice, and all else being equal, would you buy a product or package containing recycled materials?

   buy / not buy / don't know

4. All other things equal, how likely would you be to change the supermarket where you do most of your shopping if a new store opened near you that encouraged environmentally safe products and practices? Would you say you would...

   (definitely not change, probably not change, probably change, definitely change, don't know)

   (Source 22)

5. Do you consider the recyclability of packaging materials when making a purchase? (never, not often, sometimes, often, always)

   (Adapted from source 24)

6. Would you change your purchasing habits to buy foods and beverages sold in containers that can be recycled?

   (not at all likely, not very likely, somewhat likely, very likely, extremely likely)

   (Adapted from source 25)

Environmental Behaviors

GENERAL ENVIRONMENTAL BEHAVIORS

1. What are you personally doing currently to reduce and recycle the amount of garbage you generate? yes/ no

Doing something
- Buy in recyclable containers
* Buy in recycled containers
- Use your own cloth bags instead of paper or plastic
* Buy in large sizes
* Buy products with less/minimal packaging
* Composting
* Use refillable containers
- Use fewer disposable items
* Buy fewer products in individual sizes

Not doing anything

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(Adapted from source 13)

2. I'd like to know how often you do each of the following, measured on a scale of never, ocassionally, sometimes, often, usually)

Buy recyclable products or packaging
Read labels?
Ride a bicycle to work?
Avoid buying aerosols?
Buy products in refillable packaging
Bring bags back to the store for reuse
Buy items in single-serving packages
Return beverage containers for deposit
Recycle newspapers
Patronize repair shops
Recycle cans and bottles
Buy disposable products
Turn down the offer of a bag at the supermarket
Contribute money to environmental groups
Patronize rental shops
Reuse old cloth as rags or drop cloth
Save food containers to store things in
Save wood, glass, etc... from household projects
Reuse aluminum foil in the kitchen
Patronize thrift shops

(Adapted from source 4, source 17, and source 20)

[AN ALTERNATIVE WAY OF STATING THE ABOVE QUESTION, SO AS TO NOT ASSUME A BEHAVIOR AND CAUSE OVERREPORTING OF A SOCIALLY ACCEPTABLE BEHAVIOR, WOULD BE:

Have you ever (did you happen to)... ?
followed by:
When was the last time you ....?]

3. [Do you] How often do you pay more for a product for environmental reasons? (never, ocassionally, sometimes, often, always)

(Adapted from source 20)

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4. Here are some things people do to reduce the amount of household garbage. As I read each one, tell me if you or someone in your household makes a real effort to do it on a regular basis, or does it from time to time when it's convenient, or doesn't really bother about it.

   a. Does someone separate and prepare newspapers, magazines, catalogs, and corrugated cardboard for curbside recycling pickup on a regular basis, from time to time, or not really bother at all?

   b. Does someone separate and prepare plastic, glass, and metal containers for curbside recycling pickup on a regular basis, from time to time, or not really bother at all?

   (Adapted from Source 15)

5. First, I'd like to know if you personally have refused to buy products because of unrecyclable or unnecessary packaging yes/no/don't know

   (Adapted from Source 22)

6. How likely would you be to refuse to buy products because of unrecyclable {or unnecessary packaging}? Scale = Have already done or are very likely to do -- to -- not at all likely.

   (Source 22)

7. Now, I'd like to know if you have already done any of the following. For each item please tell me if this is something you have already done at home or not. Have already recycled

   aluminum
   newspaper
   plastic bottles and jugs
   glass containers
   corrugated cardboard
   magazines
   tin cans

   (Adapted from source 22)

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8. How do you usually dispose of _____? (Put out with trash, separate for curbside recycling, redeem for deposit, save for reuse) [This Question is Probably an Alternative to #7]

Food scraps
aluminum cans
newspaper
cardboard
plastic food bottles/containers
plastic non-food bottles/containers
plastic bags
styrofoam
glass jars/bottles
paper bags
magazines

(Adapted from Source 22)

Campaign-Specific Environmental Behaviors

1a. Is there an infant in your household, who uses diapers?

Yes_____ (proceed to b) No_____ (Proceed to 2)

1b. If so, how does your household deal with soiled diapers?

Do you wash them at home or in your building? yes no
Do you wash them at a nearby laundry? yes no
Do you throw them in the garbage? yes no
Do you have them picked up by a diaper service? yes no

2a. Did you, personally, at any time during the last month [can you remember the last time you] choose [chose] to buy a product packaged in a material that is not collected for recycling in New York City's curbside program rather than the same product in a recyclable package? (yes/no)

If so, how many times?

2b. Did you, personally, at any time during the last month [can you remember the last time you] choose [chose] to buy a product in a recyclable package rather than the same product packaged in a material that is not collected for recycling in New York City's curbside program. (yes/no)

If so, how many times?

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[Either 2a OR 2b might be chosen]

3. Did you, personally, at any time in the last month [can you remember the last time you]

   Refuse[d] a bag when offered by the cashier? yes/no
   Bring [brought] your own bag back to the store and use it for groceries? yes/no
   Purchase[d] one of Gristede's reusable bags?

   How many times (for each question)?

4. Which type of shopping bag do you use most often now?

   paper,
   plastic,
   both paper and plastic,
   cloth, leather, or string,
   different bags at different times)

   (Adapted from source 20)

Final Questions – parting words

1. In order to evaluate the effectiveness of the environmental shopping campaign we are about to implement, we would appreciate the opportunity to call you again in about two months to ask you a few questions. Gristedes is supportive of our research program, and has offered to give those who complete both survey interviews coupon books worth ___. May we call you in about two months?

2. In order to understand more about why people purchase the things they do, and what kind of impact environmental information has on peoples' attitudes and purchasing habits, we are forming a small group of Gristedes customers to explore these ideas further. All volunteers in this group would simply be asked to keep track of their purchases at Gristedes over a 2-4 month period in diaries that we would provide you. Since Gristedes wants to encourage participation, they will give all volunteers in this small group additional coupon books worth ___. Would you be willing to participate in this special study?

(If so, get further information (address, convenient times for initial meeting)
Thank you very much for your time. Someone will be calling again in about two months with a follow-up survey. I hope you have a nice evening.

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Evaluation of the Environmental Shopping Campaign post survey only

AWARENESS, RECOLLECTION, AND UNDERSTANDING OF CAMPAIGN'S MESSAGES

1. You may be aware that several types of information have been distributed in the Gristedes store about our environmental shopping program. Relating to this information, I'd like to know if you...

   a. Read any of the brochures we distributed which describes the whole environmental shopping campaign or not? yes/no

      If so, which ones? (overall brochure, recyclable packaging, reusable bags, diaper service)

   b. Saw the posters describing the campaign which were hanging in the store?

      (For the West Side Store Only)

   c. Watched the video (roughly how many times?)

   d. Spoke with the volunteer at the information booth?
   e. Took pamphlets or booklets home from the information booth?
   f. Read these pamphlets, booklets, etc...

      (Adapted from source 15)

2. Which of the following are not recommended from an environmental point-of-view:

Buying coffee in a glass package,	yes/no
Using paper grocery bags,	yes/no
Using reusable diapers	yes/no
Buying juice in individual servings (or brick-packs)	yes/no

   (Adapted from source 20)

3. Where did you, personally, obtain environmental shopping information from the campaign at Gristedes? (Indicate all that apply)

In-store signs	yes/no
Video	yes/no
Brochures/Grocery bag stuffers	yes/no
Information booth	yes/no

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(Adapated from source 27)

4. How much change has occurred in your shopping and household habits due to your participation in the study? (Scale: 1=no change; 5= great change)

* Save reusable containers
* use more returnable bottles
* reduce plastic wrap use
* reuse aluminum foil
buy more durables
buy fewer aerosols
* not buy over-packaged goods,
* use fewer paper towels
* buy items packaged in reusable containers
buy fewer disposables
* buy fewer toxics,
* buy in bulk
* reduce toxic cleaner use
change to diaper service
* use non-toxic cleaners
* use non-toxic pesticides
* use vinegar and baking soda for cleaning
buy items packaged in recyclable materials
take fewer bags at the checkout counter

(Adapted from source 28)

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PROTO-BASELINE QUESTIONNAIRE
May 20, 1993

Initials of interviewer_____
Date/Time interview began _____

Customer NAME _____ STORE: EAST ___ WEST ___
phone_____

(Read only those items in bold; note instructions not in bold)

Hello, I am conducting a survey of Gristedes customers as part of a US Environmental Protection Agency research study. We want to determine customers' shopping habits and attitudes which affect the environment. Gristedes has told us that _____, in your household, shops at their (East 75th St / West 86th St) store; is this the case?

yes____ no ____

(If no, ask)

Is there anyone else there who does shop at this store? (If no, thank them for their time and say goodbye.)

yes ____ no _____

(If yes to either question, say)

I'd like to ask you a few questions if I may. It should only take about 10 minutes; will that be OK?. Wait for response; if OK, proceed.

LEVEL OF AWARENESS, KNOWLEDGE

1. **To your knowledge, does the City government require that all Manhattan residents and businesses separate materials for recycling, or not, or don't you know?**

   Yes _____ No _____ Don't know _____

2. **Can you tell me, which of the following materials are picked up from apartment buildings by the City for recycling? Please answer yes, no, or don't know.**

   Glass bottles and jars yes _____ no ____ don't know ____

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Plastic bottles and jugs	yes _____	no ____	don't know ____
Plastic bags	yes _____	no ____	don't know ____
aluminum cans	yes _____	no ____	don't know ____
aluminum foil	yes _____	no ____	don't know ____
tin cans	yes _____	no ____	don't know ____

ENVIRONMENTAL ATTITUDES

3. **Environmental shopping is considered to include the purchase of more durable items, fewer disposable items, fewer products containing toxics, and more products in recyclable packaging, less packaging, and recycled packaging.**

   How important would you say that environmental shopping is to the preservation of the natural environment? Would you say it is

   Of no importance _____
   Of little importance _____
   Somewhat important _____
   Very important _____
   Extremely important _____

4. **Please evaluate each of the following statements. Answer on a scale of 1 to 5, where 1 is not at all true, and 5 is quite true.** (3 means you're not sure if it is true)
   (Write in number for each statement.)

   Trash disposal is a serious problem _____
   People in the US consume too much _____
   A person helps the environment by reducing the quantity of packaging and products they buy _____
   Individuals must take the most active role in solving any trash disposal problems _____
   I think my actions make a difference _____
   A person saves money by reducing the quantity of packaging and products they buy _____
   I like to repair things rather than discard them _____
   Items are not made as durably as they were in the past _____
   Governments must take the most active role in solving any trash disposal problems _____
   Technology alone will solve any trash problem _____
   I feel uncomfortable reusing bags at the grocery store _____
   Reducing consumption will lower everyone's quality of life _____

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Mandatory recycling infringes on my rights _____
I really like to throw things away _____
People who take bags with them to the grocery store are going overboard _____
I don't reuse items because I can afford new ones _____
I prefer to buy beverages in juice boxes or individual-sized containers _____
I like to bring my own bag to the supermarket _____
I prefer to purchase durable rather than disposable products _____

MOTIVATIONS

5. **Please tell me which is more important to you in buying groceries.**

(Enter B for brand name, Ec for economic value, C for convenience, and Env for environmental impact)

Brand name or economic value _____
Economic value or convenience _____
Convenience or environmental impact _____
Environmental impact or brand name _____
Brand name or convenience _____
Economic value or environmental impact _____

6. **I'm going to read several reasons why people might recycle materials. Please indicate how important each of these reasons are to you (on a scale of 1 to 5 where 1 is of no importance, 2 is of little importance, 3 is somewhat important, 4 is very important, and 5 is extremely important)**
(Write in number for each statement)

I recycle to help conserve natural resources _____
I recycle to help conserve landfill space _____
I recycle to help avoid garbage incineration _____
I recycle because it's the law _____
I recycle because it seems like the right thing to do _____

INTENTIONS

7a. **If you were offered a small incentive, say 2 cents, to bring your own bag to the supermarket for your groceries, would you bring your own bag? Please choose one of the following answers:**

Never ____
Not very often ____
Sometimes ____
Often ____
Very often ____

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(If very often, go to question 8)
(If not, go to 7b)

7b. **If the incentive were five cents, would you bring your own bag? Would it be**

Never ____
Not very often ____
Sometimes ____
Often ____
Very often ____

8. **All other things being equal, how likely would you be to change the supermarket where you do most of your shopping if a new store opened near you that encouraged environmentally safe products and practices? Would you say you would...**

Definitely not change _____
Probably not change _____
Probably change _____
Definitely change _____
Don't know _____

9. **Do you consider the recyclability of packaging materials when making a purchase? Please indicate yes, no, or don't know.**

Yes _____ No _____ Don't know _____

If yes, how often do you consider the recyclability of packaging? Would it be

Not often ____
Sometimes ____
Often ____
Always ____

SOURCES OF ENVIRONMENTAL INFORMATION

10. **Have you heard about recycling or environmental shopping from the following sources of information? Answer yes, no, or don't know for each one.**

Radio	yes _____	no _____	don't know ____
Mailings	yes _____	no _____	don't know ____
TV or videos	yes _____	no _____	don't know ____
Newspapers	yes _____	no _____	don't know ____
Posters or brochures	yes _____	no _____	don't know ____

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Friends or neighbors	yes _____	no _____	don't know ____
School or work	yes _____	no _____	don't know ____

ENVIRONMENTAL BEHAVIORS

11. **I'd like to know how often you actually do each of the following things, measured on a scale where 1 is never and 5 is always.**
(Fill in number)

Select products in recyclable packaging	_____
Read labels?	_____
Avoid buying aerosols?	_____
Recycle magazines	_____
Buy items in single-serving packages	_____
Return beverage containers for deposit	_____
Recycle newspapers	_____
Patronize repair shops	_____
Recycle cans and bottles	_____
Buy disposable products	_____
Refuse a bag offered by the cashier	_____
Bring your own bag to the store	_____

12a. **Is there an infant in your household, who uses diapers?**

Yes_____ (Proceed to b)
No_____ (Proceed to question 13)

12b. **If so, how does your household deal with soiled diapers?**
(DON'T READ THE FOLLOWING CHOICES; JUST FILL IN THE ANSWER.)

Wash them at home or in your building?	yes ____
	no ___
Wash them at a nearby laundry?	yes ____
	no ___
Throw them in the garbage?	yes ____
	no ___
Have them picked up by a diaper service?	yes ____
	no ___

13. **Did you, personally, at any time in the last month use one of Gristede's reusable bags?** yes ____ no __

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(If yes, ask) **How Often?**

Occasionally	____
Sometimes	____
Often	_____
Always	_____

(If no, proceed to next question.)

DEMOGRAPHIC INFORMATION

14. **Do you consider yourself to be white, African American, Asian, or of another race?**

White	____
African American	____
Asian	____
Other	____
Refused	____

15. **Are you of Spanish or Hispanic origin?** yes __ no __ Refused __

16. **What is the highest level of education you have completed?**

Less than high school	____
High school graduate	____
College graduate or some college	____
Graduate work or advanced degree	____
Refused	____

17. **I'm going to read a list of dollar amounts. Could you please tell me which range reflects your total household income. Is it**

< 20,000	_____
20,000 - 30,000	_____
30,000 - 40,000	_____
40,000 - 50,000	_____
> 50,000	_____
refused	_____

18. **I'm going to read a list of age groups. Could you please tell me in which range your age falls?**

< 30 years	____

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30-44 years ____
45-60 years ____
>60 years ____
refused ____

19. (Record the sex.) Male ____ Female_____

FINAL QUESTIONS

1. **In order to evaluate the effectiveness of the environmental shopping campaign we are about to implement, we would appreciate the opportunity to call you again in about two months to ask you a few questions. Gristedes supports our research program, and has offered to give those who complete both survey interviews coupon books worth ___. May we please call you in about two months?**

   Yes ____ No ____

If yes, ask **What is the best time of day to call you?**

Preferred Time (of day) to call _____
Prompt for specific answer

I have only one more question:

2. **In order to understand more about why people purchase the things they do, and what kind of impact environmental education has on peoples' attitudes and purchasing habits, we are forming a small group of Gristedes customers to explore these ideas further. All volunteers in this group would simply be asked to keep track of their purchases at Gristedes over a 2-4 month period in diaries that we would provide you. Since Gristedes wants to encourage participation, they will give all volunteers in this small group a reusable canvas shopping bag. Would you be willing to participate in this special study?**

   yes ___ no ____

IF ANSWER IS NO:

Thank you very much for your time. Someone will be calling again in about two months with a follow-up survey. I hope you have a nice evening.

IF ANSWER IS YES:

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We will want to have a meeting of the volunteer group at the beginning to tell you how to fill out the diaries and answer any questions. Could you please give me the days and times when this would be most convenient?

--- ask for at least two days/times

Times _____

Thank you very much for volunteering and for your time. Someone will be calling again to schedule the meeting of volunteers. I hope you have a nice evening.

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Appendix X

Discussions with Designers of Environmental Shopping Materials

8/9/93 Mary Chernesky, Hillsborough, Fl Cooperative Extension 813-744-5519 -- After they distribute materials to civic groups (Civitas, Womens' clubs) they send a questionnaire out to the contact for the organizing group. Their survey has 15 questions which asks questions of group members regarding their changed behaviors. They also use environmental shopping materials (including brochures) and a check quiz as support for store tours. They have developed a questionnaire, and were the developers of the Florida Enviroshopper video and kit. She referred me to Paula's Stewart's (Broward County) 1991 precycling survey (14 questions) Another longer one by Hammer and Cliff Taylor (FL extension) asked what people did to reduce, recycle, reuse, reject..., and did people make a conscientious effort to buy recyclable etc... This survey is in Florida notebook. The survey didn't ask which medium was remembered best. She sent some brochures.

8/10/93 Jeff Ledermann, Minnesota Office of Waste Management, 612-649-5737. 1350 Energy Lane, Suite 201; St. Paul, MN 55108 -- Ken Brown 612-649-5743 It's OK to use their SMART posters. They have small and large displays which they use (tabletop and 6'x9') but they don't lend them out-of-state. They did surveys before, during and after passing out brochures, hanging posters and shelf cards. They passed out 7500 brochures at each of 2 stores in one week. Result: 50% were aware of campaign; 1/3 could recall some of the message. One hundred surveys were given out at each store before, during, and after campaign -- totals were 300/store; 600 for whole campaign. The exit survey was to use scanner data to see if there was a change in purchase of 15 products. But the stores didn't have staff time to do that. Their exit survey did include: "Where did you see the info on environmental shopping?" and "Check the top two sources you think are most effective?" He sent a large package of educational materials. He estimates that about 1/4 of the stores in MN have now been covered by this campaign.

8/10/93 Paula Stewart, home economist Broward County Cooperative Extension Service, 3245 College Avenue, Davie, Fl 33314. 305- (370-3730) Maybe 5,000 people have seen their environmental shopping materials, which have been in grocery stores (with a display of other items). She will send some brochures. In 1990 and 1991 they did a "precycling" survey. This indicated that people became more aware of products (recyclable and recycled 10-40%) and sensitive to the issue. In the second year, they were asking for more information programs. Their results were not based on any one educational device, but the whole package. She sent lots of educational materials and survey results.

8/10/93 Dan Frantz, Pennsylvania Resources Council. PRC uses its environmental shopping brochures and other educational materials for press kits, conventions; they don't

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give them out in grocery stores. They give environmental shopping tours, but there's no way to gauge impact. They wanted something short and direct. We may photocopy brochures.

8/11/93 Ms. Lee Benner, Shop Smart; Washington State Energy Office Energy Extension Service /Seattle Solid Waste Management Utility, 914 E. Jefferson, Rm 300, Seattle, WA 98122, 206-296-5640 fax 206-296-5631. -- First year mascot: "Choosey", shelf tags, working with employees. Exit interview, Questionnaire -- had people recognized "Choosey"; most didn't. Next year, more education, waste prevention, recycling ; new display each month. Third year; back in with volunteers. Same displays. They had always harped on bag reuse, and have been tracking this the percentage of bag returns (rebates), not reduction in bags given out. Will send package w shelf tags, brochures, etc.. and any evaluative information she can put together.

8/11/93 Deborah Pentz, Program Coordinator, Environmental Affairs, City of Boulder, CO 303-441-4207 (Precycle -- supermarket campaign). Will send materials and any evaluations. Doesn't think that specific evaluations on efficacy of particular materials were done.

8/12/93 Cleo Manuel, National Consumers League, fx 202-737-2164. Asked her regarding permission to use earth in a shopping basket logo; said it would probably be OK (have never refused permission), but would want credit (on the back under "for more information" would be fine). Want me to send her a letter indicating what it would be used for, and then would send back permission. Sent fax on 8/13 asking permission.

Stephanie Walker, National Consumers League, re earth basket logo, and results -- said it was OK to use the logo and slogan on our materials if we list them on the brochure under "for further information".

8/16/93 Deborah Higer, Chief, Service Development, Metro Dade Dept of Solid Waste Management, 305-594-1567 (f) 1591 Faxed her a note asking about the success of her brochure and about the county procurement policy regarding the purchase and use of durable or resuable goods, and maintenance and repair of goods. She will send whatever info she can.

8/16/93 David Assmann, City of San Francisco, will check to see if there has been measurement of effectiveness /response from his brochures (doesn't think so). In process of doing citywide survey; will measure participation in recycling program /ways to improve recycling rates.

Anita Kugler, Masters student, University of Florida. Thesis on environmental shopping. She will send Joanne Vining's work at Champaign-Urbana. ph: 904-338-7918, fx 904-378-4104 1810 NW 23 Blvd, Apt. 125, Gainesville, FL 32605.

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Notes on educational materials

Diapers

The Record, "Diaper War: the latest bottom line", May 6, 1993 C1

Average child goes through 6000 diapers. DIsposable diapers do not decompose in landfill for 500 years. By the late 1980s 90% of US residents under 2 1/2 were routinely popped in and out of disposables. But by 1990 the Earth day boom caused an increase in use of diaper services to 15%. Proctor & Gamble now dominates close to half of the US disposable diaper market with Pampers and Luvs.

San Francisco's Recycling Guide: "Disposable diapers can take 500 years to decompose in a landfill; cotton diapers, which can be reused 75-100 times, decompose in one to six months."
"Each year 75,000 metric tons of plastic and 1,265,000 metric tons of wood pulp from trees are used to make disposable diapers in the US"

Gerber Cloth Diapers vs. disposable - cost $400 plus washer and dryer vs. $1700 disposables for diapering life of child.

Warmer Bulletin, Feb 1993 pullout; Babies need on average 2500 nappies each year, and use a total of 6200 nappies in an average two and a half years.

Steve Lawitz, Asst Commissioner, NYCDOS 788-3802, Sept. 1. 1993 Lawitz indicated the number of diapers in the residential and institutional waste stream at 368 tpd (of 11,000 tpd total).

Rhode Island Solid Waste Management Corporation, 1986 Annual report; "About 5 million tons of dirty disposable diapers are buried in landfills throughout the US ever year. A dirty disposable plastic diaper can take 500 years to decompose, as compared to a cotton diaper, which disintegrates in only 1 to 6 months.

Carl Lehrberger, Diapers in the Waste Stream, 1989. "Each family that chooses natural, recyclable cotton diapers for their child prevents 1 ton of waste from entering the solid waste stream each year". Also, disposal charges are calculated (1988) to be about $300million a year.

Dr. David Wiles, director of the National Research Council of Canada's Division of Chemistry, suspects that plastic breakdown [from biodegradable diapers] will worsen the 'already serious problem of gas and leachate production, possibly adding [[to the environment]] toxic chemicals [[that are]] much more damaging... than the plastic wastes themselves'" quoted in "Biodegradable Diapers: a Pseudo Solution" Ann Beaudry, in Mothering Magazine, Vol 53. quoting Colin Issacs, Probe Post (Fall 1988): 42

"It is estimated that 75,000 metric tons of plastic and 1,265,000 tons of wood pulp are used every year to make disposable diapers in the US. About 5 million tons of dirty

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diapers are buried in landfills in the US each year and consumers spend at least $100 million annually to dispose of these items."

Queens College, Center for the Biology of Natural Systems. Calculations for metric tons of plastic to gallons of oil equivalent:

75,000 metric tons of plastic annually to disposable diapers
times 2.205 x 10^3 equals 165,375,000 lbs times 11,182 BTU/lb of avg plastic

times 1 gal #2 oil/139K BTU (source Steve Krivanek) equals 13,303,764 gallons of oil.

Packaging

Mary Chernesky, Hillsborough County Cooperative Extension; "One of the best ways to reduce municipal solid waste is to cut down on packaging, which comprises about 30% of the solid waste stream, according to a 1988 Franklin Associates study for EPA. Containers and packaging accounts for 41% of all paper produced in the US, 90% of all glass, 39% of the plastic, 24% of the steel, and 59% of all the aluminum. One dollar out of every $11 spent for groceries in the US pays for packaging."

San Francisco's Environmental Shopping Guide: "13% of food costs and 50% of garbage costs are from packaging" "About 23 million barrels of oil were used for plastic packaging in 1989." "Every ton of paper produced from waste paper uses half the water and energy and results in 74% less air pollution and 35% less water pollution, that paper made from virgin materials."

INSERT: Franklin Associates' 1990 Update: Calculations of percentage of aluminum, glass, steel, plastic, and paper are devoted to packaging.

G. Kellman, P.E., Research-Cottrell.
Comparison of Weight to Size ratios for different size metal food cans

Volume of Contained Product ounces	Weight of container grams	Weight/Volume Ratio
8.0	47.7	5.96
16.0	68.0	4.25
38.5	136.4	3.54
101.0	320.6	3.17

(Container weights derived from actual weight data from four samples of the same type and brand of food product.)

Jeff Ledermann, Linda Countryman, Office of Waste Management, Minnesota Office of Waste Management: 600 surveys were distributed in 2 stores, before during and after an environmental shopping campaign which lasted only a week. When asked

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which are the "top two sources you feel are most effective in informing you about environmental shopping" from six categories these were the results for each store: (TV (78%/73.8%, radio 13.7%/22.3%, newspaper 52.3%/47.0%, store 38.7%/43.0%, direct mail 8.7%/6%, and outdoor ads 5.7%/5.7%). This substantiates the idea of continuing the campaign in retail strores...; our in-store campaign would be even more effective if supported by a media campaign such as that being considered by the Metropolitan Council. Also, after only one week, about 1/2 of the customers surveyed during the pilots were aware of an environmental campaign being conducted, and of those customers, about 1/3 were able to recall part or all of the theme. The brochure, which was handed out at the store entrance during the pilot, was by far the most effective tool to educate the consumers. A lot of effort was necessary during the pilots to make sure customers received them, however. With the help of OWM staff and local volunteers we were able to have someone stationed at the entrance to the store from 10am to about 7pm on weekdays; later on weekends. With a little assertiveness, most customers were willing to accept a brochure. The question, "Would you like a brochure on environmentally smart shopping?" or a variation of that seemed to be very successful. Very few of the brochures were left behind in the store or carts, which is noteworthy considering about 15,000 were handed out between the two stores. Overall, there was not a great deal of difference between the pre, mid, and post campaign answers. {This might be due to the short duration of the educational program.} The results show a few differences between the two pilots. At Willmar there was more awareness and retention of the program. We believe this is explained by several factors: more involvement by community (especially volunteer participation), more thorough media coverage and Cash Wise's willingness to oput more materials in the store for a longer period of time. Perhaps consequently, of the 12 value questions from the survey, customer at the Willmar store answered higher on eleven of them than customers at the Eagan store. Most customers were willing to accept a brochure, but it did take a little assertiveness. Key words that seemed to elicit a response included "environment", "research" and "package choices." "Reduction" was not very effective since most people did not understand it. Comments from store staff during post-campaign meeting: Willmar -- the sales of their cloth bags increased substantially during the campaign; about a dozen brochures a day were found discarded (a small fraction of those handed out). At Cash Wise: Shelftalkers made shoppers think a sale was on. Sale on canvas bags: increase was marginal. Staff would have liked an orientation meeting.

Bags

Minnesota Office of Waste Management "The Resource" Nov-Dec 1991.
"US shoppers used 25 billion paper grocery bags last year."

Results of campaign to have people reuse bags. Canvas bags were distributed to participants, who were also asked to sign a "take me back" pledge to reuse their bags for one month, which automatically registered them in a drawing for a Choosy lunch kit. Several of the stores already had bag rebate programs in place. During the first four months, there was a 14% average increase in bag reuse, each month, for all seven stores.

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The base count for the seven stores ranged from 50 bags to 3,871 bags. 11 different shelf tag messages were developed, including "Bring back your plastic produce bags to reuse the next time you shop"

Dave Kleckner, NYCDOS Bureau of Waste Prevention Reuse and Recycling, "Summary of the Department of Sanitation's Pilot "Bring Your Own Bag" Program in Park Slope". Some conclusions:

- If provided with "Bring your own bag" signs, many stores can be expected to continue to post the sign for an extended period of time. Approximately 80% of the 24 stores in this pilot study still had the sign posted after a year.
- Customers respond positively to the signs. Almost 63% of the stores commented that customers notice the sign and 54% notice a change in bag requests.
- A major educational campaign aimed at consumers, along with posting of the signs, could increase awareness and decrease bag usage.
- Awareness of environmental issues by store owners and managers has increased due to the sign. As a result, almost 40% of the stores said they would consider offering a rebate to customers who bring their own bags.

{This supports the use, in this project, of the DOS' "Bring your own bag" sign to encourage bag reuse.}

Source of Environmental Knowledge

Ray Shapek, University of Central Florida "Creating Public Education and Information Programs for Recycling: A Manual and Guide. p. 96. In answer to the question "Which media do you feel produced the best results (Rank in priority order, 1 is highest) the following were the results:

		mean	rank order
a.	Hotline	5.61	7
b.	Radio	3.11	2
c.	TV	2.75	1
d.	Newspaper	4.54	3
e.	Direct Mail	4.76	4
f.	Billboards	5.76	9
g.	County Sponsored Events	5.67	8
h.	Consultants	4.81	5
i.	Other printed matter*	5.13	6

* Includes recycling displays, brochures, and stickers

Mean rankings represent the subjective opinions of the county recycling coordinators (The lowest mean represents the highest ranking)

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Recycling

Steve Lawitz, Asst Commissioner, NYCDOS 788-3802, June, 1993 Recyclables account for 45.6% of waste stream; Compostables 31.85%. Total over 77% plus more for reduceables and reusables. In 1990 31% was exported, 51% went to Fresh Kills, 7% to incineration, and 12% was recycled/composted. In March recycling was 800 tpd, in summer, 1200 tpd. (Later conversation): In summer overall recycling rate: 11%, but 13% in recycling districts. Overall number expected to climb to 13% in September, 1993 when all districts are on-line.

Steve Lawitz, Asst Commissioner, NYCDOS 788-3802, Sept. 1, 1993. June 1993 data for residential and institutional recycling and composting: 11% overall; but 13% in recycling districts. Expects that when Queens comes on in Sept. the 13% number will reflect reality. Of the remainder, in June 14,870 tons per day goes to disposal (1,097 for incineration, and 13,779 to landfill). This landfill number includes 1600 tpd not collected by DOS (400 commercial and 1200 other agencies'). Thus 7% is incineration, and 82% is landfilling.

Robert Cowles Letcher and Mary Sheil, "Source Separation and Citizen Recycling in William Robinson, ed., "The Solid Waste Handbook (New York: John Wiley & Sons, 1986), from Citizen's Guide to Sustainable Development, Global Tomorrow Coalition, Washington, DC Walter Corson, ed., p. 271

Environmental Benefits Derived from Substituting Secondary Materials for Virgin Resources

Environmental Benefit	Aluminum	Steel	Paper	Glass
Energy Use	90-97	47-74	23-74	4-32
Air Pollution	95	85	74	20
Water Pollution	97	76	35	--
Mining Wastes	--	97	--	80
Water Use	--	40	58	50

Hillsborough's "You can become an Enviroshopper" from "Enviroshopping Energy Considerations", Marie S. Hammer and Joan G. Papdi, The University of Florida, Institute of Food and Agricultural Sciences, EES-73, 9/91. Table 2.

Items to Recycle	Amount of Energy Saved[1]	Equivalent Energy Saved per ton (gallons of gasoline)
Aluminum	95%	1915
Plastics	88%	695
Newspaper	34%	67
Glass	25%	31
Corrugated Paper	24%	51%

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[1] Stauffer, R.F. "Energy Savings from Recycling" Resource Recycling, Vol VII, No. 7, Jan/Feb 1989 pp. 24-5.

Slogans

Lee Benner, Washington State Energy Office, "Preventing tomorrow's garbage today: waste reduction education", in Resource Recycling, December, 1992. p46.

Earth Buying brochure from **Metro-Date Solid Waste Management, Miami, FL** "What is Earth Buying? Buying today as if tomorrow depended on it -- because it does. How and what we buy today will determine the quality of our life in the future.

Broward County Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. "Enviroshopping Makes a World of Difference",

Hillsborough's "Kash n Karry - Buy Recycled Store Tour - Script" page 8. by Mary E. Chernesky, Hillsborough County Cooperative Extension Service, 813-621-5605/754-2621; fx 813-272-7165

"Encourage manufacturers to decrease packaging. As much as 80% of waste from a grocery store is in packaging."

"Help Eliminate Waste by Choosing: Items in the largest containers feasible for your needs. A 160-ounce can uses 40% less metal than two 8-ounce cans."
"Enviroshopping and Precycling" brochure by Broward County Cooperative Extension Service, Dr. Paula M. Stewart.

"How you shop effects what manufacturers produce. When an item is purchased a vote is cast for or against the environment. Being properly informed about a product's environmental impact is critical to successful enviroshopping."

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Major Studies

Sally Foulke, PhD of Cornell Cooperative Extension in Suffolk County, 7/1/92, another recipient of an EPA Region II Environmental Shopping Research grant. She and her fellow researchers are nearing completion of their work that was focused on determining obstacles to educating people to shop environmentally. One of these obstacles is their finding that encouraging shoppers to buy recyclable packaging is difficult because there is so little choice in the supermarket; so many items are not available in recyclable packaging. Their project was structured as follows: before and after surveys were done outside of six stores (3 King Kullen and 3 Waldbaums) of roughly 250 people, of which 235 were usable. In addition, they got 50 of these families to keep shopping diaries for 8 weeks including all their register receipts (produced by scanning equipment). In this way they were able to compare what people said in the surveys and what they bought over time (but this wasn't the main focus of the study). Sally recommended that we be careful in selecting our stores, since Waldbaums (which is owned by A&P) was very meddlesome in their research, to the point sometimes of being disruptive. I mentioned I had been in touch with the A&P central office for Yonkers and Lower Hudson and she agreed that maybe the office from Long Island might differ in attitude. She agreed to send a copy of their report.

Ellen Harrison, Waste Management Institute at Cornell University was contacted 7/20/92 to learn how their Ulster County, NY, Environmental Shopping research was coming and to see how they made their first contacts with grocery stores. (They succeeded in getting Shop Rite to go along with the research program.) They were able to get Shop Rite to cooperate due to earlier association with the chain by other groups within Cornell. There was initially a confidentiality question regarding getting information generated by the Shop Rite consumer cards. This was resolved when it was determined that Cornell will only be using data in statistical (aggregated) form, and didn't need to know the identity of individual consumers. The store had to purchase a new computer program to manipulate the data for Cornell. Selection of products was difficult (Cornell's project targets source reduction). They are looking to target 20 products and substitutes, but haven't come up with the 20 pairs yet.

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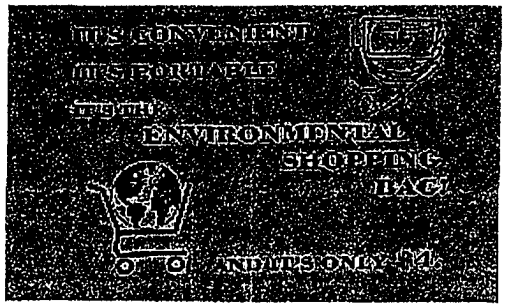
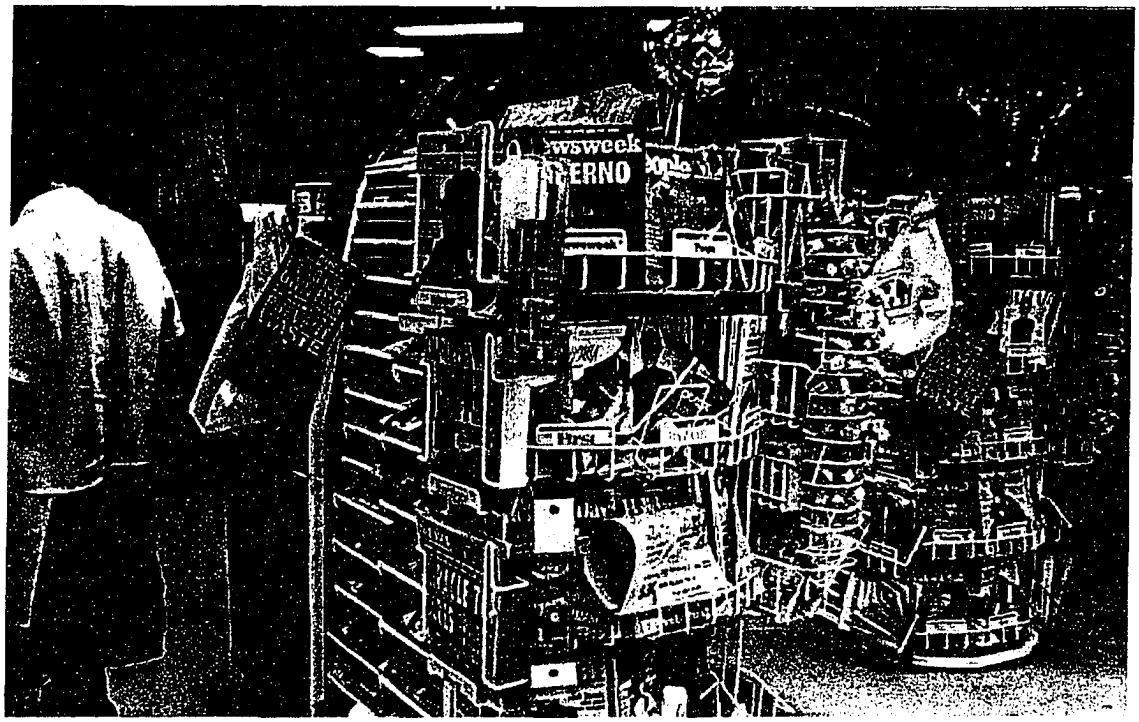
Appendix Z

Educational Materials

Campaign's Bag Advertisement
(actual size: 5.5 x 8.5")



View of Bag Displays at the West Side Store (Photo 1)



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NYC DOS' Bring Your Own Bag Sign

(actual size: ~ 9" x 13")

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Seattle Shop Smart Produce Bag Card
(actual size: 3.75 x 5.75")

Introductory Brochure (Front)
(actual size: 3.5 x 8.5")

The Earth's Future

is in *your* Shopping Cart

Be An
Environmental
Shopper at Gristede's

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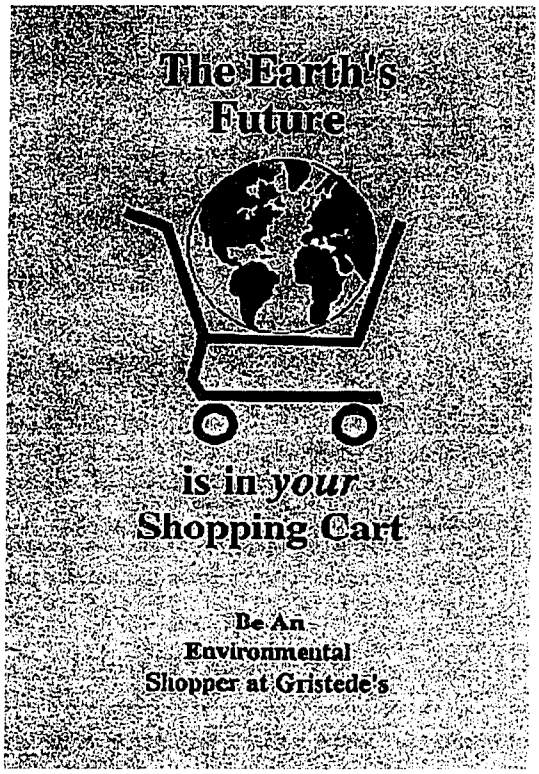
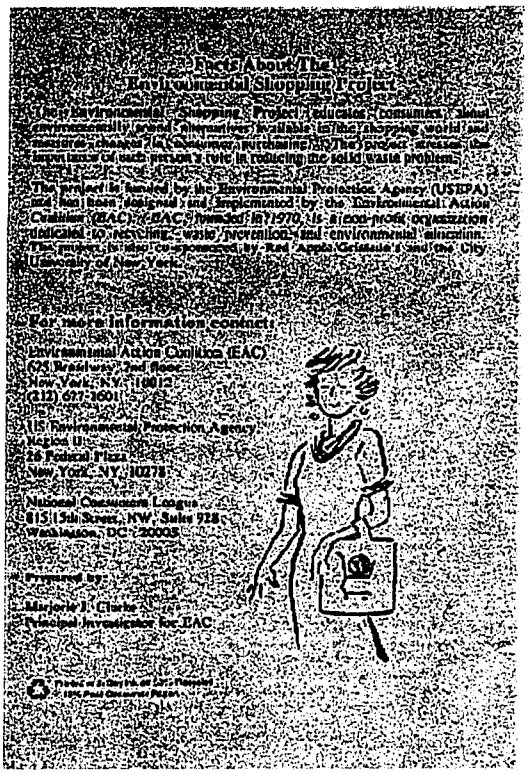
Shop for Durability (Green Brochure) – cover, back
(actual size: 5.5 x 8.5")

Front



Back



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Shop for Durability (Green Brochure) -- inside
(actual size: 8.5 x 11")

Be An Environmental Shopper!
Shop for Durability

Did you know that the fastest growing product category in the solid waste stream is items designed to last less than three years? This reflects the rapidly expanding role of disposable products, much of which are buried in landfills or burned in incinerators.

The shorter the useful lifespan of a manufactured product, the greater its environmental impact. When a product is manufactured, the raw materials must be mined or logged. These activities cause considerable environmental impact to our air, water, and land, and in some cases deplete nonrenewable resources and eradicate species. The raw materials must be transported to a factory for refinement, and then to another plant for manufacture. Each of these steps results in more emissions, effluents, soil erosion, land degradation and occasionally oil spills and refinery fires. The more times this production cycle is repeated, the greater the impacts.

What Can We Do?

We, as environmental shoppers, can reduce these environmental impacts by buying products which last a long time. For example, buying a cotton shopping bag and using it a few hundred times prevents the manufacture of at least that many plastic or paper shopping bags and all the associated environmental impacts.

Ask yourself if you are opting for convenience and acting out of habit, or are buying practical alternatives that are better for our environment. Think "environment" before making your purchases.

Reduce the Number of Bags You Take

Did you know that a typical Manhattan grocery store gives away 20,000 bags every week? And neither plastic nor paper bags are being recycled in New York City!

Everyone can help reduce the solid waste in our incinerators and landfills by making an important choice at the checkout counter. When you make a purchase, the cashier immediately starts to put your merchandise into bags. Please make a difference to help the environment!

Consider the following options:

- Say, "I don't need a bag" for small purchases. If you can carry your belongings in your hands, pockets, purse, or briefcase, you don't need a bag. Ask for a receipt when you do not take a bag, in case you have proof of purchase.
- Bring your own bag.
  Carry a reusable tote bag made from canvas, cotton, nylon or leather. Every time you use your own bag, you save not only the natural resources that are used to make paper and plastic, but you also prevent the pollution generated in their manufacture and disposal.
- Bring back your produce bags for reuse.
- If you do take a bag, use it again.
- Ask your cashier not to double-bag.

Next time you are asked, "Paper or plastic?", think of saving a tree -- saving space in a landfill -- helping to prevent pollution from incineration. Say, "I brought my own bag, thank you."

The Environmental Shopping Project encourages everyone to reduce the amount of shopping bags that we throw away. Buy a reusable bag and use it every time you shop.

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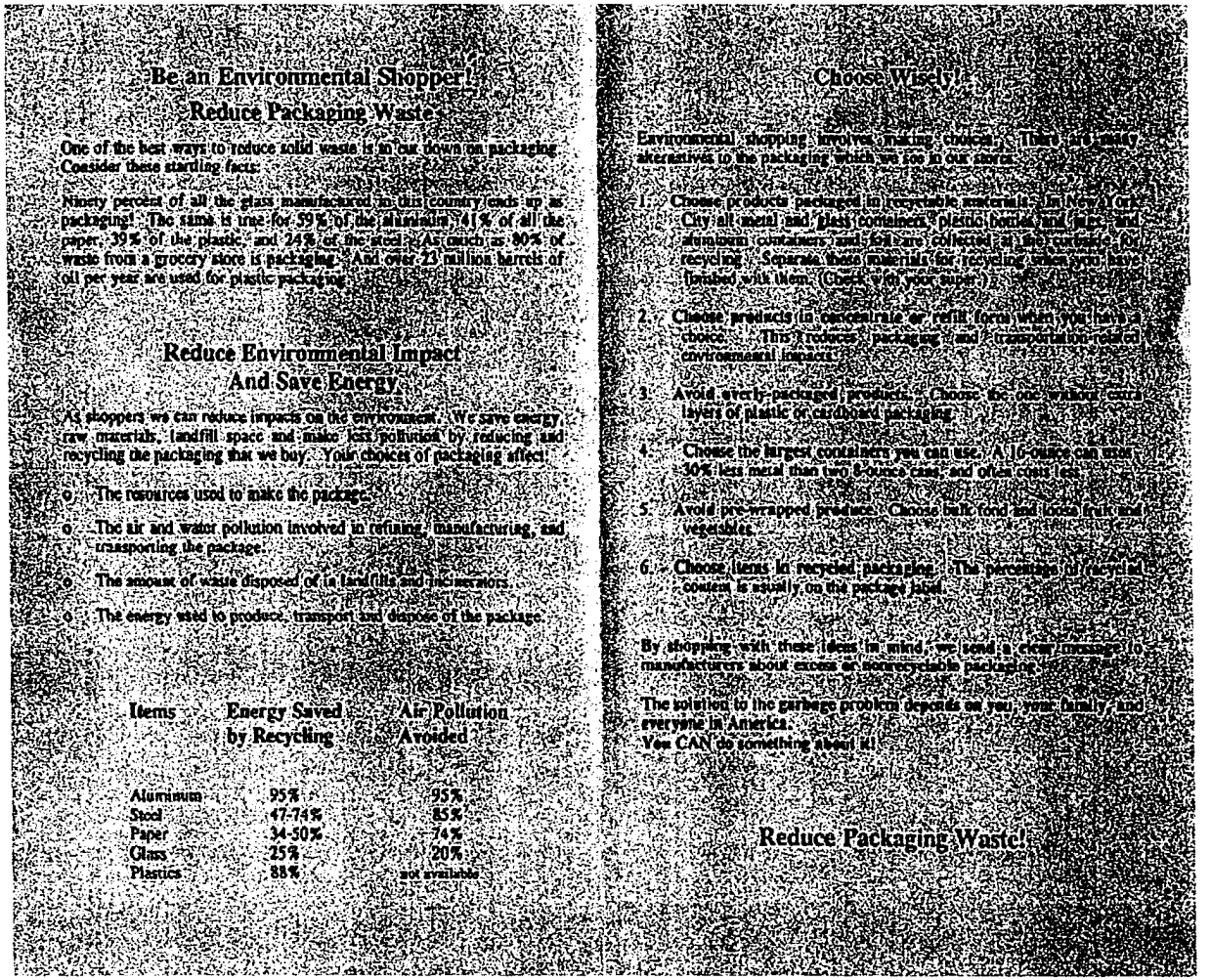
Shop for Recyclability (Goldenrod Brochure) -- inside

(actual size: 8.5 x 11")



Be an Environmental Shopper!

Reduce Packaging Waste

One of the best ways to reduce solid waste is to cut down on packaging. Consider these startling facts:

Ninety percent of all the glass manufactured in this country ends up as packaging! The same is true for 59% of the aluminum, 41% of all the paper, 39% of the plastic, and 24% of the steel. As much as 80% of waste from a grocery store is packaging. And over 23 million barrels of oil per year are used for plastic packaging.

Reduce Environmental Impact And Save Energy

As shoppers we can reduce impacts on the environment. We save energy, raw materials, landfill space and make less pollution by reducing and recycling the packaging that we buy. Your choices of packaging affect:

- The resources used to make the package.
- The air and water pollution involved in refining, manufacturing, and transporting the package.
- The amount of waste disposed of in landfills and incinerators.
- The energy used to produce, transport and dispose of the package.

Items	Energy Saved by Recycling	Air Pollution Avoided
Aluminum	95%	95%
Steel	47-74%	85%
Paper	34-50%	74%
Glass	25%	20%
Plastics	88%	not available

Choose Wisely!

Environmental shopping involves making choices. There are many alternatives to the packaging which we see in our stores.

1. Choose products packaged in recyclable materials. In New York City all metal and glass containers, plastic bottles and jugs, and aluminum containers and foil are collected at the curbside for recycling. Separate these materials for recycling when you have finished with them. (Check with your super.)
2. Choose products in concentrate or refill forms when you have a choice. This reduces packaging and transportation-related environmental impacts.
3. Avoid overly-packaged products. Choose the one without extra layers of plastic or cardboard packaging.
4. Choose the largest containers you can use. A 16-ounce can uses 30% less metal than two 8-ounce cans, and often costs less.
5. Avoid pre-wrapped produce. Choose bulk food and loose fruit and vegetables.
6. Choose items in recycled packaging. The percentage of recycled content is usually on the package label.

By shopping with these ideas in mind, we send a clear message to manufacturers about excess or nonrecyclable packaging.

The solution to the garbage problem depends on you, your family, and everyone in America.
You CAN do something about it!

Reduce Packaging Waste!

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Introductory Brochure (inside)

(actual size: 8.5 x 11")

NYC has a Solid Waste Crisis!

Each New Yorker makes 1.2 tons of garbage per year! Nondurable items, many of which are designed to be used only once and then thrown out, are 29% of our waste.

Packaging is another 28% of the waste stream. Millions of tons of our country's natural resources (trees, oil, minerals) are logged and mined each year to manufacture packaging and disposable products.

Did you know that 80% of New York City's residential waste stream can be reduced, recycled, or composted? But only about 13% is actually being managed this way! We send 80% to landfill and burn 7% in antiquated incinerators. And our only landfill will be gone in 10 years!

What Is Environmental Shopping?

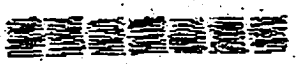
Make purchases today as if tomorrow depends on it, because it does. What we buy today will determine the quality of our life in the future.

How you shop has a powerful effect on what manufacturers produce. When you buy an item, you cast a vote for or against the environment. You can affect packaging design, recyclability, product durability, and other features which impact the environment. Being properly informed about the environmental impacts of what you buy is critical to successful environmental shopping.

By changing some habits, you can conserve energy and our precious natural resources, and lessen environmental impacts to air, water, and land of solid waste disposal.

Reduce Packaging Waste!

- Buy products in recyclable packaging and recycle them at home.
- Buy detergents, softeners, juices and other products in refills and concentrates. Using these reduces packaging and other environmental impacts.
- Thirteen percent of food cost is packaging. Save money by buying items in larger rather than single-serving sizes.
- Buy items that are not excessively packaged. Avoid produce that is pre-wrapped.



Bring Your Own Bag!

Did you know that a typical Manhattan grocery store gives away 20,000 bags every week? And neither plastic nor paper bags are recycled in New York City! If you take just 10 fewer bags per week, you prevent the unnecessary manufacture and disposal of 520 bags per year!

- Refuse a bag for small purchases!
- Ask the cashier *not* to double-bag your groceries.
- Bring your own bag! Each time you do, you save natural resources used to make and transport paper and plastic. You also save landfill space and reduce incineration.
- Carry a reusable tote bag! Attractive, durable bags can be used for years. Some can fit into your pocket!

Disposable Diapers add tons to our garbage problem

- 18 billion disposable diapers are thrown away each year in the US.
- Almost 400 tons of disposable diapers are thrown away every day in New York City. An incinerator can burn this much waste daily.
- In his/her first 2 years a baby uses 4672 disposable diapers vs. the 160 reusable cloth diapers provided by a diaper service plus 511 disposables for travel.
- Using a diaper service most of the time costs about 5% less than only using disposables.
- Diaper service provides convenient, door-to-door service.

Cloth diapers use fewer materials

Consider these facts when purchasing diapers:

- Trees and oil are used to produce disposable diapers. About 83,000 tons of plastic and 1,265,000 tons of wood pulp are devoted yearly to make disposable diapers in the U.S. This is roughly equivalent to 21.5 million trees and over 13 million gallons of oil!
- Disposable diapers can take 500 years to decompose in a landfill; cotton diapers, which can be reused 75-100 times, decompose in 1 to 6 months.
- Trees grow to maturity over decades. Cotton is an annual crop, renewed every year.
- Old cloth diapers become rags; disposable diapers become garbage.

Crowded Aisles at the West Side Store (Photo 2)

Brochures in the Magazine Racks at the West Side Store (Photo 3)

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Storefront Poster at the East Side Store (Photo 4)

Poster and Bag Display near the West Side Store Exit (Photo 5)

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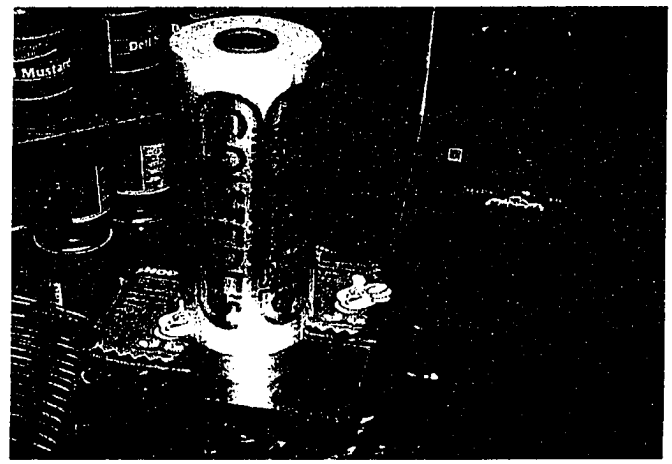
Produce Bag Shelf Cards at the West Side Store (Photo 6)



Bag Display at the West Side Store (Photo 7)

Brochures with Store Circulars at the West Side Store (Photo 8)

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