A COMPREHENSIVE SOLID WASTE MANAGEMENT PLAN FOR NEW YORK CITY and FINAL GENERIC ENVIRONMENTAL IMPACT STATEMENT

Appendix Volume 4.1

WASTE MANAGEMENT COMPONENTS

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Appendix 4-A:
Waste Prevention

Final Report

Waste Prevention in New York City

Analysis and Strategy

Prepared for

The New York City Department of Sanitation
Solid Waste Management Plan

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Table of Contents

List of Tables

List of Figures

Part I

INTRODUCTION

This report is intended to provide a framework for the development of waste prevention programs and policies for the City of New York. The report identifies and assesses concepts and strategies that can provide long term guidance to New York as it works to integrate waste prevention into its ongoing solid waste management activities.

Waste prevention is an integral part of the larger endeavor of the development of the Generic Environmental Impact Statement for New York City's Solid Waste Management Plan. Waste prevention influences the composition and quantity of waste generated by New York and can determine, in large part, whether New York City's waste stream grows, levels off or declines over time. Whether the future waste stream will include fewer toxics and more reusable, durable and less-waste intensive elements can be specifically influenced by effective implementation of targeted waste prevention activities. Because of this interaction of factors, waste prevention is an essential component of New York City's solid waste planning activities. Pursuant to New York State solid waste management policy, it can account for an 8-10% reduction in the overall City waste stream.

WHAT IS WASTE PREVENTION: DEFINITION AND TERMINOLOGY

Minimization, prevention and source reduction of waste are all terms used, originally, with regard to hazardous waste where any means of decreasing its quantity or toxicity by generators provides immediate gains to human health and the environment. Reduction of municipal solid waste, the trash discarded by residences and businesses, avoids many of the growing problems associated with solid waste management: cost, cumbersome logistics and environmental impacts. Following the US Congress Office of Technology Assessment and the NYC Department of Sanitation Recycling Office's Policy Analysis Unit (US Congress, OTA 1989, Fernandez 1989), this report adopts the term *waste prevention* to describe activities that reduce the necessity for, or the toxicity or quantity of products and materials requiring management through the solid waste system. By contrast, recycling is a way to *utilize* existing waste once it has already been generated. While recycling diverts many items from disposal, recycling requires collection and processing activities and infrastructure. Waste prevention conserves resources that would otherwise be consumed through waste management activities or through production of new goods and materials.

WASTE PREVENTION STRATEGIES

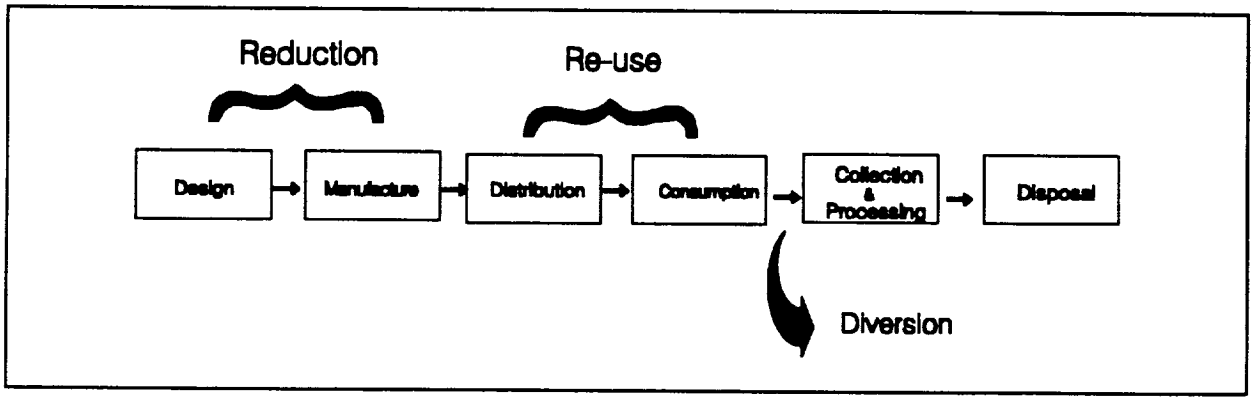
Waste prevention strategies fall into three broad sets of activities: reduction, re-use and diversion from the solid waste management system. Reduction of waste includes production and consumption of fewer products, products using lighter or less voluminous materials ("lightweighting"), and products that last longer because of greater durability or repairability. All categories of waste can be reduced: packages can be made with fewer layers or materials, goods can be made to last longer, and yard wastes can be produced in smaller quantities through strategies such as careful landscaping.

Re-use involves continued use of a material or good for substantially the same purpose. A familiar example of a re-usable good is the refillable bottle. Re-use also includes activities such as multiple use of shopping bags. The re-conditioning and repair of durable goods such as appliances for resale, known as re-manufacturing, is also a form of re-use. These labels are not rigid -- switching from disposables to durables is considered by some to be reduction and by others to be re-use.

Some practices which divert goods and materials from the solid waste management system are also considered to be waste prevention even though they may not change production and consumption patterns. Back yard composting of food and yard waste is a form of waste prevention because the wastes never enter the collection and disposal system. Where beverage deposit legislation is in effect, most beer and soda containers are diverted from the waste management system back into the commercial distribution system. Figure 1 illustrates the relationship of the product life cycle to reduction, re-use and diversion from the solid waste management system, showing that the three types of waste prevention activities occur at different points in the life cycle.

FIGURE 1

Waste Prevention and the Product Life Cycle



The goal of these waste prevention strategies is to create an overall, that is, net reduction in waste. Strategies must be examined closely to ensure that they are not merely creating shifts from one material to another and that other environmental goals are met. Some types of packaging, for example, are desirable not from a waste management perspective, but when considering total impacts on human health and the environment including packaging to maintain tamper proofing, to retard food spoilage, or to protect the sterility of medical supplies.

THE SOLID WASTE MANAGEMENT HIERARCHY

New York State has adopted a solid waste management hierarchy which ranks waste prevention above recycling, combustion and landfilling. The State Solid Waste Management Act (Chapter 70 of the Laws of 1988) requires each locality to develop a long term, comprehensive plan for managing its wastes in accordance with the State's hierarchy. The State solid waste management policy requires each locality in the state to take every reasonable step to reduce its waste by 8-10% through waste prevention activities by 1998.

Even though waste prevention has achieved this priority in solid waste policy not only in New York, but nationally in EPA policy and in most states throughout the country, implementation has not been undertaken on a large scale. As efforts to implement waste prevention proceed, a central irony emerges. Because waste prevention occurs prior to the waste management system -- in the design, production and use of goods and materials -- waste prevention is not necessarily a task that can be substantially achieved by those assigned to manage municipal solid waste (Schall and Wirka 1990). Because changing waste behavior equates to changing the basic production and consumption patterns in New York City and the US and even internationally, the endeavor of waste prevention greatly expands the list of those concerned with garbage from those traditionally involved with waste management to include industrial planners, product designers, trade officials, marketers and investment managers.

This thinking has, in large measure, shaped the substance of the Waste Prevention Report. The logic of pursuing waste prevention is irrefutable in a City where the cost of collection and disposal is so high and environmental quality so fragile. But because waste prevention goes well beyond the bounds of conventional solid waste management, this report not only suggests new approaches to waste management but also focuses on fundamental structural changes needed throughout the City and in the private sector to make waste prevention work. Ultimately, this report recommends substantial efforts to rework traditional systems and approaches and new legislative initiatives to provide incentives and opportunities to encourage waste prevention activities in the public and private sectors.

ORGANIZATION OF THE REPORT

In order to assess the potential of waste prevention in NYC both structural and programmatic issues must be addressed. It is likely that the success or failure of some waste prevention programs will be less dependent on the actual program implementation than on the underlying structural issues that affect solid waste systems. Intertwined with each issue are social, economic and institutional forces that shape and constrain the outcomes of any waste prevention efforts undertaken by the City. Therefore, Section 2 of the report, Structural Issues, begins with a brief discussion of generic issues in waste prevention that present obstacles to all communities that attempt to reduce their waste. That discussion is followed by an analysis of issues and obstacles that are either particular to NYC or are broader issues that New York City is in a position to address because of its size and stature.

Section 3 focuses on the particulars of reducing NYC's waste stream -- on the quantity and composition of waste that might be reduced in the residential, commercial and institutional waste streams. We begin by identifying waste stream components and targets of opportunity by sector (i.e., residential, commercial and institutional) and sub-sector (e.g., restaurants, hotels, offices). In discussion first at the sector level and then at the materials level, strategies are identified that address a substantial portion of the waste stream and for which there is the potential to implement appropriate and effective programs. Ideally, each strategy would be coupled with estimates of its potential savings; however, municipal waste prevention programs are in their infancy and virtually no data exist on which to make such estimates. Therefore, illustrative examples are offered based on serviceable assumptions and the limited data available.

Section 4 outlines available public policy tools and then offers policy recommendations. Suggestions for an ongoing research and development agenda are also proposed recognizing the City's limited resources.

Part II

STRUCTURAL ISSUES IN WASTE PREVENTION

There are a number of generic issues that have come to be associated with the difficulty of implementing waste prevention. These issues are reviewed briefly in this section, along with generalized approaches that can be used to address them. The remainder of this section takes a more in depth look at the structural issues that will affect New York City most greatly, and discusses ways they can be approached over time.

NATIONAL ISSUES AND APPROACHES

The following identify a number of issues that are often portrayed as barriers to waste prevention:

The United States is oriented toward growth and convenience - the notion that reduction is inconsistent with a consumption-oriented economy, where disposability and convenience are seen as spurring economic growth.

Packaging serves many purposes - what may be perceived as excess or non-recyclable packaging meets other purposes such as health and safety (e.g. single-use disposable syringes, or tamper-proof drug packaging) or theft prevention (e.g. oversized packages when purchasing cassettes or compact disks).

Interference with interstate commerce is constitutionally limited - restrictions on products and packaging in one state may provoke trade policy disputes and conflict with legal protections for interstate commerce. City or county level initiatives can also generate local and regional trade conflict.

Many environmental considerations must be weighed simultaneously - when products are examined and considered for reduction, there is no assurance that substitutes are less wasteful, less polluting, or less resource intensive.

Consumer choice is paramount - the notion that freedom to market and consume are unlimited rights in the US and that actions by manufacturers to make a product or package more appealing are part of the consumer choice process.

POLICY APPROACHES

There are several different types of approaches that can be taken to address the issues above ranging from those employing command-and-control regulatory tools to those using market forces. There is some overlap in the categories and more than one approach may be needed to address the issues cited.

Educational/outreach - Targeted public education and outreach have been shown to be a potent weapon in other public policy arenas such as with smoking. Environmental consciousness has significantly increased in the past several years and has consumers asking "what can I do?" Opportunities for waste prevention can be advanced through

appropriately targeted education and public outreach. The City has already embarked on such a campaign with its recent publication of the *Waste Reduction Handbook* (see appendix 1) and its subway poster campaign for recycling and waste reduction.

Institutional/administrative - Within a given organizational structure, actions can be taken to respond to calls for waste prevention by establishing internal administrative procedures, sponsoring programs or creating opportunities for volunteerism.

Legislative/regulatory - Laws and rules at the local, state and federal levels influence public policy toward waste prevention in a range of ways from creating programs to establishing economic incentives to outright bans of products.

Technological innovation - The answer to overcoming an obstacle to waste prevention may come from improvements in technology that can provide a new type of packaging or material, a new way to convey a good or service that eliminates material transactions such as through computers, or by rethinking traditional activities.

Entrepreneurial/business enterprise - By offering goods or services that also advance the goals of waste prevention, businesses can pursue market opportunities that coincide with policies of waste prevention.

The matrix below matches issues and approaches, illustrating that multiple strategies are needed to incorporate waste prevention as an accepted part of consumer and producer behavior.

FIGURE 2

Waste Prevention: National Issue and Approaches

	American Economy is Oriented Toward Growth and Convenience	Packaging Serves Many Purposes	Interference with Interstate Commerce is Constitutionally Limited	Many Environmental Considerations Must Be Weighed Simultaneously	Consumer Choice is Paramount
Educational/ Outreach					Educate consumers to place waste prevention concerns high on list of decisionmaking priorities
Institutional/ Administrative				Provide flexibility in administrative procedures to account for changes in technology and organizational needs	
Legislative/ Regulatory		Can mandate stores to provide incentives for packaging reduction	Investigate national initiatives to standardize waste prevention practices	Approach legislation in a comprehensive manner to consider full range of environmental impacts	Influence marketing and consumption through incentives and legal requirements
Technological Innovation	New products can gain market share by displacing wasteful products	Need for systems that provide safety, tamper and theft resistance, while meeting waste reduction goals			
Entrepreneurial/ Business Enterprise	New environmental ethic provides business opportunities				New environmental ethic provides market advantage for "green" products

STRUCTURAL ISSUES FACING NEW YORK CITY

There are several structural issues that incorporate many of the concepts discussed above, but are of greater direct concern to New York City. The following list speaks to issues that either (1) critically constrain the policy and program options New York City faces or (2) significantly shape waste prevention efforts owing to New York's size, stature or influence in the market:

- Charging residential and institutional waste generators proportionately and fairly.
- Capturing savings from avoided collection and disposal in the commercial sector.
- Integrating waste prevention into management decisionmaking.
- Ensuring that waste prevention induces beneficial substitution.
- Providing incentives to manufacturers to incorporate waste prevention in design and production.
- Altering marketing and distribution patterns in favor of waste prevention.
- Integrating waste prevention with collection, processing and disposal practices.

Without change with regard to these structural issues, the effectiveness of waste prevention programs as described in Section 3 will be severely limited.

Charging Residential and Institutional Waste Generators Proportionately and Fairly

Waste collection and disposal is a service delivered by the NYC DOS to the residential and not-for-profit institutional sectors. It is supported by the tax dollars paid into New York City's general fund by residents and commercial businesses. There are no specific charges assessed to those who receive the service, consequently, there is no specific financial incentive at the individual residence or institutional level to reduce the amount of solid waste produced.

With regard to the residential sector, the City of Seattle has shown that assessing a user fee based on the quantity of trash generated per household can be a very effective means of raising consciousness about the amount of trash generated and, coupled with a comprehensive recycling program, leads to significant reductions in waste requiring disposal. Although the data do not distinguish between recycling and reduction, Seattle, experienced a 25% drop in residential waste discarded in the period 1980-1989. Seattle has had a user fee in effect since 1961, but quantity-based rates were not introduced until 1980 (US EPA 1990a).

Similar programs in smaller cities and towns have had comparable or even better results. For example, Perkasie, Pennsylvania experienced an 18% drop in waste generation and Illion, New York saw a 29% decrease after the establishment of quantity-based user fees (QBUFs). Preliminary research suggests that for every 10% increase in the price charged for waste services, there is a 1-2% decrease in waste generation (RTI 1990). Advantages of QBUFs or "pay-as-you-throw" systems include:

- Financial incentives to produce less waste overall.
- Financial incentives to participate in less costly City and private recycling programs as a way to reduce disposal costs.[1]
- Fairness -- residents and institutions that discard less waste through reduction and recycling are rewarded with lower costs.
- Choice -- generators that find reduction and recycling to be difficult, inconvenient or uneconomical can, in effect, choose to pay more.

In many cities in the US, residents of large multi-tenant buildings, businesses and institutions are part of a *de facto* QBUF system because they receive collection and disposal services from private carters who charge according to the amount of waste requiring disposal. New York provides public collection services to a significantly wider set of "customers" than do most other major cities, including all apartment buildings and all nonprofit organizations in tax exempt buildings. In Los Angeles and Chicago, city-provided collection is not offered to residents in buildings incorporating more than four residential units. In Houston, eight units is the cut-off. Few cities provide trash services to nonprofit institutions the scale of Columbia University or Mt. Sinai Hospital as NYC does. While NYC's program provides equity in that all residences receive service -- there is no distinction, as noted above, based on the number of units, -- the fact that service is free eliminates financial incentives to reduce waste.

In cities where QBUFs have been initiated, implementation has been most successful in areas of single-family homes. Implementation of QBUFs in large, multi-family structures has proven to be much more difficult, because, as with curbside recycling, tracking compliance at the individual residence level is a complex undertaking. Thus, the number of multi-tenant buildings in New York creates a major obstacle for the City. While the owners of multi-tenant buildings in other cities already pay collection fees to private sector companies, NYC would have to implement user fees from scratch for all residences to employ such a program. Means to address residential sector implementation and the concept of landlord-tenant user fees are discussed in Part III.

It is important to note that QBUFs must be coupled with means for waste generators to reduce their trash, either thorough purchasing decisions, recycling or composting. In the absence of such constructive ways to minimize charges from users and if enforcement is not vigorous, illegal dumping will increase.

With regard to institutional generators, there is precedent for implementing charges. In December 1985, the New York City Board of Estimate approved volume-based rates for

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[1]User fee systems can be further refined to provide incentives for large generators to engage in higher degrees of source separation, as well as waste reduction. The financial incentives could come in the form of discounts provided for enhanced segregation of targeted wastes.

hospitals occupying buildings that are exempt from NYC real estate taxes and the Department of Sanitation has since established similar fees for non-profit nursing homes occupying such buildings. Given adequate planning, service fees for additional tax-exempt institutional generators could be phased in. A QBUF system for municipally generated waste would also provide incentives for City agencies to pursue waste prevention activities.

Capturing Savings from Avoided Collection and Disposal in the Commercial Sector

There are several reasons why businesses can be motivated to engage in waste prevention including civic considerations, environmental concerns, and desires to foster good relations with customers, the community and employees. Waste prevention will be more successful and more enduring, however, if such concerns are bolstered by financial incentives. The financial incentives that prompt businesses to pursue waste prevention fall into two categories: savings on the purchase and use of materials -- "front end" savings -- and reduction in the cost of trash collection and disposal -- "back end" savings. Frequently, it is only the combination of the front and back end savings that make investments in waste prevention cost effective.

Commercial collection service in New York City is provided by private carters. Increasingly, carters are finding it desirable to offer recycling services. However, waste prevention and recycling differ importantly in the incentives they provide for cooperation between generators and carters. With regard to recycling, carters, who face high tipping fees at the Fresh Kills landfill or other disposal facilities, have an incentive to remove recyclable materials from the trash that they collect. Carters can pass on a portion of the disposal savings to their customers as an incentive to the customer to facilitate source separation and recycling. Collection still must take place and carters are able to charge for the provision of carting services. In this situation, the incentives for recycling are conducive to cooperation between waste generators and carters.

Generally speaking, waste prevention, unlike recycling, is not in the financial interest of the private carting industry. If the savings occur because less trash is discarded in the first place -- and therefore neither collection nor disposal is required for the "prevented" waste -- then the carter has little financial stake in promoting waste prevention. In such cases, carters will simply be losing business as the need for collection services declines.[2] Generators capture the savings from waste prevention by seeking service reductions such as fewer collections per week or smaller size dumpsters (and therefore cost reductions) from their carters. If the carter does not oblige, the generator seeks another carter who will provide reduced service and therefore a lower fee.

Businesses in New York City face a particular problem in capturing the avoided costs of collection and disposal, because the carting industry is not fully competitive. Private carting in New York City is unofficially organized according to a customer allocation or property rights system. In this system, the right to service customers, i.e., businesses

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[2]The economics of collection are not linear, that is, decreases in the quantity of trash requiring disposal do not translate directly into decreases in the need for carting services or directly into cost savings for carters. If the carter could capture savings from reduced disposal without losing collection revenues, then carters and generators would share an economic interest in waste reduction.

requiring collection and disposal of trash, are bought and sold as property by private carting firms. The property rights system works because potentially competing carters do not solicit business or respond to requests for service from customers that they do not "control." Numerous studies and investigations have examined the role played by the customer allocation system in facilitating the operation of a carting cartel (NYC Department of Consumer Affairs 1990; Reuter, Rubinstein and Wynn 1982; Reuter 1987; Hinchey 1986). Without the threat that a competing carter will provide lower priced service and despite volume-based regulation of carting rates by the City's Department of Consumer Affairs, a carter serving a business that generates less trash by practicing waste prevention has no incentive to reduce prices and thus the business gets no financial incentive to continue waste prevention efforts.

Establishing competition in the private carting industry is a complex task. The New York City Department of Consumer Affairs currently regulates carting rates on a volume basis. While substantial efforts to promote a more competitive industry have been made several times in the past three decades, the need to promote waste prevention and recycling in the commercial sector gives new impetus to this concern. Several governmental efforts to increase competition are currently underway including efforts by the US Justice Department to stimulate the entry of national waste firms into the New York City market (Gold 1991). In addition, the recently established mandatory recycling requirements for New York City businesses will make rate issues more salient because businesses that are effective in recycling will have less trash requiring disposal.

Integrating Waste Prevention into Management Decisionmaking

Much of waste prevention concerns changing purchases and practices, especially substituting the use of re-usable goods for disposables. While some waste prevention strategies are well known and publicized -- double-sided photocopying or the use of mugs in place of disposable paper or plastic coffee cups -- other strategies are specific to organizations or buildings. For example, in a pilot study of waste prevention strategies in Itasca County, Minnesota, it was found that significant amounts of waste could be prevented by switching from disposable air filters to re-usable filters in the county garage ventilation system (Lauer and Miller 1990). Knowledge of this type of waste prevention opportunity comes from intimate familiarity with the operation of a specific facility.

To realize such opportunities, the professionals responsible for the management of facilities must be given the motivation and opportunity to pursue waste prevention. This can be achieved by making those professionals accountable for waste collection and disposal costs. By including waste prevention in appropriate job descriptions and performance evaluations, waste prevention can be made part of ongoing work activities. In a related vein, waste prevention can be integrated into budgetary processes by making departments in governmental, commercial and nonprofit organizations accountable for waste generation costs. Such an approach involves implementation of an accounting system that would monitor all costs associated with disposable supplies, waste handling, collection and disposal allowing the relevant management to evaluate tradeoffs between waste management impacts and personnel and related costs (Waste-Tech 1990).

As is discussed below in the section on substitution, waste prevention activities can lead to greater generation of waste or environmental degradation if not carefully thought out.

Decentralized responsibility for waste prevention can allow on-site managers to choose which ways of preventing waste make sense -- because they understand the costs and drawbacks of the alternatives. For example, not all shifts away from disposable goods will be cost effective. Where personnel costs or logistical demands are significant, the decision to adopt reusable materials must balance waste management concerns against other costs. Decentralizing waste prevention activities: 1) promotes the flow of information about waste prevention activities from the "ground up," 2) improves the chances that waste prevention strategies will in fact be implemented, and 3) lessens the possibilities of counterproductive practices.

Making employees accountable for waste prevention entails the development of accounting systems that can track the relevant costs, and the development of performance and budgeting systems that will integrate those costs into management decisionmaking. Within the City government, that inclusion would involve coordination with the City's Department of Personnel, the Department of General Services and any other agency involved in the management of facilities and purchasing. In the commercial and nonprofit sectors, these changes could be stimulated by increasing disposal costs and by providing the opportunity for organizations to save on those costs through waste prevention. The City can facilitate the integration of waste prevention considerations into management decisionmaking by providing model systems and guidance.

Ensuring That Waste Prevention Induces Beneficial Substitution

Reduction in the discard of a particular material or item is likely to force the use of a substitute resource. That resource is typically another material as when a durable is used in place of a disposable, but the resource can also be water, air, energy or time. The willingness of a waste generator to invest in the use of that substitute is a function of the cost of the substitute, the legal and economic pressure to reduce the generation of the waste in question, and the likelihood that the generator will have the opportunity to recoup any investments in waste prevention.

Substitution can be beneficial or deleterious. Clearly the City's aim is to promote the former and to minimize the potentially perverse effects of waste prevention policies -- where waste prevention efforts bring about increased rather than decreased solid waste management or environmental burdens. One example is the substitution of bulky, nonrecyclable paper for plastics in the absence of a composting infrastructure.

Deleterious substitution occurs when waste prevention policies are too narrowly targeted. Even if a specific material or good is prohibited, there may still be no requirement to use a material (or engage in a practice) that is relatively less burdensome to the solid waste management system. For example, banning foam polystyrene without specifying an environmentally preferable substitute can be an empty gesture. This is mostly a matter of avoiding loopholes in waste prevention policy.

By crafting policies that extend waste prevention across the entirety of the waste stream, the City can promote more advantageous substitution. Policies such as advance disposal fees and quantity-based user fees (QBUFs), because of their broad scope, tend not to prompt waste generators simply to substitute one waste product for another. But even the most carefully crafted policy will have unintended or ambiguous effects. QBUFs may

engender increased use of film plastics and other flexible packaging which are both lighter and less voluminous than most rigid packaging materials, but, in part, because the recycling infrastructure is less developed for film plastics the change will be viewed by some members of the public as less environmentally friendly.

Some materials and goods may be so problematic for the solid waste management system that they deserve banning or some other policy that may directly induce substitution. Identifying such materials is difficult because of the choice of factors to evaluate. Life cycle assessments (LCAs) attempt to weigh the relative impacts of goods and materials on the environment from cradle to grave in order to determine whether a targeted material is more harmful than its likely substitute.

Ideally, LCAs have three components:

- life cycle inventory -- the resource requirements and environmental emissions are quantified at each stage of the material or product life cycle. For example, the pounds of various air pollutants emitted are estimated.

- life cycle impact analysis -- the impacts associated with the resource uses and environmental loadings enumerated in the inventory are evaluated, so that one ton of a more toxic pollutant is not equated with a ton of a lesser pollutant.

- improvement analysis -- processes or materials shown in the assessment to be problematic are pinpointed as targets for improvement. (SETAC 1991)

The problems with LCAs are legion. Should LCAs consider only waste impacts or cradle-to-grave impacts? Which sorts of environmental impacts are considered -- just health impacts and easily defined environmental degradation or a broader set of impacts such as habitat destruction? How are impacts compared and totaled? What about nonquantifiable impacts?

LCAs are the subject of intensive research and development (World Wildlife Fund and Conservation Foundation 1990, SETAC 1991). While New York cannot yet rely on any established methodology for the assessment of cradle-to-grave environmental costs, protocols may be developed and workable estimates of life cycle impacts of products and materials may become available in the next few years. By monitoring and supporting those efforts, New York can foster the development of methods and expertise that can minimize deleterious substitution and increase "net" reduction. In the short run, much can be accomplished and much harm can be averted if proposed waste prevention policies are scrutinized as to the types of substitution they are likely to engender in New York. In addition, some of the more obvious instances of problematic substitution can be avoided without the use of complex analytical models.

Providing Incentives to Manufacturers to Incorporate Waste Prevention in Design and Production

Successful waste prevention depends in part on the availability of goods and packages that are amenable to waste prevention efforts. Waste-preventive products fall into six broad categories:

- packages that minimize the weight, volume or toxicity of discards;
- packages that are re-usable rather than disposable;
- goods that are durable and repairable rather than disposable;
- durable goods with long rather than short product lives;
- goods that minimize the toxicity of discards; and
- goods or services that minimize or make unnecessary the use and discard of materials.

Currently, manufacturers do not face direct financial incentives to minimize the waste created when their products are discarded by consumers. The incentive structure is quite different in the industrial management of hazardous waste. Here, the high costs of disposal and liability for pollution from hazardous waste under federal law, the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA, PL-96-510) gives manufacturers very strong incentives to use recycling and new modes of production to reduce the wastes they produce, because they are directly responsible for both the costs of disposal of production wastes and the environmental hazards created by those wastes. In contrast, manufacturers do not face the same incentives to minimize the waste generated when consumers discard their products. Rather, it is households and businesses, often through their local governments, that must pay for collection and disposal of municipal solid waste (Lifset and Chertow 1990).

Public concern about the waste crisis has prompted some manufacturers to integrate waste prevention into their design and marketing decisionmaking. However, voluntary efforts do not produce universal responses on the part of industry. In order for the development of waste-preventive goods to spread to all manufacturing sectors, system-wide incentives need to be established. Further, without changes in those incentives, when the public's attention shifts away from solid waste issues, manufacturers will have no enduring motives to continue their efforts.

There is one area, lightweighting, in which the incentives for manufacturers for waste prevention already work well. Lightweighting is the production of packages or goods that use fewer and especially lighter raw materials. Making products lighter saves manufacturers money in two ways: less money is spent on raw materials and transportation costs are lower. Because these savings accrue directly to manufacturers, considerable progress has been made in lightweighting. For example, new blow molding technology for the production of high density polyethylene (HDPE) bottles has reduced their weight by 10% while increasing their strength (US Congress, OTA 1989).

Lightweighting reduces the quantity of materials destined for disposal without forcing dramatic changes in marketing or consumption patterns. Lightweighting, however, is not sufficient by itself to achieve waste prevention goals. Packaging shape and size play an important role in marketing and merchandising strategy often prompting manufacturers to increase rather than decrease the use of materials. More important, many of the gains in waste prevention that can be achieved through lightweighting alone have already been made.

Technological innovation is likely to have mixed impacts on waste prevention. New products and systems can obviate the need for entire classes of materials and consequently eliminate resulting waste. However, the most heralded of these changes -- office automation -- has to date increased paper waste rather than made it obsolete. Other changes in product technology have had a better effect on the waste stream. Miniaturization of electronic components has reduced the size of goods and appliances and therefore the quantity of the resulting waste. Rapid obsolescence of electronic products has, however, shortened product lives, sending materials to disposal more quickly.

Technological innovation has also had a mixed impact on repairability and recyclability of goods. The increasing complexity of products and the relatively lower cost of production versus service labor has made repair of goods and appliances uneconomic in many instances. On the other hand, the development of modular components for some types of electronic goods may help make some repair services more financially feasible. Technological innovation can also produce complex trade-offs between durability and recyclability. While steel belted radial tires last longer than the older bias ply tires, radials are less recyclable -- steel laced through the radial tires is not easily removed and inhibits both metal and rubber recycling.

A variety of policies can spur manufacturers to incorporate waste prevention into product design. These policies range from direct regulation of products to financial incentives to voluntary encouragement and can be aimed directly at the manufacturer, the consumer, or at intermediaries in the product life cycle such as distributors or retailers. These policies are presented in more detail in Section IV, Policy Tools and Recommendations and in Figure 5.

Altering Marketing and Distribution Patterns in Favor of Waste Prevention

The distribution and marketing of products and packaging present constraints and opportunities for waste prevention that are related to, but distinct from, those facing the design and manufacture of goods and materials. Existing shipping and retail practices as well as new systems that might be set up specifically to foster waste prevention can play a key role in determining the success of waste prevention efforts.

Several aspects of existing patterns of distribution and marketing constrain waste prevention. Efforts to foster the use of re-usable packaging in shipping is often limited by the inability to maintain possession or ownership of more expensive and more durable packages. That inability makes the investment in those types of packages more risky. If a business invests in a more durable and therefore more expensive wood pallet, for example, and fails to maintain possession of it for re-use, the investment is lost.

At the retail level, re-usable packages often require handling and storage space that is in short supply in many parts of New York. Similarly, beverage container deposit systems

("bottle bills") impose handling and storage costs that many merchants find onerous. Redemption activities have been found to cost retailers between 1.95¢ and 5.97¢ per container and force retailers to store large quantities of dirty bottles and cans which sometimes puts the retailer at risk of citations from the Department of Health for sanitary violations (Moreland Act Commission 1990).

Some waste prevention practices can capitalize on the needs of retailers. For example, reduction of shipping waste through practices such as shrink wrapping of pallets to minimize the use of cardboard reduces the amount of packaging waste that must be recycled or discarded and saves valuable retail storage space. As with lightweighting discussed above, existing market incentives are already encouraging these types of practices.

In some cases, the reduction of consumer product packaging can free up retail display space allowing merchants to display and sell more goods. Shelf space, however, is a competitive asset highly valued by marketers and subject to market pressures that vie strongly with waste prevention concerns that a retailer may have. Product manufacturers seek to have their goods displayed in a manner and in the particular parts of the retail store that will attract the most consumer attention and purchases. As a result, they design packaging in part to use shelf space to maximum advantage.

Retailers can also be an unwilling point of leverage for waste prevention. "Leave the packaging behind" initiatives in Minnesota and in Germany that require retailers to allow consumers to discard packaging at the point of purchase force retailers to communicate consumer antipathy toward excess packaging to manufacturers (Minnesota Governor's Select Committee 1990, Brandt 1990, McCarthy 1991b).

Waste prevention endeavors may entail the development of new distribution networks or practices. Most re-usable goods and packages require a reverse distribution system to return the used good to a business for refilling, repair, or some form of replenishment. Re-use endeavors thus present new business opportunities. Typically, re-use distribution networks and businesses are labor-intensive, that is, they substitute transportation and service labor for the use of materials. This form of capital-labor substitution tends also to keep economic resources within the community -- the service network is usually local; the disposable materials that have been replaced often are made elsewhere. For example, the Minnesota Public Interest Research Group (MPIRG) operates a waste exchange that facilitates the re-use of shipping and packing materials for small businesses. MPIRG collects discarded polystyrene foam peanuts and other materials and sells them to businesses that can re-use these materials. In this case, local labor -- providing the collection, distribution and communications activities -- replaces materials production outside of the locality.

These characteristics of re-use businesses have positive and negative implications for New York City. On the one hand, waste prevention can be a tool of economic development by fostering businesses that provide new local jobs. On the other, waste prevention endeavors that are transportation-intensive like the MPIRG program described above can run afoul of New York City's traffic congestion. Systems that minimize additional vehicle trips through better routing or backhauling are desirable. In such programs, travel by vehicles transporting re-used waste may eventually replace garbage truck trips.

Food retailers' concerns about handling returned "bottle bill" containers can also be addressed through the creation of new distribution networks. The efficacy of bottle bills in removing containers from the waste management system into the food distribution system is impressive: in much of New York State bottle bill returns average 90% (Moreland Act Commission 1990). By comparison, yields from curbside collection systems are more in the 50 - 70% range. For New York City, both systems operate less effectively: bottle bill returns are about 55% and curbside collection participation is approximately 30% (NYC DOS 1990). Given the high cost of expanding curbside collection in NYC, improving the bottle bill system warrants attention.

One impressive way this is being done in New York is through the "We Can" program which collected some 14 million containers last year, primarily from itinerant people in NYC, serving both litter clean-up as well as social service goals. "We Can," with support from NYC Department of Sanitation, operates as a redemption center, a place separate from food or beverage stores expressly set up to pay members of the public for collected containers and to see that they are properly handled so that they are not brought back to retailers for a second redemption. Supermarkets General, which operates the Pathmark grocery stores, donated two of the three sites from which We Can operates, highlighting this approach as an alternative distribution method. We Can is now expanding its program to Brooklyn and is investigating sites in the Bronx as well.

The private redemption center model has been widely used in the State of Maine to augment efforts by retailers to redeem beer and soda containers under that state's deposit law. In 1990, Maine voted to expand its deposit legislation on beer and soda bottles to wine, liquor and juice containers as well as other non-carbonated beverages such as water. With the expansion of the bottle bill and an increase from 2¢ to 3¢ in the container handling fee, the number of private redemption centers has risen from 150 to 200. Maine has achieved a 90% redemption rate. The redemption center model is one New York City could further develop for diversion of materials from the solid waste stream.

Integrating Waste Prevention with Collection, Processing and Disposal Practices

Underlying the solid waste management hierarchy adopted by New York is the awareness that generating less trash produces the lowest amount of environmental and economic costs and conserves the greatest amount of natural resources. The goal of waste prevention, however, is to minimize the *overall* environmental and economic costs of solid waste management. This necessitates integration of waste prevention strategies with other solid waste management goals and considerations. In some cases, this analysis confirms the wisdom of existing waste prevention strategies; in others, it adds a new factor for consideration.

As discussed to this point, furthering waste prevention has involved examining a list of options and targeting the ones that reduce the quantity and toxicity of the waste stream. Additionally, waste prevention can improve the efficacy of recycling, collection, processing, and disposal practices and should be examined in this light. For example, toxicity reduction improves the safety of disposal and may thus be a high priority option for NYC to implement, whereas a program to reduce cardboard packaging, an easily recyclable item with a collection infrastructure in place, may be a lower priority. The integrated approach offers an organizing structure from which priorities can be set.

Executing the integrated approach suggests evaluating waste prevention strategies through the filter of the following questions:

- Recycling - Does the proposed waste prevention program target materials which are easy to recycle? If so, would that alter the cost effectiveness of a selected recycling program? An example here is the impact of removing aluminum from the waste stream through container deposit legislation. Because aluminum is a high value item, its exclusion from recycling programs would reduce the value of material picked up in curbside recycling programs by as much as 50% (Chertow 1989). Delaware took the approach that as long as most of the aluminum was being recycled, aluminum beverage cans would be exempt from the statewide bottle bill and the revenues it generated could be used to enhance recycling programs. NYC would have to evaluate whether a given material were more beneficial in a waste prevention program or a recycling program.

- Collection - Does the proposed waste prevention program facilitate the collection system in some way? For example, the commingled collection of glass with other recyclable materials can result in the contamination of paper with glass fragments which reduces the value of the paper to recycling processors. A waste prevention program targeting glass could lessen this problem by reducing glass in the stream to be collected.

- Processing - Could the particular waste processing system the City has adopted benefit from proposed waste prevention programs? The City may choose to collect mixed paper and separate it into many grades. If no market could be found, for example, for clay-based glossy paper, a waste prevention program could target this material for substitution.

- Disposal -- Does the proposed waste prevention program assist in final disposal? Reduction of household hazardous wastes provides the clearest example of how waste prevention can create downstream benefits for safer disposal.

Thus, waste prevention, while preceding the waste management system, can be very valuable to that system in integrating New York City's solid waste management activities.

Part III

SECTOR- AND MATERIAL-BASED WASTE PREVENTION STRATEGIES

Strategies for waste prevention can vary in the range of targets to which they apply. Some strategies for waste prevention apply across sectors to multiple waste streams. For example, reduction of direct mail would reduce the waste paper discarded in the residential, commercial and institutional sectors. Other strategies such as environmental shopping focus on one particular waste stream -- trash from residences. Finally, some strategies target particular materials in a given waste stream as with reduction of shipping waste in the commercial sector.

The designation of a strategy as sector-based or material-based is flexible. For example, double-sided photocopying could be viewed as a sector-wide strategy for office waste in the commercial and institutional sectors or as a material-based strategy for the reduction of waste paper. The review of waste prevention strategies in this report begins with an analysis of sector-wide strategies and programs and then proceeds to the analysis of material-by-material approaches. While every portion of the waste stream could have been reviewed, the intent of the report was to focus on those components with the greatest potential for reduction. The order of the treatment of the strategies does not reflect their importance or feasibility. Included in the following sections are numerous suggestions mentioned briefly that arise in the context of the discussion. The major recommendations of the report are stated in Part IV, Policy Analysis and Recommendations.

WASTE PREVENTION AND THE COMPOSITION OF NEW YORK CITY'S WASTE.

For the purposes of waste prevention, the waste stream can be broken down into four categories used by the US EPA following US Department of Commerce definitions of product life and durability:

- *packaging and containers*, such as cardboard boxes, glass bottles or film plastic wrap;
- *semi-durables* which are goods with product lives of three years or less, such as some toys, clothing or small household furnishings;
- *durables* which are goods with product lives of more than three years such as furniture and appliances; and
- *organic wastes*[3] (US EPA 1990b).

[3]A small fraction of municipal solid waste (approximately 1% of New York City's waste stream) is composed of miscellaneous inorganics which do not fit into any of the four categories above.

TABLE 1

Products Discarded in the US Waste Stream

Product Category	Portion of Total Waste Stream
Packaging and Containers	27%
Semi-Durables	28%
Durables	15%
Organic Wastes	30%
Total	100%

Source: (US EPA 1990b)

No analogous data exist for New York City's waste streams. It is likely that the composition of organic wastes differs substantially from national averages because of the dearth of yard wastes and the relatively high proportion of food wastes in New York.

Use of these categories allows discussion of waste prevention opportunities, problems and strategies with more precision than a simple material-based categorization permits. For example, semi-durables are important in any analysis of waste prevention because it is in this category of goods that disposable products are rapidly being substituted for re-usable ones. The use of disposable diapers in place of re-usable cloth diapers, for example, occurs within the category of semi-durable goods. This trend is thought to be one of the sources of the growth in the *per capita* rate of solid waste generation in the U.S.

Most waste characterization studies including the extensive study performed by SCS Engineers for New York City do not categorize waste according to these categories. One reason is that waste characterization has historically been performed in the service of recycling and combustion planning (Clarke 1990). Thus, for example, there is considerable information about the type of plastic resin in the waste stream which is relevant when determining combustion characteristics of the waste stream or recycling collection and processing strategies, but there is much less information about the type of goods made from those resins in the waste stream. Because, for example, within the category of high density polyethylene (HDPE), a good could be either disposable (e.g., milk jugs) or durable (e.g., a plastic trash can), this type of categorization does not precisely serve the purposes of waste prevention.

The data provided by New York City for this analysis are presented in sector-by-material matrix form, with "sectors" running along the horizontal axis, and individual waste categories along the vertical. There are three broad sectors: Residential, Commercial, and Institutional. The waste categories are broken into general types of material such as Paper, Plastics, and Organics, and further into specific materials within these groups. Table 2 summarizes the composition of the City's waste by sector and material.

TABLE 2

New York City Waste Composition - Summary

MATERIAL	Residential (Tons)	Sector (%)	Institutional (Tons)	Sector (%)	Commercial (Tons)	Sector (%)	Total (Tons)
Paper	1,074,100	31.2%	523,400	61.6%	1,732,200	50.8%	3,329,700
Plastics	302,900	8.8%	60,300	7.1%	273,100	8.0%	636,300
Organics	1,324,200	38.5%	186,700	22.0%	1,130,800	33.2%	2,641,700
Glass	164,200	4.8%	20,800	2.4%	133,400	3.9%	318,400
Aluminum	31,700	0.9%	7,600	0.9%	19,400	0.6%	58,700
Other Metal	128,400	3.7%	24,100	2.8%	108,700	3.2%	261,200
Inorganics	67,500	2.0%	11,400	1.3%	1,600	0.0%	80,500
Hazardous	12,300	0.4%	2,800	0.3%	7,400	0.2%	22,500
Bulk	332,000	9.7%	12,100	1.4%	0	0.0%	344,100
TOTAL	3,437,300	100%	849,200	100%	3,406,600	100%	7,693,100

Using these data, estimates are made of how the State mandated 8-10% reduction could be achieved. Two sources of reduction were estimated: reductions arising from strategies applied generically across multiple sectors or materials and those arising from specific programmatic targeting of materials. The generic strategies include 1) establishment of charges for waste services based on the quantity of waste generated; 2) implementation of the Coalition of Northeast Governors' Source Reduction Task Force (CONEG SRTF) Preferred Packaging Guidelines and related packaging initiatives (see page 31); and 3) enactment of advance disposal fees (ADFs) or similar waste taxes (see page 48).

Numerous specific targets for reduction were also identified. These targets were chosen using several criteria. Some materials were chosen as targets simply because they represented a large fraction of the total waste stream. Others were targeted because the measures needed to reduce them are simple and cost effective, even if they do not represent large percentages of the waste stream. The following chart summarizes the estimated reduction of 8.1% arising from these multiple strategies and programs. It is important to recognize the speculative character of these estimates. Appendix 3 details the assumptions and calculations used to derive these estimates.

TABLE 3

Potential for Waste Prevention

Material (2)	Total Tonnage (1990)	Tons Reduced			% Reduction		Material-Specific Approaches
		Resid'l Sector	Inst'l Sector	Comm'l Sector	of Waste Material	Tot. Waste Stream (4)	
PAPER 3,329,715	(1)				12.7%	5.5%	
Corrugated/Kraft	888,405	9,039	14,817	110,602	15.1%	1.75%	Change in packaging practices
Newsprint	598,551	15,313	5,248	9,367	5.0%	0.39%	
Office/Computer	444,307	977	15,194	60,774	17.3%	1.00%	2x copying & related practices
Magazines/Glossy	133,731	10,827	1,525	3,362	11.8%	0.20%	Dir. mail reduction; incr. flexible pkg.
Books/Phonebooks	61,797	4,444	500	0	8.0%	0.06%	
Non-Corr. Cardboard	99,106	4,209	2,238	0	6.5%	0.08%	
Mixed Paper	1,103,821	44,803	31,686	79,093	14.1%	2.02%	Direct mail reduction
PLASTICS 636,372					-2.7%	-0.22%	
Clear HDPE	45,868	1,195	70	1,029	5.0%	0.03%	
Colored HDPE	49,630	1,234	64	1,183	5.0%	0.03%	
LDPE	5,943	281	17	0	5.0%	0.00%	
Films & Bags	278,633	-11,836	-5,289	-17,908	-12.6%	-0.46%	Incr. :shifts to flexible packaging
Green PET	10,121	237	14	255	5.0%	0.01%	
Clear PET	37,829	988	49	855	5.0%	0.02%	
PVC	9,648	466	17	0	5.0%	0.01%	
Polypropylene	7,798	365	25	0	5.0%	0.01%	
Polystyrene	28,799	1,016	424	0	5.0%	0.02%	
Miscellaneous	162,103	1,969	846	5,290	5.0%	0.11%	
ORGANICS 2,641,717					5.0%	1.73%	
Grass	207,409	39,869	7,759	0	23.0%	0.62%	Bkyd composting, "Leave on lawn"
Brush/Stumps	138,887	745	626	2,483	2.8%	0.05%	
Lumber	74,616	2,073	165	0	3.0%	0.03%	
Textiles	418,400	4,590	419	7,543	3.0%	0.16%	
Rubber	66,526	1,957	39	0	3.0%	0.03%	
Fines	211,153	2,263	274	3,798	3.0%	0.08%	
Diapers	126,431	9,432	1,392	0	8.6%	0.14%	Switch to reusables
Food Waste	822,123	16,875	1,518	11,933	3.7%	0.39%	Backyard composting
Miscellaneous	576,172	7,617	755	8,913	3.0%	0.22%	
GLASS 318,443					9.3%	0.39%	
Clear Glass	102,889	14,163	1,270	0	15.0%	0.20%	Extend deposits
Green Glass	36,206	5,121	310	0	15.0%	0.07%	
Brown Glass	28,988	4,164	184	0	15.0%	0.06%	
Miscellaneous Glass	150,360	236	273	4,002	3.0%	0.06%	
ALUMINUM 58,620					1.4%	0.01%	
Food Containers/Foil	19,260	0	0	0	0.0%	0.00%	Incr. :shifts to flexible packaging
Beverage Cans	12,154	0	0	0	0.0%	0.00%	
Miscellaneous Alum	27,206	126	109	581	3.0%	0.01%	
METAL 261,237					3.5%	0.12%	
Food Containers	70,816	3,183	358	0	5.0%	0.05%	
Other	189,773	1,924	508	3,261	3.0%	0.07%	
Bi-Metal Cans	648	30	2	0	5.0%	0.00%	
INORGANICS 80,382					3.0%	0.03%	
Ceramics	5,089	143	9	0	3.0%	0.00%	
Miscellaneous	75,293	1,881	331	47	3.0%	0.03%	
HAZARDOUS 22,566	22,566	617	84	223	4.1%	0.01%	Battery & med. waste programs
BULK 115,176	344,053	36,520	1,326	0	11.0%	0.49%	Expand self-help,re-use programs
TOTAL (tons)	7,693,108	239,053	85,166	296,686		8.07%	
% Red'n of Sector Waste Stream:		6.95%	10.03%	8.71%			

Notes:

(1) Figures may not sum due to rounding.

(2) Materials categories are taken from NYC DOS waste characterization study performed by SCS Engineers.

(3) While overall toxicity is likely to decrease, quantities will be reduced less.

(4) Reduction is estimated to arise from 3 broad-based strategies: advance disposal fees, packaging reform, and quantity-based user fees (QBUFs). Some materials will be additionally reduced through specific programmatic efforts as noted in the final column.

Cost data for nearly all the waste prevention strategies discussed in this report do not exist because many of the programs described have not yet been implemented or tracking and measurement systems have not been developed. In two areas, however, estimates of the financial impact of waste prevention have been prepared for the City.

The New York City Medical Waste Management Report, prepared for the City Health and Hospitals Corporation, estimated the costs and savings that might accrue from a variety of waste prevention endeavors (Waste-Tech 1990). For example, the study found that replacement of paper towels by air dryers could reduce waste generation by nearly 100 tons/year with a capital investment of $35,000, annual operating costs of $2,900 and operating savings of $47,900 for an annual operating savings of $45,000 per year. Replacement of food service disposables with re-usable tableware could reduce waste generation by almost 200 tons/year with a capital investment of $300,000, an operating cost of $270,000 and operating savings of $740,000 for a net annual operating saving of about $470,000 per year. The combined effects of waste prevention techniques were estimated to reduce the medical waste stream by approximately 13%.

Unfortunately, these figures are highly site specific and are not especially conducive to generalization, because, among other factors, medical waste management costs differ from those of conventional waste management. Excerpts from the report can be found in Appendix 2.

Estimates of the cost of the City's backyard composting program were based on the City of Seattle's efforts in this area. Capital and operating costs for bins, bin delivery, training and publicity, staff costs and data collection and analysis were $564,000 for 1990 or $52.22 per household. Amortized over a twenty year period the cost per household in 1990 dollars is $5.32 for Seattle.

Because of the absence of comprehensive cost data, an alternative means for estimating the value of waste prevention was used. Scenarios were evaluated using WastePlan, the computer model used by the NYC Department of Sanitation in its preparation of the General Environmental Impact Statement and Solid Waste Management Plan.[4] Two sets of scenarios were modeled: 1) the New York City solid waste management system in the year 2000 with a reduction in solid waste due to waste prevention activities and 2) the solid waste management system in the absence of waste prevention efforts. By comparing the net systems costs for the two sets of scenarios, an upper bound for the value of waste prevention can be calculated, that is, the cost per ton above which waste prevention is too expensive. Table 4 summarizes the collection and facilities (processing and disposal) costs and impacts with and without waste prevention. In the analysis of the "no waste prevention" scenario, the waste added back from the

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[4]The scenario analysis presented here is a summary of extensive modeling done by the Tellus Institute for the NYC Department of Sanitation. A fuller treatment of the findings and implications of these scenario calculations and a description of the WastePlan model can be found in the main body of the General Environmental Impact Statement (GEIS). The summary presented here is best understood in the context of the overall modeling and planning effort described in the GEIS.

prevention scenario was apportioned to the collection, processing and disposal options in the same ratio as the overall waste stream.[5] For example, in both scenarios, 56% of the clear glass was collected in the recycling program and handled by the material recovery facilities (MRFs), 34% went to the waste-to-energy facilities and 10% to the landfill, although there were more total tons for recycling when waste prevention programs were excluded.

TABLE 4

NYC Waste Management Costs and Impacts With and Without Waste Prevention
Year 2000

	With Waste Prevention				Without Waste Prevention			
	%	Tons	$ (MM)	$/Ton	%	Tons	$ (MM)	$/Ton
Prevention	7.3%	607,024	$12	$20	0.0%	0	$0	$0
Source Separated Coll'n	35.9%	2,991,018	$348	$116	39.0%	3,255,060	$370	$114
Final (Mixed) Coll'n	56.9%	4,740,569	$453	$95	61.0%	5,083,551	$472	$93
Recycling	31.6%	2,636,060	$246	$93	34.0%	2,832,689	$255	$90
Composting	6.5%	543,565	$33	$61	6.8%	564,001	$33	$59
Transfer		1,473,350	$41	$28		1,615,447	$43	$26
Incineration	42.3%	3,525,747	$403	$114	45.2%	3,771,325	$448	$119
Landfilling (1)	12.3%	1,023,651	$156	$152	14.0%	1,167,822	$157	$134
Ash (2)	6.2%	513,780		$0	6.7%	555,275		$0
Total (3), (4)	100.0%	8,338,607	$1,692	$203	100.0%	8,338,607	$1,778	$213

(1) Landfilling includes tons exported in the no prevention scenario.
(2) Ash costs included in incineration costs.
(3) Totals do not include ash or transfer station costs.
(4) Totals may not sum due to rounding.

According to the WastePlan calculations, the prevention programs save the City $710 million over the 20 year planning life cycle of the waste management system by avoiding the collection, processing and disposal of nearly 10 million tons of waste. Each ton of prevented waste saves the City $71.14 in net present value terms (that is, after adjusting for interest rates and inflation). The prevention scenario used here was prepared using a $2/household public education cost and approximately $18/household cost for backyard composting for a total of $20.08/ton -- these costs were explicitly considered to be only a part of the cost of the waste prevention program. The $71.14/ton indicates in net present value terms how much more NYC could spend on prevention and still save money.

[5]The total reduction of approximately 8.1% identified in Table 3 differs somewhat from the figure used in scenario analysis generated using the City's WastePlan model because of minor differences in waste stream composition estimates.

The potential savings can also be expressed in terms of the costs and tonnages in the year 2000. In that year, the prevention program saves approximately $143/ton, which, according to Table 4, is the difference in total cost between the scenario with waste prevention and without waste prevention ($87 million) divided by the total amount of waste prevented (607,024 tons). At the end of this decade, therefore, NYC could spend as much as $143/ton on waste prevention and it would be less expensive than buying and operating the fleet of collection trucks and processing and disposal facilities to manage the prevented tons.

RESIDENTIAL WASTE PREVENTION

Quantity-based User Fees in the Residential Sector

As discussed in Section 2, Structural Issues, quantity-based user fees (QBUFs) are an important component of any waste prevention program but implementation of a QBUF system faces difficult hurdles in New York City because of the large number of multi-tenant dwellings. In spite of this problem, QBUFs, sometimes called "pay-as-you-throw" systems, can still be implemented on a partial basis, providing at least some stimulus to household waste prevention. Two strategies can be employed to implement QBUFs:

1) QBUFs can be established in areas of New York with a preponderance of single family dwellings while systems are developed for the application of user fee systems to apartment buildings.

2) Experimental systems can be tested in apartment buildings.

District Level Implementation. In the low density neighborhoods of New York, QBUFs could be implemented without waiting for the resolution of the "apartment building problem." The success of this approach would depend on several administrative factors. First, such neighborhoods would have to match DOS routes and solid waste districts (or the routes and districts would have to be adapted to fit with these neighborhoods). In order for a QBUF system to be fair and to stand up to political and legal scrutiny, the costs of solid waste management that were charged back to residents would have to be identifiable as arising from service to those same residents.

Second, a rebate system would have to be established so that residents paying for waste services through pay-as-you-throw would not pay again through their City taxes. This could be done by calculating an average cost of service and providing those participating in the pay-as-you-throw system with a rebate of either property or income taxes. Minimization of administrative complexity would be important to the success of this approach. Equally critical would be effective public outreach to explain that pay-as-you-throw system participants were not being forced to pay twice.

Systems for Apartment Buildings. QBUFs could be implemented by imposing the primary responsibility on landlords, on tenants or on both.

QBUFs could be imposed on landlords in a manner very similar to conventional volume-based carting rates: building owners would pay by the cubic yard, by the bin size

or some other related approach. The landlord would then have an incentive to exhort her tenants to reduce and recycle. In practical terms, this approach would probably result in increased efforts by landlords to promote tenant participation in DOS recycling programs (assuming that recycling services were free). Landlords are less likely to find waste prevention as tangible as recycling and thus would probably be inclined to devote less effort to it.

A key problem with this approach is the tendency for landlords to simply pass the cost of the new charges on to tenants without attempting to reduce the quantity of waste disposed. This is often the response of landlords to increases in electricity charges in commercial buildings. Whether or not this can be prevented will depend on the details of rent stabilization regulations, similar housing ordinances, City enforcement mechanisms, and the specific nature of the waste fee. Conversely, landlords will oppose politically any fee that they are unable to pass on to tenants.

Alternatively, a landlord could charge tenants for trash removal by establishing a bag/tag or other system within the building. The landlord would then have the same relationship to the tenant that a municipality has to a single family home in a suburban QBUF system. While tenants who found the landlord's user fee system too high could move, such a within-building QBUF system could create antagonism between tenants and landlords. This QBUFs-within-a-building approach could also run afoul of more prosaic difficulties such as absentee landlords and uninterested building management.

The QBUF could be imposed directly on the tenant through the use of a bag/tag system. Official City bags could be sold by the landlord, through participating retail outlets or through City offices. Only trash placed in the official bags would be collected. Stickers or twist tie tags -- the bags in this approach are of the conventional store bought variety -- could be used in place of official bags. Official stickers or twist ties would be sold in the same manner as the bags and only trash bags with the designated sticker or bag would be collected (US EPA 1990a).

The price for the bag/tag could include the (per unit) full cost of solid waste management including collection, disposal and administration. Alternatively, the costs could be divided into two components: 1) a flat fee related to the fixed costs of operating the City's solid waste management system that could be charged to the landlord, to the tenant through a customer charge, or paid through general tax revenues and 2) a per bag/tag fee that would capture the variable costs of solid waste management. This two component approach would offer the advantage that the fee structure would more closely track the costs faced by the City and would provide more revenue stability to the City because the fixed portion of the fees would be more predictable than the variable portion.

The key difficulty with this approach would be in enforcement. Landlords would lack a financial incentive to enforce the use of the designated bag/tag. Further, it would be hard to monitor compliance with the bag/tag system once trash has been taken out by tenants and put in a trash room, chute, compactor or dumpster. Ascribing "ownership" is impractical in such situations. Ordinances making the landlord ultimately responsible for charges would motivate the landlord to assist in the operation of the bag system.

Technological developments could eventually provide a solution to the difficulty of administering QBUFs in multi-tenant buildings. Several equipment vendors are now offering adaptations to apartment building trash chutes to facilitate source separation of recyclables. In this systems, a turn table -- essentially a "lazy susan" -- is placed in the basement of the building below the chute. At the chute opening on each floor are buttons which residents press to indicate which material is being placed in the chute and to turn the table in the basement to the appropriate container. A QBUF system could be grafted to such an apparatus by adding any of several pay-card or vending systems that would force the resident to pay for the use of the chute. Such a vending system could also incorporate discounts for recycling participation. Such a solution would be effective only if building codes revised to require this type of infrastructure.

Re-usables vs. Disposables

Prevention of residential waste can be fostered by replacing disposable products with their re-usable counterparts. Shifting to more re-usable products involves three distinct phases of the product life cycle. First, products must be designed to be re-usable. Second, consumers must choose re-usable products over disposable products. Finally, a distribution system or related infrastructure that provides the support services necessary to maintain the functionality of re-usable goods must be established or maintained. In the case of refillable bottles, for example, that infrastructure is the trucking and commercial network that returns containers to the bottler for refilling. In the case of consumer electronics, the infrastructure is the availability of cost effective repair services.

Shifting to re-usables can reduce both packaging waste -- as when canvas or string bags are used in place of single-use plastic or paper bags or when mugs are used in place of paper or plastic coffee cups -- and waste from semi-durables as when cloth towels are used in place of their paper counterparts. Extending the product life of consumer durables, while not typically labeled as an instance of fostering re-usability, effectively reduces disposability in an analogous manner. This is most obvious in situations where small consumer appliances such as cameras have been made into single use items, thereby replacing a durable item with a disposable one. Reversing this trend is an objective of waste prevention programs. Figure 4 lists a variety of common disposable household items, their re-usable substitutes and the infrastructure required to support those re-usables.

FIGURE 3

Some Disposable Household Goods and Their Re-usable Substitutes

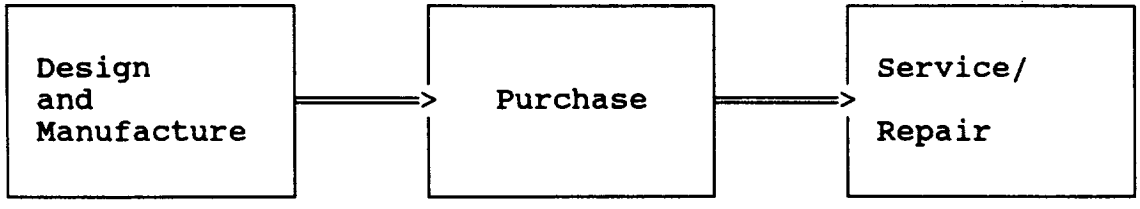
Disposable Item	Durable/Re-usable Item	Infrastructure Needed
Paper and plastic bags	Canvas/string bags	Change of consumer habits; Imposition of fees on disposable bags
Tableware and cutlery	Ceramic/metal dinnerware	None
Non-refillable beverage bottles	Refillable beverage bottles	Development of reverse distribution system
Non-refillable water bottles	Refillable water coolers	Availability of water cooler services
Batteries	Rechargeable batteries	None
Diapers	Cloth Diapers	Diaper services
Paper towels and napkins	Cloth wipes and napkins	Change of consumer habits
Plastic and aluminum wrap	Durable covers and containers	None
Pens	Refillable pens	Ready availability of refills
Razors	Replacement blades	Ready availability of blades
Throwaway appliances	Durable appliances	Availability of cost-effective repair services

It is important to note that re-usable goods and packages are environmentally beneficial only when they are in fact re-used. That is, re-usables generally consume more materials on a per item basis than their disposable counterparts. If the re-usable product is discarded after one use, then the product consumes more raw materials and creates more waste than its disposable analog. Calculations are needed to determine what the "break-even" rate is, i.e., the point at which the re-usable becomes more conserving than the disposable. With regard to beverage containers, the number of times that a refillable bottle is re-used is called a trippage rate. According to some analyses, a refillable bottle must have a trippage rate in excess of 10 circuits in order for it to have less environmental impact than a one-way bottle (Gitlitz 1990).

Strategies that New York could employ to encourage re-usable products -- whether they are packaging, semi-durables or durables -- could be aimed at any of the three relevant stages of the product life cycle. These strategies are summarized in Figure 5. In all cases, the spectrum of possible strategies runs from regulation to financial incentives/disincentives to voluntary programs.

FIGURE 4

Policies to Stimulate the Use of Re-usables



- Encouragement/pressure from the public and government can compel manufacturers to produce more re-usable goods.
- Mandating minimum lengths for service warranties gives manufacturers an incentive to extend the useful lives of products.
- Advance disposal fees imposed at the manufacturing level act as a tax on disposables.
- Subsidies such as tax incentives or grants to manufacturers can make the production of re-usables more economical.
- Taxes on disposable goods raise the cost of disposables relative to re-usables.
- Bans of disposable goods at the manufacturing level, if comprehensive, force the production of re-usables.

- Educational and promotional campaigns can convince consumers of the environmental, civic, or economic value of choosing re-usables over disposables.
- Advance disposal fees imposed at the retail level act as a tax on disposables.
- Taxes on disposable goods raise the relative cost of disposables to consumers.
- Bans of disposable goods at the retail level, if comprehensive, can stimulate the purchase of re-usables.

- The provision of repair and re-use services can be made more economic by raising the cost of disposal to waste generators through QBUFs or product taxes.
- Subsidies of repair or service infrastructure through charitable organizations, job training or economic development programs can encourage product repair over disposal.
- Deposit systems can encourage the maintenance of reverse distribution system.
- Small business loan programs can be used to encourage the development of an expanded service and repair infrastructure.

Financial incentives do not guarantee that manufacturers and consumers will shift from disposables to re-usables. Note that bottle bills were originally designed to encourage beverage bottlers to switch from one-way bottles and cans back to refillable bottles. These laws were generally unsuccessful in doing so, coming too late to change the distribution systems that had come to rely on long distance trucking from centralized manufacturing plants rather than local bottle washing.

Reduction of Packaging Waste

Reduction of discarded packaging is a focus of much of the current effort in waste prevention throughout the US and around the world. Packaging waste comprises a large percentage of the waste stream, approximately 27% nationally by weight (US EPA 1990b). It has attracted attention because much packaging is a single-use/disposable type of product and because packaging design is only now beginning to reflect solid waste concerns more fully.

Discards from packaging end up in all three of New York City's waste streams. Packaging from consumer products is discarded primarily into the residential waste stream and has attracted the most attention in recent policy debates. Products sold to businesses and institutions, however, also generate packaging waste. Packaging takes a variety of forms, often classified into primary, secondary and tertiary categories (CONEG SRC 1990).

- *Primary packaging* is the material that directly surrounds the product.

- *Secondary packaging* is wrapping around the primary package or material that serves to join two or more primary packages for consumer sale as one item (e.g., a six pack ring).

- *Tertiary packaging* is shipping and packing material used for product transport to and from retail.

Packing and shipping waste are discussed in the section on commercial sector strategies because more of it is generated by businesses than by residences.

The Coalition of Northeast Governors formed the Source Reduction Council (CONEG SRC) in 1989 by bringing together representatives of industry, environmental groups and state governments in the northeast to investigate reduction of packaging waste.[6] The CONEG SRC (CONEG 1989) has ranked packaging practices that support waste prevention and recycling hierarchically as preferred packaging guidelines:

(1) No packaging - applies to products at both retail and wholesale levels that could be sold in bulk or without a package or wrapping. Examples include retail sales from bins of produce, housewares, and hardware products and bulk delivery of liquids or solids at the wholesale level.

(2) Minimal packaging - can be achieved through product design changes (e.g., concentrates); new or different packaging design; lightweighting or volume reduction; single packaging (e.g, no secondary or tertiary packaging) and changes in shipping practices that allow the use of less packaging.

(3) Consumable, returnable or refillable/reusable packaging - includes packaging that is eliminated in the process of using the product (e.g., water soluble packets for detergents) packages that are returned to industry for reuse and redistribution (e.g., shipping containers); and packaging that may be refilled by the consumer from bulk or larger size containers (e.g, refillable plastic milk jugs, or refillable condiment containers in restaurants).

(4) Recyclable packaging/recycled material in packaging.

The CONEG is working to realize its packaging reduction goals by pursuing a "challenge" to industry calling on the top 200 users and producers of packaging in the US to begin implementing CONEG's preferred packaging guidelines on a voluntary basis. The CONEG is also drafting model packaging reduction legislation.

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[6]CONEG reorganized the Source Reduction Council in 1991 changing the membership and structure and adopting the name Source Reduction Task Force (SRTF).

Strategies for the prevention of packaging waste will differ with the type of packaging in question. Reduction of waste from primary packaging can be attacked in much the same manner as waste from disposable products as discussed above. Incentive-based programs, regulation, educational and promotional campaigns can be used to foster the reduction of packaging waste (see Section IV, Policy Tools).

Several strategies and initiatives specific to packaging reduction are in progress and worth noting. The State of Michigan encourages the use of refillable beverage containers by setting a higher deposit fee for one-way bottles (10¢) than for refillables (5¢). The Minnesota Governor's Select Committee on Packaging and the Environment (SCOPE) has recommended that the State's environmental public education programs inform consumers of their right to discard packaging at the retail point of sale. If consumers "leave the packaging behind," retailers will be burdened with the discarded packaging and will likely exert pressure on manufacturers to reduce packaging waste rather than simply raise their prices to cover added disposal costs.

The German Ministry of the Environment issued an Executive Order in November 1990 establishing consumers' prerogative to "leave the packaging behind" and placing the responsibility for management of packaging waste on producer groups. Manufacturers and distributors are responsible for collection and reclamation of shipping waste. Retailers are obligated to take back point-of-sale packaging. Further, nearly all containers for liquids, including beverages, detergents and paints face substantial deposits of approximately 33¢ (DM50) per unit. Because the deposit and take-back requirements can be avoided if industry establishes an alternative collection and processing system for recycling that meets stringent recycling rates, a "dual" or shadow industry funded recycling system has been created. A licensing cartel, the Duales System Deutschland (DSD), has initiated the "Der Grüne Punkt" or "green dot" program in which packaging users (i.e., manufacturers) can pay a fee for the right to place a green dot on their packages, indicating that the package so marked is eligible for collection in the industry funded system. (McCarthy 1991a, 1991b). The German initiative, while focused on increasing recycling, may also encourage reduction of packaging insofar as producers seek to avoid both the deposit obligations and the cost of participating in the green dot system or the cost of meeting government deposit obligations.

A "leave the packaging behind" strategy in New York would generate strenuous opposition from the retail sector. Its success would depend on the likelihood that New York retailers would effectively pressure manufacturers to make changes in packaging that would reduce the waste stream and simultaneously lessen the impact on retailers.

Operational and technological innovations can lead to reduction of packaging in the retail setting. For example, oversize packaging on cassettes and compact disks reduces theft. To avoid this wasteful packaging, stores could use a system in which customers browse through empty, display packages, and then receive unpackaged merchandise at the time of sale. Retailers, or the City, could work with distributors and manufactures to help facilitate such a system. Alternately, increased use of electronic theft prevention systems would reduce reliance on oversized packaging for this purpose.

Environmental Shopping and Labeling

As with other waste prevention efforts, the success of an environmental shopping program will rest on the ability to influence individual behavior. The thrust of such a program is to reduce waste at the customer/retail establishment level. This can be accomplished in three main ways: by reducing

store-provided packaging, by influencing manufacturers to produce less wasteful products, and through public education programs to promote environmentally informed consumption decisions.

Many programs focus on the reduction of store-provided packaging and carrying materials. Stores may offer an economic incentive for customers to bring their own bags instead of using new, store provided bags. Stores may also sell re-usable bags bearing the company logo and other waste prevention/recycling information and graphics. Simple measures such as not providing oversize bags for small purchases, and asking customers if they need a bag for single-item purchases can be easily implemented. In the Brooklyn Intensive Waste Recycling Zone, the City is investigating providing coupons to each residence redeemable for a durable grocery bag. The City could also consider mandating that all retail establishments offer an economic incentive to customers that bring their own bags to the store.

Educational programs focus on informing consumers about the options available to them to affect waste (and toxicity) prevention through their purchasing decisions. Such educational programs can be run at the establishment level, and/or on a City-wide basis. For example, the City could work with local telephone companies to add a "waste prevention" category to their yellow pages listings.

A series of public opinion surveys has shown that consumer interest in sensibly packaged, recycled and recyclable, low-toxicity, environmentally friendly products is high and growing (US EPA 1989). Concerted efforts are being made by many grocery store chains to inform consumers about the availability and benefits of such products. This has the near-term effect of waste prevention, as well as the possible long-term effect of forcing manufacturers to create more of these products. Efforts organized through the grocers' association may be the most productive way of promoting in-store educational programs.

In addition to such local educational efforts, manufacturers are increasingly attempting to gain a competitive advantage by including information directly on their products' labels touting a product's environmental friendliness. Such "green marketing" is beneficial in that it steers consumers toward products with lower environmental impact. However, some companies have advanced spurious claims about their products' recycled content, recyclability and degradability spawning widespread regulatory and legislative responses.

This response has come from both governmental and private entities. The New York State Department of Environmental Conservation (DEC) has established regulations governing the use of the labels "recycled," "recyclable," and "reusable" and of the associated symbols (6 NYC RR Part 368). Proposed legislation in other states, localities and at the federal level has similar goals. For example, CONEG defines "recycled" as post-consumer waste plus industrial scrap, but not including materials "commonly re-used in the original manufacturing process" (CONEG SRC 1990). Similarly, the Northeast Recycling Council (NERC) has established guidelines recommending that member states adopt a definition of "recycled" that requires manufactures that use the term on a package to state clearly the actual percentages of pre- and post-consumer material in the product. On the private side, there are organizations attempting to introduce environmental "seals of approval," similar to the familiar Good Housekeeping seal. Currently, there are two private entities awarding seals of environmental merit to products in the US: the Green Cross, and the Green Seal.

The City of Berkeley, California has an aggressive consumer awareness campaign called "Precycle: Do it right from the Start." "Precycle" attempts to inform consumers about the impact that their purchasing decisions can have on waste prevention. This program includes informative bus ads,

as well as buttons, posters and displays, which were distributed to stores. New York City could consider such a plan.

The City is assisting businesses in the Brooklyn Intensive Zone to encourage them to: educate their customers about waste prevention; sell re-usable, waste minimizing products; and make re-usable cloth shopping bags available to all patrons. Data on the effectiveness of these programs will help to inform decisions about their expanded implementation.

COMMERCIAL AND INSTITUTIONAL WASTE PREVENTION

Waste Prevention in Non-Residential Settings

Strategies for the reduction of waste from institutions and businesses are addressed together because the programs discussed below can be applied in governmental, nonprofit and commercial settings. Institutional and commercial waste generators also currently share another characteristic important to waste prevention efforts: these generators lack financial incentives for waste prevention insofar as they cannot capture the savings from avoided collection and disposal. This is true of government and nonprofit generators because they receive DOS-provided waste services and it is true of businesses in New York because of the lack of rigorous competition in the carting industry (see Section I, Structural Issues Facing New York).

Some differences, however, between the institutional and commercial sectors are worth noting. The City probably has greater leverage over waste-related activities in city agencies than in nonprofit organizations or private businesses. Thus, strategies such as waste audits and reduction of office waste can be pursued within city agencies in the short run while more complex policies are being designed and implemented within the other sectors. Further, the City could consider setting up accounting and budgeting systems that would effectively establish quantity-based user fees for municipal agencies.

The City currently charges hospitals occupying buildings exempt from NYC real estate taxes on the basis of volume for solid waste services and the Department of Sanitation is establishing similar fees for nursing homes in such buildings. Such programs, aside from offering monetary benefits to the City, can improve the financial incentives for waste prevention in the nonprofit sector.

The City embarked on a new program, The Partnership for Waste Prevention, in 1991 to promote waste prevention in and through New York businesses, trade associations and nonprofit institutions. The Partnership aims to reduce the generation of waste by building an alliance between commercial and institutional generators and the NYC Department of Sanitation. Organizations that agree to join the Partnership commit to:

- research and identify specific waste prevention initiatives germane to their businesses or enterprises;
- institute waste prevention practices in their establishments; and
- educate employees, members and consumers about waste prevention and recycling matters.

The NYC Department of Sanitation commits in return to:

- educate and inform generators about the economic, environmental and related benefits of waste prevention;
- provide guidance on waste prevention strategies;
- encourage adoption of model programs;
- examine means to overcoming barriers to the implementation of waste prevention initiatives (New York City Department of Sanitation 1991).

To date, the Department of Sanitation has recruited the Neighborhood Cleaners Association, the New York State Food Merchants Association, D'Agostino Supermarkets and the Direct Marketing Association. The Partnership seeks to get its members to practice waste prevention both within their organizations and facilities and in their dealings with their customers and constituents.

Waste Audits

Waste audits are an integral, first order component of any commercial reduction program. The purpose of a comprehensive waste audit is to provide generation, composition, and behavior data for all businesses, both to assist in developing subsequent reduction strategies for these businesses, as well as to provide information to policy planners. In general, a waste audit consists of a detailed investigation that assesses a company's materials acquisition, use, and disposal activities. This investigation can be performed by an independent contractor or a City worker or workers in conjunction with a company, or solely by a company.

Choosing Audit Targets. Through its Partnership program, the City has begun to promote waste audits among businesses and institutions. If the City seeks to extend waste auditing beyond the membership of the Partnership, several avenues exist. The City could simply mandate waste audits for New York businesses. Prior to embarking on an audit program, the over 250,000 City businesses must be ranked in some way. Commonly in such programs, businesses are bracketed by number of employees; enterprises with over a certain number of employees are targeted first and then the program proceeds to smaller and smaller businesses. Alternatively, individual sectors of generators, such as hotels or fast food restaurants may be targeted. In such a program the relevant industry trade group could be enlisted to assist in the design and completion of the audits, rather than face the threat of proposed product bans or mandatory reduction legislation. Other large non-business organizations such as educational facilities and hospitals, should also be part of an audit program.

In the Minneapolis - St Paul area, the Minnesota Public Interest Research Group (MPIRG) has undertaken an ambitious survey of local small businesses aimed at correlating generation estimates to a firm's line of business, as determined by its Standard Industrial Classification Code (SIC). SIC codes are a hierarchical, four digit classification system designed by the Bureau of the Census of the United States in the 1930's to divide businesses into categories that reflect the similarity of their products, services and technologies. This system is frequently used by market research firms, pollsters, academia and others interested in analyzing the business community. MPIRG surveyed over 7,000 businesses and has data available that may be applicable to New York City planners in estimating generation figures and targeting waste audits or other reduction activities based on SIC codes (MPIRG 1990).

Stimulating Participation. Compliance with a waste audit program can be either mandatory or voluntary. New York City could set up a mandatory timetable by which businesses of targeted sizes must file audits, recommendations, and ultimately reduction goals with the City (see recommendations section), although ensuring that businesses actually meet mandated goals can be extremely labor intensive and problematic. Voluntary programs rely on the inherent "front-end savings" -- internal materials purchasing and handling improvements that businesses realize when undergoing a detailed waste audit -- as well as "back-end" savings -- the avoided cost from reduced waste disposal. In general, businesses need the benefits of both these savings to justify the expense and inconvenience of undertaking a waste audit. Reform in the regulation of commercial carting, as discussed in Part II, Structural Issues, would facilitate the capture of these savings.

The City could also promote waste auditing on a voluntary basis by combining waste audits with rate audits. Under such an approach, businesses would request a combined audit. The City or a designated contractor would conduct a rate audit by verifying that the business was paying the appropriate charges for waste collection and disposal as specified by the NYC Department of Consumer Affairs's (DCA) rate regulations. At the same time, the City would conduct a waste audit. When the business had successfully reduced its generation of waste, the business would be able to use the rate and waste audit data to demonstrate its reduced need for services and therefore a reduction in charges from its waste hauler. If necessary, the generator could seek assistance from the DCA in obtaining reduced charges. Such an approach would piggyback on existing City rate regulation activities, but to be successful would probably require increased administrative and enforcement support.

The combined waste and rate audit approach would be further enhanced if financial incentives for waste prevention were strengthened. When generators produce less trash, money is saved in two ways. First, disposal costs less. Second, collection costs decline as trash volumes decrease. Trucks fill up less quickly, so fewer trips are required to the transfer station or landfill to tip loads. The savings in collection costs are not proportional to the reductions in trash set-out. Many of the costs of collection are fixed relative to the quantity of waste hauled, especially for small or moderate changes in waste volumes. For example, capital requirements (e.g., trucks) only change with fairly large changes in trash volumes. Cost savings generally accrue to the carter when volumes decline and routes are re-designed or other aspects of collection are revamped. Achieving these cost savings can require capital investment or active restructuring of some aspects of the business. Nonetheless, carters can accrue some savings in collection costs.

Theoretically, the carters should be indifferent to the part of the rate structure that covers disposal because tip fees are a pass through from the generator to the owner of the disposal site. Collection is a different matter. One strategy for encouraging carter compliance with a waste prevention program would be to "leave some money on the table" from the savings in collection costs. Generators would not obtain any of the savings accruing due to lowered collection costs -- all of those savings would go to the carter. Collection costs/savings would be very hard to monitor and are clearly under the control of the carter, thus, it would be simpler to leave those savings with the carter both as an inducement and because the City would find it difficult to determine the true changes in cost.

Currently, the Department of Consumer Affairs sets carting rates by volume (with some adjustments if the carter has more elaborate pick-up requirements such as carrying trash up or down stairs at the customer location). While the rates do not distinguish between collection and disposal costs, the DCA makes estimates of those costs when it establishes the carting rates. These

estimates could be used to facilitate separation of collection and disposal charges in the DCA rate schedule.

Institutionalizing Audits in Company Practices. Decentralization of waste management decisionmaking can play an important role in internalizing the responsibility for lowering waste costs and instituting reduction strategies in relevant departments (see Part II, Structural Issues). A good time to implement this type of system would be after a preliminary waste audit has been conducted. Subsequently, relevant job descriptions could include the performance of specific waste reduction activities. Businesses could consider offering bonuses to employees that produce sound reduction ideas, or that accomplish reduction goals within their departments. Such programs have been shown to be most effective when there is a clearly stated commitment to waste reduction at the corporate level. As an example, food processing firms in North Carolina have realized savings in excess of $200,000 per year in waste fees and materials purchases through employee training and awards programs (Richardson 1989).

Funding the Audit Program. Funding for the waste audits could be provided in several ways and would depend in part on whether participation in the program were mandatory or voluntary:

- City general funds;

- Fees paid by generators - this would discourage generator participation, but would increase the commitment of those that did choose to participate by making them take an active role in the audit process in order to recoup their investment;

- Fees paid out of accrued savings -- generators could pay a fee after they saved money on waste charges;

- Fees paid by participating carters - this would discourage carter participation, but would analogously increase the commitment of the participating carters;

- Tax on nonparticipating carters -- this would stimulate carter participation, if the program were voluntary. The tax would be appropriate because waste reduction would be in the City's interest and a clear policy linkage could be made between the burden of the tax and the benefits;

Shipping Waste

Shipping waste consists of used cardboard boxes known in the trade as "old corrugated containers" or OCC, a variety of packing fillers such as polystyrene "peanuts," shredded paper and bubblewrap, strapping and shrink wrap, steel barrels, wood pallets, and miscellaneous bins and containers. These materials make good targets for reduction efforts because many are inherently re-usable, many also have beneficial substitutes, and, overall, they represent a significant fraction of the City's waste. OCC from the commercial/industrial sector alone makes up about 12% of the City's total waste stream.

Companies can reduce the amount of shipping wastes they generate in several ways:

- Contact their own suppliers that send over-packed materials and attempt to get them to reduce the amount of packaging materials they use.

- Negotiate with suppliers to take back their shipping materials for re-use.

- Re-use incoming shipping materials in their own outgoing operations.

- Find local companies that will accept unwanted shipping materials for use in *their* own operations.

The simplest method of reducing shipping waste is for purchasers to convince their suppliers to reduce the amount of shipping materials they use. For example, rather than using a full corrugated box, shippers could use a small corrugated tray covered with shrinkwrap for some items. Similarly, some shippers have switched from bulky wooden pallets to light, pressed fiber pallets covered with shrinkwrap. While these examples of lightweighting substitute disposable, difficult to re-use or recycle items such as shrink wrap in place of readily re-usable ones such as cardboard, they are ongoing, market-driven examples of waste reduction that occur with little or no need for external intervention.

In addition to lightweighting, re-use of shipping waste is an attractive method of waste prevention in much of New York City. However, there are several internal obstacles to the re-use of shipping materials that need to be addressed. From a waste management perspective, sturdy, readily re-usable pallets, boxes, and other shipping materials are only desirable to the extent that they are actually reused. Furthermore, from the suppliers' point of view, these materials are expensive to produce as well as to transport. Additionally, in many cases, the original supplier's investment in these re-usable materials cannot be recouped because the supplier does not retain ownership of the shipping material. If the materials are re-used, it is often by unrelated third parties.

There are two possible solutions to this problem. The first is a closed system, in which the supplier itself retains ownership of the materials, backhauls them to its facility, and re-uses them. Such a system can be enhanced by a deposit system, which can help ensure that a supplier investing in durable, re-usable pallets and shipping materials does indeed receive them back for re-use. The City could further facilitate a closed-circuit shipping materials system by pursuing regulatory and tax issues to help encourage and lower the cost of such backhauling. The City could also *require* all City suppliers to backhaul their pallets and/or other packaging materials as a pre-requisite of bidding (see below). Private sector businesses could do this as well, particularly with volume based rates in place.

Second, entrepreneurs can collect shipping materials from businesses, relieving the businesses of the disposal responsibility, minimally refurbish them, and then sell them to shippers for re-use. Many pallets are currently re-used in this manner. Such a system could be enhanced by having several businesses collect enough pallets to make pick-up feasible, where pick-up from individual businesses alone would be uneconomic.

A simple waste-exchange type system could be set up for lower value materials such as polystyrene peanuts and other packing fillers. Such an exchange would match businesses with surplus packing materials with companies that have been purchasing new materials and could accept

used ones. For example, many florists and nurseries will accept polystyrene peanuts for use as an extender for their growing media. Similarly, packing and shipping companies such as Boxstop and Mailboxes, Etc. use large quantities of shipping materials, and have been willing to accept OCC boxes and other materials. In the Minneapolis - St Paul area, in cooperation with a Minnesota Public Interest Research Group waste exchange program, a local chain of packing and shipping outlets has reduced its purchase of styrofoam peanuts by 80 - 100% by accepting used peanuts from other businesses (MPIRG 1990). Traffic concerns in congested parts of the City may make it unfeasible to move packing materials around in this way for re-use. Additionally, as with other programs in the City, the lack of volume based commercial rates removes a significant incentive for businesses to undertake any of these reforms.

The City could also use its own purchasing activities as a focal point for shipping waste reduction, much as it has used its procurement activities to stimulate the development of markets for recycled materials. By developing a "zero shipping waste on the loading dock" goal, the City would be factoring the cost of disposal of shipping materials into its procurement decisions in the same manner that many private industries already do. Private industry has been working, in some cases since the 1960s, to reduce waste from distribution packaging, to minimize both the cost of materials use and the cost of disposal. In the automotive industry, General Motors worked with parts suppliers to develop re-usable boxes for shipping steering wheels and similar parts. In the office furniture industry, large shipments to one location are often shipped "uncartoned" in moving style vans using blankets and related re-usable protective materials (Twede 1988). While transportation costs are often higher, they are outweighed by packaging and disposal savings. A more familiar example is the durable milk crate used by dairies and grocers for the shipment of milk cartons.

Since 1912, corrugated boxes have dominated distribution packaging, in part because of standards established by motor and rail carriers as defined under the "Cardboard Rules". Deregulation of rail and motor carrier shipping, new developments in logistics management and innovations in packaging technology have stimulated changes in the shipping industry and an interest by shippers in rethinking the standards for shipping containers. In particular, the move away from universal standards allows the development of specialized -- and waste-minimizing -- packaging materials (Twede 1988, 1991). These changes provide an opportunity for the City to pursue shipping waste prevention. It is important to note that such a program would be a long term endeavor relying on the expertise of City purchasing and logistics officials and would need to be carefully planned in order to avoid wreaking havoc with a complex distribution system.

Waste Prevention in Offices

Waste prevention in the office environment has three major components: the reduced use of paper, the substitution of re-usable items for disposable ones, and the re-use of semi-durable products. In addition, offices can extend the service life of durables by aggressively pursuing extended service contracts.

The disposal of mixed paper in all commercial/industrial subsectors accounts for over seven percent of the City's entire waste stream, while office paper disposal adds another 2.5%. The strategies discussed in this section may have an impact on discards from offices themselves, as well as on items (predominantly paper) thrown out elsewhere but generated in offices, or both. The major strategies for the reduction of *office* paper use (and disposal) are:

- Two-sided photocopying and reduction in the use of photocopying[7];
- Read it and "pass it on" memos instead of multiple memos;
- Careful proofreading prior to printing of documents;
- The use of previously discarded paper for scrap paper; and
- Electronic mail in place of paper memos.

Similarly, *mixed* paper can be reduced by

- Electronic funds transfer in place of paychecks;
- Two-way, single piece mailers rather than using separate return envelopes for bills, renewals, etc.;
- Junk mail reduction (addressed in separate section); and
- Sharing of periodicals.

The combined impact of these strategies could be considerable. AT&T, for example, has an office paper reduction goal of 14% by 1994 (INFORM 1991).

In addition to paper, offices consume disposable items such as pens, typewriter and printer ribbons, and toner cartridges that could be replaced with semi-durable and reusable products. Refillable pens, multi-strike (rather than single strike) ribbons, and refillable toner cartridges can be used by all offices. The State of Connecticut, in accordance with Public Act 89-385, now mandates the purchase of such re-usable and durable products in all State offices. The City should consider expanding the Department of General Services recycled content procurement guidelines to stipulate the purchase of re-usable products in place of disposable ones. Waste prevention could also be furthered through the use of re-manufactured office equipment and the donation of used or out-dated equipment to appropriate nonprofit organizations. Finally, offices should attempt to adopt simple guidelines to ensure that readily re-usable items such as file folders, binders and paper clips are not discarded after a single use.

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[7]Preliminary research by INFORM indicates that, contrary to conventional wisdom, double-sided photocopying will not produce dramatic reductions in the generation of office waste paper. A fifty percent increase in double-sided copying over current practices, according to this analysis, would reduce paper consumption and discard from photocopying by an additional 7.5% (Graff 1991). To put this in perspective, according to INFORM, photocopy paper constitutes just over 3% of the US paper wastestream in 1989.

MATERIAL-BASED STRATEGIES

Direct Mail

Direct mail is an important target for waste prevention. Direct mail advertising includes "any promotional effort that uses the US Postal Service or other direct delivery service for distribution of a printed advertising piece" (Name Finders Lists n.d.). It is variously known as third class mail, junk mail and is labeled Bulk Business Mail by the US Postal Service. Direct mail is composed of advertising, promotional materials and parcels, and charitable solicitations that receive postal rate discounts because of presorting, volume mailing and other cost reducing practices.

Direct mail presents a high priority opportunity for DOS waste prevention efforts for several reasons:

- It is a significant source of mixed waste paper, one of the least recyclable grades of paper. Mixed waste paper comprises approximately 13.5% of New York City's total waste stream and direct mail has been measured to be approximately 3% of the residential waste stream.

- A significant amount of junk mail is wasteful in the old fashioned sense: the recipient does not want it and hence, the sender need not send it. According to the New York State Consumer Protection Board (Bossert 1990), between 14% and 44% of junk mail is discarded unopened.

- There is a reservoir of public resentment against "junk mail" that makes policy and program development politically feasible.

Direct mail is the fastest growing component of the mail. In 1989, the Postal Service delivered about 63 billion pieces of direct mail or approximately 550 pieces per US household. In the past decade, direct mail has increased by about 40 percent and now comprises approximately 42% of all mail (Fernandez 1990).

Direct mail is used by nearly all businesses and many nonprofit organizations because of its efficiency in targeting markets and its cost effectiveness in using presorting to take advantage of lower postal rates (Bailey 1990, Direct Marketing Association 1990). The vast majority of direct mail is delivered via US Postal Service third class mail, although about eight percent is delivered through first class mail. Privately-owned delivery systems such as Alternate Postal Delivery (APD) distribute a small but growing percentage (Reilly 1990). The most direct competitor to and likely substitute for direct mail is newspaper advertising inserts (Tierney 1988) which present solid waste problems substantially similar to those posed by direct mail.

The economics of direct mail can play into good policy formulation and effective politics. Direct mailers do not *want* to send mail to people who do not want it -- it is expensive. But, often only the recipient can tell for sure if direct mail is duplicative, as in the case of married couples with different last names. There are several policy options which could be pursued in an attempt to reduce the waste generated by direct mail.

A categorical ban on direct mail is probably bad policy and ineffectual politics despite considerable public resentment toward direct mail. Many people want direct mail, just not so much of it. Further, legitimate First Amendment issues are raised by attempts to prohibit at least some forms of communication. Finally, confronting all nonprofit mailers -- from the National Rifle Association to Greenpeace -- is high risk politics.

Mailers could be required to include a prepaid, addressed envelope that would allow recipients to return discarded mail to the sender. This would effectively make the mailer the owner of the physical mail and responsible for its disposal. In a somewhat less draconian vein, mailers could be required to include a prepaid, addressed post card in all direct mailings that would allow recipients to indicate if they did not want to receive future mailings or if they were receiving duplicates. The power of this approach is that both the sender and recipient benefit by reducing unwanted mail. In addition, the sender receives information that cannot be obtained through sorting of mailing lists and related activities. Such an approach has been proposed in a bill introduced in the Connecticut General Assembly (SHB 5816). Local policy initiatives regulating direct mail, however, may be limited by federal pre-emption of local regulation of postal activity since the federal government is explicitly charged with operation of the postal service by the US constitution.

In Ontario and Quebec, Canada, some households have begun to affix stickers to their mailboxes requesting that the postal service not deliver junk mail. This has generated conflict between the federal postal service, households and direct mailers.

Direct mail can also be reduced through increases in the postal rates charged to mailers. By increasing the cost of mailing, higher rates would effectively increase the cost of misdirected mailing, forcing mailers to devote more resources to careful targeting of direct mail. Catalog sellers would be likely to re-evaluate the frequency and extent of their mailings. Higher rates without other policy intervention would probably also shift some direct marketing activities to other advertising media particularly newspaper inserts, private mail delivery, facsimile, as well as telephone solicitation and broadcasting. Substitution toward inserts, private delivery services and facsimile would not reduce paper waste, it would merely change its source. Postal rates for third class mail increased in early 1991 for reasons unrelated to solid waste management (Foltz 1991). The rate changes are too recent to determine an impact on generation of mixed waste paper.

Alternatively, waste prevention efforts could piggyback on the direct marketing industry's voluntary efforts to reduce unwanted mailings. The Direct Marketing Association operates the Mail Preference Service (MPS) which provides subscribing mailers with lists of names of individuals who have written to the MPS requesting removal of their names from mailing lists. While no independent organization has ever audited the detailed functioning of the MPS, it appears to be fairly successful. No statistics exist indicating what percentage of mailers or what volume of mail is affected by the MPS. Locally generated and distributed direct mail ("dear occupant" mail) is not affected by the MPS.

The City could capitalize on the existing MPS function in a variety of ways. The current subway campaign publicizing the DOS *Waste Reduction Handbook* could be expanded to focus on informing New Yorkers of their opportunity to reduce direct mail waste through the MPS. Mailers could be required to participate in the MPS system. Large mailers could be "jawboned" by City officials to set an example by either participating in the MPS or by establishing a similarly beneficial policy. Again, the clout of New York City in the marketplace could be used in a voluntary effort with the largest

catalog/direct mail purveyors with a much publicized meeting of city officials with company management executives requesting their cooperation in waste prevention endeavors.

At the institutional level, organizations can take the initiative directly to reduce waste from direct mail. For example, Yale University has assigned a staff person to assist members of the University community in removing their names from unwanted mailing lists. By providing a centralized service and source of information about mailing lists and reduction of direct mail, the university encourages paper waste reduction on a widespread basis. The University's motivation is to avoid the cost of high local tipping fees.

Bulk Trash

Bulk trash accounts for about seven percent of the City's total waste stream, with almost three quarters of this amount generated in the residential sector, and the majority of the remainder generated in the commercial/industrial sector. Bulk trash consists of discarded furniture, furnishings, small and large appliances, and other oversized objects. These items enter the waste stream for many reasons. They may be so worn or damaged as to be completely without further value. However, they may simply have fallen out of favor with their owners for aesthetic or "status" reasons, or be too expensive or troublesome to repair. Similarly, residents or businesses frequently discard bulk objects when they move to avoid the inconvenience of transporting them. Finally, landlords dispose of bulk items left behind by both residential and commercial tenants who have moved.

There are three major ways that the generation of bulk trash can be reduced:

- Increase the life span of durable and semi-durable goods.
- Facilitate the economical, convenient repair of still serviceable appliances and other bulk items.
- Provide potential re-users access to still serviceable discarded bulk items prior to disposal.

Product life-spans can be increased in several ways. The ongoing shift toward a new environmental ethic, perhaps bolstered by City educational efforts, may result in people using products longer, rather than disposing of them for aesthetic reasons. Additionally, changes in manufacturing practices can result in products that simply last longer. As noted in the discussion of re-usables, there are a variety of policies that can be used to increase product life.

The inability to repair many bulk items economically in New York results in the unnecessary disposal of appliances and pieces of furniture that are still fundamentally serviceable. This is a result of the high price and lack of availability of both replacement parts and the skilled labor to perform the job. Although the costs and availability of spare parts is, for the most part, outside City control, the City could consider an employment program aimed at teaching furniture and appliance repair. Such a program could provide employment, an economical means of reconditioning bulk items, as well as reducing unnecessary disposal.

Even with an appropriate infrastructure, many items that are still serviceable are going to be disposed. The City should pursue strategies that get these materials into the hands of organizations and individuals that will attempt to re-use them. Such organizations as the Salvation Army and Good Will maintain trucks and drop-off centers that will pick-up or accept usable bulk items. These items are generally cleaned-up and minimally repaired, and resold to the public through thrift shops.

The City could assist these organizations, as well as others, to help them improve their operations, and thereby process more materials. The major barriers to Good Will and others to processing more materials are the lack of storage space, as well as the fear of a low ratio of saleable to non-saleable items that may result from a bulk trash reclamation program. The City could overcome these barriers by matching unneeded warehouse and storage space to this purpose, improving access to high-quality, salvageable materials, as well as guaranteeing expedient disposal of non-salable items. Pinellas County, Florida allows charitable organizations involved in recycling and re-use to discard two tons of unusable material free of charge for every eight tons they process (Chertow 1989). Additionally, New York could consider co-sponsoring a product repair training program as discussed above. Access to materials could be improved by scheduling well publicized bulk trash set out days, and then giving reclamation organizations the opportunity to pick-up serviceable items prior to City pick-up. The City is working with charitable organizations to help them expand their operations in the Intensive Waste Recycling Zone.

Currently, in some parts of the City, residents desiring to discard bulk trash bring the items to drop-off centers known as "self-help" centers operated by DOS. At some self help centers, an informal waste exchange has sprung -- some residents peruse the discarded materials and take away salvageable items. The City should investigate ways in which this form of re-use can be facilitated and expanded.

Alternately, the City could sponsor a City thrift shop for serviceable bulk items. Bulk trash could be sorted, and all usable items brought to a large warehouse, and sold at low cost to the public. The disposal savings would, of course, have to be weighed against the cost of such an operation. Also, the City could contract for the operation of a waste exchange. A waste exchange is a centralized service where residents or businesses can list items that they either need, or wish to dispose. The exchange attempts to make appropriate matches, and facilitates the exchange of the goods. The City is already sponsoring some re-use through the Materials for the Arts Program. In this program, the Department of Sanitation and the Department of Cultural Affairs facilitate the donation by individuals and businesses of surplus goods, supplies and equipment to non-profit arts groups. In this way, the program diverts tons of goods to further re-use that would otherwise require disposal.

Finally, despite the appeal of imposing a fee on the disposal of bulk items, it is likely that the difficulties that would face implementation of such a fee outweigh its advantages. Accurately and fairly determining the true generator of a given bulk trash pile would be very difficult in a multi-tenant setting. This problem would be compounded by the likelihood of widespread illegal dumping and "adding on" to legal piles of others.

Grass Clippings and Yard Waste

Grass clippings and other yard wastes account for about 2.5 % of the City's total waste. These materials are generated predominantly in the residential sector, with a proportional, but lesser amount produced in the institutional sector. The City DOS is currently planning an educational outreach campaign to convince generators of grass clippings not to bag them, but to simply allow them to remain on the lawn. This practice has been shown to be of no harm to the health of a lawn, and might actually benefit lawns by providing organic matter to the soil. The City Parks Department no longer bags grass clippings from Department maintained fields. The practice of "leave-it-on-the-lawn" grass maintenance is a simple, productive waste prevention measure.

There are several landscaping methods that reduce yard waste. A shift in the reliance in landscaping to plants that do not drop their leaves, and do not need regular, intensive pruning to remain attractive could be stressed. Simple measures such as less frequent cutting of lawns can also help to reduce yard waste generation (Guggenbuehl and Corcoran 1990) Despite these efforts, autumn leaves will still be present in large quantities. Segregated leaves can either be picked up for inclusion in large scale composting, or composted on a small scale in backyard piles.

Food Waste

Food waste is a large, and potentially reducible fraction of the waste stream. Comprising over 12% of the City's total waste stream, food waste is generated in significant quantities across all three sectors, and in many sub-sectors. The prevention of food waste entering the waste stream can be accomplished through a three-tier hierarchy of reduction of waste (over-supply), re-use, and on-site composting. The first tier consists of measures to better estimate food demand to reduce leftovers, as well as measures to reduce spoiling. The second tier involves the re-use of edible food to feed the hungry. Finally, most food wastes are readily compostable, and decentralized, on-site composting of these wastes should be encouraged, where possible.

Although it is unclear what proportion of food waste is due to oversupply, the City should encourage restaurants, corporate cafeteria and institutional food service managers, perhaps through a Waste Audit program, to refine food usage estimates. As stressed above, volume based disposal rates would add another incentive for this behavior. Failing better estimating to reduce waste, the City should explore additional means of conveying still edible food to the hungry. Currently, the non-profit food bank City Harvest collects five tons per day of edible food from food wholesalers and retailers, restaurants, hotels and institutional and corporate cafeterias for distribution to the hungry. City Harvest has been very successful in matching surplus food with those in need of it, and arranging the transportation to simplify the process for the donor. They are currently expanding their operations, and expressed a willingness to work with the City to include more potential donors of surplus food in their system. Other organizations and food banks could be included in similar systems.

The majority of food wastes are not edible leftovers, but rather trimmings, scraps, and spoiled food. There are certain circumstances where the City could divert these wastes from the waste stream by encouraging on-site composting. This activity is relevant for all campus-type sites (i.e. universities, schools, prisons, hospitals and nursing homes) as well as low to medium density residential neighborhoods. The City should consider a program of encouraging on-site composting at all educational institutions in conjunction with biology and ecology classes at the institutions. This could be viewed as an educational program, additionally justified by the waste prevention savings realized. Similarly, the City should encourage, or perhaps mandate, on-site composting at jails and prisons, both because food wastes comprise over 40% of correctional wastes, and because of the availability of free labor. The DOS is currently testing the feasibility of on-site composting at institutions within the intensive recycling zone pilot program.

Toxics and Household Hazardous Waste

Toxics and household hazardous waste, as the terms are used here, refer to all toxic and hazardous wastes found in municipal solid waste, with the exception of medical wastes and hazardous industrial wastes disposed by small- and large-quantity commercial and industrial generators. While the actual tonnage of hazardous wastes generated in all sectors --residential,

commercial, and industrial -- is small relative to other materials, they are important materials to reduce. Of the three sectors, the largest generator is the residential sector. Consequently, the residential generation of toxic substances (i.e. household hazardous waste) should be the focus of efforts to reduce toxics in the waste stream.

Although there is no standardized definition of household hazardous waste, it generally includes home maintenance products such as paints, stains, glues, and paint thinners (36 percent by weight); household and automobile batteries (approximately 25 percent by weight); cosmetics (12 percent by weight); and yard maintenance products (4 percent by weight). The balance of the composition is categorized as miscellaneous hazardous materials.

Substances of concern in products and packages include metals and organic chemicals. Recent efforts to reduce waste stream toxicity have focused specifically on the following four metals:

- Mercury: contained in household batteries, fluorescent light bulbs, thermometers, and mirrors.
- Lead: contained in steel cans, electronic components, automobile batteries, paint pigments and plasticizers in plastics, ceramic glazes, and some inks.
- Cadmium: contained in metal coatings and platings, rechargeable household batteries, pigments in plastics and paints, and some inks.
- Hexavalent chromium: contained in paints and wood preservatives.

Current attempts to reduce the toxicity of MSW have concentrated primarily on packaging materials and consumer products.

Toxicity reduction can be accomplished through two major strategies: products and packages can be materially altered to contain less toxic substances, and consumers can change their behavior to choose less toxic products over more toxic ones. With regard to products and packages, many have already been successfully altered to include less toxic materials. For example, lead in house paint has been replaced with titanium and zinc pigments; lead solder in food cans has been reduced from 90% in 1979 to 20% in 1986; and mercury has been eliminated from camera batteries. Toxicity reduction can also be accomplished by extending the lives of toxic products. For example, the service life of alkaline batteries has increased by 30 percent, theoretically reducing the frequency of battery purchase and subsequent disposal.

With regard to the second strategy, consumers can either cut down on the amount of toxic material they use, or they can choose less toxic substitutes. Both require changes of behavior, such as using smaller amounts of existing pesticides, or learning to use non-toxic substitute pesticides. Changes such as this are difficult to accomplish. Possible mechanisms for educating consumers include disseminating instructional information through newspapers, flyers, posters, or demonstrations placed at points of product purchase. New York City could also stimulate toxicity reduction by incorporating specifications regarding toxicity into its procurement guidelines.

To date, most progress in toxicity reduction has been accomplished by regulating the toxicity of packaging. For example, CONEG has developed model legislation that prohibits the use of lead, mercury, cadmium, and hexavalent chromium from all packaging materials. The State of New York, in addition to many other northeastern states (and some outside the region), has adopted such

legislation. New York's law includes an amendment that requires the application of risk assessment protocol to consideration of any toxic substance in packaging considered for regulation by the State that is not recommended by CONEG. CONEG is continuing to evaluate the use of toxics in products and packaging, and the City should closely monitor its progress regarding these efforts.

Household batteries are a concern in the management of New York's waste because they are a source of lead, mercury and cadmium. Several recent initiatives hold promise for progress in toxicity reduction in this area. New York Senate Bill 4275, signed by the Governor in 1991, requires a reduction in the level of mercury in alkaline batteries, production of nickel-cadmium batteries which are readily removable from appliances and establishment of a plan for dealing with household batteries. Further, because of pressure from policymakers and the public, the battery industry is working aggressively to reduce the heavy metal content of alkaline and mercuric oxide (button) batteries. The Department of Sanitation is planning a pilot program to collect button and nickel cadmium rechargeable batteries through local retailers and institutions which will give DOS information on the feasibility of collecting and marketing these batteries.

Part IV

POLICY ANALYSIS, RESEARCH NEEDS AND RECOMMENDATIONS

POLICY ANALYSIS AND POLICY TOOLS

A wide variety of policy tools can be employed to promote waste prevention. The tools vary in complexity, effectiveness, cost and political feasibility. In this section of the report, the effectiveness of the various tools are discussed as they relate specifically to their power to accomplish waste prevention goals.

Certain policy tools have attracted much attention in the debate over waste prevention and require a somewhat greater focus here. Categorical product and material bans, conditional bans, taxes and advance disposal or pre-disposal fees are among the most prominent of these policies. Just as a great deal of careful planning is required to run a successful solid waste program, so, too, does policy intervention require an equivalent emphasis on design and implementation analysis.

The Use of Bans, Taxes, Fees and Grants/subsidies to Promote Waste Prevention

Waste prevention policies vary according to the degree to which they intervene in the operation of the market. Some policies are voluntary, others place financial incentives on producers and consumers to change their behavior and a third set directly regulate waste prevention-related activities and products. It should be noted that regardless of the degree of market intervention, legislative activity of some sort is likely to be required. Even a public education campaign -- a voluntary approach to waste prevention -- will probably require budgetary authorization. More important, most policies that focus on the use of financial incentives require a statutory or regulatory structure that establishes and enforces the incentives.

Advance Disposal Fees (ADFs)

Taxes which 1) attempt to assess the financial and environmental impacts that the wastes impose on the solid waste management system and, then 2) charge those costs back to the relevant products, are called advance disposal fees. While ADFs can be imposed on any particular component of the waste stream, they have the advantage that they can be designed to address the entire waste stream.

Underlying the rationale for an ADF is the notion of using a fee or tax to internalize externalities related to solid waste management. An externality is a cost associated with a product or activity that falls on a party external to a particular commercial transaction. In the case of solid waste management, the cost of collection and disposal is not incorporated into the price of a good or package -- the external cost falls on the community rather than the producer or consumer. On the one hand, manufacturers and retailers do not bear the cost of collection and disposal of wastes created when their products are discarded. On the other, in New York City, consumers do not bear the cost of solid waste management directly or in proportion to the waste that they generate. An ADF, in effect, adjusts the price of products so that it includes waste management and environmental costs.

To be effective, an ADF must have several characteristics (Tellus 1990b). First, the ADF itself must bear some relationship to the externality that it was meant to remedy. The goal of an ADF is to

increase the price of the relevant good up to the point where its cost to the consumer equals the social cost (the conventional cost of a good combined with the cost of waste management and relevant environmental impacts). Second, the ADF should be dynamic -- it should change as the relevant external costs change. If the environmental impact of a particular good or material changes, so, too, should the ADF.

ADFs can be imposed in a variety of places in the product life cycle. Manufacturers, distributors, or retailers can pay the ADF. In all cases, the cost of waste management is integrated into the cost of the product and demand, to some extent, is lessened as the price rises to reflect the cost of the tax. However, the point where the fee is imposed has other effects. A fee imposed at the point of last sale -- where the consumer purchases a product from a retailer -- increases the visibility of the incentive to consumers and presumably heightens the educational value of the fee. At the same time, a point of last sale fee increases administrative complexity by requiring collection of fees at thousands of retail stores. A fee imposed at the point of first sale -- on manufacturers or on the first distributor to import the product into New York -- involves collection from a smaller number of taxable entities and probably has a more direct impact on product design and marketing decisionmakers.

No ADFs as described here have been enacted in the United States. The State of California is considering creation of such a fee system and has commissioned an extensive study of how an ADF might be structured and administered (Tellus 1990b).

Taxes

Other types of taxes can be employed to further waste prevention goals. The most common taxes discussed in this context are *packaging taxes* and *virgin materials taxes.*

Packaging taxes, in a general sense, are a form of ADF targeted specifically to packaging. However, most packaging taxes differ in the details of their design from ADFs. Packaging taxes have the disadvantage that they address only about 1/3 of the waste stream; they have little impact on semi-durable or on durable goods.

Packages can be taxed on a variety of bases: per weight, per volume, on the ratio of product to package, per item, per value or gross sales or receipt. At least seven states are considering packaging taxes, but to date only litter taxes have been enacted. Litter taxes are typically imposed on companies that make or sell products that contribute to litter. To date, such taxes are assessed on company revenues in such a fashion that there is little or no incentive for the reduction of packaging.

Virgin material taxes would have a more indirect impact on waste prevention. Such a tax would assess a per ton fee on all virgin materials. One current proposal suggests that this fee be imposed at the level of primary materials processing (e.g., the steel mill, paper mill or polymer plant) (Teasely 1990). The primary goal of virgin materials tax would be to stimulate the use of recycled materials by changing their price relative to their virgin substitutes. To the extent that *all* materials were made more expensive by this tax, waste prevention would be encouraged because materials use in general would become more costly. If recycled feedstocks were taxed as well, the tax would have a more direct impact in fostering waste prevention because the incentives for conservation would extend to all materials used as production inputs.

Categorical Product and Material Bans

Bans directly attack components of the waste stream thought to have an egregious effect on solid waste management or the environment. The policy consequences of bans are mixed. Their primary weakness as a waste prevention tool is that they do not specify what good or material should be used in the place of the banned product. Thus, by stimulating substitution to the wrong type of product, a ban can fail to induce waste prevention. A ban is more appropriate where toxicity is a concern and where a variety of harmless substitutes are available and are likely to be used.

Bans can provide a powerful political impetus for action by industry. Because they deny industry access to markets for their goods, industry is often provoked to become involved in solid waste management. However, the typical industry response to bans has been to promote recycling, rather than waste prevention, as an alternative to banning of the relevant product.

Conditional Bans and Related Packaging Regulation

Conditional bans outlaw (or fine) the sale or use of a set of goods or materials unless those products meet specified recycling and prevention targets. Typically, conditional bans focus on packaging and require either that packages are source reduced, that they are re-usable, that they are recycled at a given rate in the relevant jurisdiction, or that they are made of recycled or biodegradable materials. Such "rates and dates" laws, so named because of requirements that packages and/or materials meet recycling or prevention goals by specified dates and at stipulated rates, are being advanced by several organizations around the country including the Massachusetts and Oregon Public Interest Research Groups (MASSPIRG and OSPIRG). Other related proposals include bans of packaging that exceed specified ratios of "product to package" (US Congress, OTA 1989, Hershkowitz 1990). Another variant on this approach, under development by the Coalition of Northeast Governors (CONEG), requires that packaging users (i.e., manufacturers, distributors or retailers) reduce the quantity of packaging placed into commerce as measured on a company-wide basis. Under this "mass balance" approach, so named because the packaging material input and output to the relevant business is the focus of regulation, businesses can achieve their reduction goals through any combination of source reduction, re-use, recycling and recycled content.

Conditional bans are more flexible than categorical bans in that they provide multiple means by which industry can meet public policy objectives and because they establish incentives for industry compliance rather than simply outlawing market participation. Conditional bans of this sort are less effective, however, than broader tax schemes for promoting waste prevention in that they typically only focus only on the approximately one third of the waste stream comprised of packaging. Neither are they dynamic: if a package or material reaches its legal target, there is no incentive to further improve its waste prevention characteristics, while a tax can provide ongoing incentives.

Tradeable Credits

Tradeable credits, also known as marketable permits, have been proposed as a component of several waste prevention and recycling policies (Congress 1991, 57-65). Originally developed in the context of the air pollution regulation and now part of the federal Clean Air Act regime, tradeable credits allow regulated entities which surpass regulatory targets to sell the "excess" accomplishments to other firms or institutions. Tradeable credits allow firms that can comply with regulations at low cost to do so and to reap financial benefits by selling credits to firms that can only comply at greater cost. The net intended result is society-wide compliance with environmental goals

at lower overall costs (Project 88 1991). Tradeable credits can also mitigate the need for elaborate exemptions provisions in law or regulation, because firms potentially out of compliance can purchase credits in lieu of either meeting environmental requirements or pursuing administrative exemption.

Most, but not all, tradeable credit schemes in solid waste have been proposed in the context of recycled content or recycling rate legislation. The CONEG mass balance approach described above, however, includes a tradeable credit component that encompasses credits for source reduction and re-use.

Subsidies/Grants

Financial incentives to encourage waste prevention activities can be provided through tax concessions, subsidies and grants to manufacturers, retailers or consumers. Such positive financial incentives typically fall into the following categories:

- Tax credits/exemptions - provide taxpayers with deductions against their federal, state or local taxes. Manufacturers could receive investment tax credits for the purchase and use of production equipment related to waste prevention, as for example, if a bottler installed washing and refilling equipment for returnable beverage containers. The state of Rhode Island provides a sales tax exemption to retailers using biodegradable and returnable grocery bags (Tellus 1990b).

- Direct grants - government funds can be provided directly to organizations, businesses or individuals for activities related to waste prevention. Grants to nonprofit organizations developing or operating waste prevention programs are a conventional tool of government program implementation. In a related vein grants can be made to organizations promoting job training for repair services that encourage re-use of appliances and similar bulky items.

- Businesses can also be the recipients of government loans or grants to defray waste prevention costs or to develop waste prevention services.

Subsidies can provide stimulus for businesses, organizations and individuals to engage in waste prevention activities or to provide waste prevention related services. Some subsidies have the disadvantage that they violate the "polluter pays" principle of waste prevention which suggests that economically efficient environmental policy is promoted when the entity responsible for the generation of pollution bears the financial responsibility for ameliorating it.

Powers and Limitations of Local Regulation of Interstate Commerce

Because waste prevention involves stimulating changes in product design, production and distribution, many of the decisions that can bring about a reduction in waste must occur outside of New York City. Many, if not most, of the manufacturers of goods and materials that could be made "waste-prevention friendly" are not located in New York. This implies waste prevention inevitably involves policies through which a local government attempts to influence businesses and organizations operating outside its jurisdiction.

Attempts by New York City to reach beyond its borders to effect waste prevention are shaped by two sets of factors: legal limitations and political feasibility.

Legal Limits on Extra-jurisdictional Regulation

Bans of and taxes on packages and materials face constitutional challenges as unreasonable interference with interstate commerce and as violations of the equal protection clause of the Fourteenth Amendment of the US Constitution (Kovacs 1988).

In the landmark case, *Minnesota v. Clover Leaf Creamery Company* (449 US 456(1981)) the Supreme Court in 1981 upheld a Minnesota law that prohibited the retail sale of milk in plastic, nonreturnable, nonrefillable containers but allowed the use of similar containers made of other materials. Because the statute did not discriminate between products made locally and those products from outside the jurisdiction, protectionism was not at issue. The Court held that the bans were permissible as long as the burden imposed on state commerce was outweighed by the local benefits provided by the ban and that other policy alternatives were not available. One legal commentator argues that policy or technical analyses that undermine the rationale for bans could undermine the legal basis for the Courts support of bans (Kovacs 1988).

New York has had its own legal battles over the regulation of products and materials for solid waste purposes. New York City enacted a packaging tax in 1971 after the state legislature passed a law specifically providing the City with the relevant legal taxing authority. Industry successfully challenged the local law in court (*Society of the Plastics Industry, Inc. et. al. v. City of New York et. al.*, 68 Misc 2d 366 (1971)) but the City retains a clear legal authority to pursue packaging and product regulation. Clearly, any attempt by New York to intervene in interstate commerce to promote waste prevention will require careful crafting of statutory language and thorough policy analysis to avoid legal challenge.

Political Feasibility of Local Product Regulation

Ironically, local bans or taxes on goods and materials can be more politically feasible than policies imposed at the state or federal level. Where the targets of waste prevention efforts are *not* manufactured locally, bans or taxes do not impose costs on local constituencies. Similarly, local jobs and tax revenues are not impacted in these cases (Lifset and Chertow 1990, Elliott, Ackerman and Millian 1985).

There are other ways that local regulations can be effective. In the case of New York City, the sheer size of the market makes national and international producers responsive to demands for changes in product designs that incorporate waste prevention considerations. In a related vein, the threat of inconsistent regulation across local jurisdictions (and the production and marketing costs that such inconsistency imposes) forces manufacturers to take notice of local waste prevention policies. New York City possesses substantial political leverage in these respects that can bring producers to the negotiating table in a way that is not true of smaller local jurisdictions.

RESEARCHING WASTE PREVENTION OPPORTUNITIES AND IMPACTS

Because waste prevention is a relatively new strategy in solid waste management in New York and throughout the country, much remains unknown about its prospects and its impacts. The Manhattan Citizens Solid Waste Advisory Board (MCSWAB), for example, compiled a detailed list of such programs and policies that offer potential for significant prevention achievements and might profitably be the subject of further research and modeling (see appendix 4). In addition, three dimensions of waste prevention require focused research: 1) developing ways to measure the

success or failure of waste prevention efforts, 2) determining the costs of waste prevention activities, and 3) analyzing the effect of waste prevention on the local economy.

Developing ways to measure the success or failure of waste prevention efforts.

Measuring waste prevention is critical. By examining which strategies do, in fact, produce a reduction in the waste stream, the City can make decisions about where to spend its scarce budgetary dollars. Currently, there are no well established methods for measuring the effectiveness of reduction and re-use. There are two general approaches. Neither would provide the information New York City needs to evaluate its efforts. The first method is to measure the entire waste stream regularly and in detail. The second examines specific target materials only. Neither successfully allows the investigator to link specific programmatic effects to changes in the waste stream. The relationship between the amount of waste prevented and the underlying socio-economic variables has never been clearly established and quantified. The amount of a particular discarded material may decline for any number of reasons unrelated to waste prevention -- its purchase and use may diminish, for example, because of the general status of the economy or changes in the market, and all waste streams vary with population changes. The first approach is expensive. The second does not allow monitoring of system-wide changes resulting from broad-based strategies such as taxes or users fees.

These limitations might be circumvented through a new research design which would combine targeted sampling at the generator level with related empirical analysis. The targeted sampling would provide data on various types of generators at reasonable cost. The empirical analysis would allow correlation of changes in the waste stream with demographics, the specifics of local waste prevention activities and other related variables. The correlations would then permit generalization of findings about changes in waste stream composition and quantity to the entirety of the City's waste stream.

Determining the Costs of Waste Prevention Activities

The City also needs to determine the costs and savings due to pursuing waste prevention. The costs include both the costs of administration and programming and the costs incurred by the residents and businesses who are the object of the City's efforts. The savings would include reductions in DOS expenditures as well as savings accruing to waste generators. Clearly, when the effectiveness of the strategies to reduce waste are tied to the costs and savings, the City will be able to make much more informed decisions about waste prevention.

Analyzing the Effect of Waste Prevention on the Local Economy

At the same time, broader issues need to be addressed. Waste prevention may reduce economic growth to the extent that it reduces consumption. The trade-off between improvement in the environment and cost saving accruing to New York's solid waste management systems on the one hand, and any impact on the City economy, needs to quantified so that City policymakers can approach waste prevention with an understanding of its tradeoffs. Such an analysis would study the impact of waste prevention on City employment, tax revenues and economic activity.

RECOMMENDATIONS

Waste prevention can best be advanced in New York City through a three-pronged approach. First, remedies for the structural barriers need to be found. Because these barriers are institutionalized in the fabric of New York's commerce and policies, only long term strategies will be successful in bringing about change. Second, programmatic initiatives that require less daunting change should be pursued in the short run. While these initiatives will ultimately have less impact on quantity of waste reduced, they present concrete opportunities to lessen the cost and environmental impact of municipal solid waste collection and disposal. Third, research needs to be undertaken to develop techniques to measure the impact of waste prevention on the waste stream, to document the relevant costs and savings and to assess the impact of such programs on the economy of New York, so that more informed waste prevention policy can be formulated.

The recommendations are listed generally in the order in which they are discussed in the text. They are discussed in sufficient detail to make clear the specific policy or materials they are meant to address, but prior to their implementation, consideration of numerous local conditions would be needed. A recommendation is offered if, given the currently available information, it seems both desirable from a policy view point and practical from an operations perspective. In addition to the recommendations discussed below, there are suggestions made throughout the text of this report that would require more discussion, but can also be considered for implementation.

Attacking Structural Barriers

The recommendations in this section incorporate the most effective waste prevention strategies over time, but none can be implemented quickly. Most will require several years of sustained policy and program development to be successful.

Recommendation 1: Establish Charges for Waste Services Based on the Amount of Waste Generated {Ref. page 8, 10}

New York City should increase the financial incentives for waste prevention by making waste generators in the residential, institutional and commercial sectors pay for waste collection and disposal according to the quantity of trash they discard. Goals for the program would include:

1. Developing rate structures that offer significant rewards to low volume generators;

2. Refining DOS's cost accounting program so that costs can be appropriately allocated to relevant generators; and

3. Devising systems that are fair and explainable to constituents.

Phase 1 - Institutional - Devise and implement a charge system for municipal and non-municipal institutional customers based on the above goals. Volume based charges have already been implemented for certain hospitals and have been proposed for certain nursing homes. Create a study group including facility managers from institutional customers to assist in the specifics of the rate design and review process. Release proposed rate information at least six months prior to the budget cycle in which charges will be implemented so that these customers can prepare for the budget impact.

Phase 2 - Commercial - Revise existing commercial rate structures established through the Department of Consumer Affairs to make private carting fees more volume sensitive and to disaggregate collection and disposal costs. Examine the experience of other cities such as Portland, Oregon where large numbers of commercial carters are regulated and Albuquerque, New Mexico where collection service is provided by the local government, but user fees are charged. Plan implementation over several years so that carters are fully informed and expectations are set appropriately.

Phase 3 - Residential - Study the feasibility of establishing quantity-based user fees in low density residential areas and in a multi-tenant area using a bag/tag system. Include in the feasibility analysis means by which QBUFs can be field tested to gather data on how waste quantities and composition are influenced and on the administrative feasibility of user fees.

Recommendation 2: Develop Administrative Procedures to Integrate Waste Prevention Into Management Decisionmaking {Ref. page 11}

Within the City government, revise administrative directives and budget procedures so that frontline management personnel take on responsibility for the overall cost of solid waste management. The budget system would include objectives for waste reduction and expenditure lines for waste services to reflect the plan for meeting those objectives. Similarly, waste prevention objectives could be incorporated into performance evaluation systems. A City-sponsored conference could determine whether others in the nonprofit or private sectors were conducting similar efforts and, after the City or others had satisfactorily developed the system, model components could be offered to institutional and commercial generators.

Recommendation 3: Monitor New Information About the Impacts of Consumer Materials {Ref. page 12}

Efforts to examine the cradle to grave impact of products and materials are growing rapidly, but the methodology and objective results for Life Cycle Assessments (LCAs) are still unclear. New York City should monitor these processes to gain information on which waste components are least harmful to health and the environment so that beneficial materials that lead to net reduction of waste can be promoted in lieu of those found to have deleterious effects.

Recommendation 4: Support State and Federal Taxes to Encourage Waste Prevention {Ref. page 48}

It is difficult to recommend specific waste taxes in isolation from the City's financial planning as a whole, particularly given the numerous ways being explored to close the existing budget gap. In principle, broad-based taxes such as advance disposal fees (ADFs) or packaging taxes provide the basis for comprehensive, system-wide waste prevention -- an especially important consideration when policy tools such as quantity-based user fees will require considerable time for design and implementation. Yet, enactment of ADFs or other similar taxes without state or regional coordination could drive commerce out of the City. At the same time, even the possibility of taxes can prompt renewed industry efforts to facilitate waste prevention. At a minimum, New York City should provide vigorous support to efforts to develop state and federal taxes that would stimulate waste prevention.

Recommendation 5: Examine Expansion of Deposit Legislation to Improve Downstream Processing of Recyclable Materials {Ref. page 15,17}

The section on "Integrating Waste Prevention with Collection, Processing and Disposal Practices" suggests that New York City should consider prevention policies based not only on how they influence overall waste quantities, but also on how downstream waste management options, such as recycling, become effected. In the case of glass, removal prior to residential collection would be beneficial because broken glass tends to contaminate loads destined for recycling or composting and nonrecoverable glass shards create additional waste at recycling processing facilities. Glass is a desirable environmental package because, when recovered, it is easily recycled.

One way of removing glass, as well as other beer and soft drink containers, from the waste stream has been through deposit legislation. Extending deposits to all alcohol bottles would cause more glass to bypass the waste management system. To avoid over burdening retailers, the redemption center model New York has put in place, which incorporates environmental as well as social goals, could be expanded. It must not be interpreted that the objective of such a program is to target glass unfairly or to make it non-competitive. Recycled content laws or other environmentally appropriate legislation could be considered simultaneously so that products that reuse the most materials are rewarded. Exploration and analysis of extending the bottle bill to alcohol and possibly to other containers is recommended as a way to improve downstream processing and to increase the quality of recycled materials.

Pursuing Programmatic Opportunities

These recommendations call for initiating or supporting programs that affect a particular component of the waste stream or specific class of waste generators.

Recommendation 6: Legislate Performance of Waste Audits {Ref. page 35, 36}

In order to propel the business community toward the 8-10% waste prevention goal, a comprehensive program to require waste audits should be established for medium and large businesses. Rather than rely on additional DOS personnel, implementation could be organized by channeling individual businesses through relevant trade associations and business groups. The waste audit plan would:

1. Provide time initially for the trade associations and groups to develop guidelines for how waste prevention could be accomplished in each business sub-sector. It would be expected that some companies could reduce waste generation well in excess of the 10% goal.

2. Require waste audits that meet the guidelines for business sub-sectors to be completed by a specified time.

3. Require the trade associations and groups to report on implementation of the strategies generated by the waste audits and the level of reduction being achieved by the affiliated companies at least annually.

This approach to waste auditing could build on the New York City Partnership for Waste Prevention activities.

A combined waste/rate audit program could complement or substitute for the above program. By linking waste audits to rate audits based on the NYC Department of Consumer Affairs rate regulation activities, businesses could be provided some assurance that reductions in waste generation would result in reduced collection and disposal costs.

Recommendation 7: Fund a Non-profit Waste Exchange for Shipping Waste and Non-hazardous Material. {Ref. page 37}

While the concept of a waste exchange is not new, and New York City is served by the non-profit Northeast Waste Exchange in Syracuse, the listings in this service do not focus on local needs within New York City or on low value items such as packing materials. Within the City, the value of re-using many inexpensive materials is primarily the avoided cost of collection and disposal. A City-based exchange, initially supported by DOS funding, could serve as broker for a myriad of materials and eventually become a self-sustaining program by charging sufficient transaction fees. City support of such a service should be limited to the value of the avoided cost of collection and disposal.

Recommendation 8: Support the Industry Challenge by the CONEG Source Reduction Task Force to Reduce Packaging Waste. {Ref. page 31, 39}

The Source Reduction Task Force (SRTF) of the Coalition of Northeastern Governors (CONEG) is working to spur waste prevention in packaging through voluntary efforts by corporate packaging producers and users. In January 1991, the CONEG SRTF produced its Preferred Packaging Guidelines offering suggestions for packaging re-design to achieve increased reduction, re-use and recycling. The CONEG SRTF followed this up by announcing a challenge to business to voluntarily participate in a program calling on each company to inventory its materials management practices and to take steps to implement waste preventive measures. CONEG is tracking industry progress in the challenge. New York City should publicly encourage its businesses to take the challenge and suggest that many non-business organizations participate as well.

Recommendation 9: Modify City Procurement Guidelines to Stipulate the Purchase of Re-usable Products and to Minimize Packaging {Ref. page 34, 38}

The implementation of Local Law 19 raised awareness about recycling issues, especially with regard to procurement of recycled products and collection of recyclable wastes. Similarly, the government could be moved toward waste prevention by revising purchasing policies to support the substitution of durable and re-usable goods in place of semi-durable and disposable goods and the substitution of non-toxic and less toxic products for their more toxic counterparts.

The City could also investigate a program where vendors selling products to the City are required to minimize packaging waste associated with the products and to retain possession of shipping waste, much as has been done by several large corporations in the United States. Such a program should rely on the expertise of vendors and City purchasing and logistics officials, to avoid causing counterproductive disruption of City procurement and distribution activities.

Recommendation 10: Target "Junk" Mail for Source Reduction {Ref. page 41}

Like product manufacturers who have not typically had to incorporate solid waste management costs into the price of their goods, marketers, also, have not had to worry about the impact of direct

mail on the waste stream. The City should investigate restructuring of postal rates for this purpose as well as other legislative means by which solid waste management concerns can be integrated into the business decisionmaking of direct marketers. In the mean time, the City should continue capitalizing on the Mail Preference Service (MPS) by expanding its current subway campaign for waste prevention to offer mail-back postcards so that interested New York City residents can have their names removed from mailing lists. The City should also develop a model program to facilitate the removal of names of City employees from superfluous mailings lists and periodical subscriptions. Lessons from that effort can then be shared with both institutional and commercial waste generators in the City. The generators most likely to be receptive will be the ones whose waste fees decrease for each ton of waste reduced.

Recommendation 11: Increase Support to Charitable Organizations Sponsoring Re-use Programs {Ref. page 43}

Outlets for re-usable materials such as clothing and furniture would greatly benefit from support from the City to encourage them to expand their programs. The City should investigate in detail the constraints faced by organizations such as Good Will and the Salvation Army to find mutually acceptable means by which these types of organizations can increase their capacity for repair and re-marketing of salvageable goods. Options the City might offer include discounting disposal for these organizations and funding for training personnel in the skills required to reclaim and repair used goods.

Recommendation 12: Pursue Reduction of Yard and Food Wastes {Ref. page 44}

The City should fully implement a "leave-it-on-the-lawn" campaign for the reduction of grass clippings. Similarly, the City should aggressively pursue the education and organization needed to promote extensive backyard and on-site composting in relevant areas throughout New York.

Recommendation 13: Monitor the Progress of "Leave the Packaging Behind" Initiatives {Ref. page 16}

Efforts in Germany to expand the responsibility for the disposal of packaging materials to retailers and manufacturers may cause substantial packaging reduction. The City should monitor the progress of this legislation in Germany and of related US initiatives to determine the applicability of a similar program for New York.

Advancing Waste Prevention Through Research

Recommendation 14: Develop a Plan for Quantification and Impact Measurement {Ref. page 53}

Because of the critical need to establish the effectiveness of -- and the potentially high payoff for -- specific reduction and re-use strategies, research and a substantive plan for measuring impacts of those strategies on the waste stream should be pursued. Tracking of costs and savings associated with waste prevention endeavors as the City implements its solid waste management plan will allow the City to analyze and refine the cost-effectiveness of reduction and re-use activities.

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