New York State Department of Environmental Conservation

Beyond Waste

A Sustainable Materials Management Strategy for New York State

Adoption Date: 12/27/10

TABLE OF CONTENTS

APPENDICES

TABLES AND FIGURES

LIST OF ACRONYMS USED

ACM – Asbestos Containing Material

ADC – Alternative Daily Cover

ASTSWMO – Association for State and Territorial Solid Waste Management Officials

BFR – Brominated Flame Retardants

BTU – British Thermal Unit

BUD – Beneficial Use Determination

CARB – Concrete Asphalt Rock Brick

CCR – California Climate Registry

C&D – Construction & Demolition

CKD – Cement Kiln Dust

CO2E – Carbon Dioxide Equivalent

CRA – Comprehensive Recycling Analysis

CRT – Cathode Ray Tube

CW/CA – Clean Water/Clean Air

DEC – Department of Environmental Conservation

DEP – Department of Environmental Protection

DER – Division of Environmental Remediation

DFWMR – Division of Fish, Wildlife & Marine Resources

DOCS – Department of Correctional Services

DOH – Department of Health

DOW – Division of Water

DSHM – Division of Solid & Hazardous Materials

EBC – Environmental Benefits Calculator

ECL – Environmental Conservation Law

EFC – Environmental Facilities Corporation

EIP – Environmental Investment Program

EOM – Exogenous Organic Matter

EO4 – Executive Order 4

EPF – Environmental Protection Fund

EQBA – Environmental Quality Bond Act

ESD – Empire State Development

ESU – Environmental Services Unit

E-WASTE – Electronic Waste

FY – Fiscal Year

GHG – Greenhouse Gases

GML – General Municipal Law

HDPE – High Density Polyethylene

HHW – Household Hazardous Waste

HRA – Health Risk Assessment

HTRRP – High Technology Resource Recovery Program

IMERC – Interstate Mercury Education and Reduction Clearinghouse

IPCC – Intergovernmental Panel on Climate Change

KSWS – Kansas Stripper Well Settlement

LDPE – Low Density Polyethylene

LSWMP – Local Solid Waste Management Plan

MACRS – Modified Accelerated Cost Recovery System

MACT – Maximum Achievable Control Technology

MOU – Memorandum of Understanding

MRF – Materials Recovery Facility

MSW – Municipal Solid Waste

MTCO2E – Metric Tons Carbon Dioxide Equivalence

MWC – Municipal Waste Combustor

MWR&R – Municipal Waste Reduction & Recycling

NAS – National Academy of Sciences

NERC – Northeast Recycling Council

NEWMOA – Northeast Waste Management Official Association

NMOC – Non-Methane Organic Compounds

N2O – Nitrogen Dioxide

NYC – New York City

NYSASWM – New York State Association for Solid Waste Management

NYSERDA – New York State Energy Research and Development Authority

OCRRA – Onondaga County Resource Recovery Agency

OGS – Office of General Services

PAYT – Pay As You Throw

PCBS – Polychlorinated Biphenyls

PET – Polyethylene Terephthalate

PORA – Petroleum Overcharge Restitution Act

RCRA - Resource Conservation and Recovery Act

RGGI – Regional Greenhouse Gas Initiative

RHRF – Recyclables Handling and Recovery Facility

RMW – Regulated Medical Waste

SCO – Soil Cleanup Objectives

SEQR – State Environmental Quality Review

SMART – Save Money and Reduce Trash

SSR – Source-Separated Recyclables

SUNY – State University of New York

TAR – Toxics Along for the Ride

TCLP – Toxic Characteristic Leaching Procedure

TPCH – Toxics in Packaging Clearinghouse

EPA (OR EPA) – United States Environmental Protection Agency

VDF – Vehicle Dismantling Facility

VOCS – Volatile Organic Compounds

WARM – Waste Reduction Model

ACKNOWLEDGEMENTS

Development of *Beyond Waste: A sustainable materials management strategy for New York State* has been a collaborative effort that harnessed the energy and expertise of many people, both within and outside of the New York State government. The planning process was launched at the direction of New York State Department of Environmental Conservation Commissioner, Pete Grannis and Deputy Commissioner for Remediation and Materials Management, Val Washington. It was led by Resa Dimino, Special Assistant in the Commissioner's Policy Office, with support and assistance from Sharon Gebhardt, from the Division of Solid and Hazardous Materials' Bureau of Program Management.

Staff in DEC's Division of Materials Management, formerly the Division of Solid and Hazardous Materials, constituted the core team in development of this Plan under Resa Dimino's leadership. Former Division Director Ed Dassatti, former Assistant Division Director David O'Toole and former Bureau Director Jeff Schmitt provided valuable guidance and direction throughout development of the draft Plan, with current acting Division Director Sal Ervolina and acting Assistant Director Bob Phaneuf assisting with finalization of the Plan. The division's current bureau directors David Vitale, Peter Pettit and Scott Menrath, and section chiefs Sally Rowland, Tom Lynch, with Rick Clarkson, along with regional staff, debated alternative directions and provided significant input on the substance of the Plan and its recommendations. DMM staff also drafted key portions of the Plan and the Responsiveness Summary. Of particular note, David Vitale, Scott Menrath, and staff engineers Jaime Lang and Gerard Wagner refined and analyzed available data and developed the assumptions on which projections and estimates are based, and Rick Clarkson managed the response to comments on the draft Plan.

The staff of Empire State Development's Environmental Services Unit, particularly Brenda Grober and Linda Jacobs Glansberg, contributed to the discussion and to the drafting of the Plan, particularly to the sections on economic development, job creation, and financing programs.

Staff in DEC's Division of Public Affairs provided essential assistance in editing, layout and design of the Plan. Special thanks go to Bernadette LaManna, Ellen Bidell, Elaine Bloom, John Razzano, Jenn Peiser and Bob DeVilleneuve.

External stakeholders also provided important input. More than 150 people who attended stakeholder meetings in February and March of 2008 helped formulate a basic outline and direction. Members of the Solid Waste Advisory Group, formed by DEC to aid in crafting the Plan, provided valuable information and guidance based on their own unique experiences, perspectives and expertise in the management of solid waste. They also gave generously of their own time and resources in traveling to Albany to participate in many day-long–and longer–meetings over the course of nearly two years. Their insights were indispensible to DEC staff throughout the planning process, as dozens of issues and ideas were vetted, fleshed out and debated.

The Solid Waste Advisory Group included:

- Judy Drabicki, Director, DEC Region 6, (Chair)
- Hans Arnold, Former Executive Director, Oneida Herkimer Solid Waste Authority
- John Casella, Karen Flanders and Larry Shilling, Casella Waste Systems, Inc.
- Jeff Cooper, New York State Association for Reduction, Reuse and Recycling
- Fred Cornell, Institute for Scrap Recycling Industries
- Gavin Kearny, New York City Environmental Justice Alliance
- John Kowalchyk, Office of Parks, Recreation and Historic Preservation
- Robert Lange, New York City Department of Sanitation
- Jay Pisco, New York Chapter of the Solid Waste Association of North America
- Peter Scully, Director, DEC Region 1
- Kate Sinding, Natural Resources Defense Council
- Abby Snyder, Director, DEC Region 9
- Kevin Voorhees, New York State Association for Solid Waste Management
- John Waffenschmidt, Covanta Energy Corporation
- Barbara Warren, Citizens Environmental Coalition

The Plan was released in draft for public comment on May 5, 2010, and DEC accepted comments until August 16, 2010. Five public hearings were held at which 55 people provided testimony. In addition, more than 120 individuals and organizations submitted written comments, and more than 430 people signed form letters, called or e-mailed regarding elements of the Plan. In total, more than 1,300 individual comments were received during the comment period. These comments are presented in the Responsiveness Summary, as are DEC's responses to them.

New York State owes a debt of gratitude to the individuals and organizations who contributed their time and talents to the production of the Solid Waste Management Plan.

EXECUTIVE SUMMARY

New York State's Beyond Waste Plan (Plan) sets forth a new approach for New York State—a shift from focusing on "end-of-the-pipe" waste management techniques to looking "upstream" and more comprehensively at how materials that would otherwise become waste can be more sustainably managed through the state's economy. This shift is central to the state's ability to adapt to an age of growing pressure to reduce demand for energy, reduce dependence on disposal, minimize emission of greenhouse gases and create green jobs.

Accomplishing this change necessitates increased attention to influencing product and packaging design to foster a system that minimizes waste and maximizes the use of recyclable materials. This will require the involvement of all players in the production and supply chain—product manufacturers, distributors, retailers, consumers, and government. It will also require increased investment in our recycling and distribution/reverse distribution infrastructure. Ultimately, it will result in decreased reliance on waste disposal.

The materials management system envisioned in this Plan would capture the economic value of our materials, conserve their imbedded energy, and minimize the generation of greenhouse gases and pollution. The New York State Department of Environmental Conservation (DEC) projects that implementing this plan could reduce nearly 21 million metric tons of CO_2 equivalent greenhouse gas emissions annually, save more than 280 trillion BTUs of energy each year—as much energy as is consumed by more than 2.6 million homes—and create 67,000 jobs by 2030 and economic opportunity in the process.[1]

This vision can only be fully realized if the state allocates resources for additional staff and infrastructure at the state and local level, if manufacturers take financial or physical responsibility for the reuse and recycling of the products and packaging they put into the marketplace, and if residents and businesses embrace their responsibility for proper materials management. This Plan recommends a number of potential revenue streams to offset the costs to the public sector, as well as legislative recommendations to engage the private sector more fully in moving New York State beyond waste.

[1] The methodology and data used to derive these figures is provided in Appendix A

THE ROLE OF THE BEYOND WASTE PLAN

Recycling and solid waste management have traditionally been local responsibilities and will continue be so. This Plan itself does not establish new mandates for municipalities and does not dictate a specific or rigid approach to local planning and programs. Any new mandates would be imposed through legislation or regulation, and, therefore, be subject to a formal, public process. The recommendations in the Plan suggest a starting point for these processes.

This Plan recognizes the diversity of the communities in the state, including variability in financial capacity, and presents options available to planning units and others engaged in waste reduction efforts. To be consistent with this Plan, local solid waste management plans should evaluate and then propose methods to reduce waste and increase reuse, recycling and composting within the planning unit. Planning units will be afforded flexibility in determining how to best implement their programs. They will not be ordered to establish specific facilities or programs or be held to firm or mandatory goals. Rather, they will be asked to work as aggressively as possible to reduce the amount of waste destined for disposal.

The policies, procedures and goals set forth in this document are intended to serve as a resource for the state and all its residents, local jurisdictions and businesses. This Plan will guide the New York State Department of Environmental Conservation (department or DEC) personnel and local solid waste management planning units in their planning and decision-making. It is a planning tool, and the contents of this Plan are not intended to create any substantive or procedural rights, enforceable by any party in administrative and judicial litigation with the State of New York, including the permitting of solid waste management facilities. The Plan does not commit any agency, board, commission, municipality, planning unit, authority or private entity to a definite course for specific future decisions or solid waste management activities.

MATERIALS AND WASTE MANAGEMENT IN NEW YORK STATE IN 2009

Through this planning process, DEC has taken stock of the current state of materials and waste management in New York State. The key findings are provided below.

- Twenty years after the state adopted a solid waste management hierarchy that places waste prevention, reuse and recycling ahead of disposal, nearly 65 percent of the total materials managed in the state, and approximately 80 percent of MSW, end up in MWCs and landfills.Although landfilling is statutorally the management method of last resort, landfills, either instate or out of state, handle the largest proportion of waste disposed.
- While there have been waste prevention successes, they have been offset by negative trends, such as planned obsolescence, the growth of convenience products and advancing technology, and, therefore, have yielded little or no reduction in the amount of waste generated in the last two decades.
- New York State and its communities have made significant progress in establishing successful recycling programs, as evidenced by the rise in recycling rates between 1987 and 1997, but progress in the last decade has stalled.

TERMS

A materials management approach necessitates a change in terminology. Materials are not waste until they are destined for a landfill or municipal waste combustor. So, this Plan uses the terms "materials" and "materials management" in place of "waste" or "waste management" when referring to activities at the upper end of the hierarchy.

The term "disposal" as used in the Plan includes municipal waste combustion, landfilling, and export for ultimate disposal.

- The well-established recycling industry in New York continues to meet the challenge of developing new markets for secondary materials.
- Virtually all municipal recycling programs eventually depend upon the recycling industry for the ultimate processing and marketing of recovered materials.
- The implementation of source-separated recycling programs has been inconsistent, not only from one community to the next, but also in different settings such as schools, businesses, and public spaces.

- The state's increasing reliance on waste export from many of its densely populated areas is problematic and potentially unreliable; principles of sustainability and responsibility dictate that materials be managed in the most efficient and environmentally sensitive manner, with consideration of the risks and impacts of out-of-state transportation.
- Materials management can play a significant role in combating climate change; landfill gas is 1.8 percent of the state's GHG inventory, while EPA estimates that 42 percent of national GHG emissions are influenced by the lifecycle impacts of the products and packaging that become waste.
- Reuse provides multiple environmental, economic and social benefits; there is potential to expand reuse, particularly in key sectors including building deconstruction.
- Redistributing consumable food through food banks or as animal feed provides social and economic benefits, as well as reducing waste.
- As for any commodity, recycling markets are variable; however, on average, market values for conventional recyclables (metal, plastic containers and many grades of paper) have been consistently strong for the past two decades.
- Organic materials represent 30 percent of both the materials generated and the waste disposed; recycling organics has multiple benefits, including reducing the generation of greenhouse gases, creating valuable soil amendments, creating jobs and reducing reliance on waste disposal.
- Product and packaging stewardship programs create incentives to reduce waste in product and package design and to increase recycling.
- Pay as You Throw/Save Money and Reduce Trash (PAYT/SMART) programs create a financial incentive for consumers to waste less and recycle more. Public education and enforcement are critical tools to prevent waste and increase reuse, recycling and composting.
- Market development attention is still needed for emerging or problematic recyclables, including organics, plastics, glass and construction and demolition debris.
- Construction and demolition (C&D) debris recycling has been inhibited by a lack of markets for inherently valuable materials, a lack of information on material composition, origin and destination, and concerns about asbestos contamination.
- Landfill and MWC design has significantly improved over the last 20 years, representing an important investment in environmental protection and energy generation and creating capacity that will continue to be necessary for the management of waste that cannot be prevented, reused or recycled.

MOVING FORWARD: SUSTAINABLE MATERIALS MANAGEMENT ACTION PLAN

This Plan seeks to fundamentally change the way discarded materials are managed in New York State by progressively reducing the amount of materials that go to disposal over the 10-year planning period and the 20-year planning horizon. Together, the recommendations below are intended to respond to the findings discussed above and achieve the Plan's goals. Implementing these recommendations will require allocation of significant resources by the state to local governments, as well as the full engagement of the private sector. The legislative recommendations below are intended to ensure that the fiscal impact on government is relieved through product and packaging stewardship or mitigated through the creation of new revenue generating programs.

1.1 GOALS

The quantitative goal of this Plan is to reduce the amount of waste New Yorkers dispose by preventing waste generation and increasing reuse, recycling, composting and other organic material recycling methods. Currently, New Yorkers send 4.1 pounds of municipal solid waste (MSW) per person per day, or 0.75 tons per person per year, to disposal facilities. The Plan seeks a progressive reduction in the amount of MSW destined for disposal to reach the goal of reducing disposal to 0.6 pounds per person per day by 2030. The goal applies to the state as a whole; planning units are expected to develop their own baseline and goals based on similar progressive reduction in waste destined for disposal. The quantitative goal is intended to apply to MSW. While DEC has not established quantitative goals for the reduction of construction and demolition debris, industrial waste and biosolids, the qualitative goals presented in Section 2 apply to all of the waste generated in the state.

E.1 LEGISLATIVE RECOMMENDATIONS

While some of the goals of the Solid Waste Management Act of 1988 (Act) have been met, as evidenced by the growth in recycling programs since its passage, it is undeniable that higher levels of achievement are possible. With the continued growth in the volume of solid waste generated, an evolved understanding of the environmental impacts of waste disposal, and the emergence of new materials management options, there is a clear need for new priorities. Moving forward requires an updated statutory framework that sets the stage for growth and supports the paradigm shift needed to move *Beyond Waste*.

This section includes the critical elements of a new legal structure to prevent waste and increase recycling, including an updated solid waste management act, product and packaging stewardship programs, and options for generating new resources. Together, these legislative recommendations are intended to achieve the following objectives:

- Prevent waste generation
- Use materials in the waste stream for their highest and best use
- Maximize reuse and recycling
- Engage state agencies, authorities, businesses, institutions, and residents in sustainable materials management programs
- Maximize the energy value of materials management
- Engage manufacturers in end-of-life management of the products and packages they put into the marketplace

E.1.1 Updated Solid Waste Management Act

Making truly significant progress to prevent waste and increase recycling will require a new statutory structure. Updates to the act proposed here represent an integrated package of recommendations that address many issues raised throughout this Plan. Together they create a framework that will support the state's efforts to move *Beyond Waste.*

A critical element of a new framework is an updated solid waste management act to guide the actions of the state's many involved agencies and its varied municipalities. An updated act should address the following key issues:

1. *Set new goals and define new metrics:* New and aggressive reduction, composting and recycling goals will guide New York State and its citizens, businesses, local governments, and planning units in striving for reductions in waste and increases in recycling. To measure recycling progress, the state will track *per capita* waste disposal, as well as per capita diversion of recyclables and organic materials. DEC will evaluate the effectiveness of the new metric and the state's progress against the disposal reduction goal in biennial Plan updates, which will assist the State Legislature and solid waste managers in making short and long-term policy decisions that promote both effective and environmentally responsible materials management.

2. *Update and clarify recycling and green purchasing requirements for state agencies and authorities:* The 1988 Act required all state agencies and authorities to implement recycling programs; however, many agencies have not met their obligations. Executive Order 4 (EO4) is a valuable step forward in integrating waste prevention, recycling and sustainability into state operations. (See Appendix B or http://www.ogs.state.ny.us/ExecutiveOrder4.html.) Codifying state agency waste prevention, recycling, purchasing, and sustainability requirements of EO4 would ensure that the state continues to lead by example.

3. *Clarify the Solid Waste Management Hierarchy:* Research indicates that the hierarchy is still a valid and useful tool for prioritizing waste management strategies. An updated act should maintain the core elements of the existing hierarchy, which places a preference for waste prevention, reuse, and recycling above disposal, and a preference for municipal waste combustion (MWC) over landfilling. It should also clarify that reuse is preferable to recycling, that composting and organics recycling are equivalent to recycling, and that product stewardship is the preferred approach to implementing the hierarchy. The updated act should make clear that the hierarchy is a statement of policy that communities should use as a guidepost, while using more advanced tools to evaluate the economic, environmental and GHG impacts of various alternatives to determine the best path *Beyond Waste*.

4. *Generate and allocate new resources to move Beyond Waste:* Meeting the goals and objectives of this Plan will require significant investment in planning, reuse, recycling and composting infrastructure, market development, education, outreach and enforcement. This investment will necessitate an infusion of new revenue, such as one or more of the potential revenue sources discussed in Section E.1.3.

5. *Reinforce recycling requirements for all generators:* There must be no ambiguity in the message that all New Yorkers are required to recycle, whether they are at home, at work, at school, in public spaces, or in transit stations. An updated act must clarify that recycling programs must be made available to and employed by all generators in all settings in the state; that is, that source-separation requirements extend beyond the residential sector to commercial, institutional and industrial generators and to public spaces, events and other gatherings. Establishing and enforcing programs in these areas will ensure that source-separation/recycling messages are regularly and uniformly conveyed and clearly understood.

6. *Supplement the "economic markets" clause in the current law (Section 120-aa of Article 6 of General Municipal Law) with a designated list of recyclables:* The 1988 Act required that communities establish recycling programs for materials "where economic markets exist." This clause has proven to be cumbersome in practice, creating confusion and potentially undermining the value of recycled materials because a reliable supply of material is critical to justifying private capital investment in secondary materials markets. In fact, most programs have continuously collected the same materials for much of the past two decades despite periodic dips in market values. Even in 2008, during what was the most dramatic recycling market collapse in recent history, no communities in the state reported cancelling recyclables collection.

Experience also shows that when the same items are widely understood as recyclable for long periods, public participation is more successful. After more than 20 years of experience in recycling, DEC and ESD can identify the materials that are common to most programs in the state and that have had consistently viable markets; they include paper, glass, metal, plastics and yard trimmings. These would comprise an initial list of designated recyclable materials in the updated act; other potentially recyclable materials would be subject to the "economic markets" test. DEC should be authorized to add or remove materials by regulation as the market and collection/processing systems evolve. The updated act should then provide for an expedited mechanism for communities to petition DEC for an exemption from recycling requirements and a mechanism for DEC to provide statewide waivers in times of severe economic hardship or based on other critical concerns. Any mechanism enacted should include public notice, hearing and a commissioner's decision

7. *Increase DEC's authority and resources to enforce recycling requirements:* Planning units and municipalities have had the responsibility of enforcing source-separation requirements but have had difficulty allocating resources for this important task. An updated act should supplement local enforcement of source-separation requirements with explicit authority for DEC to enforce against generators who do not source separate designated recyclables in the act.

8. *Ensure that every permitted facility maximizes recycling and reuse and otherwise affords opportunities to manage waste at the highest possible point in the hierarchy within the facility's service area:* An applicant whose facility is not explicitly part of an integrated system should contribute in other ways to encourage recycling, reuse, organics recycling, household hazardous waste (HHW) collection and other means of reducing the amount of waste disposed in the community in which it is located and by the communities within its service area.

9. *Establish disposal restrictions on bulk quantities of mandatory recyclable materials and other materials, including hazardous products, where recovery options are readily available or achievable.* Other states, including Wisconsin and Massachusetts, report that disposal bans are an effective educational and enforcement tool and help ensure that materials are properly managed or recovered where alternatives to disposal exist. They also provide a feedback mechanism so that the state and the municipality will be notified if materials targeted for recycling are not being effectively source separated. To be most effective, such restrictions should be placed on waste generators and collectors, not only on the disposal facility.

10. *Require local solid waste management planning:* The 1988 Act enabled local governments to create planning units to manage materials regionally. To foster more consistent program implementation, local solid waste management plans (LSWMPs) should be required.

11. *Authorize local governments to franchise private materials management services:* Franchising offers an opportunity for local governments to control materials collection, recycling and disposal systems without actually operating them to ensure that local systems

are consistent with the state's sustainable materials management strategy. However, local governments must be authorized by state law to franchise these services.

12. *Expand the Waste Transporter program to place specific requirements on transporters of municipal solid waste (MSW), recyclables, construction and demolition (C&D) debris and historic fill to:* enforce source separation requirements; account for wastes that are currently largely unaccounted for, and ensure that communities who export waste comply with source separation requirements and disposal restrictions.

E.1.2 Product Stewardship

Product stewardship is a centerpiece of the *Beyond Waste* Plan because it can help New York State overcome many of the critical hurdles that have hindered success. It can influence the design of products and packaging to reduce materials use, reduce toxicity and improve recyclability. It can generate resources to optimize collection and recycling systems and improve efficiency. Ultimately, it can reduce the amount of waste disposed and help New York State move *Beyond Waste*. (For more information, including the successful use of product stewardship in other jurisdictions, see Section 5, Product Stewardship.)

E.1.2 (a) Packaging Stewardship

The product stewardship concept is particularly appropriate for consumer product packaging, which constitutes 30 percent of waste generated nationwide. Despite a 30 percent recycling rate, EPA estimates that the amount of packaging being disposed as waste has not dropped since 1990. Clearly, conventional approaches to recycling are not reducing the amount of packaging heading to disposal.

Following the product stewardship model, packaging stewardship programs require manufacturers or brand owners to finance the collection and processing of recyclable materials, and, in most cases, also set aside funds to invest in education, market development, processing infrastructure or other program enhancements that improve the efficiency and effectiveness of the recycling system. Packaging stewardship encourages manufacturers to embrace materials efficiency and to design for recyclability, which helps local recycling programs capture more materials. And, when manufacturers must pay for the amount of packaging they use, they have a financial incentive to use less.

E.1.2 (b) Product-Specific Stewardship

A list of potential products most suited to a stewardship approach was developed by DEC through research and feedback from stakeholders throughout the development of this Plan. The un-annotated list is presented below, with detailed justification for inclusion of each of these products provided in Section 5.

- Household Hazardous Waste
- Pharmaceuticals
- Mercury-Containing Products
- Paint
- Automobiles
- Carpets
- Office Furniture
- Roofing Shingles
- Appliances
- Tires

E.1.2 (c) Product Stewardship Framework

In many Canadian provinces, multiple product stewardship programs are implemented through a single law that establishes the structure of product stewardship in the province and creates a process and criteria for identifying products for stewardship and adding them as they meet the criteria. Known as product stewardship framework, this approach maximizes efficiency by structuring stewardship programs in a consistent manner.

California, Washington, Oregon and Minnesota introduced product stewardship framework legislation in 2009; Rhode Island and Maine introduced similar legislation in 2010, and that year Maine was the first state to enact a product stewardship framework law in the US. New York State should pursue legislation to ensure efficient and timely implementation of product stewardship programs.

E.1.3 Revenue Generating Programs

Achieving the goals of this Plan—reducing waste generation, increasing reuse and recycling and reducing disposal—will require a significant commitment of funding to the state, and especially to local governments. In addition to more resources, the state needs greater flexibility in allocating resources to respond to emerging issues and critical needs. Likewise, municipalities need access to a less restricted base of financial support than currently provided through the Environmental Protection Fund (EPF) to create and implement the next generation of integrated materials management plans and programs.

The funding sources below are described in greater detail in Section 6. Potential sources include:

- State funds dedicated to reduction, reuse and recycling: The Environmental Protection Fund and Bond Acts (1972, 1986 and 1996) have been used to generate hundreds of millions of dollars for environmental infrastructure investments in the past, including municipal recycling and solid waste management. Other states have used unclaimed bottle deposits to fund community recycling programs because the containers not redeemed are either recycled or disposed of in local systems.
- Solid Waste Disposal Fees: More than 30 states assess some type of fee on the disposal of solid waste, serving as both a disincentive to disposal and a source of revenue to meet various funding needs. Fees can be structured in a number of ways to achieve specific objectives, such as to direct proceeds back to local municipalities to support integrated programs or exempt facilities whose tip fees are already dedicated, in part, to waste prevention, reuse, recycling and composting programs.
- Plastic Bag Fees: Many communities, countries and companies are considering assessing fees on the use of plastic carryout bags to raise revenue and to curb the use of this product, which poses serious management problems in the waste stream. Such fees are in place in Washington, DC, Seattle, WA, and Ireland. Enacted fees range from $.05 to $.25 per bag.
- Permit Fees: Many states raise revenues by assessing fees on solid waste management facility permits. According to a survey conducted by the Northeast Waste Management Officials Association (NEWMOA), New York State is the only state in the region that does not collect fees from solid waste facility permit applicants. Other DEC programs, including Water and Air, assess permit fees.

E.2 REGULATORY RECOMMENDATIONS

This section outlines the regulatory changes that can be made within existing statutory authority and that are necessary to support implementation of this Plan and achievement of its goals and recommendations. The passage of the legislative recommendations outlined above will likely require development of implementing regulations not discussed here.

E.2.1 Revisions to the Part 360 Solid Waste Management Facility Regulations

In addition to the technical and structural changes that have been in discussion for some time, DEC will advance a revision to the Part 360 regulations that include the following key components.

- Update requirements for construction and operation of solid waste management facilities to better protect human health and the environment.
- Revise and update the Beneficial Use Determination (BUD) Program regulations.
- Add new requirements for the management of historic fill, including additional operational conditions for its use that protect neighboring areas, particularly in communities of disproportionate impact.

- Restrict the disposal of yard trimmings and source-separated recyclables in solid waste management facilities and other recyclable and organic materials as recycling infrastructure is developed or product stewardship programs are established.
- Take a regulatory approach to ensure consistent implementation of the requirements to source separate recyclables, particularly in areas served by private collectors.
- Establish separate tracks and waiting lists for EPF funding for recycling coordinators, educational activities, reuse programs, and other high-priority projects.
- Review existing state regulations to remove or address contradictory regulatory requirements that limit the creation or expansion of composting and other organics recycling facilities.
- Enact new regulation to oversee the collection, handling and recycling of electronic waste.

E.3 PROGRAMMATIC RECOMMENDATIONS

This section outlines the programs and initiatives that the state will pursue within current statutory and regulatory authority in implementation of this Plan. These recommendations are compiled from other sections of this Plan, including Materials Management Planning, Roles and Responsibilities (Section 3), Financial Assistance (Section 6), and Materials Management Strategies (Section 8). Taken together, these activities represent a comprehensive sustainable materials management program. The state's ability to implement these initiatives and achieve the goals of this Plan will depend on its ability to increase available staff and financial resources.

E.3.1 Lead by Example

As the state works with municipalities, institutions and businesses to reduce waste and increase reuse and recycling, it is imperative that it demonstrate sustainable materials management within its own operations. To that end, the state will:

- Work aggressively to implement the requirements of Governor Paterson's EO4;
- Promote and demonstrate organics recycling systems and activities by state agencies; and
- Develop memoranda of understanding (MOUs) within DEC divisions or with other agencies as needed to streamline BUD procedures or establish standards for beneficially used materials.

E.3.2 Educate the Public

Public participation in waste prevention, reuse and recycling is key to achieving sustainable materials management in New York State. To improve participation, the state will:

- Launch an aggressive public education campaign to promote waste prevention, reuse, composting, recycling and the proper management of hazardous components of the waste stream. Organize workshops and other meetings and expand web-based and other outreach materials to communicate with key constituencies to promote waste prevention, reuse, recycling and composting.
- Publicize innovative reuse, organic recycling and other model programs in the state via the DEC website, ESD's Recycling Markets Database, agency publications and other communications.
- Build regional DEC staff outreach and education capacity to assist planning units in improving recycling.
- Educate manufacturers on the feasibility and benefits of designing for reuse and remanufacture, and on optimizing the process of remanufacturing products.
- Encourage public understanding of the role of local solid waste management planning units, and how the public can participate in local materials management planning.

E.3.3 Support Comprehensive Materials Management Planning

Comprehensive planning is one of the key elements of successful materials management programs. In support of planning, DEC will:

- Expand its local solid waste management planning technical assistance program and provide guidance and tools to help stakeholders address challenging planning issues
- Require planning units to evaluate and implement, to the maximum extent practicable, the following programs, policies and initiatives as they develop new LSWMPs, modify existing LSWMPs, and otherwise plan for and implement programs:
    - Education and enforcement
    - Incentives, including volume-based pricing structures (e.g., PAYT/SMART Program)
    - Waste prevention and reuse programs and infrastructure
    - Public space, event, institutional and commercial recycling
    - Recovery of additional materials, including residential mixed paper, food scraps and other organics
    - Long-term recycled material supply agreements and/or processing contracts with multiple market outlets
- Evaluate current planning unit membership and structure to ensure that members can carry forward the next stage of planning and program implementation

- Develop an on-line reporting system to collect more timely and accurate recycling and disposal data from solid waste and recycling facilities and planning units
- Evaluate the progress toward this Plan's goals in biennial state Plan updates and amend policy approaches as necessary

E.3.4 Provide Outreach and Technical Assistance

Municipalities, businesses, institutions and agencies in the state will need guidance and assistance to develop sustainable materials management programs. To meet that need, the state will:

- Develop written guidance on organic waste prevention for specific affected sectors (e.g., grocery stores) and distribute the guidance to all known facilities in that industry in the state and other interested parties (local recycling coordinators, etc.);
- Encourage use of the Food Bank Network; Facilitate forums on C&D debris management to bring government and private entities together to identify strategies for overcoming barriers to increased material recovery, including market development, policy tools and economic incentives;
- Continue to provide technical and regulatory assistance for entities (private and public) interested in developing and expanding small and large-scale organic recycling systems;
- Issue a technical guidance document to assist local governments in planning for and implementing organics recycling and other sustainable materials management programs;
- Maximize the diversion of food scraps to feed animals by developing guidance on the regulatory requirements governing food residuals used for animal feed; identify farms and local sources of food residuals and facilitate relationships; and hold forums across the state to disseminate information and facilitate relationships between sources and farmers; and
- Work with NERC to take full advantage of its On-Farm Compost Marketing Project.

E.3.5 Combat Climate Change

Mitigating the impacts of climate change represents one of the most pressing environmental challenges for the state, the nation, and the world. The management of discarded materials represents an opportunity to reduce GHG emissions and combat climate change. In addition to the other recommendations of this Plan, which collectively reduce waste and increase reuse, recycling and composting to combat climate change, the state will:

- Ensure that landfills in New York State pursue every possible mechanism for achieving GHG reductions; and
- Maximize conversion of landfill gas to energy.

E.3.6 Develop Reuse and Recycling Infrastructure and End-Use Markets

Expanding the universe of materials diverted from disposal will require additional processing, reuse and recycling infrastructure and new or stronger markets for the materials processed. To address market and infrastructure issues, the state will:

- Develop critical recovery infrastructure through inter-agency collaboration (with ESD, NYSERDA, and EFC) and public-private partnerships;
- Expand market development initiatives to target glass, plastic film, plastics #3-7, compost, tires, and C&D materials as a means to create green jobs and encourage local recycling-based manufacturing;
- Evaluate and implement where appropriate strategies to promote the establishment of recycling and composting facilities in the environmental quality review and regulatory processes for other solid waste management facilities;
- Encourage local use of processed, mixed glass, chipped tires and other appropriate recycled materials in engineering applications;
- Establish a New York State Center for C&D debris recycling through ESD to: research issues and solutions relative to C&D debris recycling in New York State; act as a central information access point; promote deconstruction and building materials reuse; provide C&D job site training programs; identify potential investments for ESD's Environmental Services Unit; and recommend policy options to support greater C&D debris recycling;
- Encourage and facilitate food scrap recycling demonstration projects at appropriate existing composting facilities; and
- Expand beneficial use applications for mixed color recovered glass by conducting pilot projects to demonstrate acceptability of glass as a filter medium and for use in residential septic systems.

CONCLUSION

The new framework proposed in this Plan seeks to put forward resources, policy and programmatic tools and options for planning units and communities that will help ensure strong waste reduction, reuse and materials recovery throughout the state, both in areas where there is a substantial private sector role and in communities that practice flow control or use other oversight tools. The recommendations summarized above and detailed in subsequent sections of the Plan include a new broad policy, expanded financial assistance for progressive solid waste and sustainable materials management, and education for consumers and businesses to help them reduce their generation of waste and recycle what cannot be reduced. They also include detailed recommendations for how planning units can better plan for recovery and offer strategies for developing and/or improving New York State's recovery infrastructure. As a package, these recommendations will lead New York State on a path *Beyond Waste*.

1. *INTRODUCTION*

1.1 THE HISTORY OF SOLID WASTE MANAGEMENT PLANNING IN NEW YORK STATE

While the value of solid waste management planning was acknowledged by both the federal and state governments more than 30 years ago, initial progress was intermittent and overshadowed by efforts to address the environmental consequences of hazardous waste mismanagement.

The federal Resource Conservation and Recovery Act (RCRA) of 1976 required states to develop solid waste management plans, and the New York State Legislature responded with Chapter 425 of the laws of 1977, which required the Department of Environmental Conservation (DEC) to prepare a draft "comprehensive resource recovery plan." DEC prepared and submitted a plan in 1978, but the legislature took no further action until 1980. Chapter 552 of New York State's laws of that year acknowledged development of the draft plan required by Chapter 425 and recognized the need for solid waste management planning. It made DEC responsible for preparing a solid waste management plan and mandated that all solid waste management projects be in accord with the plan, once completed.

DEC prepared a draft plan in accordance with RCRA and Chapter 552, but in fiscal year '80-'81 federal funding for the municipal solid waste program was withdrawn, and further development of the plan ceased. At the federal and state levels, emphasis and funding were shifted from MSW management to hazardous waste management programs.

1.2 THE 1987 SOLID WASTE MANAGEMENT PLAN (1987 PLAN)

DEC drafted the 1987 Plan in response to several laws and concerns that arose in the 1980s. First, in 1983, the Long Island Landfill Law mandated the phaseout of landfills in the deep flow aquifer recharge zones on Long Island, thereby encouraging the transition to "resource recovery" through a combination of municipal waste combustion (MWC) and recycling and the development of infrastructure to transfer waste for long-haul export. Across the state, groundwater contamination and operational deficiencies at many older unlined landfills became a primary concern. By June 1986, New York State had 358 active landfills, only 47 of which had valid permits, and 7 operating MWCs with another 6 under construction. At that time, available disposal capacity in New York State, not including New York City's waste or the Fresh Kills landfill, was estimated to be four years. This all led to the concern of a looming disposal crisis in the state.

In response, Governor Mario Cuomo called for the preparation of a state solid waste management plan, which DEC issued in March 1987. The 1987 Plan articulated an integrated waste management system approach to the impending crisis, and implementation of Part 360 finally brought New York State into compliance with the provisions of RCRA and the state's own Chapter 425 of the laws of 1977 and Chapter 552 of the laws of 1980.

About the same time, on March 22, 1987, the Mobro 4000 barge set sail from Islip, New York carrying 3,168 tons of baled MSW destined for a pilot project in Morehead, NC to be converted to methane. Once in Morehead City, North Carolina officials began an investigation and ultimately ordered the now infamous "garbage barge" to find another home for its rotting cargo. This began a months-long odyssey that took the barge all the way to Belize and back to New York State until October 1987, when, under an agreement with the New York City Department of Sanitation, the garbage was incinerated in New York City and the ash disposed of in Islip. Although the saga was an embarrassment, the garbage barge incident was widely publicized across the nation and became emblematic of what was considered at the time to be a solid waste disposal crisis that led to significant improvements in solid waste management.

The 1987 Plan was not intended as a panacea for the state's disposal problems at the time, but, rather, represented the beginning of a change in solid waste management practices to meet both current and future needs. It was explicitly intended to be the first step of what was envisioned to be a long-term, ongoing, solid waste management planning process. The state was to update the plan annually (which was subsequently amended in a 1992 law to biennially) to address emerging issues and recommend actions to improve solid waste management in New York State. This iterative approach was intended to provide a dynamic solid waste management planning process.

The 1987 Plan contained important goals, including a goal to reduce, reuse, or recycle 50 percent of the waste stream (using 1988 as a base year) and a recommended hierarchy of preferred solid waste management methods. The 1987 Plan set what were seen at that time as visionary and aggressive, yet achievable, goals for a ten-year planning period with the intent of using annual updates to adjust policies, programs, plans and goals to ensure continued progress.

1.3 THE NEW YORK STATE SOLID WASTE MANAGEMENT ACT

In response to the 1987 Plan, the Solid Waste Management Act (ECL 27-0106, the Act) was signed by Governor Mario Cuomo, establishing in law the Plan's preferred hierarchy of solid waste management. The hierarchy established the following priorities to guide the programs and decisions of DEC and other state agencies:

a) *First, to reduce the amount of solid waste generated;*

b) *Second, to reuse material for the purpose for which it was originally intended or to recycle the material that cannot be reused;*

c) *Third, to recover, in an environmentally acceptable manner, energy from solid waste that cannot be economically and technically reused or recycled; and*

d) *Fourth, to dispose of solid waste that is not being reused or recycled, or from which energy is not being recovered, by land burial or other methods approved by the department.*

In addition to the hierarchy, the Act established:

- Structure and expectations for regional solid waste management planning units to encourage regional cooperation;
- Requirements and funding for local solid waste management plans in accordance with the hierarchy of solid waste management methods;
- A mandate that municipalities adopt and implement source separation laws or ordinances for recyclables from all generating sectors by 9/1/92 (less than five years from enactment); and
- DEC's role in fulfilling these requirements.

The Act's requirements were intended to ensure that both state and local governments work actively toward establishing environmentally sound solid waste management systems that integrate the hierarchy of solid waste management methods and emphasize waste reduction and recycling, using landfills only for materials that could not be managed in a more productive way.

1.4 SOLID WASTE MANAGEMENT PLAN UPDATES

The first update of the State Solid Waste Management Plan, produced in fiscal year 1987/1988, revised the 1987 Plan to incorporate the requirements and direction embodied in the Solid Waste Management Act, passed in 1988 (described below). Subsequent updates of the 1987 Plan did not directly revise or replace portions of the 1987/88 Plan update. Instead, each update became a stand-alone document that characterized the activities undertaken within the state with respect to solid waste management during the update period. In time, as the state's regulations and local solid waste management plans (LSWMPs) were developed and implemented, the Plan updates became more of a reporting mechanism of achievements, obstacles encountered and comparisons to the initial base year of the Plan. The Plan updates also made recommendations for action.

Because the initial ten-year planning period ended in 1997, the 1997/1998 update was prepared to serve as more than a report. It:

- Launched a new five-year planning period (1998-2003);
- Identified objectives for the five-year planning period;
- Provided baseline solid waste management data for the new planning period; and
- Summarized developments and progress in solid waste management since the last update of the Plan.

Draft Plan updates were prepared for 1999/2000 and 2001/2002. The 1999/2000 update was approved and released, but while the 2001/2002 draft update was released for public comment, it was never finalized. There have been no updates since.

1.5 MATERIALS AND WASTE MANAGEMENT IN NEW YORK STATE 1987 TO PRESENT

DEC's 1987 Solid Waste Management Plan (1987 Plan) was aggressive for its time. It set a goal of reducing, reusing or recycling 50 percent of the state's waste stream in ten years and set forth a solid waste management hierarchy, adopted into law in 1988, that placed priority on waste prevention, reuse and recycling, followed by municipal waste combustion (MWC) with energy recovery and, finally, landfilling as the lowest priority.

In broad terms, the Act has been a success in spurring development of municipal recycling programs across the state and making recycling opportunities available to most New Yorkers. The requirement for local governments to establish source-separation programs has yielded an increase in the state's recycling rate. While the Act's implementation launched successful waste prevention and recycling programs and integrated solid waste management systems, it lacks a mechanism for fostering continual improvement beyond the minimum mandates. Furthermore, changes in the marketplace have led to legal and economic realities that, in some cases, undermine the state's solid waste management planning constructs. The roles and responsibilities of the various players in the solid waste chain must evolve to respond to current conditions.

Twenty-two years later, the majority of the materials generated are managed by the lowest priority strategy, and the state is still striving to achieve its recycling goals.

The 1987 Plan was drafted to address what was determined at that time to be a developing solid waste disposal crisis. The Plan focused on an integrated solid waste management approach, to be implemented by municipal planning units which favored reduction, reuse and recycling and local self-sufficiency in managing the remaining waste stream.

The implementation of the 1987 Plan, the Solid Waste Management Act of 1988, and local solid waste management plans established by municipal planning units, has yielded significant progress. Hundreds of open dumps and environmentally harmful incinerators have been closed and replaced with modern landfills and MWCs that comply with regulations that are among the most protective in the nation. The state's recycling rate has grown from approximately 3 percent to 36 percent of the entire materials stream and 20 percent when only MSW is evaluated[2]. Many of the state's communities have implemented exemplary integrated materials management systems that have yielded recycling rates well beyond the statewide average. However, the state as a whole appears to be stagnating at levels of MSW recycling near 20 percent—well below the national average MSW recycling rate reported by EPA at 33 percent.

The 1987 Plan sought to phase out MSW incineration without energy recovery and replace landfills in the state with a network of 37 municipal waste combustors (MWCs) with energy recovery for treating the waste remaining after reduction, reuse and recycling.

[2] Total materials stream includes municipal solid waste, construction and demolition debris, biosolids (or sewage sludge) and industrial waste; municipal solid waste includes materials generated by the residential, commercial and institutional sectors. For a description of each of these streams, see section 7. For a discussion of the reporting and data on which this calculation is based, see section 8.3.1.

While at one point 13 MWCs were operational in New York State, only 10 combustion facilities remain in operation in 2010. The goal of phasing out MSW incineration was accomplished, though some biosolids (i.e., sewage sludge) are still incinerated without energy recovery.

The 1987 Plan prescribed phasing out landfilling of unprocessed MSW and using landfills only for discreet streams (i.e., MWC residues, some biosolids, and some construction and demolition debris). The number of active MSW landfills has been drastically reduced from 348 mostly unlined landfills in 1987 to the currently operating 27 lined landfills, representing significant investment in state-of-the-art engineering and controls. However, landfilling—considering both in and out-of-state disposal—remains the predominant waste management method for New York State's waste. The 1987 Plan established a framework that was built around municipal management systems. However, in recent years, operation of much of the state's landfill capacity has shifted to private companies instead of municipalities or planning units, with 75 percent of the state's working MSW landfill capacity operated by the private sector.

The many inactive landfills that have been phased out since 1987, as well as urban redevelopment sites that contain potentially contaminated "historic fill," can represent a continuing environmental liability when left in place or an additional source of solid waste requiring management when excavated or otherwise disturbed by construction projects.

Twenty years after the 1987 Plan and the Legislature's enactment of the Solid Waste Management Act of 1988, New York State finds itself relying on a mix of different, local, solid waste management systems. The current network of recycling and solid waste collection, transfer and disposal operations comprise local government-owned and operated facilities and programs, which were typical in the 1980s and significant, privately controlled waste collection, transportation and handling infrastructure.

Due to a number of factors, including a period of uncertainty regarding a local government's ability to institute waste flow control, some municipalities that had planned or developed their own integrated systems of solid waste facilities no longer have any involvement at all in the management of significant portions of the MSW generated within their borders.

Also important from a public policy and long-term planning perspective is New York State's significant dependence on privately owned facilities in other states for the disposal of more than 16,500 tons of MSW every day (six million tons per year), including virtually all of the solid waste disposed from the City of New York and much of Long Island's waste. While the environmental impact of export has been reduced in recent years by the movement of waste exports by rail instead of truck, exports have increased fivefold during the past 20 years—a trend that runs counter to the self-sufficiency envisioned in the 1987 Plan.

Waste export leaves many New York communities vulnerable to capacity restrictions and additional user fees at out-of-state disposal facilities. For nearly a decade, Congress has reviewed legislation that would allow states to constrain the movement of garbage from other states. Fortunately for New York State, no such laws have passed, but the threat of restriction serves as a reminder that the state's reliance on export is not without risks.

While all of the 1987 Plan's elements were not realized as envisioned, thanks to the significant efforts of all New Yorkers, many of its elements were implemented. Unfortunately, a reduction in DEC staff dedicated to solid waste issues, combined with the insufficient allocation of state and local resources, has resulted in many missed opportunities to prevent waste and increase recycling. Nonetheless, the state's solid waste stream is managed in a far more cohesive and environmentally sound manner today than before development of the 1987 Plan.

1.6 THE OPPORTUNITY AHEAD

Solid waste management in the U.S. has followed a pattern of dramatic change and progress in the 1990s with the implementation of recycling, composting, and waste prevention programs, followed by five to ten years of maintaining the status quo. Even as recycling programs have become more efficient and have captured more material, greater and greater amounts of non-recyclable products and packaging have entered the waste stream.

Nationally, recycling rates have been static or only increased in small increments in recent years, even for the materials considered the most recyclable—newspapers, steel, aluminum and PET plastic containers. Communities in New York State report recovery rates that are stagnant at best and may be dropping.

Much of the material sent to disposal facilities has a significant value, in terms of both direct market value and in broader economic and environmental terms. Though markets have periodically experienced downturns, markets for traditional recyclables, including paper, metals and some plastics, have been strong overall and have achieved consistently high values in the last decade.

Perhaps more important, using recovered materials in place of virgin materials saves significant amounts of energy, conserves water, and reduces pollution. The closer to home this takes place, the greater the economic and environmental value to New York State.

In 2010, the 3.7 million tons of MSW materials recycled in New York State helped to avoid more than 12 million metric tons of CO_2 equivalent ($MTCO_2E$) and conserve 99 trillion BTUs of energy. Increasing the municipal recycling rate to 30 percent would improve those gains by more than 4 million $MTCO_2E$. Achieving a 80 percent recycling rate statewide would yield impacts of an additional 21 million $MTCO_2E$ greenhouse gas emissions reductions and save an additional 286 trillion BTUs of energy[3]. Waste prevention has an even more significant impact on greenhouse gas emissions. Reducing materials use, through product and packaging stewardship initiatives and other means, would avoid the use of energy and the release of even greater amounts of greenhouse gases.

The state can also fuel economic development and job creation using materials that are not currently recycled but ultimately could be with new programs and policy. On a per-ton basis, for every job required to operate a landfill or municipal waste combustor (MWC), 10 jobs can be created to process recyclable materials and prepare them for market. In the case of organics, four

[3] These conclusions are based on the results of modeling using data explained in Appendix A and summarized in Section 7, materials composition and characterization, and EPA's WARM Model, August 2010 Update – www.epa.gov/climatechange/wycd/waste/calculators/warm_home.html

jobs can be created in composting those materials for every one job in disposal. Once recycled materials are used in manufacturing, the jobs ratio becomes even greater, and the quality and pay scales of those jobs is higher. Remanufacturing industries are the most significant job creators, with between 28 and 296 jobs—depending on the type of remanufacturing—for everyone in disposal[4].

A 2008 report by *Progressive Investor* found that with $236 billion in revenues in 2007, recycling industries already represent more than 2 percent of the national gross domestic product. *The U.S. Recycling Economic Information Study* Prepared for The National Recycling Coalition by R. W. Beck, Inc. (July 2001) found that 174 million tons of material were being recycled per year and about 1,100,000 jobs were created in the "recycling" sector, including collection, processing, and manufacturing. This equates to about 6 jobs per 1,000 tons per year recycled.

New York State's Empire State Development (ESD) Environmental Investment Program has proven that, in financing recycling-based businesses, it can create significant jobs and economic benefit. A February 2009 study prepared by DSM Environmental Services, Inc. for the Northeast Recycling Council (NERC) found that New York State recycling and reuse industries directly support more than 32,000 jobs, with 5,000 of those in collection. A broad-scale increase in recovery efforts, as outlined in this Plan, could increase the green jobs related to recycling by more than 67,000 by 2030[5].

At the dawn of the 21st century, society is confronted by broad and inter-related social and environmental challenges topped by global climate change and increased energy demands. In this context, it is not enough only to ensure environmentally sound disposal. Capturing the economic value and imbedded energy in our materials, minimizing greenhouse gas impacts of our actions, and maximizing materials and energy efficiency in our systems must be key drivers.

[4] *Wasting and Recycling in the US 2000*, Institute for Local Self-Reliance, 2000, p.27, www.grrn.org/order/w2kinfo.html

[5] An explanation of the methodology and data used to derive these figures is provided in Appendix A.

2. *BEYOND WASTE*: A NEW VISION FOR SUSTAINABLE MATERIALS MANAGEMENT IN NEW YORK STATE

New York State's *Beyond Waste* Plan sets forth a new approach—a shift from focusing on "end-of-the-pipe" waste management techniques to looking "upstream" and more comprehensively at how materials that would otherwise become waste can be more sustainably managed through the state's economy. This shift is central to the state's ability to adapt to growing pressure to reduce demand for energy, reduce dependence on disposal, minimize emission of greenhouse gases and create green jobs.

> *We live in a material world. How our society uses materials is fundamental to many aspects of our economic and environmental future. If we want the U.S. to be competitive in the world economy, the sustainable use of materials must be our goal.*
>
> *Sustainable Materials Management: The Road Ahead, EPA 2009*

This shift is especially critical given American consumption patterns and global resource constraints. While the United States (US) has only five percent of the world's population, it consumes 24 percent of the world's energy and one-third of the world's materials[6]. According to the Organization for Economic Co-operation and Development, the US generates more waste per person than any other country in the world. Municipal solid waste (MSW) generation in New York State, including both materials recycled and waste sent to disposal, was estimated at 5.15 pounds per person per day in 2008—a level greater than the national average, reported by EPA at 4.6 pounds per person per day, and thus well beyond that of other countries.

As developing countries strive to achieve a standard of living comparable to that of the US and other industrialized nations, the demand for materials and the energy needed to extract and process them will continue to increase. It is likely, too, that the costs of energy and material will increase as well. Unless we change the status quo, the environmental and climate implications of this growing demand could be devastating, and the economic impact to New York State will be a burden to individuals, businesses and especially municipalities. Never has it been more critical to examine the way we use and dispose of the materials that fuel our economy. It is simply no longer sensible to expend energy and resources to extract, transport and process materials only to use them for minutes and then throw them away. The change has to start now.

[6]U.S. Geological Survey; http://pubs.usgs.gov/annrev/ar-23-107/aerdocnew.pdf

The role of solid waste managers in the global context is significant. As this Plan clearly demonstrates, waste disposal facilities contribute to climate change and the related environmental degradation, while waste prevention and the use of recovered materials in manufacturing reduces energy consumption, greenhouse gas generation and air, water and land pollution and creates green jobs. It is critical to expand the understanding of the role sustainable materials management can play in improving the environment, locally as well as globally. Whether in government, private industry, or as individuals, all New Yorkers must help confront these challenges. All players in the materials economy are challenged to continually strive for better planning, smarter design, more efficient markets, and ever-increasing levels of materials-use reduction and recycling.

Beyond Waste is a Plan to create a more sustainable materials economy. This will require fostering a system where products and packaging are designed to minimize waste and maximize the use of recyclable materials and where there is infrastructure in place to recover and use those materials. This system would capture the economic value of our materials, conserve their imbedded energy, and minimize generation of greenhouse gases and pollution. This Plan will lead New York State to this desired system. In addition to reducing our reliance on disposal, the New York State Department of Environmental Conservation (DEC) projects that implementing this Plan could generate more than 67,000 jobs, reduce nearly 21 million metric tons of CO_2 equivalent ($MTCO_2E$) greenhouse gas emissions, and save 286 trillion BTUs of energy by 2030.[7]

What is a sustainable materials economy? In broad terms, a sustainable materials management strategy involves:

1. *Waste Prevention* – creating and implementing a combination of policies and programs aimed at reducing the volume and toxicity of waste generated and disposed, including:
    a. Packaging reduction through stewardship and other means;
    b. Product stewardship (also known as extended producer responsibility) for key material streams;
    c. Purchasing and practices, both public and private, that advance sustainability goals;
    d. Community outreach and education; and
    e. Incentives for waste prevention through volume-based pricing for waste management programs, commonly referred to as Pay As You Throw (PAYT) or Save Money And Reduce Trash (SMART).
2. *Reuse* – supporting an expanded infrastructure to redirect items that still have a value for their original intended purpose (e.g., clothing, furniture, building materials, etc.) from those who no longer need them to individuals and entities that can put them to use.
3. *Comprehensive Recycling* – including more materials and more places (e.g., workplaces, transit stations, public spaces, public venues, special events); improve education and enforcement to achieve greater participation and greater capture of targeted recyclables in all generating sectors (e.g., residential, commercial, institutional, industrial); develop local markets for both traditional recyclables and new materials targeted; and support a manufacturing base that can utilize recycled materials.

[7] The methodology and data used to derive these figures is provided in Appendix A.

4. *Recovery of Organics (food scraps, non-recyclable paper and yard trimmings)* – creating a combination of policies and programs to: expand backyard composting; expand on-site composting at institutions and large generators and develop greater collection and recovery infrastructure for commercial, institutional and residential food scraps and yard trimmings.
5. *Beneficial Use* – developing policies and programs to redirect items that still have value for uses other than their original intended purpose (e.g., paper for use as animal bedding, glass and tires for use in civil engineering applications, etc.)
6. *Best Residual Management Strategies* – advancing policies that ensure adequate capacity of the most environmentally sound and most sustainable means of disposal for the waste that cannot be reduced, reused, recycled, composted or otherwise diverted, placing a preference on disposal methods that recover energy from residual materials.

Moving Beyond Waste requires increased attention to influencing product and packaging design, which will require involvement of all players in the production and supply chain—product manufacturers, distributors, retailers, consumers, and government. It will also require increased investment in our recovery and distribution/reverse distribution infrastructure. Ultimately, it will turn the trend on New York State's ever-growing waste stream.

Other more traditional tools will be reforged for the task of achieving a true sustainable materials management approach—a combination of programmatic, regulatory and policy actions that reduce or eliminate waste or divert materials for reuse, recycling and composting. To realize this vision, the state needs to:

- update, strengthen, and expand its regulatory and statutory authority;
- obtain, develop and dedicate resources that are not yet in hand;
- use its substantial purchasing power and other opportunities to lead by example; and
- achieve coordinated cooperation from all levels of government, the private sector and individual New Yorkers.

Accordingly, this Plan identifies what the state can do now within the confines of existing regulatory structure and fiscal constraints; what it will be able to do with expanded authority; and what it will do with new resources. It defines the steps DEC will take to obtain this expanded authority and additional resources.

A NEW APPROACH FOR NEW YORK STATE

As New York State moves forward, it must address new ways to reduce the amount of waste generated and further reduce the amount of waste that ends up in landfills and combustors. Improvement on the old strategies to promote reuse, recycling and reduction are overdue, and this Plan maps recommendations for such improvement. The Plan also aims to tackle the unanticipated increase in waste from consumer products and packaging—the waste that is undermining and has essentially nullified all waste reduction efforts to date. This problem must be confronted head on by engaging product manufacturers in the end-of-life management of their products and packaging.

This Plan begins to address what each of the many players—the state, local governments, planning units, private sector solid waste managers, product manufacturers, distributors and retailers, and individual consumers—can achieve collectively and in partnership with other states and the federal government. The challenge is significant, and progress will not be measured solely against a single numerical goal. Success will be measured by sustained and continual improvement in maximizing recovery and minimizing waste. Remaining flexible, committed, and coordinated in these efforts will help to face that challenge. Using this Plan to raise awareness of these issues is critical so that New Yorkers are collectively engaged in the effort and willing to support the funding needed to ensure its success.

This Plan lays a foundation for the next chapter in solid waste management in New York State. It identifies critical areas for local, state and individual action and provides a menu of options that can help communities on the path toward sustainable materials management. On the state, regional or national level, it presents a strategy to engage product manufacturers to make end-of-life management costs a part of their economic equation. Doing so will begin to turn the tide and ultimately reduce waste generation.

Recognizing that local governments are often the firewall between waste and the environment, DEC is committed to partnering with local communities and planning units that grapple with these issues daily in their efforts to provide safe, affordable methods for solid waste management while protecting the environment. Only through leadership by New York in cooperation with committed planning units can the state successfully implement the goals of this Plan.

GOALS

The quantitative goal of the Plan is to reduce the amount of waste New Yorkers dispose by preventing waste generation and increasing reuse, recycling, composting and other organics recycling methods. In 2008, New Yorkers sent 4.1 pounds of municipal solid waste (MSW) per person per day, or 0.75 tons per person per year, to disposal facilities. *The Plan seeks a progressive reduction in the amount of MSW destined for disposal to reach the ultimate goal of reducing disposal to 0.6 pounds per person per day by 2030*[8]. See Table 2.1 for incremental goals during the planning period. The goal applies to the state as a whole; planning units are expected to develop their own baseline and goals based on similar progressive reduction in waste destined for disposal. The quantitative goal is intended to apply to MSW. While DEC has not established quantitative goals for the reduction of construction and demolition debris, industrial waste and biosolids, the qualitative goals apply to all waste generated in the state.

[8] The referenced per capita waste disposal goal will apply to MSW (i.e., the materials included in the materials composition analysis provided in section 7.1). It does not apply to construction and demolition debris, biosolids, or industrial waste.

The qualitative goals of this Plan are to:

Minimize Waste Generation

- Maximize Reuse
- Maximize Recycling
- Maximize Composting and Organics Recycling
- Advance Product and Packaging StMewardship
- Minimize Waste Disposal
- Create Green Jobs
- Maximize the Energy Value of Materials Management
- Minimize the Climate Impacts of Materials Management
- Reemphasize the Importance of Comprehensive Local Materials Management Planning
- Minimize the Need for Long-range Export of Residual Waste
- Engage all New Yorkers—government, business, industry and the public—in Sustainable Materials Management

TABLE 2.1 BEYOND WASTE GOALS

	Pounds/Person Per day Disposed
2010	4.1
2012	3.8
2014	3.4
2016	2.9
2018	2.3
2020	1.7
2025	1.1
2030	0.6

- Strive for Full Public Participation, Fairness and Environmental Justice
- Prioritize Investment in Reduction, Reuse, Recycling and Composting Over Disposal
- Maximize Efficiency in Infrastructure Development
- Foster Technological Innovation
- Continue to Ensure Solid Waste Management Facilities are Designed and Operated in an Environmentally Sound Manner

The new framework proposed in this Plan seeks to put forward resources, policy, and programmatic tools and options for planning units and communities that will help ensure strong waste reduction, reuse, and materials recovery throughout the state, both in areas where there is a substantial private sector role and in communities that practice flow control or use other oversight tools. The recommendations detailed in subsequent sections of the Plan include new broad policy, such as an updated Solid Waste Management Act and a product stewardship framework, expanded financial assistance for progressive solid waste and sustainable materials management, and education for consumers and businesses to help them reduce their generation of waste, as well as detailed recommendations for how planning units can better plan for recovery and strategies for developing and/or improving our recovery infrastructure. As a package, these recommendations will lead New York State on a path *Beyond Waste*.

Without additional regulatory or legislative action, the Plan does not and cannot provide new legal authority beyond that which currently exists. Rather, the Plan provides a direction and goals for solid waste management in New York State, alerting planning units, permittees, and the general public of the lens through which future solid waste planning, decision-making, and assessment will be viewed.

3. MATERIALS MANAGEMENT PLANNING, ROLES AND RESPONSIBILITIES

3.1 ROLES AND RESPONSIBILITIES

3.1.1 The Role of the State

Prior to 1987, state government's role in solid waste management was primarily as regulator, ensuring the protection of public health and the environment from inappropriate disposal practices. The state, through DEC, regulated the siting, construction and operation of waste disposal facilities through permits and upheld the permit conditions through enforcement. The state, through DEC, also provided technical assistance and limited financial assistance to local governments. The most notable source of financial assistance prior to 1987 was the 1972 Environmental Quality Bond Act, which provided loans for the proper closure of municipal landfills and grants for MWCs. The state did not dictate to a community how to dispose of its waste; rather, it ensured that a community's waste disposal practices did not impair the environment or threaten public health.

Through the Act, the legislature affirmed the primacy of local and regional governments in solid waste management while clearly articulating the state's role. The state was to fulfill its responsibility to ensure environmentally, economically and technically viable solid waste management programs by:

- Encouraging waste reduction and the expansion of materials recovery programs;
- Establishing clearly articulated, responsive and consistently applied regulatory oversight; and
- Providing a full range of technical assistance to local governments.

DEC is the lead state agency for materials and waste management. However, other state agencies have explicit responsibility for certain solid waste related programs. Empire State Development (ESD) is charged with the implementation of the state's Secondary Materials Utilization Grant Program, through which it invests in projects and companies that use recycled materials.

The Office of General Services (OGS) is responsible for implementing a recycled product procurement program and establishing recycling programs in state agencies. The New York State Energy Research and Development Authority (NYSERDA) provides targeted investments in solid waste and recycling projects that generate energy or achieve energy conservation.

In addition, all agencies have routine and ongoing roles and responsibilities for undertaking proper environmental stewardship, establishing waste prevention and recycling programs, and responsibly managing solid waste within their own operations. The requirements of the Act were bolstered by Governor Mario Cuomo's Executive Order 142, signed on January 16, 1991, which required all state agencies and authorities to implement far-reaching and aggressive waste reduction and recycling practices and support recycling markets by buying products made with secondary materials.[9] This

[9] A report on the progress toward implementing EO 142 is provided in Appendix B and at http://www.ogs.state.ny.us/bldgAdmin/facmod/3RsAnnualReport07_08.pdf.

order remained in effect until it was superseded by Executive Order 4, signed on April 24, 2008 by Governor Paterson. Executive Order 4 challenges state agencies and authorities to set an example for communities and businesses with regard to sustainability in operations and green purchasing. The order requires agencies and authorities to appoint a sustainability and green procurement coordinator to lead these efforts. It specifically requires state agencies to implement waste reduction, reuse, recycling and composting programs and to purchase products that meet key "green" criteria, including recycled content, waste reduction, recyclability, compostability and extended producer responsibility requirements.

In the context of solid waste management, the state also performs the following specific functions:

1. Policy Direction: As in other issue areas, the executive branch, through state agency leadership, develops materials and waste management policy initiatives and provides direction for the administration of programs to carry out executive policy. To ensure that local solid waste management plans and programs are consistent with state policy, DEC provides guidance and direction to local governments by:

Articulating the state's vision for materials and waste management through the state Solid Waste Management Plan, making recommendations on how that vision can be achieved and setting the context for the actions of local governments and other stakeholders.

Reviewing local solid waste management plans (LSWMPs) and solid waste management facility permit applications to ensure consistency with the state solid waste management hierarchy, which emphasizes maximizing waste reduction, reuse, and recycling;

Reviewing permit applications submitted by or on behalf of a municipality for most solid waste management facilities to ensure consistency with the LSWMP in effect for the municipality and confirming that a comprehensive recycling analysis (CRA) is in place that identifies the materials available for recycling and the strategies the municipality will implement to reduce, reuse, recycle and compost those materials;

Reviewing permit applications for most solid waste management facilities submitted by or on behalf of non-municipal entities to ensure that the proposed project is consistent with the state solid waste management policy and includes an assessment of the proposed facility as it relates to the LSWMP in which the facility is located and the planning units from which solid waste is expected to be received; and

Placing conditions on permits to prohibit most solid waste management facilities from accepting solid waste that was generated within a municipality that has not met core planning requirements by either completing a DEC-approved CRA or LSWMP or being included in another municipality's approved CRA or LSWMP.

2. Technical Assistance: DEC routinely provides technical assistance to local government, the private sector, and the general public through several methods and means, including: the solid waste management facility permitting process; public information meetings; planning and policy guidance; materials and waste management information and data, and training. ESD serves as the state's repository for recycling market information and assists both public and private sector recyclers in

accessing and developing markets. In that capacity, ESD has developed a recycling markets database, available at www.empire.state.ny.us/recycle.

3. Public Education/Information: DEC provides valuable information and guidance on solid waste management requirements and issues to the public. To disseminate information, DEC uses written materials, its website and other venues, such as conferences, seminars and meetings. (For a list of available resources, see http://www.dec.ny.gov/chemical/8801.html) ESD provides tools to businesses, including *Environmental Improvement Resources for Businesses in New York State*, a directory of state environmental assistance programs available at http://www.nylovessmallbiz.com/growing_/environm.htm.

4. Financial Assistance: Since 1987, DEC has provided nearly $700 million in financial assistance to municipalities and businesses for reduction, reuse, recycling, composting, recycling outreach and education, and solid waste management projects. Funding sources have included: the 1972 Environmental Quality Bond Act (EQBA); the 1986 EQBA; the Kansas Stripper Well Settlement; the Petroleum Overcharge Restitution Act; the Solid Waste Management Act; the Environmental Protection Fund (EPF), and the 1996 Clean Water/Clean Air (CW/CA) Bond Act. Today, the EPF is the only ongoing state assistance funding source for solid waste management projects. Other state agencies have also provided financial assistance for waste and recycling related projects.

For example, landfill closure projects have obtained loans from the Environmental Facilities Corporation (EFC) through the State Revolving Fund, and ESD and NYSERDA provide financial assistance for certain waste reduction, recycling, and organics recovery businesses. (For more information on state financial assistance programs, see Section 6.)

5. Statewide Planning: DEC is responsible for preparing and updating the State Solid Waste Management Plan (State Plan) in accordance with the requirements of Environmental Conservation Law (ECL) 27-0103. The state Plan is intended to provide direction, guidance and information on solid waste management and identify policy recommendations. The update process dictated in the ECL makes the Plan a "living" document that will change as new information becomes available and as planning units identify both obstacles and opportunities through implementation of their LSWMPs. This iterative process is informed by stakeholder input, feedback from planning units, LSWMP compliance reports and modifications, and other information available to the state. By monitoring local program experiences, DEC can gauge progress toward statewide goals and objectives and identify the need for new programs to help overcome obstacles impeding local planning objectives.

6. Regulatory Oversight: DEC's role as regulator is the backbone of its solid waste management program. Through regulations and their enforcement, DEC ensures that legal requirements are upheld and that public health and the environment are protected. Through its Part 360 regulations, DEC regulates the construction and operation of solid waste management facilities to ensure they are protective of public health and the environment. The Part 360 regulations also dictate requirements for local solid waste management planning. These regulations can be updated periodically to reflect new legal requirements and developments in the industry. To enforce its regulations and permit conditions, DEC places environmental monitors (DEC employees funded by permittees) at many permitted solid waste management facilities. Where monitors are not available, DEC staff carry out inspections, compliance counseling and enforcement, sometimes with the assistance of environmental conservation officers and the State Attorney General's Office.

3.1.2 The Role of Local Governments

The implementation of solid waste management programs in New York State has historically been the responsibility of local government. The day-to-day activities at the core of materials and waste management (e.g., separation, collection, recycling, transport, storage, transfer, and disposal) occur at the local level, either by the local governments themselves or through contracts or agreements with private entities. As part of that role, municipalities may:

- Acquire land for waste management and disposal facilities;
- Construct solid waste management facilities;
- Provide or contract for waste and recyclables collection services;
- Conduct facility siting studies;
- Manage application processes for state permits;
- Lead the state environmental quality review (SEQR) process;
- Operate or contract for the operation of facilities;
- Ensure compliance and reporting;
- Enact flow control ordinances (see details below); and
- Educate the public.

Some local responsibility is specifically assigned under state law, most notably the Act's requirements for localities in the state to have mandatory source separation laws or ordinances in place and to develop and maintain LSWMPs if they seek permits for solid waste management facilities. Under the Act (through amendments to General Municipal Law 120-aa), municipalities were to require source separation of recyclables in all generating sectors (e.g., residential, commercial, institutional and industrial) no later than September 1, 1992. Thus, the law placed the responsibility for mandating, designing and implementing recycling programs on local governments and the planning units they created. Some local governments do not have the expertise or resources to adequately carry out all of the functions dictated in the act and have relied on support from the private sector (see section 3.2.3).

The Act also encouraged local governments to join together to form solid waste management planning units and create LSWMPs to guide their programs and ensure alignment with the state's solid waste management hierarchy[10]. Most of the 64 planning units in the state function on the county level, but several upstate and western New York planning units include multiple counties or solid waste management authorities, while some downstate units are organized on the city level (in New York City and Nassau County) and the town level (on Long Island).

Since 1990, 60 of 64 planning units have had DEC-approved LSWMPs, and two of the remaining four have had CRAs approved by DEC. The planning periods for the LSWMPs have varied from 10 years to 20 years. As discussed more fully later in this section, LSWMP implementation has been inconsistent across the state.

As evidenced by the data in Table 3.1, New York State is at a critical point in local solid waste management planning, with more than 70 percent of the planning units in the state required to submit new or modified plans in the next two years. In at least eight planning units, one or more municipalities have ceased active participation and have not joined another planning unit or developed a CRA. While the lack of a CRA makes them technically out of compliance with the state's regulatory requirements, these requirements are only enforceable in conjunction with a permit action or condition. For a profile of each planning unit, see Appendix C.

TABLE 3.1

LSWMP Status	*Number*	*Percent of Total*
Never Approved	4	**6%**
Expired	7	**11%**
Expiration 2009	4	**6%**
Expiration 2010	30	**47%**
Plans Expiring after 2010	19	**30%**
Total	*64*	*100%*

3.1.3 The Role of the Private Sector

For more than a century, there has been a vibrant private recycling industry focused on the recovery of paper and metals. This vital role continues today with a greatly expanded menu of materials processed by private companies into marketable commodities and products. Virtually all municipal recycling programs eventually depend upon the recycling industry for the ultimate processing and marketing of recovered materials. The recycling industry has developed and implemented

[10] A planning unit must consist of a county; two or more counties acting jointly; a local government agency or authority established pursuant to state law for the purpose of managing solid waste; any city in the county of Nassau, or two or more other municipalities which DEC determines to be capable of implementing a regional solid waste management program.

innovative strategies for the processing and marketing of materials from such sources as electronics scrap, tires and end-of-life vehicles.

Beyond the recycling industry, the role of the private sector has grown during the last two decades as companies increasingly provide integrated solid waste management services to planning units, including collection, processing and disposal of both recyclables and waste. In support of those functions, private companies have made significant investments in collection, transportation and disposal capacity in New York State. In fact, private companies manage most of the waste in the state, either in their own facilities or by operating municipally owned facilities, and they are the primary mechanism for transporting waste and materials both in and out-of-state.

As such, their role is a significant one, and their engagement is critical to the state's success in moving *Beyond Waste*.

Local government interaction with and oversight of private sector collectors, processors and facility operators varies throughout the state. Some communities heavily regulate the activity of the private waste industry, using tools such as flow control, contracts, registration, permitting, and enforcement, while others provide little oversight.

Although the state's oversight of private waste collection services is minimal—only transporters of industrial commercial waste, regulated medical waste, waste oil, waste tires and septage are regulated by 6 NYCRR Part 364—DEC regulates solid waste management facilities, whether they are operated by public or private entities, through the NYCRR Part 360 regulations. To ensure compliance with regulatory and permit requirements, some private operators of permitted solid waste management facilities are required to fund a DEC monitor to oversee their operations.

In addition to day-to-day waste management activities, local governments also increasingly rely on private consulting and engineering firms to support their programs and facilities through planning, design, and construction. Furthermore, private companies are also consumers of products and packaging and generators of waste. In their role as consumers, businesses and industries can help to drive the market toward less wasteful and more recyclable products and packaging. For example, many large companies have begun to require minimal packaging and that products and packaging be developed without the use of toxic and hazardous chemicals. In the role of waste generator, businesses and industries must institute source separation programs in conformance with local laws or ordinances and should simultaneously work to instill a recycling ethic among the work force.

3.1.4 The Role of New York State's Residents

No integrated solid waste management program can succeed without the active engagement of the citizens of the state. Indeed, every New Yorker is affected by and involved in materials and waste management. For waste reduction, recycling and organics recovery programs to succeed, the public must participate. The choices New Yorkers make in what they buy, how they use it and how they dispose of it can have significant impacts on materials management—waste-preventing purchasing sends a signal to companies that consumers don't want waste; getting maximum use and reuse out of household items reduces materials use, and choosing to recycle or compost reduces waste. Members of the public can also play an important role in local materials and waste management

planning and can influence the direction taken by their local elected officials. The local planning process encourages ample public involvement and participation.

3.2 INDUSTRY CONSOLIDATION AND FACILITY PRIVATIZATION

As anticipated and encouraged in the ECL, the private sector has played an increasingly significant role in providing solid waste management services to planning units. The implementation of integrated solid waste management systems has also created enhanced opportunities for increased involvement of the private sector in various aspects of materials and waste management.

At the same time, a national trend of significant consolidation within the solid waste collection and disposal industry emerged. Fewer large companies have grown to dominate the industry, limiting the competition in what was once a very diverse field of players. However, as companies grow, their investment capability also grows, facilitating greater expansion, better facilities, advancement, and opportunity.

As a result, the industry has established:

- More technologically advanced and consistently operated and maintained facilities; and
- Greater long-term investments in recyclables processing, waste processing and disposal infrastructure.

Privatization of solid waste management facilities (i.e., private ownership or operation of facilities that provide a public service) has also become much more commonplace during the last 20 years—so much so that it is now sometimes difficult for local government-owned solid waste facilities to compete. Privatization can be an attractive option for planning units because it allows them to provide various services for their constituency without incurring the long-term indebtedness and risk associated with a large capital project or the ongoing operational costs and management burden associated with operating municipal programs. However, full privatization without the necessary safeguards obtained through competitive negotiated procurement can have negative consequences, essentially placing the municipality in a position of dependency on a private company in a monopoly situation, thereby limiting its options.

Recognizing both the positive and negative potential of privatization, some local governments have used a hybrid approach whereby the materials and waste management infrastructure is owned by the public sector, and operations are contracted out to the private sector. New York City's LSWMP rests on this public/private partnership approach for its recycling and waste transfer facilities. This type of structure reduces the risk to the public entity by ensuring the capacity is always available, while offering the benefits and efficiency of private operations.

Whether privatizing an entire system or just facility operations, local governments can maximize the benefits of privatization and minimize the risk of monopoly by using competitive procurement procedures, developing rigorous contracting processes and carefully negotiating compensation rates.

3.3 OVERSEEING PRIVATELY OPERATED WASTE MANAGEMENT SERVICES

There are several tools available to local governments to help ensure that solid waste services provided by the private sector are consistent with and supportive of waste reduction, reuse, recycling and organics recovery goals and the solid waste management infrastructure developed by the locality. Those tools include flow control legislation, registration or permitting programs, and contractual requirements.

Flow control refers to laws or ordinances enacted by local governments to direct or otherwise regulate the movement of solid waste generated within their jurisdiction by designating transfer, recycling, disposal, or other facilities at which the material will be managed. Flow control can be an important financial and planning tool to ensure delivery of sufficient solid waste to satisfy debt payments for capital intensive facilities and to generate revenue that can support waste reduction and recycling initiatives. It also ensures that materials are directed to a facility that the municipality determines is safe and appropriate for handling its waste. While implementation of flow control ordinances has been hampered by legal challenges, in 2007 the US Supreme Court held, in *United Haulers v. Oneida Herkimer Solid Waste Management Authority*, that flow control ordinances are constitutional if used to support an integrated solid waste management program. (For a full discussion of flow control, see Appendix D.)

Many communities in New York State require companies that collect solid waste to register or obtain a license or permit to operate within their jurisdictions. The requirements for licenses, permits or registrations can include provisions that:

- Require that collectors provide recycling services;
- Restrict the co-mingling of recyclables with other waste;
- Include reporting on material origin and destination; and
- Establish other initiatives that support the municipality's goals and programs.

As with any permit program, it is important for communities to maintain an active and visible enforcement component.

Using contractual structures, such as districting, local governments can bid out the recycling and solid waste collection services in a defined area and, as a condition of the bid, set requirements that support the locality's goals, such as designating certain materials for recycling collection, requiring education and outreach, directing that certain solid waste management facilities be used, and requiring reporting.

In other states, communities can use franchise agreements to structure recycling and waste collection service agreements with private sector operators. In these cases, the franchise can be bid out for a neighborhood or area, can require that certain services be provided, and can specify the facilities to be used for recycling or disposal. Franchises are similar to contract structures and districting, but enable municipalities to bid for the service and allow the contractor to bill the generator directly in accordance with the terms of the franchise. Municipalities in New York State cannot enter into franchise agreements without explicit state legislative authority.

3.4 RESOURCES FOR IMPLEMENTATION

DEC provides technical and planning assistance, as well as financial assistance, for capital and education costs related to waste reduction and recycling programs, household hazardous waste management, landfill closure projects and landfill gas management programs.

For the first ten-year solid waste management planning period (1987 -1997), the state's program interacted regularly with planning units to support the development of their initial LSWMPs. During that time, DEC provided significant technical assistance to planning units and their consulting engineers on available technologies, data, tools, and concepts. For example, DEC worked with NYSERDA and the New York State Association for Solid Waste Management (NYSASWM) to distribute modeling software to local solid waste management officials throughout the state and trained them in the fundamentals of using it.

The majority of LSWMPs were approved and implemented in the late 1990s. Unfortunately, in the last decade, solid waste management planning program staff were reduced, and programs and technical assistance efforts became more limited. At the same time, a number of LSWMPs expired without the submittal of replacement LSWMPs for review and approval.

While the state's financial assistance programs have been significant, the available funding has not been sufficient to address the need, particularly in the last decade. Waste reduction and recycling related programs have been chronically underfunded, with $6 to $10 million awarded annually and a waiting list of pre-applications for projects consistently ranging between $20 to $35 million. There has been no funding for the development or modification of LSWMPs since the $7.5 million in funding provided in 1988 was exhausted in 1992. (For more on state investments, see section 6.)

3.5 DATA COLLECTION AND USE

For the past 20 years, DEC has relied on planning units to aggregate, analyze and report recycling data, and for some composting and disposal data, for waste from all generating sectors within their planning unit. Data collection has been a great challenge for planning units, especially with respect to commercial and institutional waste. For the most part, data collection for municipally collected residential waste has provided basic, usable planning and tracking information. However, in sectors and regions with predominantly private collection, data has been weak.

Even so, the data provided by planning units was considered the best available and was used for both state and local planning and reporting purposes. In an effort to avoid double counting materials already reported by planning units, DEC did not include individual recycling and composting facility report data in the state's recovery rate calculations. However, through 2001, the state's recycling rate included data provided by the American Forest and Paper Association and the Port Authority of New York and New Jersey for non-municipally generated materials, as well as disposal data provided by facilities in the state. Since that time, recycling rate calculations have been based solely on information provided by the planning units.

Additional analysis of reported planning unit data compared to reported recycling and solid waste management facility data performed as a part of this Plan's development indicates that, in aggregate, the planning unit reports have been underreporting material processed at private

recycling and waste transfer and disposal facilities. Furthermore, reported data for yard trimmings has been inconsistent in terms of both accuracy and units. This has likely resulted in a number of data gaps over the years, especially with respect to commercial and institutional wastes. The data presented in this Plan is more accurate than previously reported information, as discussed more fully in section 8.3.1. As the state transitions to the new goal structure—a reduction in per-capita waste disposal—discrepancies must be resolved to ensure the best data is gathered and used for analysis and measurement.

Additional attention to the issue of the collection and use of data is critical to the state's ability to measure progress in moving *Beyond Waste*. It is important to evaluate one community against the next and to evaluate the state's progress in comparison to other states. DEC will continue to work with the EPA and regional organizations (e.g., the Northeast Waste Management Officials Association, NERC) to develop consistent measures of success.

3.6 WASTE COMPOSITION INFORMATION

To plan for greater levels of recovery, it is important to understand what materials are available in the waste stream. Comprehensive waste composition analyses can be expensive but are an essential tool for gaining that understanding. New York State has not conducted a statewide waste composition analysis but, rather, has relied upon planning units to aggregate specific waste composition and generation data as part of their planning efforts. For their part, few planning units have had the resources to perform a field analysis, so most LSWMPs employ EPA's national estimate of waste composition for projections and planning or rely on outdated waste composition studies that do not capture the changes in materials use and packaging trends that have had significant impacts on waste composition in the last two decades. Furthermore, few composition analyses represent the entire waste stream, including residential, commercial, and institutional waste, nor do they evaluate for reuse or prevention potential.

There are, however, a couple of exceptions. Most notably, New York City (NYC) has conducted two in-depth waste composition analyses on its residential stream, one as part of its original LSWMP in 1990 and one in 2004-2005. Onondaga County Resource Recovery Authority conducted waste composition analyses in 1987, 1993, 1998 and 2005. Through these studies, both NYC and Onondaga County were able to learn what portion of targeted materials was not being captured completely and what materials are generated in sufficient quantity to warrant new programs or market development attention. These studies and those compiled in other states form the basis of the composition analysis presented in Section 7. However, a fuller data set, covering the entire state and all of the waste streams, would provide the basis for better planning on both the state and local levels.

3.7 ENFORCEMENT

While the statutory and legal basis for mandatory recycling envisioned by the New York State Legislature when the Act was created has been partially realized, the intended result—the statewide implementation of recycling programs across the residential, commercial, industrial and institutional sectors—has not been achieved. It is noteworthy that nearly 20 years later, some municipalities (representing more than three percent of the state's population) still do not have local laws that comply with the basic source separation requirements of Section 120-aa of Article 6 of the General Municipal Law (GML 120-aa). Of those local governments that do have recycling laws or ordinances in place, much of the focus has been on residential recycling programs, and the requirements established by the legislature in GML 120-aa have been for the most part ignored as they relate to commercial, industrial and institutional generators. In addition, there has been little effort on the part of many municipalities which do have local laws in place to enforce those laws in instances where there is non-compliance in any category of generators.

As state solid waste planning staff and resources have diminished, DEC's oversight of LSWMP performance and updating has suffered. Nonetheless, the regulatory tools to create a vibrant and meaningful state and local solid waste management planning program remain in place to be more fully used and enhanced.

3.8 INCONSISTENT IMPLEMENTATION

Several planning units have established and implemented integrated solid waste management systems with aggressive waste reduction and recycling programs that demonstrate the capability and promise of the originally envisioned system. Still, there is a great disparity in the scope and performance of integrated waste management programs across the state, and progress on recycling has varied dramatically by planning unit and municipality (See Figure 8.1 in Section 8.3). The experience of the higher performing programs has simply not transferred throughout the state. For example, in 2008, on a per capita basis, reported MSW recycling rates ranged from 764 pounds per person per year of paper and containers to 17 pounds per person per year.

While some of the differences in performance can be attributed to specific regional circumstances, such as proximity to markets and possibly to data collection anomalies, these variables cannot account for the full breadth of the disparity in programs statewide. Much of the disparity is the result of a lack of uniformity in local implementation of LSWMPs and enforcement of the LSWMPs and their recycling requirements. DEC generally lacks enforcement authority over LSWMPs. While the permitting of solid waste management facilities provides some legal opportunity to enforce consistency with related LSWMPs, the fact that some facilities serve municipalities located in numerous LSWMPs and the lack of specific enforcement guidance have reduced use of this authority.

3.9 RECYCLING MARKETS

Like any commodity market, markets for most recyclable materials have fluctuated dramatically in the past two decades. No year illustrated this point as well as 2008, when many recyclable materials experienced both record high and record low market values. That fluctuation is a reminder that recycling markets are global in nature and subject to external factors well beyond the control of local solid waste managers or companies. Fortunately, New York State's recycling programs have weathered dramatic market fluctuations and, for the most part, programs have successfully endured. The state, primarily through the efforts of ESD, has worked to both develop and strengthen recycling markets for various materials. (ESDs efforts are discussed in Section 6 and Appendix E.) Planning units can help to stabilize markets by providing a consistent supply of clean, uniform recyclable materials; however, they must also be prepared for varying market conditions. Flexible strategies that protect a planning unit's programs during down times include using multiple outlets and, where possible, entering into long-term supply agreements with local or regional markets. For both short and long-term contracts, planning units should strive to include conditions that offer protection from wild price fluctuations while ensuring a steady stream of materials for the end-use market. For more on recycling markets, see Section 8.3.10.

3.10 CHANGING ROLES—PRODUCT STEWARDSHIP

As the state transitions to a materials management system that relies more heavily on product stewardship (also known as extended producer responsibility), there will be a greater role for private sector players that are somewhat new to materials management, most notably brand owners (also referred to as producers or manufacturers) and retailers. The precise roles of brand owners and retailers will be determined by the structure of the state's product stewardship laws, but it is fair to presume that an enhanced role for both of these types of companies will be realized. Brand owners will be required to either develop or finance materials management programs for their products. Retailers may be required to collect or aggregate materials from consumers. (For more on potential roles and structures of product stewardship programs, see Section 5 and Appendix F.)

3.11 FINDINGS

State agencies must lead by example and demonstrate progressive materials management strategies and sustainable operations.

The state must strengthen its efforts to direct policy, provide technical and financial assistance, perform outreach and education functions, and ensure a strong and enforceable regulatory structure.

The state must refocus on solid waste management planning by:

  - Seeking staff and resources to implement the state Plan; and
  - Working with planning units to craft a new generation of LSWMPs that embody new approaches and technologies to reduce waste and achieve higher levels of recovery and that reflect current market and regulatory conditions.

- DEC must uniformly apply planning requirements statewide under new and existing authority to ensure that LSWMPs and CRAs represent concerted efforts to reduce waste and increase recycling and are aggressively implemented.
- DEC must work to improve data collection to better measure progress in moving *Beyond Waste*.
- The state must allocate additional funding and resources to plan for and implement sustainable materials management programs and to provide necessary oversight and enforcement.

3.12 RECOMMENDATIONS

As we move *Beyond Waste*, the state and its solid waste management planning units must implement the wide range of actions listed below. Fully realizing these recommendations will require additional resources—both financial and human—at the state and local level.

3.12.1 Programmatic Recommendations

- Work aggressively with New York State agencies and authorities to implement Governor Paterson's Executive Order 4, which requires agencies and authorities to set an example of sustainable operations, including minimizing waste and maximizing recycling of materials and organics.
- Work with the Pollution Prevention Institute[11] to conduct outreach to businesses regarding life cycle considerations for "green products."
- Expand the local solid waste management planning technical assistance program, and provide guidance and tools to help municipalities, advocates, and other stakeholders address challenging planning issues, including:
  - Recycling market development and stabilization;
  - Flow control or other private sector oversight programs (e.g., waste transporter licensing or permitting and reporting);
  - Recycling and waste composition data collection and use;
  - Materials recovery infrastructure analysis and needs assessment;

[11] The Pollution Prevention Institute is a collaborative of several universities and technology development centers, funded through the Environmental Protection Fund. For more information, see http://www.nysp2i.rit.edu/.

- Technology transfer and data/information sharing;
- Incentives, education and enforcement; and
- Program implementation uniformity.

- Require planning units to evaluate and implement,to the maximum extent practicalbe, the following programs, policies and initiatives as they develop new LSWMPs, modify existing LSWMPs,andotherwise planfor and implement programs:
  - Education, and enforcement;
  - Incentives, including volume-based pricing structures (e.g., PAYT/SMART Program);
  - Waste prevention and reuse programs and infrastructure;
  - Public space, event, institutional and commercial recycling;
  - Additional materials for recovery, including residential mixed paper, food scraps and other organics; and
  - Long-term recycled material supply agreements and/or processing contracts with multiple market outlets.
- Evaluate current planning unit membership and structure to ensure that original structures are functioning, and, if not, support efforts to adjust structures or create new planning units to best carry forward the next stage of planning and program implementation.
- Develop an on-line reporting system to collect more timely and accurate recycling and disposal data from solid waste and recycling facilities and planning units; work with industry to develop uniform methods for more accurate data gathering and reporting, using the new statewide performance metrics based on *per capita* amounts collected for recycling and disposal.
- Develop guidance for planning units on performing waste composition and characterization analyses to ensure consistency in analyses undertaken across the state so that the characterization data can support state and local planning. Identify funding sources to incentivize local waste characterization efforts, and develop a program and system to conduct periodic state-sponsored waste composition and characterization analyses.
- Develop critical recovery infrastructure through inter-agency collaboration (with ESD, NYSERDA, and EFC) or public-private partnership, including the following suggested facilities:
  - Organic material recycling facilities;
  - New or upgraded material recovery facilities in select areas;
  - Regional glass processing facilities;
  - Plastics recovery capacity in the state for processing both rigid plastics #1-7 and film plastics; and
  - C &D debris-processing facilities to generate materials for high-value end uses.
- Network with other agency stakeholders to facilitate immediate response to disasters and to mitigate the impacts of disasters through better planning.

3.12.2 Regulatory Recommendations

- Develop a regulatory approach to ensure consistent implementation of the requirements to source separate recyclables, particularly in areas served by private collection companies.

3.12.3 Legislative Recommendations

- Increase DEC's authority to enforce state and local source-separation requirements.
- Advance a comprehensive and integrated financial assistance program to support development and implementation of LSWMPs. (For more detail, see Section 6.)
- Develop a targeted funding program for specific priority areas identified by the state as having the greatest potential for advancing the state's goals in moving *Beyond Waste*. The fund must be flexible enough to allow funding to planning units, the private sector, state agencies or a combination of the three.
- Require local governments to be members of a planning unit , require local solid waste management planning, and make it enforceable, notwithstanding the facility permitting process.
- Authorize municipalities to franchise solid waste management services.
- Expand the Waste Transporter Program to place specific requirements on transporters of MSW, recyclables, C&D debris and historic fill to: enforce source separation requirements, account for wastes that are not currently tracked, and ensure that communities who export comply with source separation requirements and disposal restrictions.

4. CLIMATE CHANGE AND MATERIALS AND WASTE MANAGEMENT

CLIMATE CHANGE IS THE MOST PRESSING ENVIRONMENTAL ISSUE OF OUR TIME…BY TAKING ACTION, WE SEND A SIGNAL THAT NEW YORKERS WILL DO OUR SHARE TO ADDRESS THE CLIMATE CRISIS AND WE WILL DO IT IN A WAY THAT CREATES OPPORTUNITIES FOR INNOVATION AND ENTREPRENEURSHIP TO FLOURISH.

David Paterson
Governor
August 6, 2009

Carbon dioxide (CO_2), methane (CH4) and other "greenhouse gases" (GHGs) prevent heat from leaving the earth's atmosphere, causing the planet's temperature to warm in the same way as glass allows heat to build up in a greenhouse. While GHG is naturally present in the atmosphere, a number of human activities, primarily the burning of fossil fuel, have led to higher than normal concentrations of the gases. As a result, the greenhouse effect is enhanced and Earth's temperature is rising with the potential to change the planet's climate.

Scientific evidence suggests that a changing climate poses a serious threat to environmental resources and public health in New York State, nationally and globally. Climate change will affect air quality, water quality, fisheries, drinking water supplies, wetlands, forests, wildlife, and agriculture. *Confronting Climate Change in the U.S. Northeast: Science, Impacts, and Solutions*, prepared by the Union of Concerned Scientists, concludes that flooding from climate change-related severe weather events and rising sea levels threaten communities and infrastructure in floodplains and along coastlines.

Scientists have already observed significant warming in New York State's climate due to increased concentrations of GHGs in the atmosphere. Since 1970, the northeast United States has been warming at a rate of 0.5° F per decade. Winter temperatures have risen even faster, at a rate of 1.3°F per decade from 1970 to 2000. Temperature increases in the metropolitan coastal areas of the state have been more dramatic. As outlined in the NECIA, scientists have concluded that New York State's climate has already begun to take on the characteristics of the climate formerly found in the states to the south.

The scientific literature confirms that large and rapid reductions of GHG emissions will help to mitigate the impacts of climate change, but to do this, we will need to adopt thoughtful new approaches to the way we use and produce energy. Indeed, mitigating the impacts of a warming

climate represents one of the most pressing environmental challenges for the state, the nation, and the world. New York State updated its Energy Plan in 2009 to facilitate more aggressive reductions of GHGs. In August 2009, Governor Paterson issued Executive Order 24, establishing a state goal of reducing GHG emissions 80 percent below 1990 levels by 2050 and directing NYSERDA and DEC to develop a climate action plan.

Achieving GHG reduction goals will require a fresh look at materials and waste management strategies. In addition to the direct emissions of GHGs from solid waste management facilities, the way materials are managed also has life cycle GHG impacts. Overall, waste prevention, reuse, recycling and composting are better performing materials management strategies from a GHG reduction perspective and also conserve energy and offer other environmental and economic benefits compared to disposal. Maximizing the deployment of these strategies will help the state meet its GHG reduction goals. To manage the waste that remains after comprehensive waste prevention, reuse, recycling and composting are in place, municipal waste combustion (MWC) offers significant GHG reduction advantages compared to landfilling.

There are significant opportunities to reduce or avoid GHG emissions by improving both materials themselves and our materials management practices. Strategies include reducing the amount of materials used to make products or perform services, influencing product design so fewer materials are needed to make something , enhancing recycling and capabilities for reusing materials to minimize raw material input, extending the life of products, and maximizing the ease of product maintenance and eventual recycling or transformation into parts that have further productive use.

EPA, 2009

4.1 WASTE CONTRIBUTES TO GLOBAL WARMING

According to EPA, on a life-cycle basis, 42 percent of the national GHG inventory is influenced by the energy and fuel consumed in the production, use and management of the materials that become waste.[12]

The most obvious and well-documented contribution to GHG from the management of waste is from the uncaptured emissions of methane from landfills—as organic materials break down in a landfill's anaerobic environment they generate methane, a GHG 23 times more potent than CO_2. EPA estimates that, nationally, landfill methane emissions represent 1.8 percent of GHG emissions.

[12] Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management Practices, US-EPA, September 2009.

The New York State Energy Research and Development Authority's (NYSERDA) statewide GHG Inventory for 2008 estimates that the state's landfills contribute 4.46 million metric tons of CO_2 equivalent ($MTCO_2E$) to Earth's atmosphere. This represents 1.8 percent of the state's GHG emissions[13]. In addition to direct emissions, the transportation and handling of solid waste also generates GHGs.

And the GHG implications of waste go beyond waste handling considerations. More than 70 percent of MSW comprises products and packaging, the production, distribution and disposition of which generates GHGs. Every step of the process—mining, harvesting, manufacturing, and distribution—consumes energy and generates pollution. Thus, to the extent that waste can be reduced through extended use of products and materials and through various recovery strategies, they will not have to be replaced with new materials requiring an equivalent demand on resources and the environment. Through changes in product design and packaging, many materials might not be generated in the first place, a particularly relevant concept for things that currently go from store shelves almost immediately to the garbage bin upon purchase—packaging, single-use products and other items of limited value.

In its report, *Solid Waste Management and Greenhouse Gases: A Life Cycle Assessment of Emissions and Sinks*, EPA describes the lifecycle impacts of waste:

> *For many wastes, the materials in MSW represent what is left over after a long series of steps: (1) extraction and processing of raw materials; (2) manufacture of products; (3) transportation of materials and products to markets; (4) use by consumers, and (5) waste management.*
>
> *Virtually every step along this "life cycle" impacts GHG emissions. Solid waste management decisions can reduce GHGs by affecting one or more of the following:*
>
> > *(1) Energy consumption (specifically, combustion of fossil fuels) associated with making, transporting, using, and disposing the product or material that becomes a waste.*
> >
> > *(2) Non energy-related manufacturing emissions, such as the* CO_2 *released when limestone is converted to lime (e.g., in steel manufacturing).*
> >
> > *(3)* CH_4 *emissions from landfills where the waste is disposed.*
> >
> > *(4)* CO_2 *and nitrous oxide (*N_2O*) emissions from waste combustion.*
> >
> > *(5) Carbon sequestration, which refers to natural or human-made processes that remove carbon from the atmosphere and store it for long periods or permanently.*
>
> *The first four mechanisms add GHGs to the atmosphere and contribute to global warming. The fifth—carbon sequestration—reduces GHG concentrations by removing* CO_2 *from the atmosphere.*

This EPA assessment also notes that the end-of-life management of different materials has varying implications for GHG generation related to energy consumption, methane management, and carbon sequestration. According to EPA, composting can result in carbon storage in the soil, so that composting one ton of food scraps results in a net GHG reduction of 0.20 metric tons of CO_2E, while

[13] *Climate Action Plan Interim Report*, NYS Climate Action Council, November 2010.

landfilling that material would increase GHGs by 0.28 metric tons CO_2E. Recycling a ton of aluminum yields an estimated net reduction of 13.6 metric tons CO_2E as compared to aluminum production from virgin materials, while landfilling that material would yield an increase of 0.04 metric tons CO_2E. Table 4.1, excerpted from EPA's Waste Reduction Model (WARM), provides a generic comparison of the GHG impact of managing various waste materials using different techniques.[14]

The most significant GHG impacts during the life cycle of products and packaging result, not from disposal, but during production of the products and packaging that eventually become waste. According to the US Department of Energy's Energy Information Administration, industry worldwide uses more than 50 percent of the energy consumed. Within that sector, virgin raw materials industries are among the world's largest consumers of energy. In the US, the four largest material industries—paper, metal, glass and plastic—consume more than 20 percent of the energy used nationally for all purposes.[15]

Waste prevention and recycling can significantly reduce industrial energy consumption. For example, a life-cycle study on the paper industry found that recycling paper and using that recycled paper in production reduces the GHG impacts of paper manufacturing by two to six times (depending on the paper grade) as compared to virgin manufacturing and landfilling or MWC.[16] Using recycled materials in paper production can also reduce demand for virgin timber, conserving trees that absorb CO_2.[17] The potential for positive impacts of material recovery and reuse in the metals industry is even greater. When manufacturing aluminum, 95 percent of the GHG emissions can be avoided by substituting scrap vehicle aluminum for virgin feedstock.[18] The GHG reductions related to manufacturing with recycled materials in place of virgin are so substantial that the emissions from transportation of materials for recycling are not a significant factor in the overall carbon footprint of recycling.

The Intergovernmental Panel on Climate Change (IPCC), established by the United Nations Environmental Programme and the World Meteorological Organization, recognizes the important link between materials use and global climate change in its Fourth Assessment Report, stating:

> *Changes in lifestyles and consumption patterns that emphasize resource conservation can contribute to developing a low-carbon economy that is both equitable and sustainable.*

In its *Pathways to a Low Carbon Economy* report, McKinsey & Company identified recycling as a low-cost carbon abatement strategy. In fact, recycling and landfill gas-to-energy projects are listed as products with a negative abatement cost; that is, their implementation actually saves money or generates revenue.

---

[14] The WARM model is available at www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html

[15] U.S. Energy Information Administration, www.eia.doe.gov/emeu/mecs/mecs2002/data02/pdf/table1.1_02.pdf

[16] *Paper Task Force Recommendations for Purchasing and Using Environmentally Preferable Paper,* Environmental Defense Fund, www.edf.org/article.cfm?contentid=1689 .

[17] *Environmentally Sound Paper Overview: Essential Issues,* Conservatree, www.conservatree.org/learn/Essential%20Issues/EIOverview.shtml .

[18] International Aluminum Institute, www.world-aluminum.org/?pg=100 .

This Plan considers impacts to the climate within the discussions of the various waste management options and planning recommendations. An important element of the Plan is its attention to the opportunities for saving energy and reducing climate impacts from a life cycle perspective. This approach supports proposed strategies to reduce waste, increase the reuse and recycling of discarded materials to capture their material properties and embedded energy, and recover organic materials to avoid the generation of methane in landfills and provide benefit to soils.

In this way, the Plan and its recommendations are linked to a larger vision for a sustainable New York State, where all resources are conserved to the maximum extent feasible, GHGs are reduced, and our unique natural environment is preserved for future generations.

4.1.1 Waste Prevention and Reuse

Avoiding the production of a product or package or reusing it in its original form, and thereby preventing waste altogether, offer the most significant GHG reductions in that they eliminate the need to extract resources, turn them into products and materials, transport them to market, and dispose of them as waste. For example, the NYC Department of Environmental Protection changed its practice of distributing printed phone directories and now provides them in an electronic format. In so doing, the agency eliminated the use of approximately 1.3 tons of paper each year.[19] In addition to saving money on purchases and disposal, the move reduced GHG impacts by 12.8 tons of CO_2E annually. By contrast, recycling that same amount of material would have reduced only 3.7 tons of CO_2E, combusting it would have reduced .66 tons of CO_2E, and landfilling those materials would have resulted in an increase of 2.59 tons of CO_2E annually.

[19] New York City Department of Sanitation, Bureau of Waste Prevention, Reuse and Recycling, www.nyc.gov/html/nycwasteless/html/at_agencies/govt_case_studies_waste.shtml#9 .

TABLE 4.1[20]

Net Greenhouse Gas Emissions from MSW Management Options ($MTCO_2E$/Ton)

Material	Reduction /Reuse	Recycling	Composting	Combustion	Landfilling
Aluminum Cans	-8.26	-13.61	NA	0.06	0.04
Steel Cans	-3.19	-1.80	NA	-1.53	0.04
Copper Wire	-7.38	-4.97	NA	0.06	0.04
Ferrous Scrap Metal	-3.22	-1.81	NA	-1.55	0.04
Glass	-0.53	-0.28	NA	0.05	0.04
HDPE	-1.77	-1.38	NA	0.72	0.04
LDPE	-2.25	-1.67	NA	0.72	0.04
PET	-2.07	-1.52	NA	0.97	0.04
Corrugated Containers	-5.60	-3.10	NA	-0.73	0.90
Magazines/Bulk Mail	-8.65	-3.07	NA	-0.53	-0.80
Newspaper	-4.89	-2.80	NA	-0.83	-1.30
Office Paper	-8.00	-2.85	NA	-0.70	-0.23
Phonebooks	-6.29	-2.65	NA	-0.83	-1.30
Textbooks	-9. 13	-3.11	NA	-0.70	-0.23
Dimensional Lumber	-2.02	-2.46	NA	-0.87	-1.17
Fiberboard	-2.23	-2.47	NA	-0.87	-1.17
Food Scraps	NA	NA	-0.20	-0.20	0.28
Yard Trimmings	NA	NA	-0.20	-0.25	-0.32
Grass	NA	NA	-0.20	-0.25	0.11
Leaves	NA	NA	-0.20	-0.25	-0.71
Branches	NA	NA	-0.20	-0.25	-1.17
Mixed Paper, General	NA	-3.51	NA	-0.73	-0.81
Mixed Paper, Residential	NA	-3.54	NA	-0.73	0.84
Mixed Paper, Office	NA	3.60	NA	-0.67	-0.53
Mixed Metals	NA	-5.40	NA	-1.05	0.04
Mixed Plastics	NA	-1.50	NA	0.83	0.04
Mixed Recyclables	NA	-2.87	NA	-0.65	0.73
Mixed Organics	NA	NA	-0.20	-0.23	-0.02
Carpet	-4.02	-7.22	NA	0.24	0.04
Personal Computers	-55.78	-2.26	NA	-0.22	0.04
Clay Bricks	-0.29	NA	NA	NA	0.04
Concrete	NA	-0.01	NA	NA	0.04

[20] Extracted from EPA's WARM model, available for download at: http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html

Material	Reduction /Reuse	Recycling	Composting	Combustion	Landfilling
Fly Ash	NY	0.87	NA	NA	0.04
Tires	-4.34	-0.39	N	0.51	0.04
Asphalt Concrete	0.11	0.0	NA	NA	0.04
Asphalt Shingles	-0.20	0.09	NA	-0.34	0.04
Drywall	-0.22	0.03	NA	NA	0.13
Fiberglass Insulation	0.39	NA	NA	NA	0.04
Vinyl Flooring	-0.63	NA	NA	-0.58	0.04
Wood Flooring	-4.08	NA	NA	-1.14	0.07

A negative sign (-) indicates a net reduction in GHGs or a positive impact on climate change.

This Plan proposes new product and packaging stewardship programs as a key means of achieving waste reduction (see Section 5). In stewardship programs, the producer of a product or package must take either financial or physical responsibility for managing that product or package at the end of its useful life. This reduces GHGs in two ways. First, product and packaging stewardship programs create a financial incentive for producers to use fewer materials and use materials that are more easily reused or recycled. Second, stewardship has the potential to increase the recycling and diversion of products that are currently going to disposal. For example, Washington State estimates that a product stewardship program for recycling carpet in that state could reduce GHG emissions by up to 0.9 million metric tons of CO2E in 2020 (assuming 80 percent recycling).[21]

4.1.2 Recycling

Recycling products, packaging and other materials is, generally speaking, the third best way, after reduction and reuse, to manage materials at the end of their useful life. From a GHG emissions perspective, this management strategy has significant advantages compared to land filling and combustion techniques. Recycling avoids the emissions related to energy consumption and manufacturing associated with the extraction, production and transportation of virgin materials used in original production. For example, recycling just one aluminum can conserves enough energy to power a television for three hours. Further, recycling avoids production of the GHG emissions associated with handling and disposing of these materials through conventional waste management practices.

Of all the materials readily amenable to recycling, metals offer the most significant potential for GHG emission reductions, in large part due to the energy intensive process of mining and preparing virgin metals for production. Recycling paper is also particularly important from a climate perspective because of the energy intensive virgin production process and the benefits of reducing demand for pulp and, in some cases, leaving trees standing to absorb carbon.

[21] Washington Climate Action Team, Leading the Way: Implementing Practical Solutions to Climate Change

4.1.3 Composting and Organics Recycling

From a climate perspective, recycling food scraps, through composting or anaerobic digestion, also has advantages compared to landfilling. As outlined in Table 4.1, the EPA WARM model predicts a slight advantage for composting food scraps compared to combustion and a slight advantage for combustion of yard trimmings compared to composting. EPA has acknowledged that WARM does not give credit for the GHG savings due to use of the compost product. EPA is currently developing models to quantify these savings. Given the substantial volume of organic materials currently managed in landfills— organics make up 30 percent of waste generated statewide—recovering organics is a key solid waste management strategy to combat climate change.

Recognizing this important connection, in 1999, the European Union issued a landfill directive to reduce land disposal of biodegradable materials.[22] Implementing the directive resulted in a 30 percent reduction in methane emissions (below 1990 levels) by 2002. To comply with this directive, communities in Europe have transitioned to systems that foster greater organics recovery through composting and anaerobic digestion, deployed mechanical biological treatment (MBT) systems to stabilize waste prior to land disposal, or combusted waste for energy recovery.

As the impacts of this policy and additional research in the field suggest, by diverting the materials that would generate methane in a landfill setting, a well-run composting operation will avoid potent GHG emissions.[23] Anaerobic digestion systems intentionally generate methane but capture the gas for energy recovery, which serves the dual purpose of destroying the methane and offsetting the generation of energy from fossil fuels. The production and capture of methane through the process of anaerobic digestion is far more efficient than recovering gas from a landfill because digesters use closed systems that are designed to maximize gas production.

Critical to this analysis is the fact that organics recovery facilities generate a valuable soil amendment as an end product that can supplement fertilizers, thereby reducing the GHG impacts of the agricultural sector. The compost product that results from organics recovery is considered a "carbon sink" because it returns that carbon to the soil for the long term. The organic matter inherent in compost is crucial for moisture retention, erosion control, and the microbial activities that promote plant growth. Because of these properties, compost also reduces the need for manufactured fertilizers. A recent report from the California Air Resources Board found that agricultural use of compost is a cost-effective way of reducing agricultural GHG emissions while building the nutrient base of the state's soils.[24] It is important to note that many of the currently available models that compare the GHG impacts of various waste management techniques undervalue the contribution of composting by not considering the additional benefits derived from the use of the compost product.

---

[22] Council Directive 99/31/EC, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31999L0031:EN:NOT

[23] Greenhouse Gases and the Role of Composting, US Composting Council.

[24] Recommendations of the Economic and Technology Advancement Advisory Committee (ETAAC): Final Report: Technologies and Policies to Consider for Reducing Greenhouse Gas Emissions in California; www.arb.ca.gov/cc/etaac/ETAACFinalreport2-11-08.pdf

Still, the extent of the GHG reductions gained by recycling organics relate primarily to the avoidance of disposal. Composting reduces GHG emissions as compared to landfilling in almost any instance—methane is such a powerful GHG that its avoidance dwarfs any emissions from transportation or other factors. As compared to MWC, composting offers a GHG reduction, but it is not as substantial as landfilling. Therefore, when comparing composting to combustion, transportation distances could be a more significant factor from a GHG perspective.[25] Obviously, avoiding transportation impacts by managing materials closer to the point of generation is often a better environmental and economic choice.

4.1.4 Municipal Waste Combustion

Waste prevention, reuse, recycling, and composting offer significant climate benefits, further justifying their preferred status in the waste management hierarchy. For residual waste that is not or cannot be prevented, reused, recycled or recovered, disposal methods must be employed. Viewed through a climate lens, disposal in an MWC (also known as a waste-to-energy or energy-from-waste facility) offers advantages over disposal in landfills. This is primarily because treatment through combustion facilities: reduces the amount of waste sent to landfills for disposal and the methane generated by landfilling; recovers metals that would otherwise be wasted; produces electricity more efficiently than landfill gas-to-energy facilities, and offsets fossil fuel electricity generation.[26] Still, the energy produced at combustion facilities is less than that conserved through waste prevention and recycling. A 2008 study found that the energy generation potential, per ton of MSW handled at combustion facilities, is less than one-quarter of the energy generation potential of recycling.[27]

One study estimates that the GHG impacts of landfilling, during a 30-year period, are significantly greater than those from combustion—45 times greater in landfills with gas collection and energy recovery and 115 times greater in landfills without gas collection and destruction.[28] While the gross GHG emissions of MWC are higher than fossil fuel-generated electricity, with the average emission rate from MWCs in the US at 2,988 lbs./MWh of CO_2 as compared to 1,672 lb/MWh for oil, 2,249 for coal, and 1,135 for natural gas, common carbon accounting practices discount the biogenic portion of MSW by approximately 65 percent of total emissions. Once that adjustment is made, the CO_2 emissions from MWC average 1,045 lbs./MWh, less than those from oil, coal or natural gas. As we move *Beyond Waste* and more biogenic materials (food scraps and paper) are diverted to

[25] This statement is based on information presented in Section 8.4, Composting and Organics Recycling. For a full discussion and the results of modeling using the Northeast Recycling Council's Environmental Benefits Calculator, see that section.

[26] *Modern Waste-to-Energy as an Energy and Environmental Management System*, Brian Bahor, Covanta Energy Corporation, Keith Weitz, RTI International, Inc. , www.reventurepark.com/uploads/1_WTE_ART_5.pdf .

[27] *Assessments of Materials Management Options for the Massachusetts Solid Waste Master Plan Review*, Tellus Institute, for the Massachusetts Department of Environmental Protection, December 2008, www.mass.gov/dep/recycle/priorities/dswmpu01.htm.

[28] *Greenhouse Gas Dynamics of Municipal Solid Waste Alternatives*, Alan Eschenroeder, Harvard School of Public Health, 2001, www.energyanswers.com/pdf/eschenroeder_ghg_dynamics_MSW_alternatives.pdf.

composting and recycling it may justify a reduction in the discount factor thereby changing the relationship of MWC emissions to oil, coal and natural gas. Specific estimates of GHG emissions from MWC depend on the design and operation at a given location.

4.1.5 Landfilling

Landfills represent the largest direct contribution to GHGs of any waste management technique. Landfills produce methane, a potent GHG, as a result of the decomposition of organic material within the oxygen-starved (anaerobic) conditions of a landfill environment. Methane emissions also increase ozone in the troposphere, which causes radiative forcing that exacerbates global climate change. [29] Capturing that methane, to the greatest extent possible, must remain a priority to limit the GHG impacts of the state's primary waste disposal method.

In addition to methane, the gas produced from waste decomposing in a landfill contains non-methane organic compounds (NMOCs) such as benzene and toluene, as well as carbon dioxide, particulate matter and other pollutants. Landfill gas collection systems are typically installed to control odors and other pollutants. Nonetheless, methane and carbon dioxide usually make up more than 90 percent of the total gas produced. If the methane is captured to generate electricity, it offsets fossil fuel consumption. Landfill gas collection is now common in New York State, and conversion of landfill-gas-to-energy is growing, particularly at the larger landfills. In New York State in 2008, approximately 10.5 billion cubic feet of landfill gases were destroyed through flaring at active landfills, and 14 billion cubic feet were used to generate energy. Implementation of landfill gas-to-energy projects has been inhibited by significant costs and engineering hurdles, most commonly involving the process for connecting the landfill's energy generation to the local electrical grid systems. Despite these impediments, two MSW landfills have added gas-to-energy production systems since 2008.

According to EPA, landfill GHG emissions are a function of several factors, including: (1) the total amount and age of waste in MSW landfills, which is related to total waste landfilled annually; (2) the characteristics of landfills receiving waste (e.g., composition of waste-in-place, size, cover system, climate); (3) the amount of methane that is recovered and either flared or used for energy purposes, and (4) the amount of methane oxidized in landfills instead of being released into the atmosphere.

The rate of landfill gas generation is also related to waste composition. The composition of waste affects not only the volume but the timeframe in which landfill gas is generated. For example, according to the U.S. Composting Council, food scraps break down quickly and can begin generating methane in days or weeks (depending on their location in the landfill and how quickly any oxygen present is consumed), often before capture systems can effectively manage the gas.

Beyond understanding the factors that influence GHG production at landfills, measuring the precise impacts is difficult and controversial for two key reasons. First, the global warming potential of methane gas differs depending on the time horizon used. IPCC protocol dictates the use of a 100-year time horizon for the global warming potential of GHGs; using this method, methane is 23 times

[29] Radiative forcing is a measure of how the energy balance of the Earth-atmosphere system is influenced when factors that affect climate are altered.

more potent than CO2. However, unlike other common GHGs (CO_2 and N_2O), methane has an accelerated decay rate, so when viewed within a 20-year time horizon, it is 72 times more potent than CO_2. Using this method, the contribution of landfill gas to the national GHG emissions inventory increases from 1.8 percent (based on 100-year time horizon) to 5.2 percent.[30]

Second, there is significant variation in reported landfill gas capture efficiencies. Most models use EPA's default estimated national average of 75 percent collection efficiency. The actual amount depends on the landfill size and age, gas collection efficiency, "tightness" of the landfill liner and cover systems, organic/inorganic waste proportions, electrical efficiency, and other factors. According to a 2007 study by SCS engineers, landfill gas collection efficiency can range from 55 to 99 percent, depending upon the landfill's design and operation.[31] Other studies have predicted lower capture efficiencies, in some cases well below 50 percent. As mentioned above, efficiency can be low early in the landfill's life, which is not always considered in these assessments. Higher collection efficiencies are most often predicted for modern state-of the-art landfills that have been designed and constructed from the ground up with liner systems and gas collection systems that were installed as early as possible in the landfill unit's operating life.

Most landfill operators estimate methane gas generation using EPA's LandGEM model and derive collection efficiency based on the actual volume of gas collected as a percentage of what the model predicts is being generated.[32] However, the generation of methane will vary based on several site-specific factors, such as rainfall, waste composition, temperature, and specific facility design. Given the size and physical variations of the many landfills in New York State, differences in actual performance as compared to the default parameters used in LandGEM can result in significantly differing estimates of GHGs. Several industry initiatives are underway to better measure actual methane generation and fugitive landfill gas emissions to verify capture efficiency. Technology for both quantifying and capturing GHG from landfills continues to evolve.

The level of GHG emissions from the 1,600 inactive landfills in New York State is also largely unknown and has not been evaluated through any modeling or extensive investigation. However, DEC staff have found high methane concentrations in tests of sub-surface gas in New York State landfills where waste had been in place for decades. Evaluating and addressing the GHG emissions from these older landfills may be an important strategy to combat the climate change impacts of the state's waste legacy.

Despite the difficulties in measuring methane and the lack of information about its continued production at abandoned landfills, it is clear that mitigating and avoiding the impacts of methane generation at landfills can play a strategic role in the stabilization and reduction of atmospheric GHG concentrations and must be a priority for New York State.

---

[30] *Stop Trashing the Climate*, Institute for Local Self-Reliance, 2008, www.stoptrashingtheclimate.org/fullreport_stoptreashingtheclimate.pdf.

[31] Current MSW Industry Position and State of the Practice on LFG Collection Efficiency, Methane Oxidation, and Carbon Sequestration in Landfills, June 2008, www.scsengineers.com/Papers/FINAL_SWICS_GHG_White_Paper_09-11-08.pdf.

[32] *Landfill Gas Emissions Model (LandGEM) Version 3.02 User's Guide*, EPA-600/R-05/047, May 2005, www.epa.gov/ttncatc1/dir1/landgem-v302-guide.pdf.

4.2 GREENHOUSE GAS IMPACTS OF CURRENT MUNICIPAL SOLID WASTE MANAGEMENT IN NEW YORK STATE

Using the best available data, including facility reports on tonnage, and the EPA WARM model to estimate GHG emissions, estimated GHG reductions from the state's existing MSW management system are represented in Table 4.2, as are projections of the impacts of implementing this Plan to reduce reliance on disposal. These estimates are based on MSW materials only, which collectively represent approximately one-half of the total material stream in New York State. It does not include construction and demolition debris, biosolids, or industrial wastes. While these reductions may not occur within the state's borders, they would not occur if not for the actions of the state. (For an explanation of each of these categories, see Section 7; for a full discussion of the reporting and data on which the current estimates are based, see section 8.3.1; for an explanation of the NERC EBC calculator and the data used to derive these estimates, see Appendix A.).

TABLE 4.2 ANNUAL GHG REDUCTIONS AND ENERGY SAVINGS OF VARIOUS SCENARIOS

	Pounds/Person Per day Disposed	GHG Reduction (Million $MTCO_2E$)	Energy Savings (Trillion BTUs)
2010	**Current 4.1**	12.8	99
2012	3.8	14.3	116
2014	3.4	17.1	151
2016	2.9	20.5	197
2018	2.3	24.7	249
2020	1.7	29.1	311
2025	1.1	31.8	351
2030	0.6	34.6	386

4.3 FINDINGS

- Waste contributes to climate change in a number of ways, including: direct emissions of GHGs from solid waste management facilities, most notably methane emissions from landfills and, more significantly, life-cycle impacts of the products and packaging that become waste, including their production, distribution and use.
- Mitigating and avoiding the impacts of methane generation at landfills can play a strategic role in the stabilization and reduction of atmospheric GHG concentrations and must be a priority for New York State.
- An analysis of the climate impacts of waste management supports the existing solid waste management hierarchy, which places a priority on waste prevention, reuse and recycling compared to disposal and states a preference for treatment through MWC with energy recovery compared to disposal in a landfill.
- Waste reduction, reuse, recycling and composting provide significant benefits in combating climate change by eliminating or diverting the materials that may generate methane in a landfill and by providing valuable materials for industrial feedstocks that will help manufacturers reduce demand for energy and reduce pollution in the production process.

- Diverting food scraps from landfills to composting or anaerobic digestion is the most reliable method of methane abatement from landfills. While landfill gas capture and destruction systems are an important and necessary tool for controlling emissions, even the best performing systems do not completely capture landfill gas. Thus, a preventative approach that focuses on minimizing the generation of methane via composting or more efficiently capturing methane for energy via anaerobic digestion, will provide a greater impact on GHG emissions.
- Advanced landfill gas collection systems are critical elements of good environmental management. These systems help to mitigate the contribution of landfills to climate change and also help to control odors, capture VOCs and prevent other hazardous chemical releases to the air. Most of the active landfill capacity in New York State has such systems in place.
- Capturing landfill gas to generate energy is an important strategy to help reduce reliance on fossil fuels for electricity generation.

4.4 RECOMMENDATIONS

The overall goals of moving *Beyond Waste* require materials management strategies that serve to combat climate change. As such, the recommendations summarized below are, in large part, discussed in more detail in other sections of the Plan and in Sections 10 and 11 (Agenda for Action and Implementation Schedule and Projections).

- Maximize Waste Reduction, Reuse and Recycling: Sections 8.1, 8.2, and 8.3 detail a host of legislative, regulatory and programmatic recommendations that collectively will maximize reduction, reuse and recycling.
- Implement Product and Packaging Stewardship Programs: As further discussed in Section 5, product and packaging stewardship are important policy tools to reduce materials use, increase recycling, and reduce disposal. Their implementation will help to reduce GHGs to combat climate change.
- Divert Organics from Landfills to Composting or Recycling: Section 8.4. includes detailed recommendations to maximize the recycling of organics and thereby avoid the generation of methane in landfills.
- Ensure that Landfills in New York State Pursue Every Possible Mechanism for Achieving GHG Reductions: DECs Part 208 and 360 regulations and the financial incentives provided by the carbon market have resulted in the installation of landfill gas collection and destruction systems at most active MSW landfills. DEC will continue to assess the emissions and operations of facilities and markets in New York State to ensure that landfills maximize gas collection and destruction.
- Maximize Conversion of Landfill Gas to Energy: DEC will continue to work with other state agencies and entities involved in the electrical grid system's governance and operation to minimize the costs to connect, while still ensuring sound engineering.

5. PRODUCT AND PACKAGING STEWARDSHIP: AN EMERGING MATERIALS MANAGEMENT STRATEGY

To accomplish the goals of this Plan, which are largely focused on reducing the amount of waste destined for disposal, the state needs to fundamentally change the way materials that become waste are managed. While more waste reduction is certainly possible under the current approach to waste management, which relies almost exclusively on local government planning and resources and a mix of public and private facilities, the system has a critical inherent limit—it can only manage those materials and products that end up in the waste stream. The current system lacks a feedback loop to inform those responsible for designing products and packaging of their end-of-life impacts and costs. To overcome these significant limitations and reach new levels of sustainability in light of critical energy and GHG imperatives, the state must work to change the waste stream at its source. Manufacturers, distributors, retailers and consumers of products and packages that now end up in the waste stream must become involved for such a fundamental shift to occur. Product stewardship is a tried and promising vehicle for this kind of change and this kind of broad involvement.

Product stewardship, also known as extended producer responsibility, extends the role and responsibility of the manufacturer (also known the producer or brand owner) of a product or package to cover the entire life cycle, including ultimate disposition of that product or package at the end of its useful life. In these programs, manufacturers, often in cooperation with their distribution networks and retailers, must take either physical or financial responsibility for the recycling or proper disposal of products or packages.

Product stewardship can be a powerful driver for the reduction of waste volume and toxicity. By placing responsibility for end-of-life management on the manufacturer, these programs ensure that end-of-life impacts of the product or package are considered during the earliest stages of design. As such, stewardship programs create incentives for manufacturers to redesign products and packaging to be less toxic, less bulky and lighter, as well as more recyclable. (For examples, see *Product Stewardship at Work* on page 62) Reducing material use and toxicity and increasing recycling results in significant environmental, economic, energy and GHG reduction benefits.

The collection cost of product stewardship programs must be free and convenient to the consumer at the time of collection to encourage participation. Collection and processing costs can be fully internalized by the manufacturer or passed along as part of the cost of the product. Instead of requiring local solid waste managers to fund collection and recovery programs for discarded products, in product stewardship programs, manufacturers cover the cost of recycling or disposal. Pilot projects have found that to maximize recovery, manufacturers must provide an incentive to drive collection of certain products. For example, mercury-containing thermostat stewardship programs have been most successful when a bounty is offered to the consumer who is otherwise prepared to discard a thermostat.

In stewardship systems, the costs of recycling or end-of-life management, including any necessary incentives, are internalized into the cost of the product and borne jointly by the manufacturer and the consumer, not by local taxpayers and ratepayers. This ensures that consumers get proper price signals—materials that are easier to recycle or dispose of at the end of life should be less expensive.

E-stewardship programs reduce the financial burden on local solid waste management programs. Today, local taxpayers or ratepayers are required to pay for whatever winds up on the curb, with little or no ability to influence the design of the products or packaging to reduce management costs or improve recycling options. The costs are borne locally for production decisions made remotely, usually without consideration of end-of-life management implications.

The European Union, many Asian countries and many Canadian provinces rely on product stewardship programs to manage significant and diverse waste streams, including packaging, electronics and vehicles. In the U.S., more than 30 states have at least one legislatively mandated product stewardship program in place, primarily targeting products considered to be toxic or hazardous, including electronic waste, mercury switches, mercury-containing thermostats, and rechargeable batteries.

Product stewardship is a centerpiece of the *Beyond Waste* Plan because it represents a paradigm shift that can help New York State overcome many of the critical hurdles that have hindered further success. In addition to influencing the design of products and packaging to reduce materials use and improve recyclability, it can garner resources to optimize collection and recycling systems and improve efficiency. Ultimately, product stewardship will reduce the amount of waste disposed of and help New York State move *Beyond Waste*.

Product stewardship represents the latest evolution of materials management policy from earlier statutes that regulate whole classes of materials (e.g., the Federal Resource Conservation and Recovery Act and the state Solid Waste Management Act), to laws that impose specific requirements on a product-by-product or product category basis. The first product-based law in New York State was the Returnable Container Law (also known as the Bottle Bill). A similar deposit-based system for lead-acid batteries followed suit, and subsequent product-specific programs, such as the waste tire abatement program, have assessed fees on product sales to address remedial issues. More recently, New York State enacted legislation requiring retailers to collect cell phones and plastic bags from their customers at no cost. These product-specific laws are considered predecessors of modern product stewardship programs because they establish requirements to collect and manage materials outside of the taxpayer and ratepayer-funded system. However, they do not represent true product stewardship because, in the case of the cell phone and plastic bag laws, the manufacturers or producers are not required to participate. In the case of the Bottle Bill, collection and recycling is incentivized through deposits placed on beverage containers by “deposit initiators” which may not be the manufacturer or bottler. Therefore, the primary responsibilities for proper management of the product often do not lie with the producer making design and marketing decisions.

Additionally, the Bottle Bill has not noticeably affected the redesign of beverage containers to be more recyclable, nor is there any requirement for reporting on the final disposition of the containers. (A recent amendment provides for the collection of unclaimed deposits by the state, though the recycling or disposal of unredeemed containers still will be managed by local planning units.)

THE NEW YORK PRODUCT STEWARDSHIP COUNCIL

Recognizing the potential of product stewardship to bring necessary change to the way materials are managed in New York State, in 2009, the New York State Association for Solid Waste Management (NYSASWM) created the New York Product Stewardship Council (www.nypsc.org). The council's mission is to promote product stewardship as the priority policy for solid waste management, thereby shifting our waste management system from one focused on government-funded and ratepayer-financed waste diversion to one that relies on product stewardship to reduce public costs and drive improvements in product and packaging design that promote environmental sustainability.

The New York Product Stewardship Council works to implement the principles of product stewardship in New York State and the nation by:

- Developing and recommending workable product stewardship policies and providing educational tools to individuals, organizations, institutions, local governments, the State Legislature and elected officials;
- Providing effective leadership and guidance on product stewardship initiatives;
- Coordinating and participating in product stewardship initiatives locally, regionally and nationally;
- Working with manufacturers and their trade associations to develop and implement workable product stewardship initiatives;
- Educating manufacturers, the public, elected officials and other decision-makers on the benefits of product stewardship;
- Providing a forum for the exchange of information regarding existing and proposed product stewardship programs; and
- Evaluating and, where necessary, recommending improvements to product stewardship programs once they are instituted.

5.1 ROLES AND RESPONSIBILITIES IN THE CONTEXT OF PRODUCT STEWARDSHIP

5.1.1 The Private Sector's Role

In product stewardship programs, the primary responsibility for managing products or packaging at the end of their useful life is placed on the entity with the most control over the item's design—the manufacturer, producer or brand owner. This means that the manufacturer must provide or arrange for collection, reuse, recycling and/or disposal of the product or packaging targeted. Product stewardship programs allow for flexibility so that manufacturers can, for example, design the collection system that works best within their business model or work collaboratively with other manufacturers, distributors or retailers.

While collection and recycling of the products targeted are the key elements of product stewardship, public education, reporting, consumer convenience, and standards for performance are also critical elements of these programs. Public education is needed to garner participation in any recycling or end-of-life management program. Manufacturer reporting requirements on key program elements ensure transparency in the product stewardship program and provide measures for success and accountability. Convenience standards (e.g., requiring that collection options are available in each county of the state) ensure that any consumer wanting to participate has a reasonable opportunity to do so. Performance standards (e.g., requiring manufacturers to collect a certain amount of the targeted product) create an incentive for manufacturers to develop effective programs and promote them widely to encourage participation. In addition, product stewardship programs should always consider how to manage products whose producer, manufacturer or brand owner is no longer in existence (also known as orphan products).

Retailers also often play an important role in product stewardship programs. Because they communicate directly with the consumer at the point of sale, engaging retailers is critical to promoting product stewardship programs and ensuring that citizens are aware of their recycling options. In some product stewardship programs, retailers also provide collection services, either on behalf of a manufacturer or as the result of statutory requirements to do so.

5.1.2 The Local Government Role

Many product stewardship programs allow for local government participation; however, local government collections are generally not required. Communities that have or seek to establish collection infrastructure for a targeted product may be able to participate as a partner in a manufacturer sponsored program. For example, in Washington State's E-Cycle electronic waste product stewardship program, manufacturers have entered into contracts with local government collection centers to meet their stewardship obligations. In the few stewardship programs that require local government collections, the costs of those collections are paid by manufacturers and consumers, not taxpayers.

5.1.3 The State Government Role

The state's primary role in product stewardship programs is to enact product stewardship legislation and then, through an appropriate state agency, promote participation in programs, provide oversight and ensure accountability. In most cases, manufacturers are required to register with the state and regularly report on their programs. The state must compile and analyze the information provided by manufacturers and enforce compliance with key program requirements, including registration, reporting and compliance with convenience and/or performance standards. Often, the state must also enforce other elements of product stewardship programs, including, for example, disposal bans for targeted products and operating standards for collection, handling and recycling facilities. In many product stewardship programs, the state is required to produce periodic reports on program implementation, thereby helping to keep the public informed and the participants accountable.

5.1.4 The Role of New York State's Citizens

No product recycling or end-of-life management program can succeed without the participation of the consumer. Just as most New Yorkers have become familiar with recycling programs and understand the wisdom of recycling, once they are introduced to the concept and logic of product stewardship, a convenient and well-promoted program is likely to drive participation.

PRODUCT STEWARDSHIP AT WORK

The implementation of Germany's stewardship program (the Duales System Deutschland, or Green Dot) resulted in a decrease in green dot packaging of 14 percent between 1991 and 1995; during that same period, U.S. packaging increased 13 percent. (Source: Summary of Germany's Packaging Take-Back Law; Clean Production Action, September 2003; http://www.cleanproduction.org/library/EPR_dvd/DualesSystemDeutsch_REVISEDoverview.pdf)

In Belgium and other European countries, amounts of packaging have remained fairly constant despite a substantial increase in the gross domestic product; thus, stewardship has helped to "decouple" economic growth from packaging growth. (Source: Implementation of the European Packaging Directive in Different European Member States, Joachim Quoden, Packaging Recovery Organization Europe; Presentation at the Fourth National Product Stewardship Forum, June 4, 2008.)

Electronics product stewardship programs in Europe and Asia have included directives to phase out many hazardous constituents in those products.

The product stewardship approach that is core to Xerox's business model—leasing copiers—resulted in the company implementing significant design changes to enable easy disassembly and the reuse and refurbishing of component parts; in 2004, 90 percent of Xerox-designed product models introduced were designed for reuse. (Source: DEC Environmental Excellence award information; http://www.dec.ny.gov/public/36178.html.)

Automobile product stewardship programs in Europe and Asia have led to the standardization of materials, allowing for greater levels of recovery and much less auto shredder residue requiring disposal. (Source: Effectiveness of EPR Programme in Design Change, International Institute for Industrial Environmental Economics, 2000.)

In 2009, the State of Washington's electronics product stewardship program will save Snohomish County $368,000 in annual electronic waste (e-waste) program operating costs and generate $180,000 in revenue per year for providing some of the e-waste collection infrastructure/services for manufacturers, for a net gain of $548,000 per year for that county. (Source: Proceedings from the Product Stewardship Policy Summit November, 2008; New York State Association for Solid Waste Management and NYSDEC)

5.2 EXISTING PRODUCT STEWARDSHIP PROGRAMS

New York State enacted its first true product stewardship programs in 2010.

5.2.1 Electronics

When DEC prepared the 1987 Plan, it did not anticipate the onslaught of electronic devices that would, during the next two decades, take the world into the digital age. The sale of electronics in the US (including televisions, cell phones, computers, printers and peripherals) has increased from 61 million units in 1987 to more than 426 million units in 2007. This growth in sales, coupled with rapid technology development that leads to more immediate obsolescence and technological incompatibility, has facilitated the dramatic growth of the electronics waste stream.

EPA estimates that the amount of electronic waste entering the waste stream almost doubled between 1999 and 2007, from 7.7 to 14.9 pounds per person per year.[33] While the amount of electronics collected for recycling has increased somewhat in the last few years, the diversion rate has remained small. EPA estimates that 10 percent of consumer electronics generated were ultimately recycled in 2000 as compared to 13.6 percent in 2007.[34]

The proliferation of electronic waste or "e-waste" has created a new challenge for waste managers. The presence of certain hazardous constituents in electronics makes their proper management essential to protecting the environment. For example, televisions and computer monitors with glass screens (CRTs) contain four to eight pounds of lead, while those with flat panel screens often contain mercury. Electronic components can contain a variety of hazardous chemicals and compounds, including brominated flame retardants (BFRs) and toxic metals.

The potentially significant environmental impacts of improper disposal, coupled with the difficulty in developing effective collection for recycling, have put electronics at the top of the list for product stewardship. Many European and Asian countries, several Canadian provinces, 23 U.S. states including New York have enacted legislation to create electronics product stewardship programs. New York State's Electronic Equipment Recycling and Reuse Act was signed into law by Governor Paterson on May 28, 2010. This law will ensure that every New Yorker has the opportunity to recycle their electronic waste in an environmentally responsible manner. The law requires manufacturers of covered electronic equipment to establish a convenient system for the collection, handling, and recycling or reuse of electronic waste, free of charge to most consumers, by April 1, 2011. The law enables manufacturers to meet their obligations through individual or collective electronic waste acceptance programs (Collectives). Other features of the law include a requirement for manufacturers, collectives, collection sites, consolidation facilities, and recycling facilities to register with DEC by January 1, 2011, as well as basic management standards for collection sites, consolidation facilities and recycling facilities of electronic waste.

---

[33] *Electronic Waste Management in the Unites States, Approach 1,* EPA 530-R-08-009, July 2008, www.epa.gov/osw/conserve/materials/ecycling/docs/app-1.pdf.

[34] *Municipal Solid Waste in the United States, 2007 Facts and Figures,* EPA 530-R-08-010, November 2008, www.epa.gov/osw/nonhaz/municipal/pubs/msw07-rpt.pdf.

Manufacturers of covered electronic equipment or collectives will be responsible for implementing and maintaining an acceptance program for discarded electronic waste, with oversight by DEC. Information on the law is available at: http://www.dec.ny.gov/chemical/65583.html.

The presence of recyclable and reusable materials in waste electronics, such as ferrous and non-ferrous metals, precious metals, plastics, and even glass, makes their recycling an important and appropriate management option. Electronics recycling is a growing industry segment, with approximately 45 dismantlers/recyclers operating in New York State in 2008.[35] To ensure that this industry grows in a manner that is consistent with the state's goals for protection of environmental and public health, DEC is currently developing regulations to set operating standards and requirements for these facilities.

5.2.2 *Rechargeable Batteries*

Most rechargeable batteries contain hazardous components. To date, rechargeable batteries have been included in some HHW collections and are subject to a national voluntary manufacturer's collection program. In 2010, legislation was proposed to establish a mandatory, manufacturer-sponsored collection program for rechargeable batteries.

5.3 PRODUCTS TARGETED FOR FUTURE STEWARDSHIP PROGRAMS

DEC will pursue product stewardship for several individual product categories. The initial high-priority targets are described in more detail in this section. The list of potential products targeted for stewardship was developed through internal research and feedback from stakeholders throughout the development of this Plan.

5.3.1 Pharmaceuticals

Recent scientific studies have revealed that numerous pharmaceuticals are present in rivers and streams as well as in the drinking supplies of a number of American cities. This condition has likely existed for some time, but only recently have testing methodologies been developed to detect pharmaceuticals in water bodies. While the concentrations of pharmaceuticals found in water are far below typical medical doses, studies have found problematic impacts on wildlife. The EPA has acknowledged the ecological impacts and the potential for human health concerns and confirmed that pharmaceutical discharges to waterways are a serious concern.

A 2009 study identified several pharmaceutical substances in the tissue of fish caught near wastewater treatment plants in five US cities, and a nationwide study conducted in 1999 and 2000 by the United States Geological Survey found low levels of drugs such as antibiotics, hormones, contraceptives and steroids in 80 percent of the rivers and streams tested throughout the US. Documented impacts include the feminization of male fish (producing eggs) when exposed to

[35] *Recycling Economic Information Study*, R.W. Beck, Inc. for the Northeast Recycling Council, June 20010, www.nerc.org/documents/recycling_economic_information_study_final_report_2000.pdf.

hormones and reduced fertility or irregular spawning in certain aquatic organisms exposed to other drugs such as anti-depressants and beta-blockers. Scientists also believe that long-term exposure to low levels of antibiotics might result in the evolution of, or selection for, drug-resistant microbes and bacteria.

One source of pharmaceuticals in the state's waterways is wastewater discharge from hospitals, institutions and individuals that for years have been instructed to dispose of their unwanted pharmaceuticals by flushing or pouring them down the drain. Proper disposal of unused and unwanted pharmaceuticals is a critical strategy for avoiding unnecessary discharges of pharmaceuticals into wastewater treatment systems and ultimately into waterways. Other sources include direct discharges from manufacturing facilities and excretion of unmetabolized medications through the human body. DEC is currently addressing these other sources through its inter-divisional pharmaceutical work group.

Several communities and pharmacies in New York State have voluntarily established take-back programs for unused and unwanted pharmaceuticals. Some communities have included pharmaceuticals in their HHW collection events, while pharmacies and certain other communities have established stand-alone pharmaceutical take-back events. While these events have been very successful and popular with New Yorkers, they are limited in their reach because they are available only to a small number of communities, and they are infrequent.

The public demand for collection events is growing, but there are significant and costly regulatory hurdles that make it unlikely that a broad-scale, effective program will be developed without legislation. Pharmaceutical collection events must follow specific protocols to ensure that pharmaceuticals collected, particularly controlled substances, are not misused or misdirected. Depending on the actual structure of the event, requirements can include the presence of a pharmacist and law enforcement personnel. In a major step forward, Congress enacted the Secure and Responsible Drug Disposal Act of 2010, which authorizes the U.S. Attorney General to revise regulations related to the return of controlled substances for proper management and destruction. The new law should result in a streamlined regulatory approach, including a number of approved methods of collection without law enforcement personnel present.

Other states have demonstrated the viability of several collection methods, including dropoffs in clinics and pharmacies (Washington), mail-back programs (Maine, Wisconsin), and dropoff at police stations (Kentucky). However, sustainable funding for these programs remains a challenge. In Washington and Maine, legislation was introduced in 2009 to formalize and expand their pilot collection programs through product stewardship, requiring pharmaceutical manufacturers to absorb the cost of collection and safe handling. Product stewardship programs exist in some European countries and Canadian provinces.

In British Columbia, for example, more than 90 percent of pharmacies collect unwanted pharmaceuticals from consumers. The safe management and destruction of those pharmaceuticals is financed by pharmaceutical producers.

In New York, the State Legislature has considered a number of bills relating to waste pharmaceuticals, including a bill developed by DEC in 2010, known as Departmental Bill #277, which would begin to move the state toward a product stewardship solution. The bill would prohibit

institutions from discharging pharmaceuticals into the state's waters (through flushing or pouring down drains) or disposing of them in landfills. It would also require manufacturers to establish a take-back program for pharmaceuticals generated by institutions.

DEC also has developed a webpage—www.dontflushyourdrugs.net—and other educational materials about proper management of pharmaceuticals. DEC currently recommends that consumers place unused, unwanted or expired drugs in the trash, taking care to destroy or disguise them to avoid misuse or misdirection (for full instructions, see the webpage). Pursuant to the Drug Management and Disposal Act passed in New York State in 2008, the educational materials developed include a notice that must be displayed in all pharmacies and retail stores that sell medications, including over-the-counter drugs, vitamins, and supplements. This information is intended to provide New Yorkers with an interim strategy to more appropriately manage their unused and unwanted pharmaceuticals while a more comprehensive and environmentally protective pharmaceuticals collection program is developed.

5.3.2 Household Hazardous Waste (HHW)

Most residents of New York State generate waste in their homes which contains some of the same chemical components as the hazardous waste generated by industry. Termed household hazardous waste (HHW), this material includes:

- Old "legacy" products that are no longer produced because of the hazards they pose, such as leaded paint, banned pesticides, and PCB ballasts
- Household pesticides
- Oil-based paints, varnishes and stains
- Organic-based solvents and cleaners
- Harsh cleaners, including masonry washes and toilet cleaners
- Pool chemicals
- Reactive chemicals, such as bleach, ammonia and peroxides
- Mercury-containing products, such as fluorescent light bulbs and electronic waste

Often, HHW is stored within the household for extended periods or is mixed with other solid waste intended for disposal. DEC estimates that, of the approximately 14.6 million tons of MSW disposed of annually in New York State, less than half of one percent, or approximately 58,000 tons, is HHW.

Commercially and industrially generated hazardous wastes are subject to stringent management and disposal standards that are designed to be protective of human health and the environment. However, all household waste, regardless of its hazardous characteristics, is excluded from the regulatory definition of hazardous waste and is currently exempt from state and federal hazardous waste regulations, though some of these wastes are banned from disposal under state law and Part 360 regulations.

The effects of improperly discarded HHW on the environment and human health are hard to quantify but could be significant. Sanitation workers can be injured if a discarded chemical container opens suddenly during collection. If incompatible HHWs are released in a waste collection truck during compaction, the resulting reaction can cause an explosion, fire or release of toxic vapors. When HHW is deposited in a landfill, liquids can seep down through the layers of waste and become leachate, which must be collected and treated so that it does not contaminate groundwater, soil, or surface water. Wastewater treatment plants that accept leachate are not designed to treat many of these hazardous constituents. Many hazardous products easily evaporate and contribute to air pollution or, if poured onto the ground or into a storm sewer, can contaminate groundwater or a nearby stream, river or lake.

To address the potential hazards posed by HHW, communities around the state and the country have organized programs to collect, package and transport HHW to hazardous waste treatment, storage, recycling or disposal facilities. HHW programs reduce environmental threats by providing a collection and management system, informing residents about how to properly manage HHW and, most important, how to avoid using hazardous products at home.

Collection of HHW is not mandatory in New York State and, consequently, is not available universally across the state. To encourage these programs, DEC provides reimbursement for 50 percent of the costs for eligible expenses for community HHW collections through the Household Hazardous Waste State Assistance Grant Program. (For details, see Section 6.) In 2008, approximately 1.5 percent of the state's population participated in a HHW collection event or program. The participation rate in those municipalities where collection programs were available was approximately three percent of the local population. This is consistent with national data that indicate that the most active programs serve no more than five percent or at the very most ten percent of the service-area population annually.[36] However, it is important to note that most people do not generate HHW on a regular basis and, therefore, do not need to participate every year. The popularity of these programs indicates a higher level of engagement than the numbers suggest.

Furthermore, teaching residents how to reduce or avoid generating HHW is an integral component of all HHW collection programs in New York State**.** HHW prevention techniques include: the substitution of less toxic products; purchasing only the amount of a product that is needed, and using all of the product for its intended purpose. Although education is an integral component of all collection programs, its benefits are difficult to calculate and often overlooked when assessing the value of HHW programs.

Data for 2008 indicate that during that year, approximately 13.7 percent of the HHW generated, or approximately 0.08 percent of the residential waste stream, was collected through HHW programs. From 2000-2008, HHW collection programs in New York State collected and properly managed a total of approximately 58,000 tons of HHW. It is important to note that these figures include materials that have been traditionally collected in HHW programs but may no longer be considered hazardous, such as latex paint.

[36] Handbook on Household Hazardous Waste; What is Household Hazardous Waste?; Dave Galfin and Phillip Dicker, 2008.

In New York State, HHW programs either involve scheduled collection days or established collection and storage facilities.

- **Collection Days:** Many communities collect HHW through a collection day or a series of collection days, when residents are encouraged to bring materials to a central location for proper management. Broome County was among the first communities in the country to organize HHW collection days in 1982. Since then, the number of HHW collection days conducted in New York State has grown substantially. In 2008, there were 146 collection days sponsored by 55 municipalities.
- **Collection and Storage Facilities:** An HHW collection and storage facility occupies a fixed site and is traditionally open on a regular schedule. [37] The first HHW facility in New York State began operating in 1988 in the Town of Southold. In 2008 there were 12 HHW facilities in the state, one of which is privately owned. While several of these facilities serve only as storage and aggregation points for materials picked up on collection days, the majority are open for routine collection of HHW. They operate, on average, in excess of 30 days per year, with half open more than 100 days per year. Generally, these facilities achieve greater participation at a lower per-ton cost than individual collection days. (See Table 5.1.)

TABLE 5.1: COST AND PERFORMANCE OF HHW COLLECTIONS IN NEW YORK STATE

	HHW Collection Days		HHW Collection & Storage Facilities	
	2008	2000-2008 (avg.)	2008	2000-2008 (avg.)
Average Cost/Ton	*$760*	*$593*	*$500*	*$533*
High Cost/Ton	$2,740	$3,638	$1,140	$2,438
Low Cost/Ton	$220	$184	$200	$133
Average Participation	*2.3%*	*1.9%*	*4.8%*	*5.3%*
High Participation	25.9%	16%	33.1%	26.2%
Low Participation	0.2%	0.3%	1.3%	0.9%

Source: Based on reports provided to DEC by municipalities. Average participation represents the percentage of the population in the area served that participated in the HHW program.

[37] HHW collection and storage facilities are regulated under 6 NYCRR, Subparts 360 and 373-4.

The low participation rates reported in Table 5.1 are generally attributed to the limited availability of collection events or locations. As Table 5.1 demonstrates, however, participation at collection facilities is greater than at collection day events. This increase can be attributed to HHW collection facilities hosting multiple collection days year-round while HHW collection events are usually offered one or two days per year. These events are generally hosted in a central location in the municipality sponsoring the collection event. If a resident misses an event, the waste must be properly stored for up to six months or a year until the next event is offered. However, this is problematic for people who must dispose of items right away because of personal circumstances, such as moving. While not an ideal solution, the HHW collection programs offered throughout the state provide a necessary service to residents and opportunities for outreach, and help protect the environment of New York State.

The cost per ton for management and disposal of HHW through community programs has dropped significantly as the experience and the number of programs has grown. Nonetheless, in 2008, the average cost for HHW programs (reflecting both events and facilities), including disposal, education and outreach, was still $640 per ton. The cost for disposal of hazardous waste has always been considerably higher than the cost for disposing of MSW, and these costs reflect that fact. At this cost, if all HHW generated annually in New York State was collected through current collection programs, the total costs would be $37.1 million annually or $1.90 per person per year in New York State.

Several Canadian provinces, including British Columbia and Ontario, have implemented product stewardship programs to finance effective collection networks for some or all of the materials that make up the HHW stream.

While HHW programs are extremely popular and have long been seen as a cornerstone of an integrated materials management program, they are also expensive. The *Beyond Waste* Plan seeks to more efficiently and cost-effectively capture a greater portion of the HHW stream. For these reasons, the products that become HHW are key targets for product stewardship. The existing program structure and state financial assistance represent an interim strategy to address this important stream until a stewardship program is established.

5.3.3 Packaging and Printed Products

Packaging continues to constitute a significant portion of the overall MSW stream—more than 30 percent of waste generated nationwide. Printed products, such as books, magazines, phone books, newspapers and advertising circulars represent another 10 percent of the MSW stream. Some of these products are unnecessary and unwanted. For example, phone books are often delivered to users, sometimes multiple copies, without the user having requested them or given the opportunity to refuse delivery. While changes such as lightweight packaging and downsizing newspapers have taken hold in recent years, overall the changes have not yielded a reduction in the amount of

packaging and printed materials generated. In fact, the amount of containers and packaging generated in the U.S. annually has actually increased by 13 million tons since 1990.[38]

While much packaging and printed material is readily recyclable, each year new materials and packages enter the marketplace with little or no regard to their compatibility with community recycling programs. As a result, even with effective recycling programs in place in the last 20 years for many packaging materials and a national recycling rate of more than 30 percent, EPA estimates that the amount of packaging going to disposal was the same in 2006 as in 1990—47 million tons. Clearly, conventional approaches to recycling are not reducing the amount of packaging heading to disposal facilities in the state.

As the primary parties responsible for providing recycling programs, New York State's municipalities spend hundreds of millions of dollars each year to educate their residents and to collect and process recyclable materials. Even more local tax and rate-payer resources are spent to dispose of the non-recyclable packages and printed products.

Most communities in New York State offer recycling for basic packaging and printed materials. Common recyclables include metal and glass containers, plastic bottles (numbers 1 and 2), corrugated cardboard, newspapers and magazines. However, on a statewide basis, community programs typically capture less than 50 percent of the materials targeted and programs do not frequently add other packaging materials to the core list.

To increase recycling and reduce dependence on disposal, manufacturers must embrace materials' efficiency and design for recyclability concepts, and recycling programs must capture more of the material targeted and include additional materials. Packaging stewardship is a tool for achieving these ends. First, it provides an incentive for waste prevention. When manufacturers must pay for the amount of packaging they use, they have a financial incentive to use less. Programs with more substantial fees have experienced greater levels of waste prevention/materials-use reduction. Second, it either generates much needed revenue for community recycling programs or alleviates local governments' responsibility for providing those programs. Third, it improves recycling by allocating resources for critical education programs, infrastructure improvements and market development. In Ontario, Canada, the packaging stewardship program yielded a ten percent increase in the recycling rate in the first three years[39]. And fourth, it incorporates the cost of recycling or disposal into the cost of the product, sending an important signal to the consumer—packages that are easier to recycle should be less expensive.

[38] *Municipal Solid Waste in the United States, 2007 Facts & Figures*; EPA, EPA 530-R-08-010, November 2008, www.epa.gov/osw/nonhaz/municipal/pubs/msw07-rpt.pdf.

[39] Proceedings from the Product Stewardship Policy Summit, November 20, 2008; New York State Association for Solid Waste Management and NYSDEC.

To stem the rising tide of packaging and printed material waste and to finance local recycling programs, the European Union and many Canadian provinces have turned to stewardship programs. While the programs differ in many ways, most packaging stewardship systems have the following components:

- Fees: Manufacturers or brand owners pay into a fund based on the amount of packaging they use or the volume of printed materials they distribute and the cost to recycle those materials or otherwise manage them at the end of their useful life.
- Funding: Most packaging stewardship programs use proceeds to cover the costs of collection and recycling or disposal of the packages/materials covered. Many also allocate funds for market development, infrastructure improvements, education or other methods to improve materials recovery and efficiency in the system.
- Third-party Organization or Authority: Packaging stewardship programs tend to be run by independent or quasi-governmental organizations or authorities that assign fees, collect and redistribute funds, and identify and fund system improvements and market development projects.

5.3.4 Mercury-Containing Products

New York has recognized the threat of mercury in the environment and developed a robust program to reduce the use and discharge of this toxic heavy metal and powerful neurotoxin. (See http://www.dec.ny.gov/chemical/285.html.) In 2005, state legislation restricted the use and disposal of mercury-containing products. However, the legislation did not include product stewardship or recycling provisions. As a result, the state now has a "ban without a plan" for how to recover these problematic products. DEC recommends product stewardship for all mercury-containing products, including mercury-containing lamps, auto switches, medical devices, thermostats, and other products.

According to the Product Stewardship Institute, 14 states have product stewardship programs for mercury automobile switches, 9 have such programs for containing thermostats, and two states have product stewardship programs for fluorescent lamps. (http://www.productstewardship.us/displaycommon.cfm?an=1&subarticlenbr=280) Mercury-containing thermostats are a particularly important target because they represent a small waste stream that, unfortunately, includes a significant amount of mercury. Each thermostat contains an average of 4 grams of mercury, equaling the total amount of mercury in 800 to 2,900 compact fluorescent bulbs, depending on the mercury content of the bulb. Despite their significant potential for environmental harm and the existence of a voluntary program organized by the Thermostat Recycling Corporation, the recycling rate for mercury-containing thermostats is very low. While many product stewardship efforts target individual mercury containing products, there are few if any examples that designate all mercury-containing products for stewardship.

5.3.5 Product Stewardship Framework

In many Canadian provinces, multiple product stewardship programs are implemented through a single piece of legislation that establishes the structure of product stewardship in the province and creates a process and criteria for identifying products for stewardship. Known as product stewardship framework, this approach maximizes efficiency by structuring stewardship programs in a consistent manner and avoiding the inevitable, lengthy process and debate that would accompany the creation of a brand new program for another product.

Given the many years it often takes to build momentum to pass a law, it makes better sense to adopt a thoughtfully crafted and fully vetted framework for stewardship rather than pursue stewardship programs for individual products in a series of legislative efforts during the course of what would likely take decades.

For these reasons, California, Washington, Oregon and Minnesota all introduced product stewardship framework legislation in 2009; Rhode Island and Maine followed suit in 2010. Maine enacted the first product stewardship framework legislation in the U.S. in 2010. Framework legislation sets criteria for identifying products to target for stewardship, defines a legislative or regulatory process for adding products that meet the criteria, and defines the structure of stewardship programs in the state. The legislation is based on the Principles of Product Stewardship, which have been endorsed by product stewardship councils in New York State, California, the Pacific Northwest, the Midwest, Texas and Vermont (See Appendix F). In support of this approach, the Association for State and Territorial Solid Waste Management Officials (ASTSWMO) issued a product stewardship framework policy document that provides greater detail on the various options in pursuing a framework approach (See Appendix F). By mid-2010, seven New York counties had endorsed the product stewardship framework by passing local resolutions.

5.3.6 Other Targeted Products

In addition to the products and categories outlined above, DEC has identified the following potential products for stewardship programs:

- *Paint:* Paint is a large component of the materials captured at most HHW collection events and facilities, but most paint used today is latex, which is not, in fact, hazardous. Managing paint through the HHW stream is expensive and not effective in capturing substantial volumes for recycling. The Product Stewardship Institute has developed an agreement among many stakeholders to create an industry-funded paint stewardship organization. In 2008, the organization launched a pilot project in Minnesota in preparation for a larger-scale program. In 2009, Oregon passed legislation to establish the first statewide paint product stewardship program; California enacted similar legislation in 2010.
- *Automobiles:* Many countries in Europe and Asia have implemented stewardship programs for automobiles to achieve several aims: increase recycling rates; eliminate the use of certain chemicals and materials, and create incentives to design for disassembly, reuse and recycling. Industry sources report that these programs have led to the development of automobiles that are more easily recycled and less toxic and have yielded higher recovery rates and less

automobile shredder residue. Because of the clear waste management benefits, stakeholders in the development of this Plan have recommended that New York State target automobiles for a stewardship approach.

- *Carpets:* Carpets were an early target for government stewardship programs for two reasons. First, they are bulky and expensive to dispose. Second, some carpet manufacturers had already launched voluntary stewardship and take-back programs. In 2002, state and federal governments joined with industry to develop a Memorandum of Understanding (MOU) for Carpet Stewardship. The MOU established goals for reduction, reuse and recycling carpets for the ten-year period from 2002-2012. To date, 12 states, NERC, and EPA have signed the agreement, as have the major carpet and rug manufacturers and their trade association. In 2010, the parties, including New York State, initiated a process to update the MOU. Also in 2010, California became the first state to enact carpet product stewardship legislation.
- *Office Furniture:* Office furniture has a high reuse potential if designed properly but is bulky and, therefore, costly and difficult to manage through traditional waste management systems. Office furniture reuse and refurbishing operations exist in New York State on a limited scale. Stewardship could foster more of this valuable activity.
- *Roofing Shingles:* Asphalt roofing shingles are a valuable recyclable material, though New York State lacks a recovery infrastructure and market for recycled shingles. A stewardship approach could provide financing for the infrastructure needed to reclaim these materials.
- *Appliances:* Appliances are bulky and can include problematic materials, such as Freon. While many appliances contain valuable scrap metal and, therefore, are very likely to be recycled, not all are recycled responsibly with appropriate care to protect the environment from hazardous components. Some European and Asian countries, and the Canadian Province of British Columbia use a product stewardship approach to manage these products.
- *Tires:* Discarded tires pose unique management problems. When stockpiled, they create a significant fire hazard and a breeding ground for disease-carrying insects. Although tires contain valuable materials and can be altered to create new products –chips for many engineering applications and crumb rubber for use in a variety of manufactured products or in turf playing fields –recycling and reuse markets are not always strong or easy to access. For these reasons, many Canadian provinces have implemented product stewardship programs. To ensure the proper management of waste tires in New York State, the Legislature enacted the “Waste Tire Management and Recycling Act," effective September 12, 2003, which, among other things, banned the landfilling of waste tires and created a Waste Tire Management and Recycling Fund derived from a recycling fee of $2.50 on each new tire sold. The funding mechanism has been extended from its original sunset date for an additional three-year period and expires on December 31, 2013. If the Legislature does not extend these provisions further, it may be appropriate to consider the creation of a tire product stewardship program.

5.4 FINDINGS

Product stewardship creates an opportunity to fundamentally change how materials are managed in New York State by more equitably sharing costs and responsibilities among manufacturers, governments and consumers. As such, it is a priority for the state and a cornerstone of the Plan to move *Beyond Waste*.

5.5 RECOMMENDATIONS

The state will pursue product stewardship by implementing the following recommendations.

5.5.1 Programmatic Recommendations

- Establish product and packaging stewardship as a preferred approach to implement the solid waste management hierarchy;
- Explore regional or national approaches to product stewardship through NEWMOA, Association of Territorial and State Solid Waste Management Officials (ATSWMO), National Product Stewardship Institute and other multi-state organizations;
- Work with the New York Product Stewardship Council, NYSASWM, and other stakeholders in the state to develop consensus and support to move a product stewardship agenda; and
- Work with the New York State Pollution Prevention Institute[40] to provide education to manufacturers regarding the benefits of using lifecycle assessment as a tool in the design and implementation of product stewardship programs.

5.5.2 Regulatory Recommendations

- Enact regulations to implement the Electronic Equipment Recycling and Reuse Act and other product stewardship legislation as necessary.

5.5.3 Legislative Recommendations

- Seek legislative authority to implement stewardship programs and build toward a statewide framework legislation.

[40] The Pollution Prevention Institute is a collaborative of several universities and technology development centers, funded through the Environmental Protection Fund. For more information, see http://www.nysp2i.rit.edu/

6. FINANCIAL ASSISTANCE AND FUNDING SOURCES

Replacing town dumps with double-lined landfills and municipal waste combustors (MWCs) and implementing waste reduction, reuse and recycling programs has come at a substantial cost. The gains New York State has made in materials and waste management during the past 20 years have been fueled by significant investment from all stakeholders, including state and local government, as well as the private sector. Achieving the goals of this Plan will require additional investment and new funding sources. Such investment will reap significant benefits in terms of environmental protection, energy conservation, greenhouse gas reduction, job creation and economic opportunity.

This section describes the state's financial assistance programs that most directly support materials management programs and summarizes existing and potential funding sources. State funding awarded through ESD has been matched or exceeded by private investment, and state funding awarded through DEC has been matched by municipal investment. These funds have been supplemented by programs in other agencies, including EFC and NYSERDA, which have provided grants for discreet materials and waste management projects.

In addition to the state investments described below, New York State's local governments have allocated significant resources to building the current integrated waste management system in New York State. A 2009 survey conducted by NYSASWM found that 11 of the state's planning units (not including New York City) have made capital investments of more than $526 million in local infrastructure during the past 20 years. Even with conservative assumptions about investments made by the other 53 planning units, it is clear that local investment is on a par with, if not greater than, state investments to date. In addition to capital expenditures, local governments spend millions every year to maintain and operate these systems.

6.1 DEC FINANCIAL ASSISTANCE PROGRAMS

Since 1987, DEC's financial assistance to municipalities for solid waste related projects has totaled nearly $700 million. All of this has been through reimbursement grants for eligible expenses and require a match of local funding, in most cases 50 percent of the project cost up to a maximum allowable amount.

The landfill closure and landfill gas programs combined have provided the greatest financial assistance to municipalities ($319.8 million), followed by the aggregated waste reduction and recycling programs ($208.7 million). Table 6.1 provides a breakdown of DEC's financial assistance for solid waste-related projects since 1987 by general program area.

While each program was individually established to address a specific area of concern, collectively, they have addressed the major solid waste management strategies. Each funding area and grant program summarized below is described in detail in Appendix G.

TABLE 6.1

Project Type	#	Amount (millions)	Source*
Waste Reduction & Recycling	*769*	*$208.7*	
Recycling Equipment	381	$138.0	EQBA; SWMA; CW/CA; EPF
Organics Recycling	191	$31.5	EQBA; SWMA; CW/CA; EPF
Education	160	$30.8	SWMA; KSWS; EPF
Reduction	37	$8.4	SWMA; PORA; EPF
Solid Waste Management Planning	36	$7.5	SWMA
Household Hazardous Waste	461	$30.2	EPF
Municipal Waste Combustors	19	$122.3	EQBA
Other Solid Waste Disposal	3	$11.0	EQBA
Landfill Programs	*266*	*$319.8*	
Landfill Closure	254	$307.5	EQBA; CW/CA; EPF
Landfill Gas	12	$12.3M	EQBA; CW/CA;
Total	1554	$699.5	

Source: * EQBA - Environmental Quality Bond Act ; SWMA - Solid Waste Management Act ;

KSWS - Kansas Stripper Well Settlement ; PORA - Petroleum Overcharge Restitution Act ; CW/CA - Clean Water Clean Air Bond Act ; EPF - Environmental Protection Fund

6.1.1 Waste Reduction and Recycling

Since 1987, DEC's $209 million in funding for waste reduction and recycling programs has supported 769 projects. While this may sound like a substantial amount, given the overall cost of waste management, these grants do not begin to meet local pleas for assistance. The average annual appropriation to EPF recycling programs during the last three years has been $10.16 million or $0.53 per capita. By contrast, California allocates more than $36 million annually to recycling and related activities or $2.42 per capita, and Minnesota allocates more than $5 million or $2.78 per capita.

6.1.2 Solid Waste Management Planning

Recognizing the need for local planning to integrate waste reduction, reuse and recycling with waste disposal, the 1988 Solid Waste Management Act authorized DEC to administer a $7.5 million planning grant program. The grants were intended to foster and facilitate local planning for integrated solid waste management systems to implement the state's solid waste management hierarchy. (For more on planning, see section 3.) This $7.5 million represents only 1 percent of DEC funding to municipalities for solid waste management projects and activities since 1987, as summarized in Table 6.1.

6.1.3 Household Hazardous Waste

The 1987 Plan identified the need for and the benefits of separate collection and handling of HHW and recommended actions to help foster development of these programs. In 1982, Broome County sponsored the first HHW collection event in the state, and by 1988, there were 31 collection events sponsored by 13 municipalities. While HHW programs continued to grow in popularity, it became apparent that the major impediment to widespread HHW collection was the high cost of individual events or permanent collection facilities. To address this need, in 1993, the Environmental Protection Act authorized and began funding an HHW State Assistance Program, and, since then, the state's commitment to local HHW collection efforts has been consistently strong, providing $30.2 million in reimbursement to municipalities during the program's 15-year history. (For more information on HHW, see Section 5.)

6.1.4 Solid Waste Disposal

DEC's funding for new solid waste disposal capacity has been limited to the High Technology Resource Recovery Program (HTRRP), which was created in 1972 to assist local governments in the planning, design and construction of MWC projects. This funding was consistent with the 1987 Plan, in which MWC was envisioned as a significant part of the long-term strategy to address what was viewed as a looming disposal capacity crisis and to move the state toward self-sufficiency with respect to solid waste management. Although a statewide network of MWCs was not completely realized, the state provided more than $122 million toward the establishment of MWCs. (For more information on MWC, see Section 9.3.)

6.1.5 Municipal Landfill Closure

The 1987 Plan articulated a strong concern about groundwater contamination and operational deficiencies related to older, unlined landfills. In June 1986, there were 358 active landfills in New York State, only 47 of which had valid permits while the rest required upgrading or closure. Ninety-four of the non-permitted landfills were under consent orders resulting from enforcement action, 80 of which were required to close by a specific date. The Plan set a goal of upgrading or closing unpermitted facilities or those not meeting modern landfill requirements. Recognizing the significant cost this would impose on municipalities across the state, the legislature authorized DEC's Municipal Landfill Closure Program which, since its inception, has awarded a total of $307.5 million to 254 projects, including $75 million specifically allocated for the closure of the Fresh Kills Landfill in New York City. Thanks to the state's efforts, the 1987 Plan goal of upgrading or closing substandard landfills was substantially met.

6.1.6 Landfill Gas Management

The Municipal Landfill Gas Management State Assistance Program was established to improve air quality and reduce odors at solid waste landfills and to encourage energy recovery from landfill gas. Municipal owners or operators of non-hazardous-waste landfills who have incurred costs associated with the design and construction of an active landfill gas collection and treatment system are able to receive reimbursement of up to 50 percent of eligible costs, up to a maximum of $2 million dollars. Since the program was launched in 1996, $12.3 million in funding has been provided for 12 projects. As of early 2009, four applications for a total of $8 million remained on the waiting list with limited funding allocated in the past few fiscal years.

6.1.7 Limited Funding

The funding needs for waste reduction, recycling, HHW, landfill closure and landfill gas programs have consistently outpaced the appropriations available. Funding has not been sufficient to keep pace with annual need, creating an ever-growing backlog of projects on the waiting list. Additional funding is necessary to address both projects on the existing waiting lists and new project applications received on an annual basis.

6.1.8 Lack of Flexibility

While each of DEC's financial assistance programs has helped address an important and clearly identified need, the lack of flexibility in the programs' enabling legislation and their implementing regulations, particularly the first-in, first-out provisions, has resulted in an inability to target the state's resources to address new priorities or emerging issues. Because funding has been limited to only certain types of projects and equipment, DEC has not been able to provide more holistic support to help underwrite integrated programs.

Greater flexibility in funding sources and regulatory and legislative authorization would accomplish two critical aims:

- *Addressing immediate priorities:* With greater flexibility in distributing funds obligated to infrastructure and education (e.g., the EPF), DEC could more effectively advance critical priorities and achieve more targeted goals. DEC should have the ability to apply the principles used in grant programs of other agencies, such as NYSERDA, whose programs identify priorities, issue program opportunity notices, and evaluate responses based on the greatest likelihood of effectively addressing that priority. For example, potential priority areas for a DEC program could include commercial recycling improvement, food scrap recycling infrastructure, or waste prevention education, and awards would be granted for the most promising and well-grounded proposals.
- *Providing holistic support:* A DEC fund to provide core support for planning units to implement their LSWMPs would provide an incentive for planning units to engage in substantive planning and would allow DEC to provide comprehensive support for a plan that implements the solid waste management hierarchy and moves the planning unit toward the state's policy goals.

6.2 ESD FINANCIAL ASSISTANCE PROGRAMS

More than 20 years ago, the New York State Legislature recognized that the state could not achieve its solid waste management goals without the support of a vibrant recycling industry and the conversion of its manufacturing base to the use of recycled feedstock and environmentally sustainable practices. The legislature directed ESD to create a comprehensive program of financial and technical assistance for business to build a market-based recycling industry and develop new technologies to enhance sustainable manufacturing.

ESD assistance to the recycling and manufacturing sectors is a vital component of sustainable materials management and an essential complement to local and state materials and waste management strategies. ESD's Environmental Services Unit (ESU) fosters market-driven capacity for recycling and helps manufacturers achieve enhanced competitiveness through pollution prevention, recycling and sustainable management. As markets and technologies evolve, ESD's ESU continues to facilitate economic growth through enhanced environmental management.

The current ESU program represents the latest evolution of a 20-year history in recycling market investments, summarized in Appendix E. Despite its broad market development mandate, early funding was scant. From 1987 through 1993, ESD implemented two key programs to facilitate recycling market development:

- Feasibility Study grants of up to $100,000 (later raised to $200,000) were offered on a competitive basis to New York State firms to evaluate recycling technologies, processes, systems or products manufactured from recycled materials.
- Recycling Technology financing (direct loans or interest subsidies) was offered competitively for the construction of recycling facilities or the acquisition of related machinery and equipment.

Through 1993, ESU (known at the time as the Office of Recycling Market Development) awarded nearly $2 million in feasibility study grants, committed $1.4 million in loans and interest subsidies,

and directed an additional $36 million in loans, interest subsidies and loan guarantees from the Urban Development Corporation and the New York State Job Development Authority for recycling market development projects.

6.2.1 Environmental Investment Program

Funding to support the ESU mandate improved significantly with the passage of the New York State Environmental Protection Act in 1993, creating the EPF as a dedicated fund to support recycling and a broad range of other environmental initiatives. Beginning in 1994, ESD received annual allocations from the EPF. With a reliable source of funds to support the legislative mandate, ESD created the Recycling Investment Program. In 1998, with legislative expansion, the program became the Environmental Investment Program (EIP).

EIP assists three types of projects:

- Capital projects assist in the acquisition of machinery and equipment and improvements to building, property, and infrastructure directly associated with the environmental outcomes achieved by New York State businesses. Non-profit organizations or municipalities apply on behalf of New York State businesses.
- Research, development and demonstration projects answer questions between product/process prototypes and their commercialization or implementation and are available to New York State businesses or non-profit organizations.
- Technical assistance projects for non-profit organizations or municipalities help groups of New York State businesses to achieve measurable recycling, pollution prevention or sustainability outcomes.

EIP operates as an outcome-based funding program, and applications are reviewed competitively for multiple criteria including: how well they compare to EIP investment benchmarks for recycling, pollution prevention and sustainability outcomes; associated economic benefits; return on investment; ability of the applicant to successfully complete the project, and the amount of private investment leveraged by the EIP award. Applicants must achieve environmentally significant and measurable results to receive funds.

EIP establishes investment priorities annually, based on areas of greatest need and inefficiency in the marketplace and identifies specific strategies within each priority that receive highest consideration during competitive review. In state fiscal year 2008/09, EIP investment priorities included paper, plastic, glass, tires, C&D debris/building materials reuse, food-processing waste and industrial pollution prevention.

Investment strategies for each priority area assess specific needs for enhanced waste diversion, processing capacity, technology innovation and development of value-added end-use markets. ESD consults with DEC in the development of investment priorities to advance statewide strategic objectives for solid waste management. In FY 2008/09, ESD added a new investment priority for sustainable product and technology development, recognizing the need and opportunity for New York State firms to compete in the global market for sustainable products.

The EIP program has demonstrated during two decades that investing in environmentally sustainable business enterprise generates economic development results, as detailed in Appendix G. On average, EIP capital projects return $6 of economic benefit to the state economy for every $1 of public funds invested. As the global conversion to sustainable business practice accelerates, ESD is positioned to help New York State firms capitalize on this growing market opportunity.

ESD has also learned, through two decades of measuring EIP investment results, what projects are less likely to succeed. ESD continues to refine the EIP investment strategy and analysis methodology to ensure the best possible value for the use of public funds–value that is determined by measurable improvements to environmental quality and sustainable economic return.

6.2.2 Environmental Investment Program Results

From 1994 through 2008, EIP committed $59.74 million to 399 projects that leveraged $221.05 million in private sector support. Appendix E provides aggregated economic and environmental benefits achieved by all ESD environmental investments from 1987 through 2008, grouped by investment priority areas. In total, these projects have:

- Established new capacity to recycle 3.329 million tons/year of secondary materials
- Developed the capacity to recycle 421 million gallons/year of water for beneficial uses
- Helped to create or retain nearly 4,800 jobs
- Created a recurring economic benefit estimated at $279.63 million per year

6.2.3 Operating Constraints

In recent years, ESU's annual EPF appropriations have increased while staffing levels have dropped by nearly half. Most current staff have been with the program since its inception and represent more than 80 years of combined experience in recycling market development and pollution prevention. Their expertise is essential to the development of quality projects that return both economic and environmental results, as well as to the on-going facilitation of recycling market networks in New York State. ESU has outsourced some project and technology development through partners like the Regional Technology Development Centers and the New York State Pollution Prevention Institute.[41] But there is a limit to how much external partnerships can compensate for the reduction in in-house expertise. Staffing constraints limit ESU's capacity to address the full spectrum of recycling issues and the growing role of sustainable production, resulting in lost opportunities for economic growth.

The market forces that shape sustainable recycling and manufacturing have evolved since passage of the ESD-enabling statute in 1987 and its amendment in 1998. For example, the cost of energy and transportation exert greater market pressure now, making some earlier business choices non-competitive while supporting new opportunities—transporting heavy waste materials long distances

[41] The Pollution Prevention Institute is a collaborative of several universities and technology development centers, funded through the Environmental Protection Fund. For more information, see http://www.nysp2i.rit.edu/.

for recycling becomes less competitive, while the possibility of capturing energy value from them is increasingly attractive.

The EIP-enabling statute sought to direct investment to specific policy priorities—waste prevention, reuse and recycling—and, therefore, precludes investment in projects that don't fit those criteria, particularly energy recovery. This prevents ESD from funding technologies, such as anaerobic digestion, that provide the dual benefit of capturing energy from bio-gas and creating a digestate that can be composted and used as a valuable soil amendment. In essence, the statutory preclusion is an impediment to improving food scrap recycling in New York State.

This result of the statutory restriction is anomalous, in that, during the past two decades, ESD has invested in a broad range of organics recycling projects. Projects that recover organic materials from dairy and food processing facilities have been particularly successful when nutrients are recovered for beneficial uses as nutriceuticals or animal feed. ESD has also invested in various projects to build merchant capacity to divert commercially generated food scraps into compost, including research projects to test technologies and waste-mix formulations and capital projects to build collection and recycling capacity.

Because food scraps are wet, heavy and putrescible, they cannot be stored for extended periods of time, and long-distance transportation is expensive. The specialized equipment needed to collect, transport and compost the material creates a capital burden that may not be recovered from the value of composted soils and low tip fees required to compete with relatively low landfill fees in many parts of the state. Given the benefits of organics recovery as a solid waste management strategy, including the energy benefits of recovery of bio-gas through digestion, state assistance funding categories must be adjusted to support local investment in food scrap recycling.

6.3 FINANCING THE MOVE *BEYOND WASTE*

To advance the goals of this Plan, the state and its communities will need resources well beyond what is currently available. While New York State can implement certain elements of the Plan within existing constraints, additional staff and funding at the state and, more critically, the local level, are essential to significantly increasing reuse and recycling and reducing dependence on disposal.

While the Plan does not dictate the precise methods that communities and planning units in the state will use to move *Beyond Waste*, DEC estimates that a significant financial investment will be necessary to achieve its goals. These funds would be used to make investments in materials management program planning and implementation at the local and state level, as well as public and private sector capital investments to develop the infrastructure necessary to reuse, recycle and compost more materials in New York State. Substantial as they may seem, these costs will be more than offset by the economic and environmental benefits to New York State's communities and to the climate.

With municipal governments shouldering much of the burden of solid waste management, meeting new goals and making maximum use of new options for reducing the amount of waste disposed will necessitate significant state participation in the form of grants, training, planning assistance, and

demonstration projects. DEC intends for the bulk of any new revenues raised to flow to individual planning units and will seek greater flexibility in targeting funds to achieve the greatest overall gains for the reasons noted in Section 6.1.8.

The funding sources described below include existing revenue streams used by the state, as well as potential new sources. To develop the list of potential sources, DEC evaluated funding mechanisms used in other states and looked particularly closely at states with strong recycling programs and high diversion rates, including California, Minnesota, Oregon and Massachusetts.

6.3.1 Existing and Potential State Funding Sources

6.3.1 (a) Environmental Protection Fund

In 1993, New York State inaugurated the EPF to support environmental programs in special need of regular and sustained funding. EPF funding is proposed annually by the Governor, and appropriated by the Legislature as a part of the state budget, using as the primary funding source a dedicated portion of the proceeds of the Real Estate Transfer Tax. EPF appropriations have increased from $31.5 million in 1994/95 to $250 million in 2007/08.

Solid waste programs have been funded by the EPF since its inception. In the first program year (FY 94/95), solid waste programs were assigned the largest portion of the fund—$13 million or 42 percent of the $31 million total. However, as the amount of EPF funds grew, the percentage allocated for solid waste programs got smaller. For example, when the EPF reached its peak of $250 million in FY 07/08, only $21.5 million or 8.6 percent was allocated to solid waste programs despite a 63 percent increase to the funds allocated to the EPF.

Solid waste program funding has included three primary line items within the EPF: landfill closure (including landfill gas management); municipal recycling (including HHW collection), and secondary materials market development. Annual allocations for the landfill closure grants have ranged from $0 (FY 02 to 05) to $18 million (FY 96/97). Municipal recycling appropriations have ranged from $2 million (FY 94/95) to $10.8 million (FY 09/10). Allocations for the secondary materials markets line, managed by ESD, have ranged from $2 million (FY 94/95) to $8.75 million (FY 07/08). EPF grants generally require a match of 50 percent or more from the grantee—a municipality in the case of a DEC grant and a private company or not-for-profit in the case of an ESD grant.

6.3.1 (b) Product and Packaging Stewardship

Product and packaging stewardship programs require the producers or brand owners of a product or package to extend their responsibility to the end-of-life management of the products or materials they put into the marketplace. In these programs, producers take either physical or financial responsibility for recycling and safe disposition of their products or materials. As a result, these programs either relieve a government obligation, generate revenues for state and local governments or both. (For more information, see Section 5.)

In all cases, stewardship programs reduce the demand for local resources by shifting responsibility from local governments, taxpayers and ratepayers to producers and consumers. In addition,

stewardship programs often include a requirement that producers pay annual registration fees to the state to offset the program management and oversight costs.

In some cases, stewardship programs generate revenue for government entities, particularly those that provide collection services for producers. For example, the Washington State E-Cycles product stewardship program has yielded new revenue for local governments with e-waste collection sites. One county in Washington was able to achieve a net gain of more than $500,000 per year by avoiding $368,000 in operating costs and generating $180,000 in revenue by providing e-waste collection infrastructure.

In Ontario, Canada, the packaging and printed product stewardship program requires brand owners to pay 50 percent of the costs of residential recycling programs. Reimbursements to local municipalities are based on the amount of material recycled and the net cost to manage each material, as derived from a formula agreed upon by the brand owners and municipalities. The program generates approximately $48 million per year for municipal recycling programs, and, during the past four years, it has generated approximately $60 million in investments in efficiency and other system improvements.[42]

6.3.1 (c) New York State Bond Act

One tool for financing large-scale public investments is bonding. The authority to issue bonds must be approved by the State Legislature, then by the public through a general referendum, and then, once again, by the Legislature. In New York State, this tool has been used to fund environmental infrastructure investments three times, with enactment of the 1972 EQBA, the 1986 EQBA, and the 1996 CW/CA Bond Act. Each of these included significant allocations for materials and waste management.

The 1972 EQBA authorized a total of $1.15 billion in environmental spending, including $175 million for solid waste projects. The 1986 EQBA provided $1.2 billion for various projects, including $100 million for zero-interest loans to local governments to properly close municipal landfills. The 1996 CW/CA Bond Act authorized $1.75 billion in total, including $175 million in the solid waste category. Some stakeholders have suggested a new bond act that would help to finance the move *Beyond Waste*.

6.3.1 (d) Solid Waste Disposal Fees

More than 30 states assess some type of fee or tax on the disposal of solid waste, serving as both a disincentive to disposal and a source of revenue to meet various funding needs. Generally, those fees are either passed on to the consumer or absorbed by the entity charged with paying it. Fees vary by state from $.25 per ton, to $8.25 per ton. With the exception of Massachusetts, all of New York State's neighbor states assess a solid waste disposal fee. (See Table 6.2) Most states assess the

[42] *Packaging Stewardship in Action*; presentation by Gordon Day, Corporations Supporting Recycling; November 2008. Additional information available at www.stewardedgs.ca, www.stewardshipontario.ca, and www.ontarioelectronicstewardship.ca.

fee on waste only (not on recyclables) and use the revenues raised to fund solid waste-related programs such as landfill closure or recycling programs and grants.

The state fees and taxes of other states summarized below demonstrate that disposal fees can be structured in a variety of ways, depending on the policy goals and financial needs of the state and local governments targeted. For example, in New York State, a fee could be structured either to exempt facilities that already support an integrated solid waste management system, including waste prevention, reuse, recycling and composting programs, or to enable some portion of the fee to remain with the local government to fund such systems. In any instance, the fee should be directed to a special fund dedicated to support planning, infrastructure, education and outreach expenses to implement waste prevention, reuse, recycling, and composting more aggressively throughout the state.

Using current disposal figures, New York State could generate more than $100 million each year to fund recycling activities if a moderate $5 per ton tip fee was imposed. This would have a significant impact on recycling activities in the state, representing more than five times the funds currently available from the EPF.

TABLE 6.2 – SOLID WASTE DISPOSAL FEES IN NEIGHBORING STATES

State	*Per-Ton Fee*	*Comments*
Vermont	$6.00	On all waste, including export, to fund Solid Waste Implementation Fund (grants, state programs, education, etc.)
Connecticut	$1.50	Assessed on waste at MWC facilities; funds Solid Waste Account at CT DEP
New Jersey	$3.00	Funds Recycling Fund (60% to municipalities; 30% to counties; 5% to higher education institutions; 5% to state)
Pennsylvania	$7.25	Includes: $4 waste-disposal fee; $2 recycling fee; $1 host municipality benefit fee; $.25 stewardship fee
Ohio	$3.50	$1 for hazardous waste fund; $1 for solid waste fund; $1.50 for environmental protection fund; also authorizes local entities to levy additional fees for specific solid waste-related uses

Some states have structured their disposal fees to advance policy goals, either by providing greater support for areas with lower recycling rates, or by rewarding strong performers. For example, the fees assessed by the State of Iowa are greater for "planning areas" with lower recycling rates and lower for areas with higher rates, with some of the fee retained by the planning area for planning and implementation. Areas with less than a 25 percent diversion rate are assessed a fee of $4.75/ton, $1.45/ton of which is retained by the planning area; in areas with greater than 50 percent diversion, the fee is $3.25/ton, $1.30 of which is retained by the planning area.

New Jersey's Recycling Tax funds four distinct revenue streams, with all funding used to support solid waste and recycling related programs:

- Sixty percent of the proceeds of the Recycling Tax are dedicated to the Recycling Tonnage Grants Program. This program provides payments to municipalities based on the overall weight of materials recycled, thereby providing an incentive for communities to achieve greater levels of recycling and put strong data collection and reporting mechanisms in place.
- Thirty percent of the tax proceeds are distributed to counties in the state in three ways: the majority of county funds are distributed for implementation of solid waste management plans based on the counties' waste generation levels; a portion is set aside for recycling enhancement grants for counties to establish new programs (e.g., enforcement, education, etc.) , and a portion is set aside for public information and education.
- Five percent of the tax revenues are used to provide grants to universities and other institutions of higher education to conduct research on recycling.
- Five percent is used to fund a portion of the New Jersey Department of Environmental Protection's solid waste program.

West Virginia has the highest per-ton tip fee surcharge at $8.75. The funds are raised for the following specific purposes:

- $1.75/ton Solid Waste Assessment Fee to fund solid waste management programs
- $1.00/ton Solid Waste Assessment Interim Fee for a solid waste management fund, half of which is distributed to county or regional solid waste authorities, and half is used for grants and administration
- $2.00/ton Recycling Assessment Fee, half of which is dedicated to grants for municipalities to plan and implement recycling programs, while the remainder is distributed to other agency funds
- $3.50/ton Closure Cost Assessment Fee for the landfill closure assistance program
- $.50/ton County Solid Waste Assessment Fee for administration, cleanup, litter control, or other county solid waste programs

Minnesota originally financed its solid waste management program through a disposal fee assessed at the solid waste facility but later transitioned to a Solid Waste Management Tax paid by waste generators (i.e., residents, businesses, and institutions). Non-residential (i.e., commercial and institutional) MSW generators pay a 17 percent tax on their waste disposal bills (including fees for

collection and disposal of waste), while residential generators pay 9.75 percent. Generators of other waste streams, including C&D debris, industrial and infectious waste, pay $.06 per cubic yard collected. Fees for materials collected for recycling, composting, and use as alternative daily cover at landfills are exempt from the tax, as are disaster debris and industrial wastes disposed of in a landfill owned by the generator. Half of the revenue from the tax is dedicated to landfill clean up and state agency activities, and the remainder goes to the general fund.

6.3.1(e) Plastic Bag Fees

Many communities, countries and companies are considering assessing fees on the use of plastic carryout bags to raise revenue and to curb the use of this problematic product. Such fees are in place in Washington, DC and Seattle, WA, Ireland, Belgium and other countries. Enacted fees range from $.05 to $.25 per bag. Several Canadian retailers have implemented such fees voluntarily and report a reduction in bag use of 50 percent or more.

6.3.1 (f) Permit and Compliance Fees

Many states raise revenues by assessing fees on solid waste management facility permits. According to a survey conducted by NEWMOA, New York is the only state in the region that does not collect fees from solid waste facility permit applicants. DEC does collect fees for many other types of permits, including those issued by the air and water divisions, and assesses hazardous waste regulatory fees.

In some states (Connecticut, Massachusetts, New Hampshire and Rhode Island), fees are paid to the general fund, while others (Maine, New Jersey and Vermont) use permit fees to fund their solid waste programs. The fees charged in other northeastern states differ dramatically, ranging from approximately $1,000 (for small transfer station permit modifications in MA) to $100,000 or more (for landfills in NJ and RI). Most states use a formula or a set of criteria for determining the fee schedule for different types of facility permits, usually related to the facility acceptance rate or whether the facility is in public or private ownership.

In addition, with the exception of New Hampshire, all of the other northeast states charge permit renewal or annual compliance fees which, like permit fees, vary widely from state to state. It is important to note that, although New York State does not have a compliance fee *per se*, some solid waste disposal facilities are required to fund a DEC-employed monitor to provide independent oversight of their operations. The fees paid by facility operators to cover the cost of monitors are intended to ensure compliance.

6.3.1 (g) Unclaimed Bottle Deposits

In 2009, thanks to the leadership of Governor Paterson, the New York State budget included an expansion of the state's bottle deposit/return program (Bottle Bill) to capture water bottles and redirect to the state's general fund 80 percent of all unclaimed deposits on beverage containers. The revenues from unclaimed deposits, estimated at $115 million per year, are to be used to offset substantial anticipated revenue shortfalls in the state's General Fund.

Several states use, or have used, unclaimed deposits to fund recycling programs or agency activities. The logic is simple—if the deposit on a container is not redeemed, that container will end up as solid waste to be managed by a government program. For example, in California, unclaimed deposits have funded grant programs and administrative activities, as well as municipal recycling programs. California communities received the unclaimed deposits for those containers that are managed in their solid waste programs, as determined by reports and periodic audits, instead of being returned for deposit.[43] For many years, Massachusetts funded its state agency solid waste program and a municipal recycling grant program through the use of unclaimed deposits.

6.3.2 Existing and Potential Local Funding Sources

6.3.2 (a) Property Tax

Most municipalities in New York State fund their solid waste and recycling programs using general revenues derived from property taxes. This system provides no incentive to the resident/taxpayer to reduce or recycle waste because the actual cost of waste disposal is hidden. Moreover, this approach, while simple and straightforward, leads to difficult budget decisions where investments in waste reduction and recycling compete with other critical public services, such as police, fire protection, libraries and schools. Those who waste less essentially subsidize their neighbors who waste more.

6.3.2 (b) Pay as You Throw/Save Money and Reduce Trash (PAYT/SMART)

More than 400 communities in the state employ some form of volume-based pricing. These programs charge residents for waste collection and recycling services based on the volume of waste generated. When properly structured, the full system costs (including recycling, composting and waste prevention programs) are included in waste disposal fees, while recycling and composting collections are provided for free. This gives residents an incentive to reduce their waste and recycle more. These properly structured volume-based pricing programs are known as PAYT/SMART. EPA has documented the benefits of PAYT/SMART programs.
(See http://www.epa.gov/osw/conserve/tools/payt/.)

6.3.2 (c) Integrated Systems Fees

Some municipalities in New York State own solid waste management facilities (transfer stations, landfills or MWCs) and finance their integrated solid waste management programs with revenues from the tip fees charged at those facilities. Like PAYT/SMART, these programs generally place fees on disposal, though not at the household level, but provide recycling programs for free. In some cases, integrated systems are further supported by flow control ordinances that allow municipalities to direct the waste generated within its borders to particular waste management facilities. This structure enables a municipality to set fees based on total system costs without regard to

[43] http://www.conservation.ca.gov/dor/lgacp/curbside/Pages/csp.aspx

competition from private waste facilities whose prices can be lower because they either do not provide or separately charge for other services, such as recycling and composting, and because they enjoy efficiencies related to economies of scale. (For more on flow control, see Appendix D.)

6.3.2 (d) Private Subscription Service

In many communities in New York State, the municipality has little involvement in recycling and waste collection, processing and disposal. In these areas, residents subscribe to collection services provided by the private sector. Communities can regulate services provided by private carting companies by local law to ensure, for example, that recycling services are provided or otherwise set performance parameters. However, many New York State communities do not exercise that oversight.

While private subscription services are fee-based, they tend not to achieve the waste reduction gains of PAYT/SMART programs because the fees are assessed based on actual service cost, not on system costs. For example, many private carting companies charge for recycling or yard trimmings collection services. They also tend to assign a waste management fee amount for collection, with only minor incremental increases, if any at all, for greater volume—a 64-gallon container will cost only a small amount more than a 30-gallon container. In contrast, PAYT/SMART programs purposely discourage higher volume disposal by charging more than twice as much for a 64-gallon container as a 30-gallon container. Most private subscription services are simply not structured to incentivize waste reduction and recycling.

6.3.2 (e) Sales Tax

One New York State county uses a portion of its sales tax to finance its innovative solid waste management program. In Delaware County, one cent out of every eight cents collected in sales tax is dedicated to the county's solid waste management complex, which includes a material recovery facility, a mixed waste (MSW, food processing waste, and biosolids) composting facility, a C&D debris recovery facility and a landfill. Sales tax revenues have made possible the substantial investment in mixed-waste composting that produces a marketable product and reduces the residual waste stream, thus facilitating an increase in recycling in the county and a significant extension to the site life of the county landfill.

6.3.2 (f) Generator Fees and Other Direct Municipal Charges

Some municipalities in New York State charge residents a separate, dedicated fee for solid waste-related services. For example, Otsego and Tompkins counties directly bill residents and businesses a "generator fee" to finance recycling, composting, and solid waste programs. Other municipalities charge residents for municipally operated or contracted waste collection services either directly, as a bill, or as a line item on local taxes. These programs can have the same drawbacks as private subscription services unless they are structured as PAYT/SMART systems or otherwise provide incentives for waste reduction, recycling and composting. The main benefits of municipally operated

or contracted collection, as compared to private subscription service, are reduced truck traffic and cost savings that result from collection efficiencies and economies of scale.

6.3.3 Existing and Potential Financial Incentives

6.3.3 (a) Carbon Credits

Carbon offset credits are an emerging revenue stream, designed to monetize the environmental value of reducing GHG emissions through enhanced environmental management techniques. There are several voluntary carbon offset trading programs, including the Voluntary Carbon Standard (VCS) and the California Climate Registry (CCR). In addition, the Regional Greenhouse Gas Initiative (RGGI) operates a regulated market. Each RGGI state, including New York State, has issued regulations setting basic operating parameters, such as what actions yield tradable credits. The others are venues for private transactions between generators and purchasers of offsets without government oversight or endorsement, and the vigorous verification associated with a regulated program.

To trade carbon credits, the offset measure must be verifiable using an approved protocol. Such protocols exist for the destruction of methane gas and, as a result, methane destruction credits are routinely traded on all of the markets listed above. To date, verification protocols have not been developed for recycling, but once protocols are in place, they can be used to capture carbon offset revenue for the recycler through the trading of credits. Ideally, that revenue could used to finance infrastructure and other investments in recycling and organics recovery.

Price variability and volatility limit the application of carbon offset credits as a reliable financing mechanism for the investments necessary to move *Beyond Waste*. Reliability is also diminished by the fact that, in time, national legislation regulating carbon emissions could either preempt or support credits for waste-related activities. Reliability aside, carbon credits can still provide a valuable incentive to improve solid waste management performance by monetizing the environmental benefits of actions like recycling and composting.

6.3.3 (b) Feed-In Tariffs

Some states and many European countries use Feed-In tariffs to incentivize renewable energy production, such as the capture of bio-gas for energy production in anaerobic digestion systems. In these systems, the government sets a rate that utilities must pay for renewable electricity sources. The rate is well beyond market rate to create a financial incentive for renewable energy production.

6.3.3 (c) Tax Incentives

According to the EPA, 25 states use tax incentives to foster recycling. Most of these states provide tax credits for investments in recycling equipment; some also exempt recycling equipment or recycled content products from state sales tax or provide a property tax reduction for recycling companies. [44]

Allowing for accelerated depreciation of the value of recycling equipment is another way of offering a tax incentive for recycling companies. Using a modified accelerated cost recovery system (MACRS) to depreciate capital expenses on a faster timeline allows companies to deduct the value of depreciation sooner, thus providing a direct financial incentive for recycling-related investments.

6.4 FINDINGS

- To achieve the state's goals and move *Beyond Waste*—reducing waste, increasing recycling and composting, and reducing disposal—will require:
    - More significant investment of state resources;
    - Greater flexibility in how those resources are disbursed to respond to emerging issues and critical needs; and
    - A mechanism to provide general support to planning units to implement integrated LSWMPs.
- Building market-driven recycling capacity, industrial pollution prevention and the development of new green products and process technologies requires:
    - Keen understanding of evolving market and regulatory conditions that shape new business obstacles and opportunities for sustainable production and economic growth
    - Assistance to New York State firms to help them compete in a sustainable global market place and to ensure that economic growth is coupled with enhanced environmental quality at home
- There are many options for funding the implementation of this Plan, enhancing local programs and moving *Beyond Waste*.
- Properly structured financing programs can provide incentives to reduce waste and increase recycling.

[44] http://www.epa.gov/waste/conserve/rrr/rmd/bizasst/rec-tax.htm

6.5 RECOMMENDATIONS

6.5.1 Programmatic Recommendations

- Continue to allocate state resources to ESD and DEC investment programs and ensure adequate staff capacity to process and disburse funds
- Support monetization of the GHG benefits of materials management strategies through carbon offset credit trading or other methods of carbon valuation

6.5.2 Regulatory Recommendations

- Target EPF Solid Waste Program funding: To complement the new program described below, EPF funds could be targeted through a request for proposals or similar process to address critical priorities identified annually, such as education, outreach, reuse, composting, etc. Possible priorities, identified in other sections of this Plan, include:
    - Increased enforcement of source separation requirements throughout all generating sectors, with special focus on improving recovery of materials from the commercial and institutional sectors;
    - Infrastructure development in focused areas such as enhanced organic materials recovery, glass recovery, plastics recovery, and the updating and upgrading of the current materials recovery facility processing network;
    - Increased development and stabilization of local secondary materials markets;
    - Volume-based pricing (PAYT/SMART) program evaluation and implementation across the state based on volume (PAYT/SMART); and
    - Conducting periodic state-sponsored waste composition and characterization analyses

6.5.3 Legislative Recommendations

- Develop a package of preferred funding mechanisms and develop legislation to advance the package
- Create a new grant program, with a new funding source, to provide consistent, annual funding to planning units to implement waste prevention, reuse, recycling and organics recovery programs. This program would: address the long-standing need for enhanced resources for planning unit program implementation; be easily implementable; deliver funding in a timely manner; provide an equitable distribution of funds to municipalities, and foster consistent implementation of sound LSWMPs.
- Establish Product and Packaging Stewardship Programs: Such programs either generate revenue directly or relieve government from the obligation to finance collection and end-of-life management of the products and packaging targeted, thus releasing resources for other priorities. (For more information, see Section 5.)
- Authorize ESD to support organic materials recycling technologies that provide the dual benefits of capturing energy and creating a valuable product

7. MATERIALS COMPOSITION AND CHARACTERIZATION

This section evaluates the composition of the materials in New York State's MSW stream and provides a description of the characteristics of the key streams it includes. It also describes the other waste streams managed in the state, including industrial waste, construction and demolition debris and biosolids. This section is intended to be background information to aid communities in evaluating appropriate materials management strategies and implementing the state's solid waste management hierarchy. The data summarized in this section is provided in more detail and in an expanded presentation in Appendix H. Because this section is analytical in nature, it does not include a discussion of findings or recommendations.

In 2008, facilities in New York State managed a total of more than 36 million tons of materials and waste, as depicted in Table 7.1.

TABLE 7.1 MATERIALS AND WASTE MANAGEMENT IN NYS, 2008

	MSW		Industrial		C&D		Biosolids		Total	
	Million Tons	%	Million Tons	%	Million Tons	%	Million Tons	%	Million Tons	%
Recycle/ Compost	3.7	20	1.4	39	7.2	55	0.9	47	13.1	36
Landfill	6.0	33	2.1	60	4.1	32	0.3	17	12.5	34
Combustion	2.5	14	<0.1	1	<0.1	0	0.4	24	3.0	8
Export for Disposal	6.1	33	<0.1	0	1.7	13	0.2	12	8.0	22
Total	*18.3*	*100*	*3.5*	*100*	*13.0*	*100*	*1.8*	*100*	*36.6*	*100*

7.1 MATERIALS COMPOSITION

7.1.1 Methodology

DEC has developed estimates of the composition of the materials present in the MSW stream using data inputs that include field-based waste composition studies performed within New York State, in other major US cities, and in other states that have similar demographic characteristics to some of New York's regions. In developing these estimates, DEC aimed to characterize the MSW that is discarded or recycled by the residential and commercial/institutional (CI) generators.

The MSW composition estimate does not include the separately managed construction and demolition debris (C&D) stream; C&D is addressed in Section 7.2.5. It does not include several organics streams (biosolids, septage, agricultural materials, etc.), industrial waste, or medical and biohazardous materials. It contains data on tires and scrap metal that are generated as part of the MSW stream but not the full range of those materials managed outside of the MSW management structures. More detail on each of these streams is provided in Section 7.2.

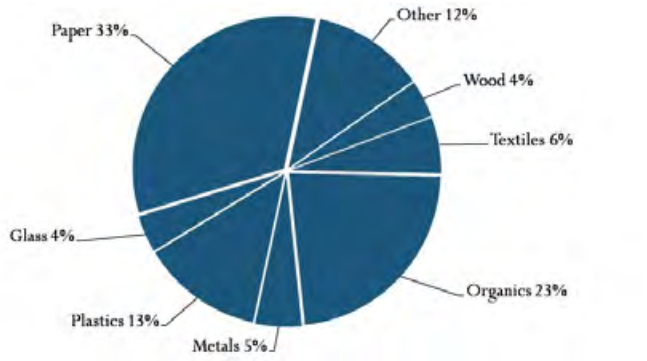
DEC's analysis looks at the variations in the materials stream based on urban, rural and suburban generators, as well as residential and commercial/institutional generators. Because no one study provides directly transferable data by these divisions, data from multiple sources were compiled and aggregated to create the DEC composition estimate. After a careful review of dozens of composition analyses, the data from the following sources were used:

- Municipalities within New York State: New York City and Onondaga County Resource Recovery Authority (OCRRA)
- Municipalities in other states: Seattle, WA and San Francisco, CA
- Other States: Vermont, Wisconsin, Missouri, Iowa, Georgia, Oregon, Ohio, Delaware, Pennsylvania, and California

7.1.2 MSW Generation Estimates

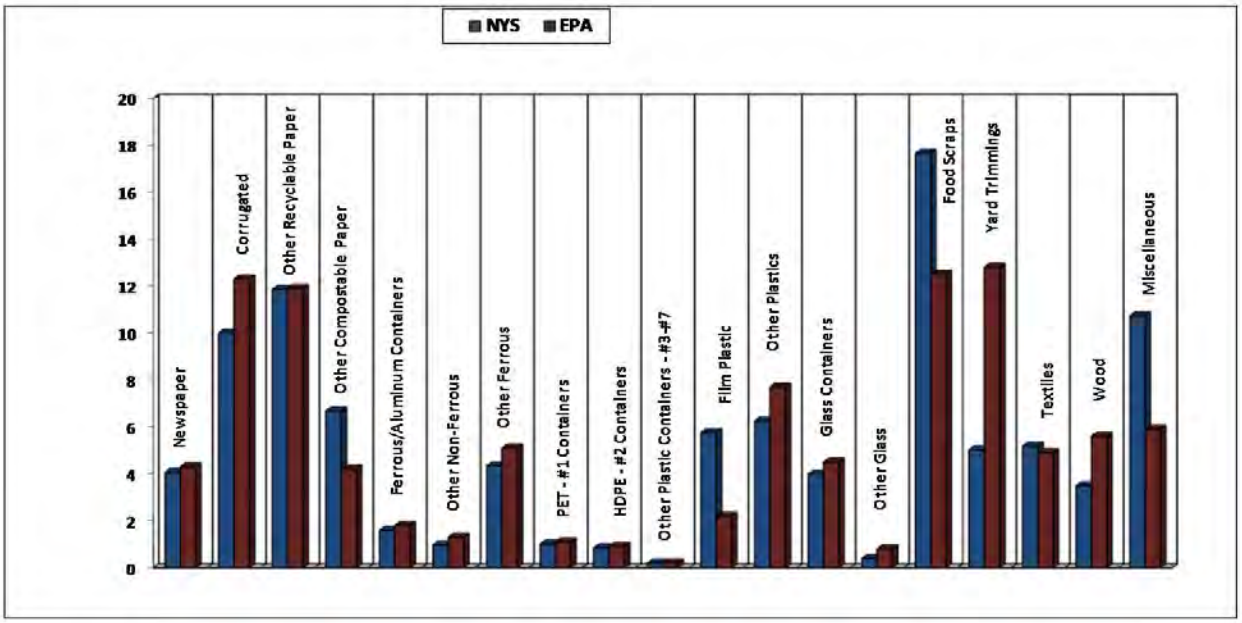
The estimated composition of materials generated by the residential and commercial/institutional sector is presented in Figure 7.1. A comparison of the results of DEC's analysis with the US EPA's *Characterization of MSW in the United States*, which is commonly used as a baseline by states and local governments, is presented in Figure 7.2. The notable differences—rates of generation of yard trimmings, food scraps, some containers and paper products—are likely related to differences in methodology or the demographic characteristics of New York State, such as the substantial urban population.

FIGURE 7.1 ESTIMATED MSW GENERATED IN NYS



As noted, DEC's estimates are based on field studies. The EPA study estimates for most materials are based on a materials flow approach which relies on production data (adjusted for imports and exports) and certain assumptions about patterns and length of use for various products. However, for food scraps and yard trimmings, EPA uses data reported from states as well as materials composition studies. The substantial differences between EPA and DEC estimates of food scrap generation are likely due to New York City's high rate of generation of this material as compared to other urban, suburban and rural areas. The yard trimmings differences are likely attributable to the low rate of generation of this material in NYC as well as the fact that in rural communities, generators mostly handle this material onsite.

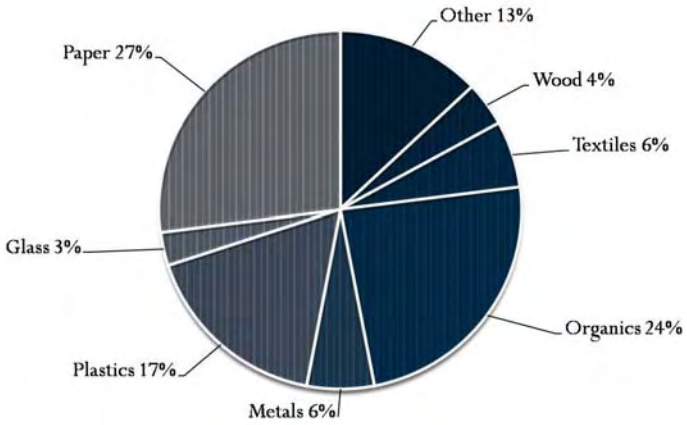
FIGURE 7.2: ESTIMATED MSW COMPOSITION IN NEW YORK STATE AS COMPARED TO EPA ESTIMATES (by percent of MSW)



7.1.3 Materials Discard Estimates

Figure 7.3 depicts DEC's estimate of the composition of the materials discarded in New York State. These estimates are particularly useful in developing programmatic, legislative, and regulatory priorities to minimize disposal and move *Beyond Waste*. Disposal data can inform program managers regarding how well their programs are capturing targeted materials and can help identify targets to maximize diversion.

FIGURE 7.3 ESTIMATED MSW DISPOSED OF IN NEW YORK STATE



For example, approximately 20 percent of the material disposed of in New York State is paper that is commonly recycled in many of the state's municipal programs. Clearly, those programs are not achieving their optimal capture rates. More than 30 percent of the materials currently discarded are organics (food scraps and yard trimmings) and compostable paper. So, strengthening the organics recycling infrastructure must be a priority to move *Beyond Waste*. For a more detailed composition of MSW disposed of in New York State, see Figure 7.6.

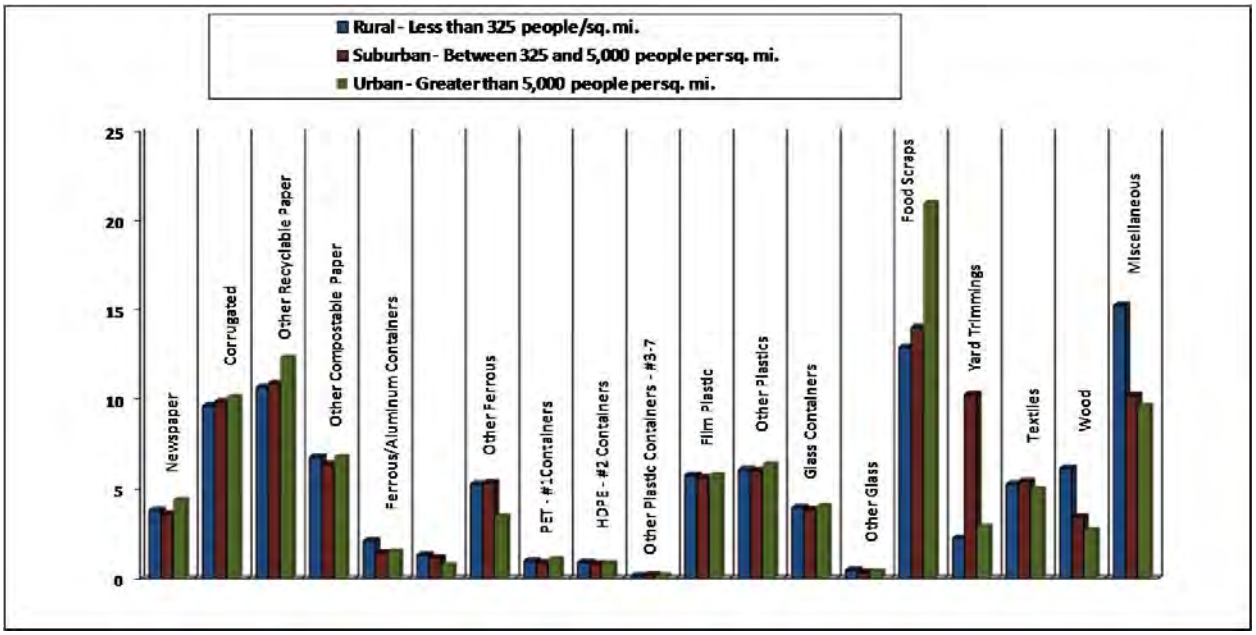
7.1.4 Materials Composition in Urban, Suburban and Rural Areas

The population density of a community can have an impact on the composition of its waste stream. As illustrated in Figure 7.4, DEC estimates that the materials generation differences in New York State's urban, suburban and rural areas can be significant, particularly with regard to food scraps, yard trimmings, wood and certain grades of paper. Urban areas account for 54 percent of the state's population, while suburban areas account for 30 percent and rural 16 percent.

For the purposes of this analysis, DEC defined rural areas as communities in the state with a population density of less than 325 people per square mile; suburban areas as communities with a population density between 325 and 5,000 people per square mile, and urban areas as communities with population density greater than 5,000 people per square mile. A higher population density for suburban and urban areas was used compared to most other states, primarily due to the greater population density of the suburban areas of Long Island and New York City. These distinctions are important to note when using this data for local planning purposes or comparison with other states and national data.

FIGURE 7.4 ESTIMATED MSW GENERATED IN RURAL, SUBURBAN, AND URBAN AREAS OF NYS

(by percent of MSW)



7.1.5 Materials Composition in the Residential vs. the Commercial/Institutional Sectors

DEC estimates that 54 percent of the MSW generated statewide is residential, and 46 percent is commercial/institutional. In designing waste prevention and recycling programs for specific sectors, it is important to understand the details of the materials generation patterns in those sectors. As Figures 7.5 and 7.6 indicate, there are some important differences between sectors that are useful to know in determining which materials to target for aggressive recycling programs. For example, the generation of food scraps and corrugated cardboard in the commercial/institutional sector is substantially higher than in the residential sector, as is the generation of other recyclable paper and glass. There are also important differences in the waste composition between different business sectors. Office buildings routinely generate a greater percentage of high-grade paper than other sectors, whereas big box retail and grocery stores tend to generate much higher percentages of corrugated cardboard and film plastic. Similarly, food scraps are generated in greater percentages in grocery stores and hotels than in most other sectors.

FIGURE 7.5 ESTIMATED MSW GENERATED IN THE RESIDENTIAL AND CI SECTORS IN NYS

(by percent of MSW)

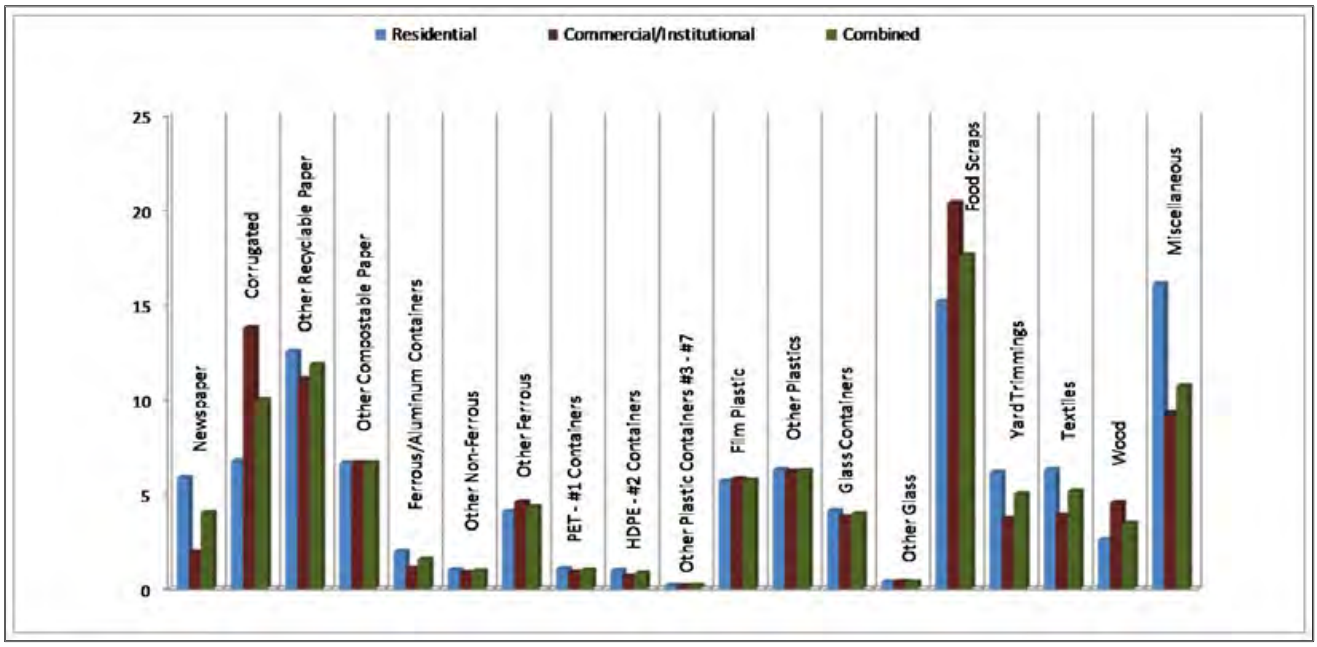
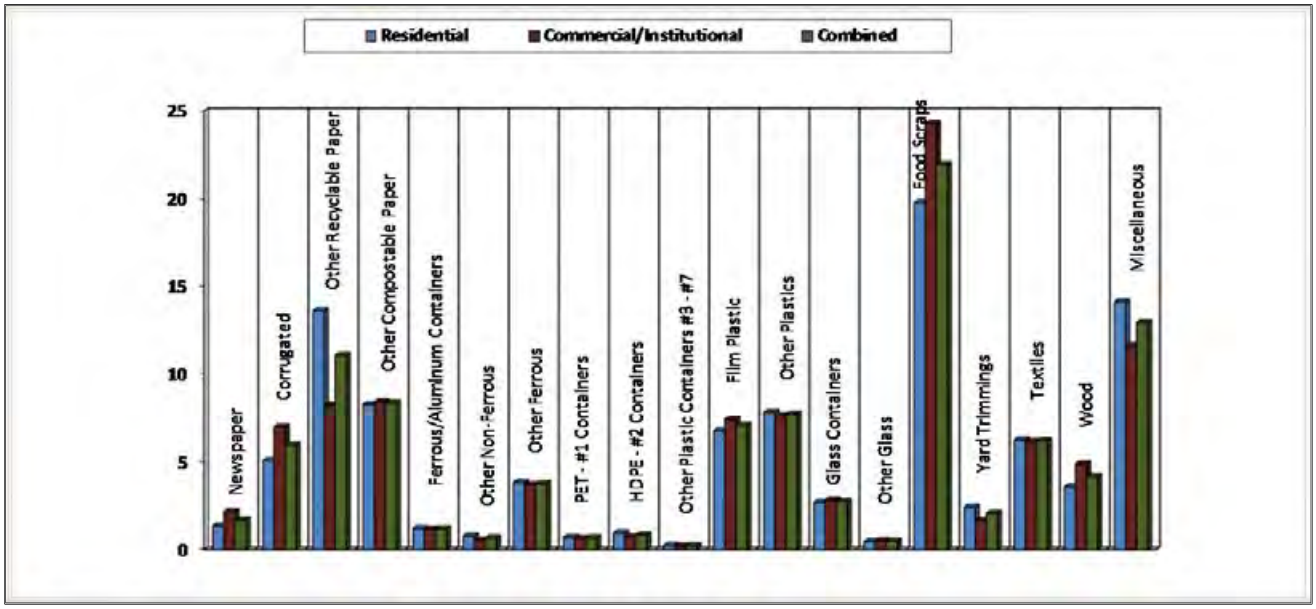


FIGURE 7.6 ESTIMATED MSW DISPOSED OF IN THE RESIDENTIAL AND CI SECTORS IN NYS

(by percent of MSW)



7.2 MSW MATERIALS CHARACTERIZATION

This section will further characterize the components of the MSW stream generated by residential, commercial and institutional sources to provide more specific information to aid in local and state planning and in programmatic efforts. The analysis includes materials streams that are addressed in the composition analysis above and those that are not included in the discussion in Section 7.1 but are considered MSW. All should be managed in accordance with the state's solid waste management hierarchy favoring waste prevention, reuse and recycling instead of disposal. All percentages and figures provided are based on weight.

7.2.1 Paper

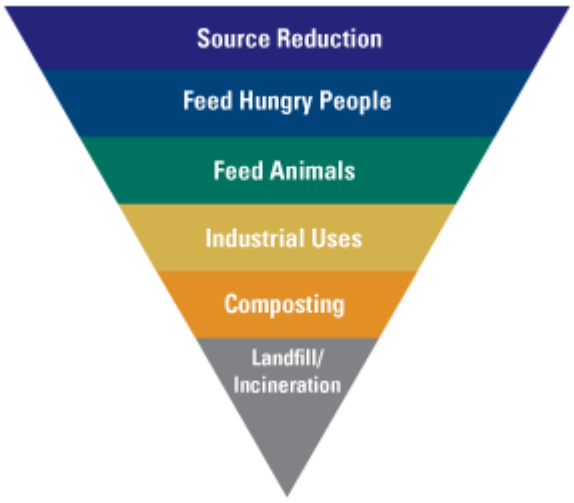
Paper comprises approximately 33 percent of the MSW generated in New York State and 28 percent of MSW sent for disposal. The paper stream is technically completely recyclable or compostable and, as generated, includes:

- Newspaper (4 percent)
- Corrugated cardboard (10 percent)
- Other recyclable paper, such as printing paper, office paper, magazines, books, telephone directories, junk mail and boxboard or paperboard (e.g., cereal boxes) (12 percent)
- Other compostable paper, such as paper towels, food-contaminated paper and cardboard, tissues, and napkins (7 percent)

According to the NERC's 2009 Recycling Economic Information Study (REI), 25 mills recycle paper in New York State.

7.2.2 Food Scraps

FIGURE 7.7 EPA'S FOOD RECOVERY HIERARCHY



Food scraps include uneaten food and food preparation materials from residences, commercial establishments (such as restaurants and supermarkets), and institutions (such as colleges, hospitals and prisons). About 96 billion pounds of food are wasted each year in the U.S., costing one billion dollars to manage.[45] In New York State, DEC estimates that food scraps represent nearly 18 percent of the MSW generated every year.

There are many ways to divert excess food and/or food-grade material from disposal. EPA has developed a food-recovery hierarchy, which is

[45] EPA website, "Basic Information about Food Scraps"

shown in Figure 7.7. Aggregating unused food to provide meals for the hungry is the highest priority use for excess food management, and there is a strong, established network of food banks and other charitable organizations in New York State that actively seek food for the needy. Food scraps as animal feed is another way to cost effectively manage food scraps while also reducing feed costs for farmers. Historically, rendering (considered an industrial use) has been a well-established and available industry for processing select organic wastes, primarily animal tissue and fats from the food processing industry, to make multiple products used in industry.

Composting converts food scraps into soil products and is the most common management option at this time. Anaerobic digestion has the potential to extract energy from food scraps and also to generate materials that can be further composted into fertilizers and soil amendments. Landfilling and municipal waste combustion are the least desirable options for food scraps. Due to their water content, food scraps do not combust efficiently. Food scraps in landfills generate methane that cannot be completely controlled and leads to GHG emissions, as described earlier.

7.2.3 Yard Trimmings

Yard trimmings (yard waste or yard debris) include leaves, grass clippings, and garden debris, and comprise, on average, approximately five percent of the MSW stream. Quantities of yard trimmings vary significantly depending on the type of community (urban, suburban or rural) and the character of the properties in the area (mature trees, etc.). DEC estimates that just under three percent of MSW generated in urban areas are yard trimmings compared to more than ten percent in suburban areas and approximately two percent in the state's rural areas.

Yard trimmings, especially leaves, are relatively easy to compost because they are often collected separately from other residential wastes, providing a clean stream of material that can be composted using relatively simple methods, windrow composting (i.e., using long rows of material) being the predominant method.

7.2.4 Plastic

Plastics make up more than 14 percent of the MSW generated and nearly 17 percent of the MSW disposed of in New York State. This stream includes plastic bottles, rigid containers and film plastics. While all plastics are technically recyclable, most community programs collect PET (#1) and HDPE (#2) bottles; together, these comprise less than two percent of the overall MSW stream. According to the NERC REI study, there are 20 plastics reclaimers in New York State. The largest plastic component in the waste stream, nearly six percent, is film plastic, made up of soft, pliable bags and wraps, such as grocery bags, shrink wrap and garbage bags. While film plastic is the largest plastic component, collection and processing this material can present significant logistical and marketing challenges as there is great variability in resin type, strength properties and application, along with the inherent contamination of many products based on their use (e.g., garbage bags). Film plastic is also problematic in most MRF operations, so it is not often collected at curbside. To help address film plastics, legislation was passed in 2008 requiring most retailers who use plastic bags to provide film plastic collection to the public. (For more on the plastic bag recycling law,

see http://www.dec.ny.gov/chemical/50034.html). In addition, DEC has contracted with Cornell University to help address agricultural film plastic through its Recycling Ag Plastic (RAP) program.

7.2.5 Wood

More than three percent of the MSW generated by residences, businesses and institutions is made up of wood. While this stream generally does not include materials handled by a contractor as C&D debris, it can include materials generated through small-scale or do-it-yourself projects and discarded items such as furniture and pallets. Most communities in New York State do not have programs in place to recycle residentially generated wood waste.

7.2.6 Textiles

Textiles in the MSW stream generally include used clothing, carpets, towels, sheets and draperies. These materials make up approximately five percent of the materials stream. Many textiles are readily recyclable through clothing dealers and exporters, wiping-rag graders and fiber recyclers, as well as the significant charitable contributions network. EPA estimates that nearly half of discarded textiles are donated to charities. Many communities and organizations have accessed markets for textiles that are not reused locally; New York City will embark on a significant program for these materials in accordance with recently amended city law.

7.2.7 Metals

Metals make up nearly seven percent of the waste stream in New York State and include consumer packaging such as steel and aluminum cans, aluminum foil, appliances, and other municipally generated scrap metal (e.g., bicycles, toys, pots and pans, etc.). All metals are technically recyclable, though many communities collect only metal containers in their source separation programs. Some communities provide drop-off locations for larger scrap metals and appliances or provide special collection days/procedures.

7.2.8 Glass

Glass makes up a four percent of the materials generated in New York State. It includes glass packaging and other items, such as window glass, ceramics, etc. Most communities in New York State collect glass containers, though few provide collection of other types of glass.

7.2.9 Other

This category includes elements of the waste stream that collectively comprise nearly 11 percent of the state's generation. It includes residentially generated C&D materials, other durables, diapers, electronics, HHW, and tires, among other items. The other durables category often contains products and materials which are composites of a number of individual, dissimilar materials in a

single product (e.g., various metals and plastics). Recovery of otherwise readily recyclable individual components from these products can present significant logistical and marketing challenges, particularly because the individual components can be very costly to separate. Electronics and HHW are fully discussed in Product Stewardship, Section 5.

7.3 NON-MSW MATERIALS CHARACTERIZATION

7.3.1 Organic Materials

While composting and organics recycling is generally comparable to recycling of other materials in terms of priority on the state solid waste management hierarchy, DEC supports the EPA hierarchy specifically for organics (see graphic), which mirrors the broader solid waste management hierarchy and combines principals of waste reduction and reuse as well as recycling. Additional information on organic materials management is provided in Appendix I.

7.3.1 (a) Biosolids

Biosolids, also referred to as sewage sludge, are the solid or semi-solid organic materials generated as a result of the treatment of wastewater. Biosolids' characteristics vary depending on the sources of wastewater to the treatment plant and the treatment methods used at the plant. Biosolids may contain contaminants (heavy metals, pathogens, etc.) that would be detrimental to the environment if not properly controlled. DEC has regulations in place (see Part 360-4 and 360-5 at http://www.dec.ny.gov/regs/2491.html) that require routine testing of biosolids to be recycled or beneficially used and set standards for pollutants of concern.

In New York State, 584 publicly owned treatment works (POTWs) generate biosolids. The combined design capacity of the POTWs is about 3.7 billion gallons of wastewater per day, with an actual flow to these facilities of about 2.55 billion gallons per day (representing 70 percent of available treatment capacity). More than half of the POTWs have design capacities of less than one million gallons per day. In total, POTWs in New York State generate 353,000 dry tons, which is equivalent to 1.8 million wet tons per year (about 1,000 dry tons or 5,000 wet tons per day) of biosolids requiring further management.

Approved beneficial uses of heat-dried or composted biosolids have become the most common management strategy in New York State. On a dry-weight basis, 48 percent of the biosolids generated are beneficially used, while 26 percent are landfilled and 25 percent incinerated. Beneficial use processes include heat drying (37 percent of beneficial use or 18 percent of total biosolids), composting (24 percent of beneficial use or 11 percent of total), land application as an agricultural fertilizer (20 percent of beneficial use or 10 percent of total), and chemical stabilization with a neutralizing agent to produce a liming material, (19 percent of beneficial use or 9 percent of total). Some very small treatment plants have the ability to store biosolids for many years before they must remove and recycle or dispose the material. This practice accounts for the remaining one percent. Nearly half of the biosolids generated in New York State are managed out of state, either in landfills or through beneficial use.

More data on the generation and use of biosolids are provided in Appendix I.

7.3.1 (b) Septage

In many areas of New York State, residents and businesses rely on septic systems for sewage treatment. Septage contained in system tanks must be pumped periodically and properly managed at a wastewater treatment plant, or it can be land applied to supply nutrients on agricultural property. However, for land application, septage must be mixed with lime and meet other criteria defined in the state's solid waste management regulations (see Part 360-4). More than 90 percent of the septage generated in New York State goes to municipal POTWs. In 2006, about 16.4 million gallons of septage were land applied, while nearly 190 million gallons were transported to POTWs and, therefore, ultimately managed as biosolids.

7.3.1 (c) Paper Mill Residuals

The production of paper products, either from virgin wood or recycled paper, results in the production of residuals, sometimes termed paper mill sludge. These residuals are primarily organic in nature, consisting of short fibers, lignin, and other constituents of wood that are undesirable in paper production because they could degrade the ultimate product. Depending on the manufacturing process employed, there is also the potential for chemicals used in the process, like bleaching agents or coloring inks, to end up in the residuals stream. Paper mill sludge can be a challenge to compost because paper fibers decompose slowly; however, it can be composted effectively with the appropriate type and quantity of amendment. Currently, there is one paper mill residual composting facility in New York State, located in Washington County, composting about 70,000 tons annually.

7.3.1 (d) Carcasses, Manure, and Other Agricultural Waste

Animal carcass sources include mortalities at farms, roadkill, and butcher residuals. More than 25,000 animals, primarily deer, are killed each year on the roads of New York State. An estimated 14,000 cow carcasses are generated by dairy farms in New York State each year.[46] Poultry and swine farms in New York State also generate carcasses through normal animal mortality. In addition, about 400 butchers in the state must properly manage the byproducts of their operations, estimated at 58,000 tons per year.

Besides carcasses, farming and raising animals result in other organic wastes that must be managed, including manure and crop residues. Crop residues are typically turned into the soil on the field where they are generated. With an average generation rate of 100 pounds of manure per cow, per day, dairy cows in New York State produce 12 million tons of manure each year. In the past, land application on farm fields was the standard method for handling animal manure. However, as the typical farm has increased the number of animals it manages, and with more regulatory restrictions on land application, farms have turned from land application to other methods for manure management, including anaerobic digestion, composting, and reuse of the dried manure as animal bedding.

CARCASS COMPOSTING

In the past, these carcasses were either taken to landfills or dragged into the woods along the side of the road. Today, landfill operators prefer not to handle large animals, and the practice of dragging carcasses into wooded areas is no longer an option in many communities. Instead, a number of New York State Department of Transportation (DOT) sites have established compost piles specifically designed to handle road-killed animals. The carcass composting procedures they employ, developed by Cornell University, are also being used at many farms for normal mortalities that occur in a herd and for disease incidents.

7.3.2 Scrap Metal

Scrap metal includes a wide variety of materials generated by many different entities. It includes end-of-life vehicles, prompt scrap from metal manufacturers, appliances and metal from construction and demolition (e.g., copper pipe, aluminum siding, radiators, obsolete machinery, structural beams, bridges structures), among other things.

According to the Institute for Scrap Recycling Industries,

[46] In 2001, there were 670,000 milk cows and 80,000 beef cows in New York State. The typical mortality loss is 2 percent for dairy herds and 0.5 percent for beef cows, resulting in 14,000 cow carcasses each year.

scrap recycling (which includes other recyclable materials, in addition to metals), is a $65 billion industry that employs more than 50,000 people and processes more than 150 million tons of material each year.

The economics of scrap metal recycling differs from that of most recyclable materials. Scrap metal values, although volatile, are always positive and almost always higher than the cost of processing. This means that scrap metal recyclers almost always pay for material that is received at their facility. This payment has allowed the scrap metal business to be vibrant for many years, without governmental mandates or incentives. The value of the scrap metal to the generators or their intermediaries has provided enough incentive for recycling rates to remain high. As a result of differing economics, the scrap metal recycling infrastructure was developed long before the recycling infrastructure for most other commodities, and these two recycling infrastructures remain largely separate to this day.

While DEC believes that scrap metal comprises a substantial portion of the total waste stream by weight and enjoys a significant recycling rate, most of the facilities that process these materials are exempt from state reporting requirements. The State of New Jersey requires scrap metal recyclers to report recycling tonnages to the state through an annual reporting program. Based on these data over recent years, scrap metal recycling represents five to ten percent of the total tonnage recycled in New Jersey. While some New York State planning units report significant quantities of scrap metal recycling, DEC suspects this represents non-MSW materials reported by scrap metal dealers to the planning unit. On a broad scale, there is little data available at this time to enable DEC to evaluate the extent of this waste stream in New York State or its contribution to the state's recycling success.

Recently DEC has begun collecting data on end-of-life vehicles. Pursuant to legislation passed in 2006, vehicle dismantling facilities (VDFs) are now required to submit annual reports to DEC. In the first reporting year, 548 of the 993 VDFs identified by DEC, or 55 percent, submitted reports documenting the recycling of nearly 400,000 vehicles in 2007. A full description of DEC's VDF program is provided in Appendix J. The data submitted in the required VDF annual reports for 2007 have been summarized in the DEC report available at http://www.dec.ny.gov/chemical/58165.html

7.3.3 Tires

New York State has a substantial scrap tire management program that was created with the 2003 Waste Tire Management and Recycling Act. As part of that program, ESD commissions an annual market analysis, the latest of which found that in 2006, New York State generated more than 200,000 tons of waste tires or the equivalent of 20.3 million passenger tires. In that year, more than 80 percent of the used tires flowed to in-state end-use markets, with the remainder going to other states and Canada. In general, use of New York State tires in tire-derived fuel and ground rubber applications steadily grew, while use in aggregate applications and, to a lesser degree, other recycling steadily declined. Ground rubber, used in a variety of applications from road paving to athletic fields, grew from the fourth largest use in 2003 to the second largest use in 2006. A full description of the program, including more full market data, is provided in Appendix K.

7.3.4 Construction and Demolition (C&D) Debris

Similar to the analysis described in Section 7.1.1 for the MSW stream, DEC has developed estimates of the materials present in the C&D debris waste stream using data inputs that include field-based waste composition studies and research-based evaluations performed both within New York State and within states and cities that have demographic characteristics similar to some of New York State's regions.

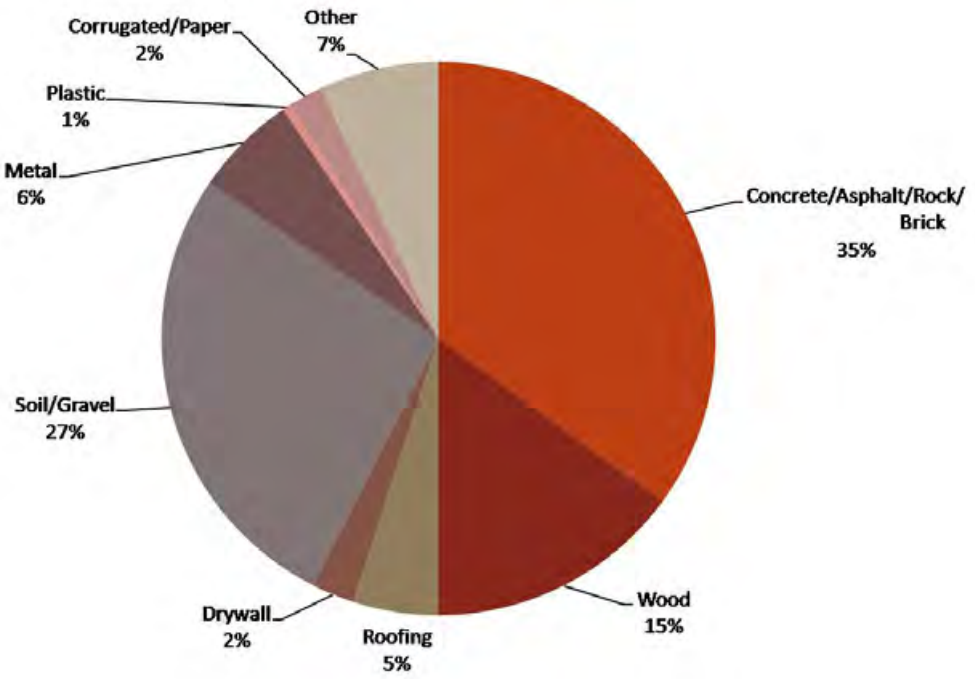
In broad terms, C&D debris is defined as uncontaminated solid waste resulting from the construction, remodeling, repair and demolition of utilities, structures and roads and includes land-clearing debris. In developing these estimates, DEC's analysis aimed to characterize the C&D debris that is discarded by both the building and infrastructure-generating sectors. Additionally, DEC's analysis looks at variations in the materials discarded from the building sector from new construction, renovation and demolition activities from both the residential and non-residential sectors, as well as differences between rural/suburban and urban generation.

Because no single study provides directly transferable data by these divisions, data from multiple sources were compiled and aggregated to create the DEC composition estimates. After careful review of a number of compositional analyses and research evaluations, data from the following sources were used:

- Municipalities within NYS: Town of Babylon and New York City
- Municipalities in other states: Seattle, WA and Des Moines, IA
- Other states: Vermont, Wisconsin, Oregon, Delaware, Minnesota, Florida, and California
- US EPA

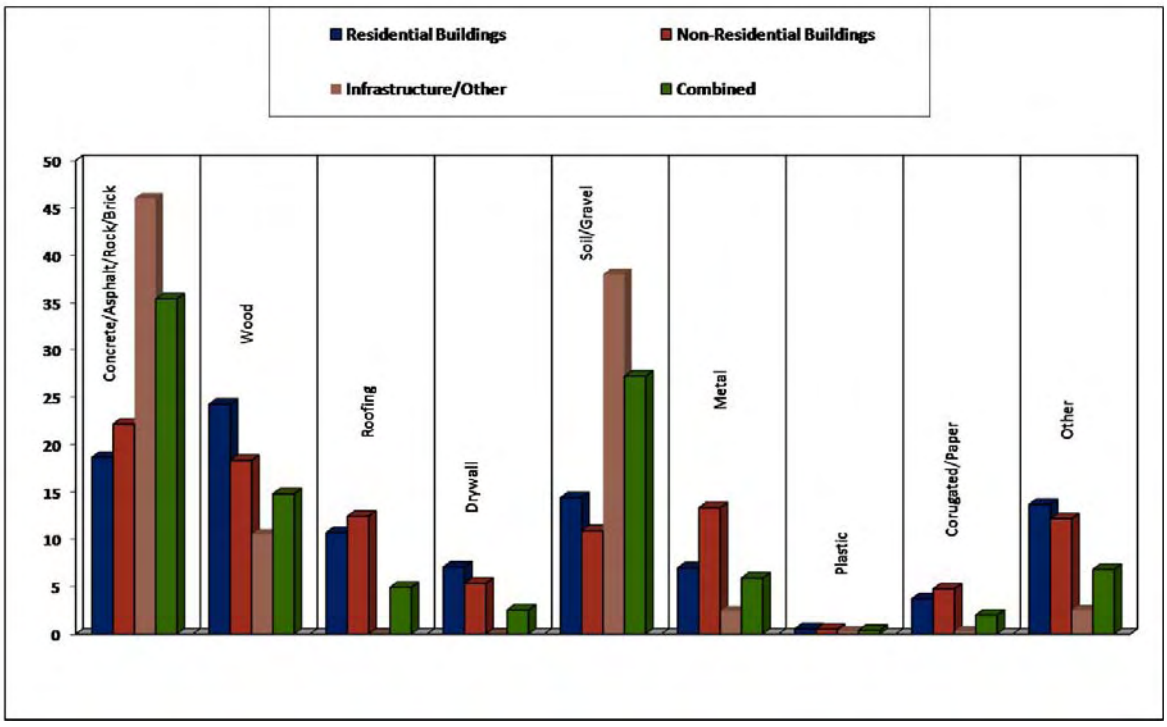
The estimated composition of C&D debris generated statewide before recycling or other diversion is presented in Figure 7.8. The concrete/asphalt/rock/brick (CARB) and the soil/gravel material categories are by far the greatest material segments at approximately 35 percent and 27 percent respectively, with wood a distant third at 15 percent. It is important to note that the percentages shown are based on weight; the diagrams would look quite different if they were based on volume. The most significant difference would be the percentage of wood versus CARB, because CARB is more than twice as dense as wood and therefore much heavier.

FIGURE 7.8 ESTIMATED C & D DEBRIS GENERATED IN NYS, BY WEIGHT



Differences among residential buildings, non-residential buildings and the infrastructure/other generating sectors are presented in Figure 7.9. While the differences are most significant between the building and infrastructure segments, interesting differences can be seen between the residential and non-residential building sectors. The greatest differences appear to be in the CARB, wood and metal material categories.

FIGURE 7.9 ESTIMATED STATEWIDE C&D DEBRIS GENERATION BY MATERIAL (by percent of C&D)



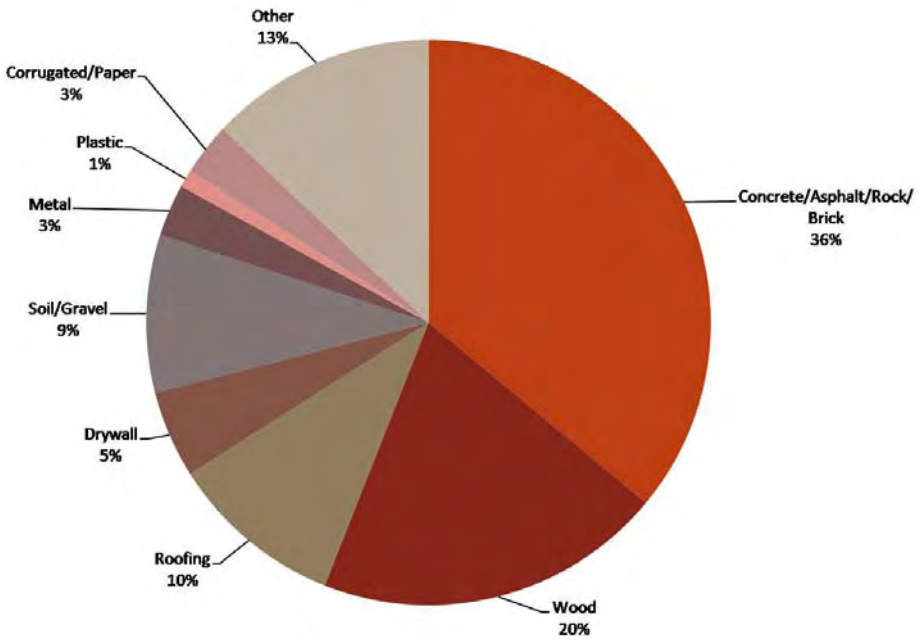
C&D debris tends to be generated in larger quantities in areas of the state with a greater population, as evidenced by the fact that nearly 90 percent of the C&D debris processing capacity is located in New York City and Long Island. While there is limited data and information available on the origin, destination and flow of C&D debris in New York State, DEC understands that these materials tend to flow through transfer stations and or C&D debris processing facilities on their way to ultimate disposition (For a discussion of these, see Section 9.1).

DEC estimates that a significant amount of both the soil/gravel and CARB materials are often used on or near the construction site, especially in the infrastructure generating sector. There are a number of exemptions within the regulations for this use, and, therefore, it is likely that a significant portion of C&D debris is not included in the reporting of this material. Based on the available data within the compositional analyses and DEC's evaluation in this analysis in conjunction with data reported, DEC estimates this to be between 3.5 and 9 million tons per year, which equates to between 20 and 40 percent of the amount of C&D debris generated.

DEC also estimates that much of the C&D material is ultimately recycled, beneficially used as aggregate, or disposed of in exempt C&D landfills, while only a portion is disposed in dedicated C&D debris landfills or in MSW landfills or combustors.

The estimated composition of C&D debris disposed on a statewide basis after recycling or other diversion is presented in Figure 7.10. The CARB and the wood-material categories are the greatest material segments disposed at approximately 36 percent and 20 percent respectively.

FIGURE 7.10 ESTIMATED C&D DEBRIS DISPOSED IN NYS

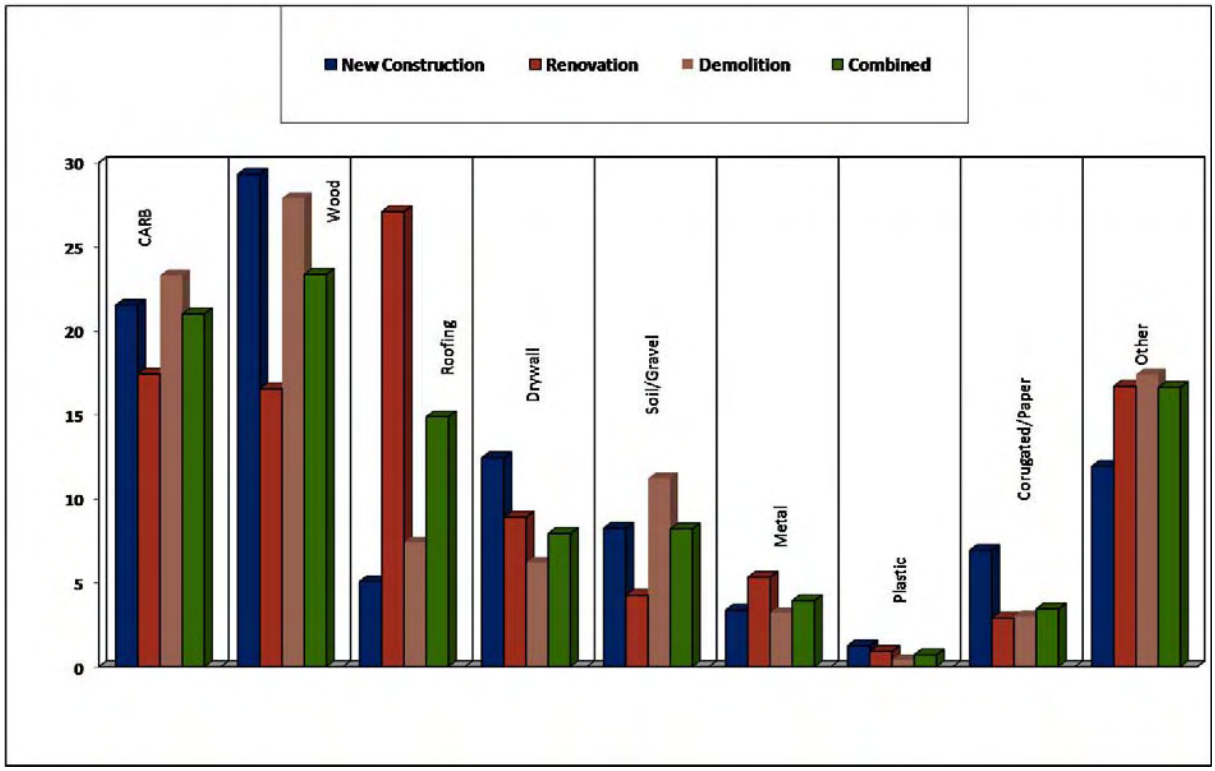


Differences among residential buildings, non-residential buildings and the infrastructure/other generating sectors are presented in Figure 7.10. As was the case with C&D debris generation, the differences are most significant between the building and infrastructure segments, with the differences between residential and non-residential buildings less pronounced.

Because much of the infrastructure generating sector material is likely handled onsite as part of many projects, additional analysis was directed toward identifying differences within the building generating sector. Most C&D debris waste composition analyses have primarily focused on this generating sector. Figure 7.11 presents the differences of materials disposed from three general building activities: new construction, renovation, and demolition. There are some significant differences in the materials discarded among these activities. The most significant differences are in the roofing wood, drywall, CARB and corrugated/paper material categories.

FIGURE 7.11 ESTIMATED STATEWIDE C&D DEBRIS BY BUILDING ACTIVITY

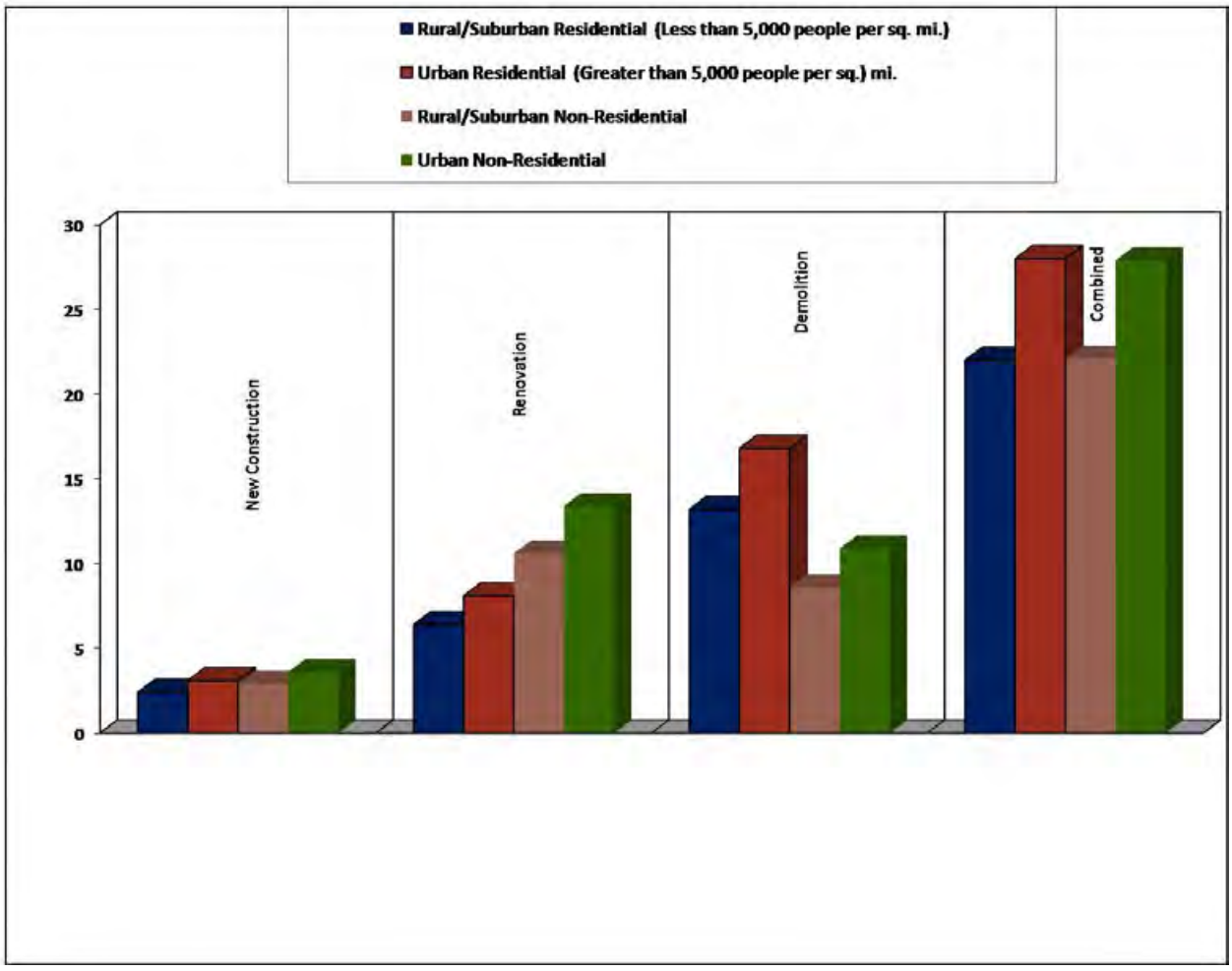
(by percent of C&D)



A comparison of the discards from the rural/suburban areas and urban areas of the state is presented in Figure 7.12 for each of the three general building activities. The greatest differences are in the demolition and renovation work areas. Urban areas account for 54 percent of the state's population. This has a significant effect on both the quantity and composition of the C&D debris waste stream. It is important to note this when using this estimated C&D debris waste composition data for planning purposes and to use the data that is most applicable to each individual circumstance.

FIGURE 7.12 ESTIMATED STATEWIDE C&D DEBRIS DISCARDS BY BUILDING ACTIVITY VS. POPULATION DENSITY

(by percent of C&D)



7.3.4 (a) C&D Debris Volumes

Overall, about 10.2 million tons of C&D debris was managed by permitted and registered C&D debris processors in 2008, with about 60 percent of the C&D debris processing in NYC and another 26 percent on Long Island. Approximately 250 registered C&D debris processing facilities managed more than 6 million tons of registration material in 2008. (For a distribution of C&D processing facilities, see Figure 9.2.) Based on the limited data available, DEC estimates that 55 percent of C&D materials processed are reused as aggregate or alternative daily cover at landfills, and 50 percent was directly landfilled.

7.3.4 (b) Processed Concrete, Asphalt, Rock, Bricks & Soil (CARBS)

A particular challenge in and around New York City, Long Island, the counties immediately north of New York City, and other major urban areas in the state is managing the large amount of concrete, asphalt, rock, brick and soil (CARBS) that is generated from the construction and demolition industry. These materials generally are processed at registered C&D debris processing facilities where, typically, the materials are reduced in size so that they may be used as a substitute for crushed rock or gravel in a variety of construction related applications. The residues and soil-like products resulting from the size reduction process is often marketed as general fill, the movement and use of which is difficult to track or monitor, posing regulatory challenges.

7.3.4 (c) Historic Fill

Historic fill refers to C&D debris, putrescible waste, ash or "inert" industrial waste used to fill selected urban locations in the early and middle 20th century for creation of land for development. Using data compiled by the USDA Natural Resource Conservation Service, DEC estimates that approximately 20 percent of the land in New York City is historic fill.[47]

The push for urban development in the last two decades has coincided with a better understanding of the breadth of historic and industrial contamination that marks our urban centers. Non-soil, deleterious components of historic fill, such as coal ash and demolition debris, render it inappropriate for general distribution as construction fill. Comparison of the chemical analysis of historic fill with recently promulgated 6 NYCRR Part 375 soil cleanup objectives (see further discussion in Section 8.5.4) highlights the need for careful consideration of the off-site reuse of historic fill, particularly on residential developments, parks, preserves, and other locations with a high potential of human or biota exposure to contamination.

Despite DEC enforcement efforts and regulations, historic fill has been processed at registered C&D debris facilities that are only authorized to handle recognizable, uncontaminated soil, and distributed without restriction. DEC has responded to historic fill reuse in the short term by allowing developers of historic fill sites to reuse the historic fill on the same site or sites with similar contaminants, under pavement or with an appropriate clean soil cover to protect the public and the environment. Historic fill is best managed within urban transportation corridors, brownfields and historic fill areas. Planning units should work with DEC to develop strategies for accomplishing that objective. The 2010 proposed amendments to Part 360 will address management of historic fill sites and the movement of historic fill.

[47] Walsh, D.C. 1996. Geochemistry of Solid Waste Landfills. PhD Thesis. Rensselaer Polytechnic Institute, Troy, NY.

7.3.4 (d) Unrecognizable C&D Debris Materials

DEC has investigated numerous sites, primarily in the downstate area, where C&D debris has been placed as fill in a manner which violates the exempt disposal site criteria in Part 360. Most of these violations have involved sites where otherwise acceptable C&D debris includes waste materials not allowed at exempt sites or includes material which was pulverized at the job site or illegally at a registered C&D processing facility and is no longer recognizable. Such unrecognizable material is likely to be unsuitable for use in residential settings as it could contain processed historic fill or other problematic materials. Like historic fill, C&D debris fines are best managed within urban transportation corridors, brownfields and historic fill areas with appropriate engineering and institutional controls to protect public health and the environment. Planning units should, in conjunction with DEC, develop strategies for accomplishing that objective. Many nearby states have developed regulated fill policies to address these issues; DEC will follow suit as it develops the 2010 amendments to Part 360.

7.3.4 (e) Asbestos Containing Materials

Asbestos containing material (ACM) is a particularly challenging type of waste to manage. Although not prohibited by DEC regulations, many solid waste management facilities choose not to handle ACM due to perception, liability, and permitting issues. These issues are complicated by the fact that several state and federal agencies regulate different aspects of the material, and oversight sometimes overlaps. Better guidance on the removal, handling, and disposal of ACM is needed from all involved agencies, particularly for homeowners.

7.3.4 (f) Creosote-Treated Wood

Creosote includes a variety of products: wood creosote, coal tar creosote, coal tar, coal tar pitch and coal tar pitch volatiles. These products are mixtures of many chemicals created by burning beech and other woods or coal, or from the resin of creosote bushes. Effective January 1, 2008**,** ECL Article 27, Title 25, (27-2501 through 27-2513) banned the manufacture, sale, and use of creosote or products containing creosote by anyone other than utilities, railroads, or marinas. Creosote-treated wood products can be brought to most waste disposal facilities that accept C&D debris. However, because of the ban on its sale and use, certain treated materials such as used railroad ties have reportedly started to stockpile at locations where these materials may have previously been sold or given away to landscapers or homeowners. Also, the statutory definitions of the terms “manufacture” and “sale” have created some ambiguity, making enforcement problematic.

7.3.4 (g) Disaster Debris

Both natural and human-caused disasters have the potential to produce volumes and types of debris that require special procedures and policies. Recent events have stressed the challenge of handling debris from large-scale disasters and the need for clear guidance. For example, debris is often co-mingled with various types of waste, including hazardous materials. DEC has issued guidance that can be used in times of emergency when quick waste management decisions must be made to protect public health and the environment. DEC will also track the activities of the state's Sea Level Rise Task Force and include guidance anticipating associated coastline emergencies, such as guidelines for protecting hazardous and non-hazardous debris storage from floodwaters.

7.3.5 Regulated Medical Waste and Biohazardous Waste

The awareness and concern about regulated medical waste (RMW) has evolved into a broader category of biohazardous waste issues that encompasses: RMW biohazard incident waste, and contaminated or infected animal and food supply waste.

7.3.5 (a) Regulated Medical Waste(RMW)

This subcategory includes discarded cultures and stocks, sharps, human pathological waste, human blood or blood products, animal waste, and waste generated in the production and testing of biologicals. There are approximately 36,000 generators of 250,000 tons of RMW each year in New York State. One-third of this volume is attributed to healthcare facilities such as nursing homes, hospitals, and clinical laboratories, while the other two-thirds is generated by physician offices, blood establishments (those that collect, manufacture, store, or process blood and blood products), colleges and universities, veterinarian and dental offices, funeral homes, research laboratories, and pharmaceutical and biotechnology facilities.

New York State has provided regulatory oversight of the RMW stream since the early 1980s and has adopted a comprehensive regulatory framework covering all aspects of handling, storage, treatment and disposal of RMW. In accordance with state laws and regulations, both the New York State Department of Health (DOH) and DEC jointly administer New York State's RMW Program.

DOH has jurisdiction of hospitals, freestanding diagnostic and treatment centers, residential health care facilities and clinical laboratories, and their onsite waste management procedures. DOH is also responsible for developing treatment standards and approving alternative waste treatment technologies. RMW treatment categories include thermal, chemical, irradiation and thermal/electrical. DEC staff collaborates with the DOH to evaluate an alternative treatment system's capacity to process RMW and on the classification of present and emerging RMW treatment technologies.

DEC has oversight authority for: all storage, treatment and destruction processes located on site of facilities not under DOH jurisdiction**;** off-site transport of RMW; all generators; tracking of waste; response to illegal disposal incidents, and all off-site storage, transfer, treatment and disposal facilities.

In New York State, most RMW is disposed of away from the site of generation, with 94 hospitals and eight research facilities treating their own waste onsite. In accordance with both federal and state requirements and to ensure containment, untreated RMW (except medical waste sharps) must be placed in plastic bags and then packaged in single-use (e.g., corrugated boxes) or reusable rigid (e.g., plastic) or semi-rigid, leak-proof containers before transport. Once packaged, RMW is either transferred to a designated secure storage or collection area within the facility for third-party pickup or to a generator's on-site treatment facility. Treated waste may be disposed at a landfill or combustor authorized to accept the waste.

In 2008, 11 commercial RMW transfer facilities, 5 treatment facilities and approximately 112 transporters were permitted by DEC to handle RMW. Fourteen radiopharmacies were also permitted to store low-level radio pharmaceuticals that are also considered RMW. Once the waste decays to background levels at the storage facility, it may be safely managed as an RMW.

7.3.5 (b) Biohazard Incident Waste

This subcategory includes the waste generated from a cleanup response to an accidental spill or other unintended release, from a naturally occurring source, or from any intentional release of infectious agents (e.g., an act of bioterrorism). The waste may comprise large volumes of building decontamination residue and may require special packaging and additional decontamination to ensure that infectious agents are contained or have been destroyed. Once disinfected at the site of the incident, due to heightened public concerns, the debris may still need to be handled as if it were still contaminated.

New York State has experienced two biohazard emergencies in recent history: the 2001 anthrax incidents that impacted several buildings in New York City and the 2006 contamination in Brooklyn, NY from naturally occurring anthrax associated with imported animal hides. In both cases, large volumes of contaminated building materials required special waste management strategies. Such wastes have similar contamination concerns as those associated with RMW (i.e., infectious agents), and, consequently, most of the waste was treated at RMW treatment facilities prior to disposal.

7.3.5 (c) Contaminated or Infected Animal and Food Supply Waste

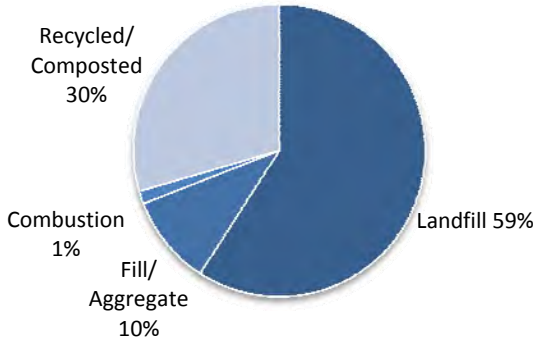
This subcategory includes animal waste from naturally occurring diseases that may have a significant impact on human society (e.g., transmissible spongiform encephalopathies, foot and mouth disease, exotic Newcastle disease, etc.) and include those that are indigenous to other countries but not found in domestic animals or poultry, wildlife, or the environment within the US. Contaminated food supply waste is the waste from the human and animal food supply known to be contaminated with infectious agents or their toxins. It can include large volumes of food waste that require special handling and management strategies such as the animal feed tainted with melamine that was recalled in 2007 and canned goods contaminated with *Clostridium botulinum*.

No formal handling and management standards or federal and state rules and regulations exist for addressing the handling and disposal or environmental impacts associated with these wastes. In New York State, these have been managed on a case-by-case basis, depending on the unique characteristics of the materials and circumstances.

7.3.6 Industrial Waste

Industrial waste includes discarded materials generated by manufacturing or industrial processes and include materials such as paper mill residuals, food processing waste, coal ash, liquid wastes (acids, leachate, etc.), and foundry sands but do not include materials resulting from mining, oil or gas drilling. DEC estimates that approximately 3.5 million tons of industrial waste was generated in New York State in 2008 and managed as shown in Figure 7.13. The industrial waste landfills in New York State are described in Section 9.4.5.

FIGURE 7.13 INDUSTRIAL WASTE MANAGEMENT IN NYS



8. MATERIALS MANAGEMENT STRATEGIES

This section describes the various materials management strategies employed by communities in New York State and around the country. DEC understands that the range of strategies and facilities used to implement integrated materials management programs will differ from one community to the next. Therefore, this Plan does not aim to dictate the particular application of any combination of approaches. Rather, DEC will evaluate local solid waste management plans (LSWMPs) and solid waste management facility permit applications against regulatory standards and for conformance with the state policy that places a clear preference for waste prevention, reuse and recycling above disposal.

8.1 WASTE PREVENTION

Waste prevention, also known as source reduction or waste reduction, refers to changes in the design, manufacture, purchase or use of materials or products to reduce their volume or toxicity before they become waste. The original 1987 State Plan (1987 Plan) and later, the 1988 Solid Waste Management Act (Act) placed waste prevention at the top of the state's solid waste management hierarchy.

As its priority standing in the hierarchy indicates, the state values the reduction of volume and toxicity of materials that ultimately become waste as the strategy with the greatest overall environmental benefit. By not producing waste to begin with, we don't have to manage it—whether by reuse, recycling, combustion or landfilling—and we save money and natural resources besides.

Waste prevention is not in the state's purview alone—individuals, businesses, institutions and governments all share responsibility for preventing waste. To make greater use of this strategy, manufacturers must make better and more informed choices in the materials they use, the amounts they produce, and the packaging they design, and consumers must make better choices in products they purchase. Avoiding the creation and use of products and packaging that are unnecessary and are destined to become waste can also avoid the consumption of energy, raw materials and fuel required to produce and distribute the material, in addition to savings related to its collection and end-of-life management.

Progress in waste prevention requires behavioral change, and behavioral change requires education. DEC's outreach and education program to promote waste prevention, reuse and recycling was born in 1989 when the Bureau of Waste Reduction and Recycling was created subsequent to the Act. The Bureau developed one of the nation's best collections of web-based and published waste prevention resources. Unfortunately, DEC's ability to execute this important program has eroded as the staff dedicated to education and outreach has been reduced dramatically. A renewed emphasis on outreach and education is critical to progress.

The 1987 Plan made several recommendations to achieve waste prevention; some have been implemented while others have not. Notably, New York State developed a strong program to reduce waste in agency operations and improve the state procurement process by purchasing less wasteful

products. Through this program, the state developed an impressive, environmentally preferable products purchasing program that resulted in the specification of more than 100 distinct energy-efficient, recycled and less toxic products for use by New York State agencies.

More recently, in April 2008, Governor Paterson signed Executive Order 4 (EO4) which establishes an Inter-Agency Committee on Sustainability and Green Procurement (Committee) co-chaired by the commissioners of DEC and OGS to implement its many provisions, including the establishment of waste prevention and paper use-reduction goals for agencies and authorities. In addition, EO 4 requires that the Committee establish lists of and specifications for green products each year. The criteria for "green products" includes recycled content, prevented waste, reduced toxicity, recyclability, compostability and extended producer responsibility. EO4 also requires that state agencies designate a sustainability coordinator and develop and implement a sustainability and environmental stewardship program. The order specifically requires that state agencies implement waste prevention, reuse, recycling and composting programs. (For more information, see www.state.ny.us/governor/executive_orders/exeorders/eo_4.html).

The First Annual Progress Report on EO4 Implementation (available at http://www.ogs.state.ny.us/EO/4/Default.asp) documents an impressive list of accomplishments and sets the baseline by which progress against the order's waste reduction goals will be measured. According to the report, 93 state agencies and authorities have appointed sustainability coordinators, reporting entities cumulatively achieved a 50 percent recycling rate, and several agencies made significant progress on waste reduction, with two of them reducing paper consumption by approximately 50 percent.

Among the still worthy, yet unimplemented waste prevention recommendations of the 1987 Plan are:

- Setting packaging reduction requirements
- Mandating product and packaging take backs

These recommendations fall under what we now refer to as product stewardship or extended producer responsibility. Stewardship will be a key waste prevention strategy for New York State. (See discussion below and Section 5.)

8.1.1 Reducing Volume

Volume-based pricing programs for waste, known as Pay as You Throw or Save Money and Reduce Trash (PAYT/SMART), have taken hold in thousands of communities throughout the country, including many in New York State. These programs create a financial incentive for consumers to waste less and reduce and recycle more. In fact, according to EPA, communities with PAYT/SMART programs reduce the amount of waste destined for disposal by 40 percent, with one-third of that reduction attributable to waste prevention. (For more on the benefits of PAYT/SMART programs, see http://www.epa.gov/osw/conserve/tools/payt/.)

While New York State has not developed an estimate of waste prevented, EPA estimates for 1996 indicate that 23 million tons or about 11 percent of the waste generated was prevented, which is an

increase from 630,000 tons in 1992.[48] Nonetheless, waste prevention efforts, undertaken by government, the private sector, and citizens, have yielded some improvements. For example:

- Light weighting of packaging (making the same package using less material) for almost all packaging types
- Typical aluminum beverage containers and 10-ounce steel cans are now one-quarter of their 1987 weight.
- Product or packaging design changes that deliver the same product or service using less or alternative material (e.g., concentrated cleaning supplies)
- Target Stores eliminated 1.5 million pounds of waste by changing the specifications for vendor packaging to have products delivered "floor ready" instead of individually packaged.
- Packaging elimination through design changes and supply chain management
- Sears now offers small tools and items in bins or directly on hooks, eliminating the need for plastic blister packs.

While there are many examples that illustrate the reduction of materials used to deliver products and/or services to the American consumer, these changes have been driven primarily by economics—fewer or lighter materials cost less to produce and are also cheaper to transport and deliver to market. The waste prevention gains experienced in New York State and around the country have *not* been the direct result of government policy or environmental stewardship constructs though, undoubtedly, public and government pressure helped highlight the waste reduction aspects of these actions. As transportation and material costs continue to escalate, the economic drivers for reduced materials use will remain strong.

Despite the progress noted above, other economic and social trends have yielded an increase in the waste stream in gross terms. According to EPA, the amount of MSW generated on a *per capita* basis has remained relatively constant between 4.5 and 4.65 pounds per person per day since 1990. Therefore, as the population has increased, the total amount of waste generation has increased accordingly. As a result, even though waste prevention and recycling have increased, the volume of waste going to disposal has not decreased since 1990. EPA estimates *per capita* generation of MSW at 4.6 pounds per day. By comparison, DEC estimates that waste generation in New York State in 2008 was 5.15 pounds per person per day.

The drive for "convenience" products has resulted in ever greater numbers of single-use, disposable products and packaging. A notable case in point is the advent of bottled water. In the past decade, the number of water bottles sold nationally has increased 10-fold, from 3 billion in 1997 to 31 billion in 2006. Convenience foods, such as packaged lunches and cleaning products like disposable cleaning wipes are examples of newer market entrants that yield a great deal of additional waste.

[48] National Source Reduction Characterization Report for Municipal Solid Waste in the United States, EPA 530-R-99-034, November 1999.

Furthermore, the combination of "planned obsolescence" and the rapid commercial introduction of new technologies have created waste streams that were not anticipated two decades ago. Products like computers, cell phones, other electronics and appliances are constantly upgraded and designed with shorter and shorter useful lives. This is compounded by the fact that related components such as batteries and chargers are not standardized and, like the electronics they augment, rapidly become obsolete. The result is more waste generated and generated more quickly, with volumes expanding as the products increase in popularity and affordability.

TRAYLESS DINING REDUCES CAFETERIA WASTE

Many colleges within and outside of New York State are looking for ways to reduce waste and cut spending. For example, the University of Buffalo reduced its impact on the environment and saved money by implementing trayless dining at its four residential dining halls. Lacking trays, students must take only the food they can carry. Implementing this change:

- *Reduced food scraps by 40 percent*
- *Saved 700 gallons of water per day*
- *Eliminated a full-time dishwashing position*
- *Reduced food costs by 4 percent*

8.1.2 Reducing Toxicity

The hierarchy emphasizes reduction in the toxicity as well as volume of waste. New York State has made strides to reduce the toxicity of products and packaging through two key initiatives:

8.1.2 (a) Toxics in Packaging Clearinghouse (TPCH)

In 1990, New York State enacted the Hazardous Packaging Act (ECL Article 37 Title II Section 37-0201), which requires the reduction of lead, cadmium, mercury and hexavalent chromium used in packaging. The legislation was based on a model developed under the direction of the Coalition of Northeastern Governors (CONEG) in the late 1980s with the help of a broad array of stakeholder perspectives, including government, advocates and industry. The model legislation has since been adopted by 19 states and several countries. New York State is a charter member and executive board member of the TPCH, a consortium of 10 states that aim to reduce the toxicity of packaging

by cooperatively implementing the model legislation. The TPCH provides a forum for industry to advise the states about technology changes and trends to help in decision-making and to help ensure a consistent approach across the country. The TPCH website contains a significant amount of additional information: http://www.toxicsinpackaging.org/index.html.

DEC's participation in the TPCH allows a consistent national interpretation and implementation of the toxic reduction requirements included in Article 37 and similar legislation adopted by other member states. As part of New York's and TPCH's outreach, education and implementation efforts, the TCPH tested packaging, with funding from EPA to determine the extent of compliance in the packaging industry. A copy of the final report summarizing the test results, including information on potential compliance and non-compliance, is available at: http://www.toxicsinpackaging.org/docs/assessment_of_heavy_metals_in_packaging_09_update.pdf The TPCH continues to evaluate whether it is necessary or desirable to include additional substances under the law's restrictions and has thus far concluded that no additional materials or substances should be added.

8.1.2 (b) Mercury-Added Consumer Products

In 2005, New York State enacted legislation (Chapter 145, Laws of 2004, and Chapter 676, Laws of 2005) placing requirements and restrictions on the sale and distribution of most mercury-containing products, based on model legislation developed by the Northeast Waste Management Officials Association (NEWMOA). While not all the provisions of the model were included in New York State's version, New York's law contains product stewardship concepts that require manufacturers and distributors to take on some end-of-life management responsibilities of mercury-containing products they sell and trade. The legislation authorizes New York State's participation in an interstate clearinghouse which, similar to the TPCH, helps states implement their mercury product laws in a consistent manner. More information about this program can be found on the Interstate Mercury Education and Reduction Clearinghouse (IMERC) website: http://www.newmoa.org/prevention/mercury/imerc.cfm.

8.1.3 Waste Prevention Education and Outreach

DEC has had an outreach and education program to promote waste prevention, reuse and recycling since 1989 when the Bureau of Waste Reduction and Recycling was created subsequent to passage of the 1988 Solid Waste Management Act (Act). DEC now boasts one of the nation's best collections of consumer resources on these issues, mainly in the form of web-pages and printed publications. (See http://www.dec.ny.gov/chemical/8502.html.) Many New York State communities have taken advantage of this information to educate their citizens, as have other states and municipalities across the country.

Typical waste prevention strategies promoted in DEC outreach programs and materials include: buying items in bulk to reduce packaging; leaving grass clippings on the lawn; printing on both sides of paper; reducing junk mail by refusing catalogues and other unwanted circulars; using e-mail and the Internet instead of print copies of documents, etc.

Unfortunately, DEC's ability to execute this important program has eroded as the staff dedicated to education and outreach has been reduced dramatically. In the early 1990s, DEC had one waste

prevention/recycling specialist assigned in every DEC region of the state. By 2009, DEC had only three regional staff who still dedicated some of their time to providing this information to the tens of thousands of businesses, institutions, and municipalities across the state. Altogether, there is less than one full-time equivalent percent per year dedicated to waste prevention.

Despite this, DEC has been able to continue funding municipalities to develop, promote, and expand waste prevention, reuse and recycling programs through several funding sources, most currently the Environmental Protection Fund (EPF). (For more information, see Section 6.)

8.1.4 The Stewardship Solution

Product stewardship, also known as extended producer responsibility, extends the role and responsibility of the manufacturer of a product or package to include the entire life cycle, including ultimate disposition of that product or package at the end of its useful life. In stewardship programs, manufacturers (or producers) must take either physical or financial responsibility for the recycling or proper disposal of products and/or packages.

Product stewardship can be a powerful driver for the reduction of waste volume and toxicity. By placing responsibility for end-of-life management on the producer, these programs ensure that manufacturers consider the end-of-life impacts of their product or package during the earliest stages of design. As such, stewardship programs create incentives for manufacturers to redesign products and packaging to be less toxic, less bulky and lighter, as well as more recyclable. For more information and examples of stewardship at work, see Section 5.

Given the importance of stewardship as a policy tool, DEC intends to pursue expansion of this approach in New York State by:

- Working with the New York State Product Stewardship Council to build support and momentum for product and packaging stewardship
- Seeking legislative authority to implement stewardship/producer responsibility programs and exploring regional or national approaches to product stewardship through the national Product Stewardship Institute and other regional and multi-state organizations
- Working with other stakeholders in New York State to develop consensus and support to move a product stewardship/producer responsibility agenda
- Working with the New York State Pollution Prevention Institute[49] to develop stewardship initiatives

8.1.5 Preventing Medical Waste

Waste reduction is practiced by many of New York State's generators of RMW. For example, many healthcare institutions have switched from using disposable, single-use rigid sharps containers to

[49] The Pollution Prevention Institute is a collaborative of several universities and technology development centers, funded through the Environmental Protection Fund. For more information, see http://www.nysp2i.rit.edu/.

reusable sharps containers, are reprocessing unused supplies, are evaluating options such as reusable dishware instead of single-use polystyrene or paper, and collecting batteries and electronics for recycling.

8.1.6 Polyvinyl Chloride (PVC) Products and Packaging

PVC plastic and its chemical precursor, vinyl chloride monomer, have been clearly linked to adverse health effects. Vinyl chloride monomer is one of only 52 chemicals listed by the National Toxicology Program as a confirmed human carcinogen. In normal use, PVC products give off gases in the form of volatile organic compounds (VOCs) that can have harmful health effects. When landfilled, PVC products can release phthalates into landfill leachate, and, when combusted, they can generate dioxins and furans. When improperly recycled, PVC from packaging can contaminate the more valuable and widely used PET stream.[50] As a result of these concerns, many European cities and countries have restricted the use of PVC in some or all applications. DEC will continue to monitor this issue and will consider additional policy options in biennial Plan updates.

8.1.7 Findings

- Waste-prevention gains have been driven primarily by economics, not public policy.
- Waste-prevention successes have been offset by negative trends, such as planned obsolescence and the growth of convenience products, to yield no substantial reduction in the amount of waste going to disposal in the last two decades.
- Product and packaging stewardship offers an opportunity to create an incentive to reduce waste in product and package design.
- PAYT/SMART programs create an incentive for consumers to waste less.
- Public education is critical to preventing waste.

8.1.8 Recommendations

As we move *Beyond Waste*, the state and its solid waste management planning units must implement the wide range of actions listed below. Fully realizing these recommendations will require additional resources—both financial and human—at the state and local level.

8.1.8 (a) Programmatic Recommendations

- Demonstrate waste prevention in state operations by implementing EO 4's waste prevention and paper use reduction goals.

[50] Affidavit of Senior Public Health Scientist, New York State Office of the Attorney General, in the matter of Resilient Floor Covering Institute v. NYSDEC.

- Maximize current education programs to organize workshops, meetings and otherwise communicate with key constituencies to:
    - Encourage, promote and demand longer-life products
    - Encourage leave-it-on-the-lawn/grasscycling and other organic waste prevention strategies
    - Promote junk mail and phone book reduction/opt-out lists
- Expand the DEC Waste Prevention Education Program to reach a broader audience.
- Allocate funding for community-based education through the EPF and other sources.
- Identify products and packaging that pose particular post-consumer management challenges for attention from the Pollution Prevention Institute (P2I), where research and development projects can be devised to improve packaging and product designs.
- Require planning units to evaluate and implement waste prevention programs, such as outreach, education, and subsidized backyard composting bins.
- Develop written guidance on organic waste prevention for specific sectors (e.g., grocery stores) based on similar documents available from Cornell University's Waste Management Institute and successful strategies being employed by other states and organizations (e.g., *MA Supermarket Composting Handbook* and several documents by NERC); distribute the guidance to all known facilities in that industry in the state and other interested parties (e.g., local recycling coordinators, etc.).
- Develop additional resources, tools and information for local governments and planning units relating to volume-based pricing (PAYT/SMART) and promote their use. The resources will, at a minimum, outline the basic elements of effective PAYT/SMART programs, highlight varying programs that can be developed to address the unique characteristics of each municipality and planning unit, and provide model policies for easy adaption.

8.1.8 (b) Legislative Recommendations

- Establish product and packaging stewardship programs (See Section 10.1.2.)
- Expand mercury-containing product sale restrictions to be consistent with the model legislation developed by NEWMOA and implemented in other states, with very limited exemptions.

8.2 REUSE

Reuse is the recovery of materials and products for the same or a similar use for which they were originally produced. It involves the collection and distribution of useful products, such as household and office furniture, food, building materials, books, sporting equipment and appliances, from those who no longer want or need them to those who can put them to use. Reuse includes remanufacturing and refurbishing products for their original intended use.

Practicing reuse helps to build a materials conservation ethic and illustrates, in a hands-on way, the benefits of moving *Beyond Waste*. Like waste prevention, effective implementation of reuse strategies often requires behavioral change and is aided, therefore, by education and outreach efforts to motivate new actions and activities.

The solid waste management hierarchy does not distinguish between reuse and recycling in the second position on the hierarchy, and prior state Plans have considered these two strategies together. However, reuse typically offers greater environmental, economic, and social benefits than recycling, and the actions required to maximize reuse are distinct from those that increase recycling. Therefore, this Plan addresses them independently.

Reuse offers New York State triple bottom-line benefits. Because reuse maintains the integrity of the original product, it retains the embedded energy and value of the materials used, with obvious and significant environmental benefits. Reusing, remanufacturing and refurbishing products can also have significant economic benefit. For example, the labor intensity of computer repair makes it a potential job creator. According to the Institute for Local Self-Reliance, refurbishing 10,000 tons of used electronics for reuse creates 296 jobs as compared to only one job to landfill it.[51] Because reuse operations generally capture and retain the value of higher-end products, such as refurbished computers and building supplies, the jobs created generally require more skilled labor than simple sorting and processing.

Perhaps most important, reuse also offers tremendous social value. For example, reuse offers high-quality office furniture to startups and nonprofits operating on tight budgets; provides computers and supplies to school children and arts organizations; provides furnishings for the homes of people transitioning out of shelters; creates a source of more affordable building materials for homeowners and contractors, and feeds the hungry.

Across New York State and the nation, there is a significant and growing infrastructure for reuse, particularly through nonprofit organizations. Thrift shops, such as Salvation Army and Goodwill, and consignment stores redistribute clothing and furniture to the frugal and those in need; the proceeds of sales also often support people in need. Food banks in the state and other nonprofits (e.g., City Harvest, Long Island Harvest, etc.) redistribute surplus food to the hungry. Retail centers that specialize in building materials (e.g., Build It Green, Buffalo Reuses, Habitat for Humanity's ReStores) sell used or surplus building materials to the public at reduced prices. Other reuse centers (e.g., Materials for the Arts, Hudson Valley Materials Exchange, Material Resource Center) provide supplies for school children and arts organizations. And, of course, community tag sales and

[51] Institute for Local Self-Reliance, Washington DC, 1997; http://www.ilsr.org/recycling/recyclingmeansbusiness.html.

individual yard sales create a vibrant market for reuse. With regard to commercial and industrial reusables, several materials exchanges operate in the state today, serving much of the population.

Nonetheless, reuse opportunities are not fully used or consistently available to all regions of the state, and quantities of readily reusable material still go to waste in New York State. Work remains to promote the full use of the state's existing reuse infrastructure through education and outreach, and to fill infrastructure gaps.

On the community level, reuse can be a low-cost, low-effort waste management strategy that provides great environmental gains. Because local transfer stations often already serve as drop-off sites for recyclables and waste, many communities have added structures at these facilities to allow residents to drop off products and materials they no longer need and take, at no cost, items they can use.

Reuse shed at a rural transfer station

On a commercial scale, New York State is fortunate to be home to the Rochester Institute of Technology's National Center for Remanufacturing and Resource Recovery (Center). The Center fosters reuse of components and equipment through applied research and development of tools and technologies for efficient remanufacturing and environmentally benign product design. With funding from ESD, the center has done valuable work to advance reuse (e.g., rebuilding of small engines, remanufacturing of toner cartridges, etc.).

New York State also hosts a statewide chapter of the Reuse Alliance—a professional association that connects, supports, and promotes reuse sector organizations. Reuse Alliance hosts a variety of programs and services to sector members, including a web-based certificate program, online resources, and annual conferences and meetings.

It is important to note that quality control and data collection are critical elements of any reuse program. Many organizations engaged in reuse are confronted with donated materials that are damaged, dirty or otherwise undesirable. Reuse education programs must emphasize the importance of reuse but also specify what items are suitable for reuse and in what condition (i.e., "readily reusable"). Likewise there is currently no sector-backed standard for collecting and distributing data (e.g., tons diverted from the waste stream, value of materials donated, etc.). Standards for quality control and data management would make the sector even more effective and could aid in public outreach efforts.

8.2.1 Building Deconstruction and Materials Reuse

A new but rapidly growing trend to maximize reuse in the construction and demolition industry, called deconstruction, is taking hold in New York State and nationally. This technique involves taking apart a building or structure in a manner that allows higher value components to be separated as they are removed and then directed for reuse.

Deconstruction has the potential to: create training and job opportunities; foster the creation and expansion of reuse retailers to distribute the salvaged material from deconstruction projects, and benefit the environment by diverting valuable resources into productive use. Deconstruction can be cost competitive by generating materials sales revenues and by reducing waste disposal costs.

Deconstruction initiatives often market their materials through or to building materials reuse outlets. In the last decade, a number of building materials reuse stores have been launched across the state. ESD's Environmental Services Unit has provided funding for building material reuse, recycling and deconstruction via its Environmental Investment Program. (See Section 6 and Appendix E for more on ESD efforts.)

8.2.2 Reuse of Consumable Food

8.2.2 (a) Food Banks

DEC estimates that in 2008, more than 1 million tons of usable food were disposed of by New Yorkers. Recovering unused food to feed hungry people is an important component of any food management process. In 1998, about 36 million Americans, including 14 million children, lived in households that suffered either from hunger (about 10 million) or food insecurity. An estimated 21 million Americans depend on food donations. New York State has a comprehensive food bank system in place that covers every county in the state, but these programs frequently run out of supplies. Meanwhile, about 27 percent of the food supply in the US is disposed of each year, representing more than 300 pounds of food for every person in the country. For each 5 percent of those discards recovered, 4 million people could be fed each day.[52]

Although not all discarded food is suitable for human consumption—NYS's Department of Health regulates the conditions under which food can be redistributed—there are significant sources of excess food that can be redirected to feed people, and there are many well-established organizations to assist with its redistribution. Generators of excess food that currently participate in these efforts include colleges, restaurants, and grocery stores. These sectors work with food banks and local food providers, such as soup kitchens, to deliver leftovers in a timely manner. To encourage food donations, the federal "Bill Emerson Good Samaritan Food Donation Act" protects businesses, organizations, and individuals that donate food in good faith from legal liabilities that might arise from their donations. However, to continue to increase supplies to those who need them, it is critical that more and improved connections are made between generators and food

[52] *Waste Not, Want Not: Feeding the Hungry and Reducing Solid Waste Through Food Recovery*, EPA 530-R-99-040, www.epa.gov/wastes/conserve/materials/organics/pubs/wast_not.pdf.

providers. Such connections are now being facilitated by outreach from food banks, DEC's regional food scrap forums and supplemental actions, and a statewide food residuals listserve to help match generators and users of excess food.

8.2.2 (b) Animal Feed

Farms and zoos can also use food scraps as feed for their animals. While reuse of food scraps for animal feed is somewhat limited by the specific dietary needs and restrictions of certain animal populations, animal feed represents a high-value end-use for food scraps that should be facilitated. The acceptable types of food scraps will depend on a number of factors:

- Nutrient density – energy, protein, minerals, roughage, etc.
- Target animals – the type and age of the animals
- Quality and variability of the food scraps – variability in nutrient content and contamination with non-food material
- Moisture content –Moisture levels must be compatible with the feed system (dry or slurry) at the farm or zoo.
- Handling –The food residual production schedule, delivery schedule, use schedule, and ability to store food must be coordinated to meet the needs of all parties.
- Regulations –The New York State Department of Agriculture and Markets (Ag & Markets) has restrictions on acceptable food for some animals.

8.2.3 Reuse of Medical Devices

Advances in medical science and, in particular, minimally invasive surgical and diagnostic procedures have stimulated the development of new and improved medical devices. The design of devices for reusability is particularly important in an effort to provide cost-effective healthcare. Collection and reprocessing of reusable medical devices is growing in New York State, with commercial RMW processing facilities often offering this service to healthcare facilities. US Food and Drug Administration requirements for reprocessing reusable medical devices that require cleaning, disinfection or sterilization prior to reuse.

8.2.4 Findings

- Reuse provides multiple environmental, economic and social benefits.
- Significant infrastructure exists, particularly through charities, but reuse options are not consistently available or convenient across the state.
- Potential exists to expand reuse, particularly in the key sectors of building deconstruction and food redistribution.

8.2.5 Recommendations

As we move *Beyond Waste*, the state and its solid waste management planning units must implement the range of actions listed below. Fully realizing these recommendations will require additional resources—both financial and human—at the state and local level.

8.2.5 (a) Programmatic Recommendations

- Support and promote reuse centers and material exchanges: DEC will continue its support of existing materials exchanges and will seek additional resources to fund or otherwise support commercial and residential online exchanges (e.g., NY WasteMatch, NY Biomass Trader, NY FoodTrader, NY C&D Material Trader, Pencil Box, ReSwap, FreeCycle), reuse centers, technical assistance, networking forums, quality control, data management, and other means to foster the reuse sector
- Maintain and expand outreach and education efforts on reuse: strengthen the reuse component of the DEC website; develop a broad education campaign on the importance of reuse
- Support and promote food and clothing donation programs: Food banks and charitable organizations play an important role in providing necessary support for the state's indigent population; DEC will support these programs and encourage other relevant state agencies to do so.
- Encourage design for reuse disassembly and process optimization within the remanufacturing industry: Through the New York State Pollution Prevention Institute[53] in collaboration with RIT-CIMS and other outreach efforts, the state will educate manufacturers on the feasibility and benefits of designing for reuse and remanufacturing, as well as optimizing the process of actually remanufacturing products.
- Encourage and incentivize building deconstruction and building material reuse: The state will encourage deconstruction and building materials reuse by removing disincentives in state policy and funding programs and, with additional resources, foster the growth of deconstruction through funding, incentives, and support.

[53] The Pollution Prevention Institute is a collaborative of several universities and technology development centers, funded through the Environmental Protection Fund. For more information, see http://www.nysp2i.rit.edu/.

- Incorporate reuse into government procurement and asset management programs: State agencies will be authorized and required to ensure that gently used furniture, equipment and supplies are directed to reuse, and that government buildings are deconstructed instead of demolished. To the extent that barriers to the purchasing of used products exist, they will be reexamined and, if not serving a valid public purpose, be removed.
- Require planning units to plan for reuse: Planning units must address and, where possible, create infrastructure and implement outreach and education programs to foster reuse.
- Encourage the use of the Food Bank Network: DEC will work with municipalities and planning units to organize meetings in each food bank region of the state, inviting representatives of relevant state and local agencies, local recycling coordinators, and institutional and commercial sources of excess food. The meetings should focus on identifying potential new suppliers to food banks, raising funds to expand food bank activities, creating education programs for commercial and institutional generators about food donation options, and addressing regulatory, economic and other barriers to increased food redistribution.
- Work with appropriate state agencies (e.g., OGS, the Dormitory Authority) to incorporate "design for deconstruction" concepts into the many other aspects of sustainable building design and construction and to create incentives for deconstruction in state projects.

8.2.5 (b) Legislative Recommendations

- Amend the Creosote Ban to allow the sale of used railroad ties for non-residential landscaping purposes.

8.3 RECYCLING

"MORE PEOPLE RECYCLE THAN VOTE... RECYCLING IS MORE POPULAR THAN DEMOCRACY."

Jerry Powell, Editor, Resource Recycling Magazine

Recycling involves the recovery, processing, sale and use of materials that otherwise would be destined for disposal. While waste prevention provides more significant environmental benefits, recycling shares the second tier of New York State's solid waste management hierarchy with reuse because it conserves natural resources and energy, reduces air and water pollution, and can save money. Reuse offers greater overall environmental benefit because it generally retains the embedded energy and material value with minimal processing.

RECYCLING SAVES ENERGY, REDUCES POLLUTION AND COMBATS CLIMATE CHANGE

Using recycled aluminum in place of virgin bauxite:

- *Reduces the energy used in production by greater than 90 percent*
- *Decreases air pollution by 95 percent*
- *Decreases water pollution by 97 percent*

Substituting recycled paper for pulp from trees:

- *Reduces energy use by 23 to 74 percent (depending on the paper grade)*
- *Reduces air pollution by 74 percent*
- *Reduces water pollution by 35 percent (source:* Wasting and Recycling in the US, *Grassroots Recycling Network, 2000; p. 25.)*

Recycling one ton of:

- *Aluminum reduces GHG emissions by 13.7 tons*
- *Office paper reduces GHG by 4.3 tons*
- *Newspaper reduces GHG by 2.5 tons*
- *Steel cans reduces GHG by 1.7 tons (source:* Solid Waste Management and GHG, 3rd Edition *EPA 2006*

Recycling, on the other hand, generally consumes more energy and fuel in the processing and transportation of materials than reuse. For materials that have already been produced and are not readily reusable, recycling is the best strategy from an environmental perspective, because it conserves natural resources by keeping valuable materials in circulation and, in turn, reduces the volume of waste destined for disposal. By offsetting the use of virgin materials, recycling avoids the environmental impacts of mining, extracting, transporting and using those materials in production and provides significant GHG reductions. Industries that replace virgin feedstocks with recycled materials pay less for the raw materials and energy consumed to make their products, helping them to remain competitive in today's global market.

Recycling offers other economic benefits as well. It creates jobs in collection and processing in addition to the manufacturing jobs associated with creating the new products. According to the *Recycling Economic Information Study Update: Delaware, Maine, Massachusetts, New York and Pennsylvania* released in February 2009 by NERC, more than 2,300 New York State businesses are directly engaged in recycling, with another 250 in businesses related to or dependent on recycling (e.g., glass container manufacturing using recycled content). The recycling businesses support more than 13,000 jobs, while businesses related to or dependent on recycling support another 14,000 jobs in the state.

Today, there are more than 250 recyclables handling and recovery facilities (RHRFs) in New York State, including material recovery facilities (MRFs) and convenience and transfer stations that aggregate recyclables for further processing at MRFs. Half of these facilities are privately owned and half are in public ownership, though some of the publicly owned facilities are privately operated.

8.3.1 Reporting, Data and Recycling Rate Calculations

Data collection and subsequent reporting on recycling rates and program performance has been a constant challenge in New York State and nationally. In New York State, the 1987 Plan and each subsequent update has identified data and reporting as an area of concern, as has the Legislative Commission on Solid Waste Management in its series of *Where Will the Garbage Go* reports.

Nationally, EPA, *BioCycle Magazine* and others have identified data and reporting as critical to gauging progress toward recycling goals but fraught with data collection, reporting, measurement and analytic difficulty. As a result, reported disposal and recycling numbers tend to be imprecise at best, with their unreliability compounded when used to compare data across jurisdictions and across time.

Since 1988, DEC has relied almost entirely on planning units[54] to aggregate, analyze and report recycling and composting data for all generating sectors within their geographic areas, while additional data was gathered from facilities (composting facilities, landfills, MWCs, etc.) that manage materials and waste. However, collecting reliable data has been challenging for the planning units as well, especially with respect to commercial and institutionally generated materials.

[54] Planning units contain two or more local jurisdictions that jointly plan and implement solid waste management programs. For a full discussion of planning units, see Section 3.2.2.

ALUMINUM RECYCLING COMBATS CLIMATE CHANGE AND CONSERVES RESOURCES LOCALLY AND GLOBALLY

International aluminum manufacturer Alcoa's use of scrap aluminum in place of virgin reduces GHG emissions and reduces the need to mine bauxite. Alcoa's annual operations globally have:

Recycled 772,000 metric tons of aluminum

Replaced 4,000,000 metric tons of bauxite that would have been mined

Reduced 7,000,000 metric tons of CO2E produced

In the Massena, NY facility alone, the company's annual operations have:

Recycled 127,000 metric tons of aluminum

Replaced 658,000 metric tons of bauxite that would have been mined

Reduced 1,152,000 metric tons of CO2E produced

For the most part, the strongest and most consistent data collected has been municipally collected residential materials; the weakest is from regions or planning units dominated by private collection.

DEC regularly collects data from municipal recycling programs through an annual survey of the state's 64 planning units. (For a profile of each planning unit, see Appendix C). During the last decade, DEC has typically only received annual recycling reports from approximately 80 percent of the state's planning units, representing about 90 percent of the state's population. The data was not independently verified and is not uniform; some planning units report only residential materials recycled, while others report only materials that the municipalities handle, and still others include all commercial and industrial materials recycled or processed within the planning unit.

Even so, the data provided by planning units was considered the best available and was used for both state and local planning and reporting purposes. To avoid double counting materials already reported by planning units, DEC did not include recycling and composting facility report data in the state's recovery rate calculations.

From 1987 to 2002, DEC calculated and reported the total recovery rate based on materials reported by planning units supplemented with data from other sources, including the Bottle Bill, beneficial use determination (BUD) data (not including fuel and landfill related uses); the Port Authority of New York/New Jersey (PANY/NJ) and the American Forest and Paper Association (AFPA) for non-municipally generated materials, and facility reports for waste disposal and export data. In 2003, DEC discontinued use of the PANY/NJ and AFPA data and the facility reports for disposal to

avoid double counting because it was expected that by 2003, most of that material was included in planning unit reports.

Based on the best information available at the time, DEC estimated that in 1997, 42 percent of the solid waste generated in the state was diverted through a combination of reuse and recycling. Using the data received from the sources described above, DEC reported that the total state recycling rate rose from three percent in 1987 to 50 percent by 2002.

In September 1997, the EPA published *Measuring Recycling: A Guide for State and Local Governments* (EPA 530-R-97-011), intended to provide a consistent methodology to compare recycling achievements of states and localities. The EPA methodology examines only the recovery of MSW generated by households, commercial or institutional sources, not C&D debris, industrial waste or biosolids. New York State, on the other hand, had since 1987 reported total recovery, which includes all recyclables and yard trimmings plus other recyclable materials, such as Bottle Bill material, C&D debris, non-hazardous industrial materials, and some beneficially used materials.

In 2000, DEC also began calculating the state's recycling rate using EPA's methodology and planning unit reported data. With the considerable variability of the reporting methodologies of the planning units, this separate MSW recycling rate calculation was considered less reliable. Using this method, New York State's MSW recycling rate remained relatively stable between 26 and 30 percent between 2000 and 2005.

For development of this Plan, DEC undertook additional analysis of the data reported by planning units as compared to facility data. This intensive analysis revealed that a significant amount of material that is handled in private sector recycling, transfer and disposal facilities has not routinely been included in most planning unit reports. Also, closer scrutiny of the reports revealed errors in units of measure, terminology, and other areas that substantially alter the amount of materials recycled and waste disposed. Therefore, DEC's reliance on planning unit reports has likely resulted in data gaps. The greatest differences appear to be related to planning units underreporting waste disposal, both at in-state facilities and exported and, to a lesser extent, the underreporting of recyclables. This difference is more apparent in recent years because DEC has been improving data collection and reporting by those facilities.

Given this effort, DEC now believes that the actual facility-reported data is the best available and is more representative of the reality of materials management in New York State. While DEC believes that regulated transfer stations and recycling facilities report the majority of the materials recycled in the state, it is important to note that some recyclables are sent directly out of state, and many recycling facilities (e.g., scrap metal yards, recycled paper manufacturers, etc.) are not required to report to DEC, so the recycling figures may be understated.

Beginning with data for 2006, DEC is using facility report data as the basis for estimating both the total recovery rate and the MSW recycling rate, using the EPA methodology, supplemented with data from other sources, including BUD reports and, where available, export data collected by the states that import New York State's waste. Using these data sources, the state's MSW recycling rate was 20 percent in 2008, and the total recycling rate was 36 percent. The 20 percent MSW recycling rate is well below both EPA's estimated national recycling rate of 33.4 percent and the *Biocycle*

Magazine "State of Garbage In America Survey" estimate of 28.6 percent, despite the significant efforts of the state, local planning units, industry and individual New Yorkers.

While the calculations for 2008 as compared to 2005 and earlier create an apparent drop in the level of recycling in New York State, these differences can be attributed most directly to the different methodology used to calculate the rate, not an actual reduction in recycling activity. In addition, as described more completely in Section 7.1.2, New York State's waste stream is somewhat different from the EPA's national estimate. This difference effectively lowers the comparative recovery rate for the state using EPA protocols. Applying the EPA's recovery rate percentages for each individual material to materials composition estimates in New York would yield an expected recycling rate of 26 percent in the state. These changes allow for more appropriate comparison between EPA's estimated national rate and New York State's recycling rate.

As such, the analysis undertaken to prepare this Plan also underscores the need for a new metric based on more reliable, available and accurate data and supports the use of a *per capita* disposal metric to be the key measure of progress in implementing this Plan. Disposal weights are perhaps the most accurate metric DEC can acquire because disposal facilities are under direct state regulatory control. Normalizing data to a *per capit*a basis reduces the data anomalies inherent in a state with substantial demographic and geographic disparities.

The analysis also supports greater focus at the state, regional and national levels to improve the consistency of reporting mechanisms and platforms. Better and more uniformly managed data will improve performance nationwide and allow for more fair and true comparisons across jurisdictional lines. Nonetheless, this analysis confirms that New York State must refocus and redouble efforts to improve recycling and reduce waste.

8.3.2 Local Responsibility

The Act required municipalities to adopt laws or ordinances that require waste generators in all sectors (e.g., residential, commercial, institutional and industrial) to separate their recyclable materials from waste at the point of generation (i.e., source separation) by no later than September 1, 1992. Thus, state law placed the responsibility for designing, implementing and enforcing recycling programs on local governments and the planning units they created. The Act specifically directs "[a] state-local partnership, in which the basic responsibility for the planning and operation of solid waste management facilities remains with local governments and the state provides necessary guidance and assistance…"

Under the Act, the state was directed to regulate solid waste management facilities, develop state solid waste management plans, develop programs to promote waste reduction and recycling market development, provide technical assistance to local governments, approve LSWMPs, and fund various recycling-related activities at the local level. (For more on state and local roles in materials management, see Section 3; for more on state investments in recycling, see Section 6.)

As described in Section 3, subsequent to the Act, 64 planning units were formed to manage solid waste within their borders. A significant number of planning units are organized on the county level, while several encompass local governments from multiple counties, others are subsumed within

solid waste authorities created by the State Legislature, and still others are town and city based, such as those in Long Island and New York City.

Although most municipalities did adopt the requisite local source separation laws or ordinances before the statutory deadline of September 1992, in some cases, local laws still lack fundamental and important provisions such as requiring source separation in all generating sectors and providing for enforcement. In many cases where the laws include enforcement provisions, municipalities have not effectively used them, particularly for commercial and institutional generators.

The programs and infrastructure developed, and, by extension, the progress in recycling has varied dramatically by planning unit and municipality, as evidenced by the data presented in Figure 8.1. While some of this variation may be related to reporting anomalies, there are clearly significant differences in recycling performance. Recovery rates for MSW paper and containers range from a low of 17 pounds per person to a high of 764 pounds per person per year. While there is no single explanation for why some communities have performed better than others, data and anecdotal information suggest that success in recycling is related to a municipalitiy's commitment to staff and provide financial resources to education, enforcement and infrastructure and the level of dedication and drive behind the program and the financial incentives in place, such as PAYT/SMART, to drive participation.

MEASURING SUCCESS

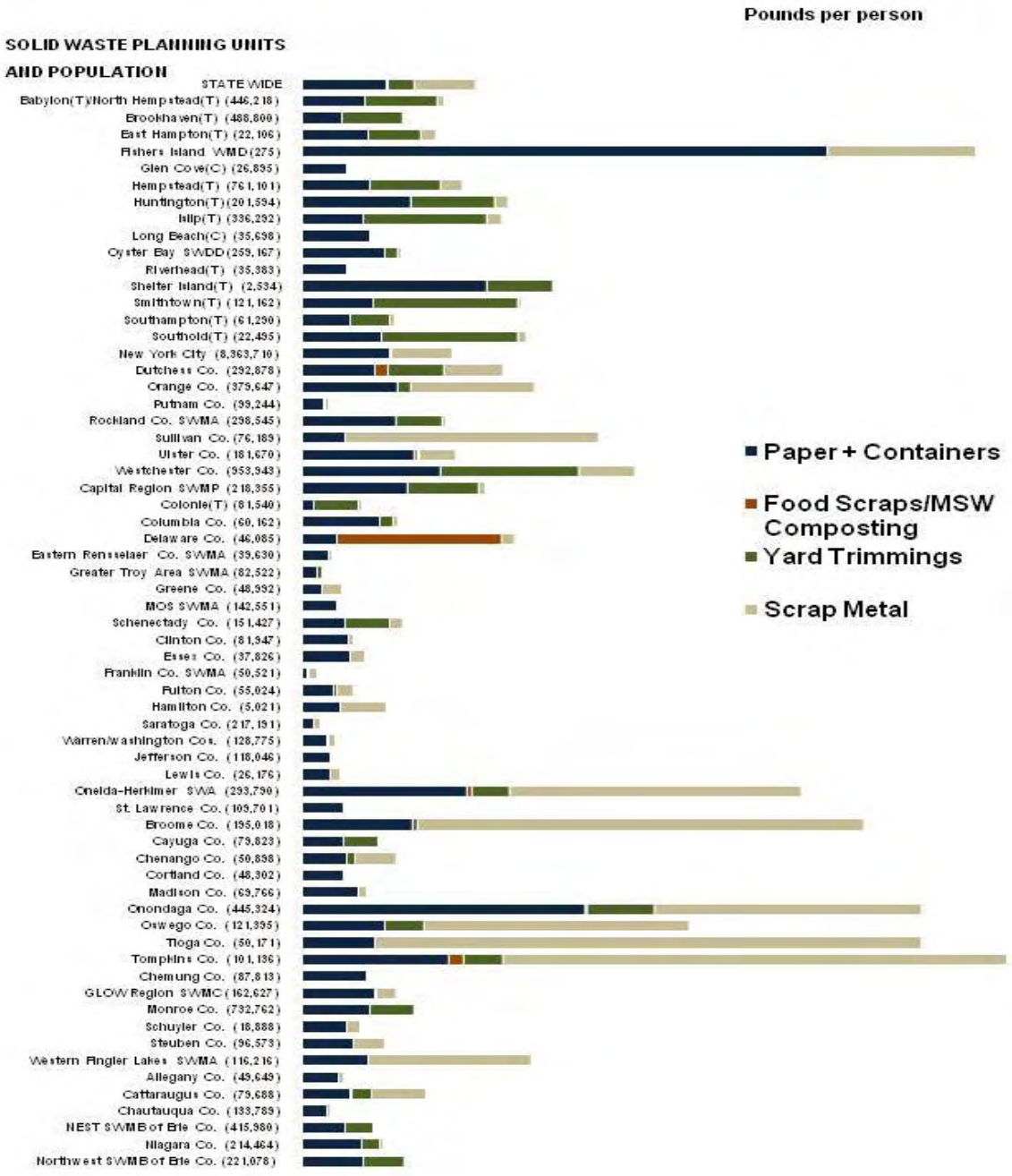
Recycling diversion rates are a fair barometer of progress on a statewide basis or in areas where closed systems (e.g., flow control) are in place. However, there are many variables that arise in calculating a recycling rate. Issues like how to account for yard trimmings or food scraps that are composted at home, how lightweighting (e.g., reduction in the weight of containers) and overall materials-use reduction (e.g., fewer newspapers being read) affect recycling rates, etc., have been debated at length. It is often difficult to derive an accurate diversion percentage, in part because some planning units under or over report the full volumes of waste sent for disposal or recycling when, for example, some local waste is transported for management outside of the planning unit or the reverse. In addition, some planning units report significant amounts of scrap metal presumably processed by private companies and within the planning unit, while most do not.

The challenge is to inspire the highest-performing communities to continue to strive for even lower levels of waste disposal, while working with lower-performing communities to bring them to the level of the more successful efforts.

Instead of diversion rates, then, DEC is using pounds *per capita* recycling rate, broken out by major material category, and *per capita* disposal rates to better measure local programs. Even these metrics may not support comparisons from one community to the next if, for example, one community enjoys a sizable seasonal population. However, the *per capita* metrics will help to gauge each community's progress *Beyond Waste* by determining whether their recycling tonnages are increasing and disposal tonnages are decreasing with time. (See Figure 8.1 for illustration and sidebar for more information.)

FIGURE 8.1 2008 PER CAPITA MSW RECYCLING AS DETERMINED FROM PLANNING UNIT AND FACILITY REPORTS[55]

Co.—County SWMA--Solid Waste Management Authority SWMB--Solid Waste Management Board SWMC--Solid Waste Management Committee SWDD--Solid Waste Disposal District SWMP--Solid Waste Management Partnership WMD--Waste Management District



[55] The information presented here is based on the 2008 recycling report forms submitted by planning units and supplemented with additional information provided by RHRF annual report forms. This data was adjusted to represent only MSW where possible; however, the distinction was not clear for all planning units, especially with respect to scrap metal.

To better understand the status of waste reduction and recycling, we must go beyond the calculation of a recycling rate and look for new metrics that more accurately evaluate efforts. As it implements this Plan, DEC will transition to a metric primarily based on *per capita* tonnages recycled and disposed. In 2008, New Yorkers recycled and composted about 382 pounds of MSW per person per year and disposed of 1,497 pounds of MSW *per capita* annually. Nationally, the average American recycles and composts 562 pounds of MSW per person per year and disposes 1,336 pounds of MSW.

Using this measure to gauge the state's progress in implementing the 1988 Act, the *per capita* MSW disposal rate has dropped by nearly 25 percent, from 5.4 pounds per person per day in 1988 to 4.1 pounds per person per day in 2008. DEC will use this metric to measure achievements under this Plan; as disposal numbers go down, we will know we are progressing toward our goal of moving *Beyond Waste***.**

8.3.3 The Solid Waste Management Act's "Economic Markets" Clause

The Solid Waste Management Act of 1988 provides that municipalities must adopt local laws or ordinances that require generators to source separate recyclable materials "for which economic markets for alternative uses exist." (See Section 120-aa of Article 6 of General Municipal Law.) While specific recyclables were not listed in the law, most programs have continuously collected the same suite of materials for much of the past two decades despite periodic dips in market values. Even in late 2008, a period widely recognized as the worst recycling market collapse in recent history, no communities in the state reported cancelling recyclables collection. Experience over the last 20 years has demonstrated that market downturns tend to be short term, and communities are more likely to ride out the markets than to adjust their programs and face the associated costs of educating and re-educating the public. Experience also shows that when the same items are widely understood as recyclable for long periods, public participation is more successful and recycling rates increase.

After more than 20 years of experience in recycling, DEC and ESD can identify the materials that are common to most programs in the state and that have had consistently viable markets; they include paper, glass, metals, plastic and yard trimmings. These could comprise an initial list of designated recyclable materials in an updated Solid Waste Management Act (see Section 8.3.14(c)) with other potentially recyclable materials subject to an "economic markets" clause. By creating a core list of readily recyclable materials, the state can better educate the public, enforce recycling requirements and otherwise support local efforts.

It is important to note that recycling cannot be divorced from economic considerations, and there may be times when continuing to recycle a material could cause a community significant economic distress. To address these rare occasions, the requirement should provide for an expedited mechanism for communities to petition DEC for an exemption from requirements for designated recyclables and a mechanism for DEC to provide statewide waivers in times of severe economic hardship or based on other critical concerns. Any mechanism enacted should include public notice, a hearing and a commissioner's decision.

8.3.4 New York State's Bottle Bill

The Returnable Container Law (also known as the Bottle Bill) remains the most effective recycling program in the state, capturing, on average, 73 percent of the targeted cans and bottles sold annually. In the 25 years since it was enacted, the Bottle Bill program has reclaimed more than six million tons of material. By promoting recycling and discouraging the wasting of that material, the program helped conserve 285 billion BTUs of energy and avoid the release of 4.8 million metric tons of GHGs. Notably, states with a $.10 deposit achieve even higher recycling rates, averaging more than 90 percent.

The drafters of the original Bottle Bill, in addressing the popular soda and beer market, could not have contemplated the significant expansion of the beverage industry to include bottled water, sport drinks, fruit juices, tea and other non-carbonated beverages, none of which are covered by the law. In 2009, thanks to the leadership of Governor Paterson, the New York State budget included an expansion of the state's Bottle Bill to capture water bottles and redirect 80 percent of unclaimed deposits into the state's general fund.

8.3.5 Engaging All Sectors

While many municipalities and planning units have established strong residential collection programs, DEC suspects that recycling in the commercial and institutional sectors has been much less aggressive and much less successful in many areas of the state. Many municipalities and planning units continue to view commercial and institutional waste as a private sector responsibility outside their control or influence.

It is important to note that much recycling does happen in the commercial and industrial sectors that is not regularly reported to or by the planning units and is not tracked by the planning unit. Nonetheless, there are countless office buildings, including government offices, apartment buildings, schools, and other businesses and institutions that do not have effective recycling programs or, often enough, any recycling at all.

The commercial and institutional waste stream often contains significant quantities of valuable material. However, many companies do not have the time or expertise to identify the value in their materials or to design programs and systems to source separate those materials. Many recycling companies and consulting services specialize in auditing a company's waste stream and designing recycling programs with an eye toward maximizing disposal cost savings and secondary materials revenues. These types of technical assistance efforts are critical to ensuring program implementation and capturing the economic and environmental value of recycling for the commercial and institutional sectors.

Notably, as of 2007, many public and private schools in New York State still did not have recycling programs in place. After years of confusion, in 2007 DEC partnered with the State Education Department to inform all schools in New York State that they are required to recycle and launched a School Recycling Challenge. Nonetheless, New York State is fortunate to be home to some outstanding school recycling programs. For example, New York City supports its collection program with curricula that enable teachers to integrate recycling into lesson plans, and many school districts

have developed robust recycling programs either on their own (e.g., Goff Middle School in East Greenbush) or through programs like the Go Green Initiative (e.g., Syracuse Central Schools).[56]

To increase recycling rates, municipalities, planning units and companies must step up their efforts to ensure that recycling programs are in place in the commercial and institutional sector. For its part, DEC will seek legislative authority to increase the state's enforcement capacity in this area to assist municipalities in their efforts.

8.3.6 Improving Recycling Rates and Participation

Part of the reason that recycling rates have not increased appreciably in the last decade is that in most municipalities, the "low hanging fruit" has been harvested—most, if not all, New Yorkers have access to recycling programs at home, and most people who are inclined to recycle are able to do so at least to some degree. To achieve increases, communities need to expand participation and seek other methods to improve materials capture rates, identify additional materials to recycle and gain access to markets for additional recovered materials.

To improve the recycling rate of materials that are already targeted by municipalities for source separation, there is a need to engage those who do not already participate and to encourage those who do recycle to capture all that is recyclable wherever they live, work or play. Recycling programs must be designed or modified to provide opportunities to recycle wherever waste is generated, whether in residences, in public spaces, in offices, in schools, etc. Improving participation on a broad scale will require a combination of the following tools:

- Education: With or without incentive programs, communities that have dedicated resources for outreach and education experience greater recycling success. The public must be continually made aware of the many reasons why recycling is important: to reduce both the environmental and financial costs of waste disposal, combat climate change, reduce pollution from the extraction and manufacture of virgin materials and to comply with the law. They also must be reminded regularly about what materials are collected and how, and they must believe that their materials are actually recycled, not mixed with garbage and disposed. It is not possible to overstate the importance of employing dedicated recycling coordinators for this type of effort. As evidence, regions in which DEC has a strong recycling outreach presence or, more important, in which planning units have recycling outreach staff, experience better recycling performance than those without dedicated staff.
- Incentives: The most common incentive program is volume-based pricing, also referred to as "quantity-based user fees," like PAYT or SMART. In PAYT/SMART systems, generators are charged for disposal based on the amount of waste picked up or dropped off, with recycling and composting programs provided for free. PAYT/SMART programs in communities as diverse as Seoul, South Korea and Worchester, MA have consistently reduced waste going

[56] For more information on school recycling, see http://www.dec.ny.gov/chemical/8803.html, http://www.epa.gov/osw/conserve/tools/localgov/sectors/school.htm, and http://www.gogreeninitiative.org/

to disposal by 40 percent, with one-third of that reduction attributable to increases in recycling, one-third to composting and one-third to waste prevention and reuse. PAYT/SMART programs can be implemented in a variety of ways, depending on the needs and goals of the community. For example, some PAYT/SMART programs rely on the sale to the consumer of bags, stickers or tags to measure, segregate and label waste to be disposed, while other programs use specifically designed collection containers as a core element of their measurement strategy. EPA and DEC have encouraged these programs since the mid 1990s and, according to EPA, volume-based pricing systems are currently in place in more than 7,000 communities in North America, including more than 400 in New York State.

A second type of incentive program rewards households with "points" based on the amount of material set out for recycling. These points are redeemable as coupons and credits at retailers who volunteer to support the program. This strategy requires a capital investment in carts with imbedded computer chips to track volumes and calculate "points." That investment has proven very successful. For example, in one pilot program, Philadelphia, PA increased recycling participation from 7 percent to 90 percent of households. In Wilmington, DE, a similar program helped the city increase its recycling rate from 3 percent to 32 percent in the first year.

Special incentive events can also be run from time to time to spur additional interest in recycling. For example, the Town of Yorktown, NY celebrated the tenth anniversary of its recycling program by sending out educational materials. Included in the items sent to residents was an entry form for the "best blue bin" contest. Entries were drawn at random, boxes inspected unannounced, and participants with impeccably sorted recyclables were awarded prizes, such as gift cards to local businesses. This event succeeded in increasing recycling rates for the town by several percentage points. The educational materials were partially funded through DEC's MWR&R grant program.

Planning units can also provide incentives for their member municipalities to increase recycling participation. Westchester County tabulates the materials sent for recycling by municipalities and calculates the amount of money saved by recycling rather than disposal. "Recycling report cards" are then issued to each municipality to publicize the economic benefits realized by taxpayers through recycling and to help communities gauge their own progress. Report cards for the 2008 reporting data reflect increased recycling volumes during the prior year in each municipality that sent material to the county MRF.

- Access to recycling collections: Many public events and public spaces do not provide recycling for participants or visitors. Increasing the presence of recycling collection bins at concerts, street festivals, parks, NYC subways, transit stations, and other public spaces will enable greater levels of recycling and reinforce the recycling message. Many communities around the country have vibrant public space recycling programs. New York City's recent public space recycling pilot project demonstrated that recycling in parks, transit stations, and other public spaces can be efficient and effective. (For more information, see http://www.nyc.gov/html/nycwasteless/html/recycling/public_space_recycling.shtml.)

- Enforcement: When all else fails, citizens, businesses and local governments can be motivated to source separate their recyclables by the possibility of a fine or other enforcement action. Enforcement is a logical extension of the education program—the backstop in the case where other means of education do not achieve the necessary change. In most cases, DEC lacks the authority to enforce local recycling requirements, and there is a wide disparity in the approaches to enforcement taken by New York State's municipalities and planning units. Several municipalities in New York State have active recycling enforcement programs that both improve participation and raise revenue, but many planning units do not have dedicated staff, resources, or clear authority to enforce recycling requirements. It also appears that some elected officials oppose enforcement and, therefore, block programmatic efforts fearing potential voter backlash. Even in communities that have strong programs, enforcement in the commercial and institutional sector is the exception rather than the rule. This must be resolved to achieve increases in recycling.

INCREASING PARTICIPATION RATES

Many communities in New York State have improved participation in recycling programs through well-promoted campaigns. For example, as a part of its commitment to combat climate change, in 2008 Westchester County stepped up its recycling enforcement efforts. In January of that year, the county informed residents and businesses that it would begin to enforce recycling requirements. For the first month, waste and recyclables that were improperly sorted were left on the curb and tagged with a yellow sticker. Starting in February, both municipal and private haulers licensed to operate within the county did not collect materials that were improperly sorted, and violators were fined. The program was extremely successful, with the volume of materials collected for recycling increasing by 25 percent before the full enforcement program was underway in February.

8.3.7 Collection Strategies

As they seek to improve performance of their source-separation programs, communities have multiple collection options, including curbside and drop-off programs, and single, dual or three-stream collection. To control costs and minimize GHG emissions related to collections, it is important that communities develop collection strategies and routes that maximize efficiency and ensure that recycling trucks are operating at full capacity.

Much of the state's population is served by curbside recycling collection, although the more rural communities tend to rely on drop-off sites and transfer stations. Since the passage of the Act, DEC has consistently advised that the same level of service for waste collection must be offered for the collection of recyclables (i.e., In locations where curbside waste collection is offered, curbside recycling collection must also be offered, and where waste drop-off programs are used, access to recycling is also required).

As communities evaluate their collection and processing options to maximize the volume and value of materials recovered, with guidance and assistance from the state, they should consider which system would work best in their local circumstances and would make the best use of existing infrastructure. Whatever choice is made, it is imperative that municipalities, planning units and private companies make the investment necessary to ensure that recycling collection and processing systems generate high-quality materials that meet market specifications and minimize residue.

8.3.7 (a) Dual-Stream Collection

Currently, a majority of the communities in New York State operate traditional dual stream collection programs which segregate recyclables into two streams—one for paper (newspapers, cardboard, junk mail, paperboard, etc.) and one for containers (metal, glass, and plastic). The separation of these two recycling streams is maintained through collection and transportation to an MRF or paper processor for further separation into marketable commodities. While there is a substantial network of dual-stream MRFs in the state, many were developed in the late 1980s and early 1990s and have not updated the technology and equipment to facilitate optimal levels of recovery. Many will require capital upgrades to improve performance and allow for added materials.

The major advantages of dual-stream collection programs are:

- They are well established; most New Yorkers are comfortable with this type of separation and understand the reasons for keeping paper and containers separate.
- There is an existing processing infrastructure; many communities already have access to an MRF or other processing facility for dual-stream materials.
- They produce quality materials using simple processing technologies; keeping containers separate from paper generally simplifies processing and avoids contamination, such as shards of glass imbedded in newsprint and other recyclable paper, which can create problems for end users and limit recycling market options.

8.3.7 (b) Single-Stream Collection

A number of communities in the state have moved to single-stream collection, an emerging trend in recycling collection that combines all recyclables (paper and containers) in one collection stream, while collecting waste separately. This system has emerged as a way to control costs and improve participation by allowing residents to place all recyclables in one container. The experience with single-stream collection in New York State to date has been positive, with five "state-of-the-art" single-stream processing facilities serving several community recycling programs, and others in the

planning stage. New York State's single-stream communities report high participation, increased diversion and low residue rates.

The major advantages of single-stream recycling include:

- Greater participation: Because sorting is easier for residents and large recycling containers are usually provided, single-stream programs have greater participation rates. Some single-stream system operators report that recovery rates increase by 20 to 40 percent above prior dual or multiple-stream performance when these programs are launched.
- Reduced collection costs: Because the systems usually involve semi-automated collection, larger volumes of materials and only one recycling truck (with one compartment), collection costs—one of the most expensive steps in the recycling process—are reduced.
- Compatibility with other program changes: Many communities around the country have implemented single-stream collection of recyclables along with other program changes, such as the addition of source-separated food scraps collection, additional recyclables collection, or PAYT/SMART pricing, yielding strong overall results.

While newer single-stream facilities have proven to function well, any conversion of existing dual-stream facilities to single stream must be carefully planned and designed and sufficiently capitalized to maximize the benefits. While some single-stream processes in other jurisdictions have generated poor quality materials and high-residue rates, experience in New York State and elsewhere indicates that when appropriate technology is employed, contamination problems can be avoided.[57]

8.3.7 (c) Multi-Material Collection

Some communities, many of which are smaller and rely primarily on drop-off programs, have more than two recycling streams; instead of requiring that only paper and containers be separated, some programs require residents to separate several types of material (plastic, metal, glass, newspapers, cardboard, etc.) from one another at the drop-off location or the curb. These programs often yield very high-quality materials that are more readily marketable for higher-value uses which, presumably, allow for higher prices. On the other hand, in the case of multi-material curbside collection, there may be greater labor costs and greater consumer participation challenges.

8.3.7(d) Recycling and Food Scrap Collections

Dozens of communities nationwide have launched what is commonly referred to as "three-stream" collection programs—single-stream recyclables, an organics stream with food scraps and other compostables, and a waste stream. By combining organics collection, including food scraps for composting, with single-stream recycling and PAYT/SMART, these communities are achieving very high recovery rates. In New York State, at least two planning units (Tompkins and Onondaga counties) are developing such programs for the commercial sector.

[57] Single Stream Recycling Best Practices Implementation Guide, Susan Kinsella and Richard Gertman, February 2007.

Through three-stream collection, municipalities have achieved organics collection without increasing overall program collection costs by implementing source-separated organics collection along with other program changes instead of as an "add on" to existing systems.

This can be accomplished by:

- Adjusting collection schedules: Once recyclables, food scraps and other putrescible organics are removed from the waste stream, the remaining waste can be collected less frequently. For example, in Toronto, organics are collected weekly, while recyclables and remaining waste are collected on alternate weeks.
- Converting to semi-automated collection: Using toters and semi-automated collection can reduce the number of workers per truck, thereby reducing labor costs as well as worker injuries, resulting in significant savings.[58]

8.3.8 Post-Collection Separation

As has been noted, anecdotal information suggests that many commercial and institutional generators and their haulers have generally not met their source-separation obligations under state and local law, and there has been little effort on the part of local planning units to bring these sectors into compliance. However, in some areas of the state, particularly in New York City, some commercial carters have developed extensive post-collection separation systems to supplement minimal source-separated recycling. In these systems, "pantry waste," including most food scraps and other putrescibles, is separated and collected in black bags for disposal, while all other materials are collected in clear bags and separated for recycling. Commercial haulers report that between 70 and 95 percent of the material collected in clear bags is recyclable.[59]

State law does not support post-collection separation as an alternative to source separation, but it can be used as a supplemental management method. DEC's Part 360 regulations require post-collection separation facilities to obtain a permit subject to the requirements for both recyclables handling and recovery facilities and transfer stations. Unless the percentage of putrescibles is extremely low, post-collection separation facilities can have all of the same environmental impacts and concerns as waste transfer stations.

While these systems require minimal workforce education or effort, they can also undermine the educational messages to source separate at home and elsewhere. Nonetheless, given the high levels of recovery achieved in some commercial post-collection separation facilities, and the efficiencies gained and emissions reduced through consolidating collections, stakeholders have argued that supplemental post-collection separation should be explicitly supported in New York State. In the absence of a change in the law, DEC will continue to require communities to implement source-separation programs in all generating sectors.

[58] Making Recycling Work: A Roundtable on the Future of Recycling Proceedings Report, Center for Environmental and Economic Partnership.

[59] Communications with Sprint Recycling and Metropolitan Recycling.

8.3.9 Glass

Many communities around the state and the nation are struggling with how to manage glass collected curbside with other recyclables. Because haulers often use compaction for more efficient collection and eject their loads directly onto concrete surfaces, much of the glass breaks during the process. The broken glass often becomes contaminated with other waste and ends up color mixed in a pile that includes small bits of paper, plastic and other materials. Broken glass can also become embedded in other material, thereby contaminating other recyclables.

ESD has invested significant resources in identifying value-added opportunities for the management of mixed-color glass collected curbside. As the material is typically too contaminated to be used in traditional markets for recovered glass, such as container or insulation manufacture, research supported by ESD has shown that with minimal processing, glass can be an effective substitute for aggregates used in a variety of engineering applications, such as sub-base for road construction, embankment construction, drainage and as a component of asphalt. As a result, specifications are in place for the use of recycled glass in these applications. Indeed, many of these categories qualify as "green specifications" through the implementation of Governor Paterson's EO4. Although these end uses do not typically earn revenues for a MRF, if the glass can be used locally for any of these purposes, the community can avoid the cost of purchased aggregate and can significantly reduce or eliminate transportation costs.

ESD has also invested in the development and implementation of technologies that allow for the cost-effective cleaning and color-sorting of MRF-generated glass. As a result, some businesses in central and western New York State are successfully converting mixed-color, contaminated glass into feedstock for container and insulation manufacture, as well as for sale as alternative sandblast medium, landscape and drainage media. With additional refinement, the glass could even replace a portion of the cement needed for making concrete products. Two manufacturers, one in New York City and another in the Finger Lakes region, have successfully developed building products made with significant amounts of recycled glass.

While strong markets do exist for clean, color-sorted glass, primarily material generated through the Bottle Bill, preparing municipally collected glass to access those markets can still be difficult and costly. To clean, sort and dry the material requires a significant initial investment in equipment that cannot usually be recouped in the absence of substantial economies of scale. Accordingly, the state needs to continue to assist with the development of markets or enhanced collection, transportation and processing systems that maximize the productive recycling of glass and reduce contamination of other recyclables, especially paper. With a continued trend toward single-stream collection of recyclables, this becomes increasingly important.

8.3.10 Construction and Demolition (C&D) Debris Recycling

While nearly half of C&D debris in New York State is recovered today, much of it is used for low-value applications, such as chipped clean wood mulch. In many areas of the state, opportunities exist to increase the amount of C&D material recycled and to improve the value of C&D materials recovered through enhanced source separation and processing of materials.

Many materials from the C&D debris stream, such as metals and cardboard, are commonly recycled, with established markets supported by supply-and-demand economics. A growing consensus exists among government and industry researchers that the C&D stream holds other materials that are inherently valuable and highly recyclable. It makes both environmental and economic sense to remove many of these materials prior to disposal.

Materials such as asphalt shingles, carpet and ceiling tiles, are potentially recyclable and generally easier to separate at the point of demolition. Recycling these materials can provide a significant benefit in terms of reduced GHG. Recycling materials such as unadulterated gypsum wallboard can also avoid other problematic emissions, such as the odorous hydrogen sulfide released when crushed gypsum is landfilled in an anaerobic environment.

However, inexpensive disposal tip fees for C&D materials have limited growth in recycling, and incentive programs have, in some cases, missed the mark. For example, the LEED Green Building Program allows "points" for recycling C&D materials, even if they are used as alternative daily cover, providing "green" credit for C&D materials that are ultimately used in a landfill, albeit through a more beneficial use than disposal. Instead, incentives should be driving higher uses of recycled C&D materials and avoiding the energy and raw material costs of producing new building products.

While it takes time for markets to develop, this time could be well spent by regulatory agencies developing and enhancing clear regulatory structure and support that will foster new markets. State government can support or encourage markets through careful management of its own construction projects to ensure the recycling of C&D debris and the optimal use of recycled construction materials.

8.3.11 Recycling Markets

Recyclables are commodities and, like other commodities, values fluctuate based on overall market conditions. In response to a need to ensure value-added uses for recovered materials and try to capture the economic returns associated with a strong recycling industry, the Act created an office in the State Department of Economic Development (now ESD) that would work to expand and strengthen New York State's recycling marketplace and serve as a repository for recycling market information. That office, currently known as the Environmental Services Unit, continues to improve recycling opportunities for collectors, processors and end users of recovered materials. Personnel and resources at ESD assist businesses that want to build new recycling capacity. In addition, ESD maintains an on-line recycling markets database that enables generators to search for regional markets for the materials they handle or, in the case of manufacturers in need of raw materials, to locate adequate supplies. Access to the database is free, and recyclers are encouraged to be listed on the database, located at www.empire.state.ny.us/recycle. For more on ESD's programs, see Appendix E.

New York State has been a leader in supporting markets for recyclables by channeling the state's purchasing power toward the products that contain recycled content. Beginning with passage of the Act and bolstered first by Governor Mario Cuomo's Executive Order 142 and, more recently, Governor Paterson's EO4, OGS developed a comprehensive green purchasing program. In fiscal year

2007-08, OGS issued more than 30 contracts for products that reduce waste, are remanufactured or contain recycled content.

In more general terms, during the past decade, the recycling industry has experienced some of the strongest market conditions in history as demand for secondary materials in China, India and other developing nations exploded. The economic events of 2008 illustrate the volatility of the markets, though they represent only a snapshot in time. In the early part of that year, recyclers enjoyed record high market values for their materials. However, due to the general economic decline felt in the fall of 2008 and the related downturn in purchasing of consumer goods and related packaging and products made from recycled materials, many secondary materials end users, particularly in Asia, slowed down or stopped their intake of secondary materials. As a result, the economic downturn late in the year brought dramatic drops in secondary materials prices. Corrugated cardboard in the Northeast dropped from $120 per ton to $30 per ton in one week in October 2008. Residential mixed paper dropped from $50 per ton to $5 per ton.[60] Similar reductions in secondary material value were experienced in the plastic and metal markets. These drops were dramatic and largely unanticipated.

This example represents a temporary downturn in what has otherwise been demonstrated as a positive trend in recycled materials market value in the last decade. Nonetheless, to weather these temporary storms, the state must continue to encourage local programs to maintain access to more than one market and to remain flexible in terms of sorting, processing and storage capacity. It is challenging for local or regional secondary materials end users to compete with foreign markets during upswings in market value like those experienced in early 2008, but, ultimately, stabilizing collection programs and recycling markets will require both the development of local and regional end users for recycled materials and the commitment of recycling program managers and MRF operators to long-term supply contracts.

Communities that weathered the 2008 recycling markets collapse most successfully were the ones that had long-term contracts with market outlets. Communities that choose to sell material on the spot instead of making long-term commitments have likely seen short-term gains, but those gains may have come at the expense of long-term stability.

Long-term contracting for recyclables processing provides stability to the municipality, its contractors and materials markets generally. The value of recyclables' can vary greatly year to year and sometimes even month to month, but responsible government budgeting requires the ability to reasonably project expenditures and revenue. To maintain a consistency of service, processors need to protect themselves from market volatility as well. Long-term (10-20 year) contracts protect both parties from this volatility. In return, though, both parties must sacrifice—municipalities sacrifice some portion of the market value of their commodities during upswings, while processors accept some added risk by guaranteeing a modest floor price regardless of market conditions.

Long-term supply contracts usually have provisions for a floor price with a mechanism for revenue sharing when market values go up. In most cases, revenue sharing arrangements are valued based on a mutually acceptable market index. For example, New York City's contracts with paper

[60] "Recycling Market Woes," *BioCycle*, November 2008, www.jgpress.com/archives/_free/001763.html .

processors include a floor price of $10 or more per ton, with provisions to increase revenues to the city when markets improve. The city has experienced revenues of up to $70 per ton under these contracts.

Because markets for most grades of paper and metals are well developed, notwithstanding periodic downturns in market value, the state's market development efforts should focus on secondary materials that are challenged by troubled or less mature markets. Examples include:

- Glass: As noted above, while markets for clean, color-sorted glass are stable, most communities generate a mixed-color broken glass that is usually contaminated with small bits of paper, plastic and other unwanted materials. There are facilities in New York State that can clean and process glass to meet market specifications. A network of glass-processing facilities would help to provide communities with outlets for this troublesome material. Creative local uses of mixed glass in construction and civil engineering projects can also help address this problem.
- Plastics: Markets for plastic bottles, particularly PET (#1) and HDPE (#2), are relatively stable. However, markets for other plastic containers, such as tubs, jars, and film are less robust and require development assistance.
- Organics: As discussed in Section 8.4, capturing more organic materials such as food scraps, food-processing waste, non-recyclable paper and yard trimmings, will be critical to increasing recovery and reducing waste disposal in New York State. It will be necessary to develop infrastructure for organics recovery and end markets for compost and other organic products to support increased recovery.
- Tires: Thanks to the Waste Tire Management and Recycling Act, ESD has made significant investments in tire market development. While those investments have yielded significant improvements, in 2006 (the most recent year studied) the predominant in-state market for scrap tires was tire-derived fuel. In the period between 2003 and 2006, the use of tires generated in state in tire-derived fuel and ground rubber applications steadily grew, while use in tire-derived aggregate applications and, to a lesser degree, other recycling steadily declined. Additional attention to value added markets for tires is needed. (For more detail on tire markets, see Appendix K.)
- Construction and Demolition Materials: Much of the concrete, brick, asphalt and metal generated on construction sites is routinely recovered; however, other potentially valuable materials like gypsum wallboard, asphalt shingles, and wood are often sent for disposal. Local end-use markets for these materials would encourage greater sorting and recovery.

8.3.12 Responsible Recycling of Electronics

Electronic waste improperly disposed can potentially release lead, mercury and/or other hazardous substances into the environment. Given the hazardous nature of many components in electronic equipment, it is imperative that these materials be handled safely and appropriately. It is also true that all of the materials from used electronic equipment (metals, plastics, and glass) are potentially recyclable, reducing the need to produce these materials from raw materials and diverting waste

from disposal. For these reasons, in 2007, DEC initiated a rulemaking to streamline the management of used electronic equipment, whether regulated as hazardous waste or solid waste, so that collection and recycling will become more efficient and safer, and manufacturer take-back programs will not be discouraged by regulatory impediments. The proposed rulemaking includes:

- Adopting provisions of the federal Cathode Ray Tube (CRT) Rule, which will remove barriers to recycling CRT glass
- Adopting management standards for collectors, dismantlers, and recyclers of used electronic equipment that will better protect human health and the environment
- Adopting provisions of the New York State Wireless Telephone Recycling Act and the Electronic Equipment Recycling and Reuse Act
- Amending the requirements of New York State's current generator "c7" notification, which would improve the ability to ensure that used electronics are properly recycled

The export of electronic waste also constitutes a significant environmental, public health and public policy issue because the waste goes to developing nations with minimal oversight or standards for its handing. As documented by the Basel Action Network[61] and reported in the major media, much electronic waste is exported under the guise of reuse or recycling, only to be managed in abysmal conditions that threaten workers and the communities that host these activities. New York State does not have the constitutional authority to regulate the export of electronic waste, and, to date, the federal government has not taken action to restrict these exports.

8.3.13 Product and Packaging Stewardship

Product stewardship, also known as extended producer responsibility, extends the role and responsibility of the manufacturer of a product or package to include its entire life cycle, including ultimate disposition of that product or package at the end of its useful life. In these programs, manufacturers (or producers) must take either physical or financial responsibility for the recycling or proper disposal of products or packages. As described more fully in Section 5, these programs are an important driver to both prevent waste and increase recycling.

Stewardship programs reduce the financial burden on local communities. Local governments are required to manage and pay for whatever winds up on the curb, with little or no ability to influence the design of the products or packaging to reduce management costs or improve recovery options. The costs are borne locally for production decisions made remotely, usually without consideration of waste-management implications.

Instead of requiring local governments to fund collection and recovery programs for discarded products, stewardship programs incorporate the cost of disposal or recovery into the cost of the product, so those costs are borne jointly by the manufacturer/producer and the consumer, not by local government and taxpayers. This reduces the financial burden on communities and internalizes

[61] *Exporting Harm: The High-Tech Trashing of Asia*, Basel Action Network, www.ban.org/E-Waste/technotrashfinalcom.pdf.

disposal costs into the cost of the product, so materials that are easier to recycle or dispose of at the end of life should be cheaper.

To stem the rising tide of packaging and printed material waste and help finance local recycling programs, the European Union and many Canadian provinces have turned to stewardship programs. While the programs differ in many ways, most packaging stewardship systems have the following components:

- Fees: Producers/manufacturers pay into a fund based on the amount of packaging they use or the volume of printed materials they distribute and the cost to recycle those materials or otherwise manage them at the end of their useful life.
- Funding: Most packaging stewardship programs use proceeds to cover the costs of collection and recycling or disposal of the packages/materials by paying either municipalities or private companies to provide these services. Many also allocate funds for market development, infrastructure improvements, education or other methods to improve materials recovery and efficiency in the system.
- Third-party Organization or Authority: Packaging stewardship programs tend to be run by independent or quasi-governmental organizations or authorities that assign fees, collect and redistribute funds, and identify and fund system improvements and market development projects.

Packaging stewardship achieves several critical ends. First, it provides an incentive for waste prevention. When manufacturers must pay for the amount of packaging they use, they have a financial incentive to use less. Programs with more substantial fees have experienced greater levels of materials-use reduction. Second, it generates much needed revenue for community recycling programs. Third, it improves recycling by allocating resources for critical education programs, infrastructure improvements and market development; in Ontario, Canada, the packaging stewardship program has yielded a 10 percent increase in the recycling rate in just its first three years. And fourth, it incorporates the cost of recycling or disposal into the cost of the product.

8.3.14 Findings

- While New York State and its communities have made progress in establishing successful recycling programs, as evidenced by the rise in recycling rates between 1987 and 1999, progress in the last decade has stalled.
- There is a wide variation in municipal recycling reporting and program performance statewide, with reported amounts of MSW paper and containers collected for recycling ranging from 17 to 764 pounds *per capita* per year.
- Data collection and analysis of program and industry performance needs to be refined; new statewide performance metrics are needed to better gauge progress toward this Plan's goals.

- The implementation of source-separated recycling programs has been inconsistent from one community to the next and in different settings such as schools, businesses, and public spaces; engaging all sectors is critical to success.
- Like any commodity, recycling markets vary; however, on average, market values have been consistently strong for the past decade.
- Local or regional markets and long-term supply-and-demand agreements provide stability to community programs.
- Market development initiatives must expand to address organics, plastics, glass and C&D debris.
- C&D debris recycling has been inhibited by competition with inexpensive disposal, in part due to a lack of markets for valuable materials.
- Planning units either lack resources or have not consistently dedicated them to outreach, education and enforcement of recycling programs, particularly in the commercial and institutional sector.
- Some municipal recycling processing infrastructure is aging and in need of upgrading to capture more materials or access higher-value markets.

8.3.15 Recommendations

As New York State seeks to improve recycling and move *Beyond Waste*, the state and its solid waste management planning units must implement the wide range of actions listed below. Fully realizing these recommendations will require additional resources—both financial and human—at the state and local level.

8.3.15 (a) Programmatic Recommendations

- Launch an aggressive public education campaign to promote waste prevention, reuse, composting and recycling and proper management of hazardous components of the waste stream. DEC will seek funding to develop the campaign, which will also include the production of tools such as templates and informational materials for local governments to use in their own outreach efforts.
- Require planning units and local governments to implement incentive, education, and enforcement programs. As planning units develop new LSWMPs or modifications and otherwise plan for and implement programs, DEC will require them to evaluate options for incentive, education and enforcement programs and put them into action where possible. (For more on LSWMP requirements, see Section 3.)
- Build recycling markets by increasing the state's purchases of recycled-content products through implementation of Governor Paterson's EO4.
- Improve data collection. DEC will develop an on-line reporting system to collect more timely and accurate recycling and disposal data and will work with industry to develop uniform

methods for more accurate data gathering and reporting, using the new statewide performance metrics based on *per capita* amounts collected for recycling and disposal.

- Encourage regional or national collaboration to develop consistent data collection and reporting protocols and systems through partnerships with NERC, NEWMOA, EPA and others as appropriate.
- Evaluate, and implement where appropriate strategies to promote the establishment of recycling facilities in the context of environmental quality review and regulatory processes for other solid waste management facilities.
- Encourage public space, event, institutional and commercial recycling. Through the implementation of EO 4, DEC will work with state agencies and authorities to ensure that recycling is implemented at all state facilities and spaces. DEC will also require planning units to address these critical issues as they develop new LSWMPs or modifications.
- Encourage long-term recycling agreements. As planning units develop new LSWMPs or modifications, DEC will encourage long-term recycling market contracts to ensure the stability and viability of recycling programs.
- Develop additional resources, tools and information for local governments and planning units relating to volume-based pricing (PAYT/SMART), and promote their use. The resources will, at a minimum, outline the basic elements of effective PAYT/SMART programs, highlight the varying programs that can be developed to address the unique characteristics of each municipality and planning unit, and provide model policies for easy adaption.
- Ensure that appropriate staffing and resources are made available to ESD for recycling market development assistance and to encourage the use of recycled feedstocks by New York State-based manufacturers.
- Expand market development initiatives for glass, plastic film, plastics #3-7, organics, tires, C&D materials, etc., to further advance recycling and as a means to create green jobs and encourage local recycling-based manufacturing and use of secondary materials. The state needs to increase its investment in this effort to ensure that sufficient attention is placed on developing local markets for key materials and, in doing so, creating economic opportunity.
- Provide assistance to local governments to help determine the need for MRF upgrades. Many municipal MRFs in the state were developed more than a decade ago. To maximize efficiency and collect additional materials, these facilities may need to be upgraded. DEC will seek funding to aid planning units and municipalities in analyzing their infrastructure to determine the capital improvements necessary to bring the recycling infrastructure in the state up to modern standards and capabilities and to help finance those improvements.
- Develop regional processing facilities for specific materials, most particularly glass, plastics, organics, and C&D debris.
- Encourage local use of processed, mixed glass, chipped tires and other appropriate recycled materials in engineering applications.

- Continue to make EPF funds available for the development and expansion of recycling capacity throughout the state. EPF funds for the ESD have been effective for spurring private investment in recycling infrastructure and helping manufacturers convert to recycled feedstock.
- Facilitate the development of forums to bring government and private entities together to identify strategies for overcoming barriers to increased material recovery, including market development, and address C&D debris management issues.
- Track and evaluate trends in the C&D debris management industry and technologies available to foster greater materials recovery.
- Establish a New York State center for C&D debris recycling through the ESD to: research issues and solutions relative to C&D debris; act as a central information access point; promote deconstruction and building materials reuse; provide C&D job-site training programs, identify potential investments for ESD's ESU, and recommend policy options to support greater C&D debris recycling.
- Work with the state OGS to require recycling of materials generated on state-funded construction sites.
- Implement the Electronic Equipment Recycling and Reuse Act, a statewide electronic equipment product stewardship program that requires manufacturers to establish convenient collection systems that achieve designated waste-reduction performance objectives.

8.3.15 (b) Regulatory Recommendations

- Enact new regulations to improve the safe and appropriate collection, handling and recycling of electronic waste
- Restrict the disposal of yard trimmings and source-separated recyclables in solid waste management facilities
- Prohibit the commingling of source-separated recyclables and waste in collection vehicles

8.3.15 (c) Legislative Recommendations

- Increase state appropriations for municipal recycling. Municipal recycling grants provide critical funding for recycling education and infrastructure. To achieve the goals of this Plan and move *Beyond Waste*, the state will need to increase the resources allocated to public education and recycling infrastructure and link resource distribution to local solid waste management planning. (For more on investment programs and funding needs, see Section 6.)
- Expand the Returnable Container Law (Bottle Bill) to include all beverage containers.
- Create a packaging stewardship program. (See Section 5.)

- Create product stewardship programs. (See Section 5.)
- Update the Solid Waste Management Act to acknowledge the new state Plan and allow for its implementation by, among other things:
    - Setting waste disposal reduction goals
    - Increasing DEC's enforcement authority, particularly with regard to commercial and institutional recycling requirements
    - Allocating additional resources for planning, education, enforcement, and other critical activities
    - Updating procurement and recycling requirements for state agencies and authorities
    - Explicitly designating the basic materials that must be recycled throughout the state (which provide for expansion of the list and hardship waivers) and where recycling opportunities must be available (e.g., residences, businesses, schools, transit stations, public spaces, etc.).

8.4 COMPOSTING AND ORGANIC MATERIALS RECYCLING

"THERE IS NO SUCH THING AS ORGANIC WASTE – ONLY WASTED ORGANICS."

City of Christchurch, New Zealand Solid Waste Plan (2006)

Organic residuals are of plant or animal origin and are a common and ubiquitous byproduct of modern life. From animal manure and crop residue, to the uneaten food generated daily in cafeterias, restaurants and homes, to massive quantities of food-processing waste, organic residuals constitute a large component of today's waste stream. As described more fully in Section 7, organic materials, including yard trimmings, food scraps, and non-recyclable papers, typically make up 30 percent of New York State's MSW. The biodegradable portion of the waste stream is in fact much higher–a full 60 percent—but the additional 30 percent comprises nonputresible materials that can be recycled into cardboard and other paper products, a higher and better end use from both an economic and environmental perspective.

As New York State moves to further reduce the amount of waste going to disposal, organics diversion offers an enormous opportunity toward that end. As more fully discussed in the sections on waste prevention and reuse, preventing organic waste through the redistribution of usable food, changing processes and practices to reduce residual organics, and other means provide greater social and environmental benefits than organics recycling. DEC has long considered composting, anaerobic digestion and other organic material recycling technologies to be equivalent to recycling of other materials and, therefore, in the second tier of the state's solid waste management hierarchy.

Composting involves the aerobic biological decomposition of organic materials to produce a stable, humus-like material. While it is the most prevalent method of recovering organic materials for

value-added end use, it is not the only method of organics recycling. Technologies such as anaerobic digestion, long used in sewage treatment plants, are now being applied to convert food residuals, manure and other materials into a biogas that can be recovered for energy and a digestate that can be composted and used as a soil amendment.

Organic materials in the state's waste stream contain rich nutrients that, when captured through composting or other recovery methods, can play an important role in rebuilding the state's soil structures. According to the US Composting Council, compost's useful properties lead to healthier soil and plants, better nutrient cycling and greater fertility and also aid in erosion control and storm water management.[62] However, the very characteristic that makes organics valuable as potential soil amendments—degradability—creates challenges in effective collection, handling and recycling.

Organics recycling also plays an important role in combating climate change. Once in a landfill, organic residuals degrade and generate methane—a potent GHG. Because these materials start to create methane within days of disposal, some of the methane escapes before it can be captured by a landfill gas destruction system. Research compiled by the University of Washington's Dr. Sally Brown confirms that every ton of food waste generates an average of 6 tons of carbon equivalent, and that generation happens in the first 28 to 100 days—well before large landfills are required by federal regulations to begin capturing gas. By contrast, a well-operated composting system will generate little if any methane.[63]

When used to enrich soil, the application of compost increases soil's carbon storage capacity by increasing the formation of stable carbon compounds that remain bound in the soil for long periods. This storage also provides a GHG benefit. According to the European Commission's Working Group on Organic Matter:

> *"Applying composted EOM [exogeneous organic matter] to soils should be recommended because it is one of the effective ways to divert carbon dioxide from the atmosphere and convert it to organic carbon in soils, contributing to combating greenhouse gas effect."*

The positive impact of composting on GHG emissions from waste management systems can be significant; just how significant depends on the waste disposal method being avoided when materials are diverted for composting. Using the NERC EBC and waste composition and quantity data from New York's Capital District, DEC estimates that a community can reduce its GHG emissions related to waste management by 10 percent if it diverts half its food scraps from an MWC to a composting facility. If a community achieves the same 50 percent diversion of food scraps from a landfill, the reduction is 129 percent. It is important to note that neither the NERC or WARM models account for the additional GHG benefits of using compost (e.g., offsetting the use of other soil amendments and reducing the need for fertilizers) which would further increase the projected benefits.

---

[62] *USCC Position Statement: Keeping Organics Out of Landfills,* U.S. Composting Council, www.compostingcouncil.org.

[63] Ibid.

These findings are consistent with research being undertaken around the country and the world. In the first full lifecycle study on the environmental impacts of composting, the Australian Department of Environment and Conservation found that commercial composting of organic materials and the application of compost to agricultural soils resulted in net GHG reductions, even if the recycled materials have to be transported more than 370 miles for agricultural application. The fact that vehicle transportation is a minor contributor may seem counterintuitive because vehicle emissions as a whole do have a significant impact on climate change. In this analysis, the number of vehicles is relatively small and the avoidance of potent methane emissions has a large influence on the overall GHG reductions through composting. This analysis was on the composting process itself, so it did not include the GHG emissions avoided by not disposing the organic materials in a landfill. The study also determined that commercial composting and agricultural application resulted in other benefits, including "reduction in use of fertilizers, herbicides, water, and electricity resulting from compost applications and, therefore, reducing release of GHGs, nutrients and toxic chemicals to environment (air, water, and soil) during production and use of these avoided inputs."

Since there are many different types of organic materials and methods for recycling them, the best approach for any particular organic waste stream will depend on a number of factors, including the volume and makeup of the material, the space available for aggregation and management, flexibility, cost, GHG emissions, transportation distances, etc.

In New York State and nationally, the recycling of organics has grown phenomenally since the 1987 Plan. The EPA estimates that yard trimmings composting has grown from diverting 12 percent of total yard trimmings in 1990 to 64 percent in 2007. Few composting operations existed in New York State in the late 1980s, while more than 300 facilities exist today. The facilities vary in size, with smaller ones handling a few hundred cubic yards per year and larger facilities handling more than 100,000 cubic yards per year. In total, DEC estimates that more than 600,000 tons of yard trimmings are composted annually in New York State, which represents 67 percent of the total estimated generation.

One significant factor that helped promote the development of yard trimmings composting sites was the inclusion of special conditions in solid waste disposal facility permits prohibiting the acceptance of yard trimmings. Four of the five largest landfills in the state and all MWCs have special permit conditions that include this prohibition.

However, large quantities of organics, especially food scraps and soiled paper, still end up in landfills instead of being used to improve the physical, chemical and biological properties of New York State's soils.

8.4.1 Organic Recycling Technologies and Methods

This section briefly describes organic waste diversion methods and biological recycling technologies currently used in New York State, without attempting to provide an exhaustive list of all technologies and methods available or on the horizon. As this is a dynamic area of waste management, new technologies for organics recycling will likely surface in the coming years, each posing environmental concerns that must be properly addressed prior to planning for their use. Their resultant products must also be fully understood. For example, depending on the waste that is

being processed, pathogens, heavy metals, or pesticide/herbicide residues may be present and would need to be managed. The state's solid waste management regulations, 6 NYCRR Part 360, contain specific design and operational criteria governing these facilities.

8.4.1 (a) Composting

As previously described, composting involves the aerobic biological decomposition of organic materials to produce a stable, humus-like material. Composting happens naturally in the environment when organic material falls to the soil surface. There are many compost technology options for managing most organic materials in the waste stream, each striving to optimize the biological conditions in the mass of material to achieve the most uniform, mature compost in a reasonable amount of time.

The composting process is somewhat forgiving in practice, so it is not always necessary to meet ideal conditions for making good compost, but, the closer the system can get to the ideal, the better and more consistent the product will be. The resultant compost product makes a valuable soil amendment due to its high organic matter content. Because compost contains high levels of organic carbon, which can fuel key ecosystem functions like nutrient cycling, water retention, and erosion control, it can also help rebuild soils.

One distinct advantage that composting has compared to other organic treatment systems is its ability to work at a wide range of scales with both low technology and sophisticated systems. A homeowner's backyard compost bin or pile can be an effective method for recycling household food scraps and yard trimmings. On a larger scale, municipal and private facilities operating in New York State recycle from as little as a few hundred cubic yards of organics to more than 200,000 cubic yards each year and handle a variety of materials, including yard trimmings, food scraps, manure, biosolids, and mixed solid waste. When evaluating alternative processing methods, key criteria include available land and labor—passive composting systems with limited management requirements will use more land area and take more time. More active composting systems with greater management requirements can process the materials more quickly using less land. While it is important to be aware of odor concerns, a well-run composting system will not create problematic odors.

As discussed above, expanding composting to capture the substantial volume of food scraps and non-recyclable paper that are still being thrown away would significantly decrease the overall disposal rate in New York State. The cost for a composting facility for food scraps varies depending on the technology employed, the size of the facility, and the revenue received for the product. As demonstrated in the table below, typically the processing cost will be $40-$60 per ton of food scraps received. Food scrap composting programs may also incur additional costs, including collection. However, collection costs can be avoided or minimized through the development of on-site systems, such as backyard composting for residences and small-scale composting operations at the location of large generators, such as colleges, institutions and food processing facilities.

TABLE 8.1

Operating Costs for Food Scraps Composting Facilities	
NYS DEPARTMENT OF CORRECTIONS	$34/TON
TERRA FIRMA ORGANICS, WYOMING	$50/TON
BARNES NURSERY, OHIO	$26/TON
CEDAR GROVE, WASHINGTON	$55/TON
MACKINAC ISLAND, MICHIGAN	$37/TON
CITY OF ANN ARBOR, MICHIGAN	$52/TON

Large-scale composting systems for mixed solid waste streams have been available in the US for 25 years. While some facilities built in the last two decades have closed due to odor or product quality issues, 13 still exist today.[64] One of the newest and most successful systems is located in Delaware County, NY. The Delaware County MSW Co-composting Facility is a sophisticated system designed to accept mixed solid waste, biosolids, and dairy waste. The Delaware County facility was designed to manage 33,400 tons of MSW annually (after source separation of recyclables), 2,300 tons of whey, and 9,900 tons of biosolids. The facility, which is fully enclosed (with three months of product curing/storage capacity), consists of a large rotating drum that accomplishes the initial biological degradation, a primary separation system to remove non-organics, a multi-bay composting system, a secondary removal system, and a long-term aerated curing and storage area. The result is a product that meets the state's strict quality standards for sale as Class A compost and generates revenue to offset operating costs.

[64] *BioCycle*, November 2008.

NYS DEPARTMENT OF CORRECTIONAL SERVICES LEADS IN FOOD COMPOSTING

The NYS Department of Corrections (DOC) diverts more compostable material from the waste stream than any other entity in the state. The DOC's 29 composting facilities divert more than 50 tons per day of food scraps and wood chips from 52 correctional facilities. Since the inception of DOC's resource management program, the agency has diverted more than 270,000 tons of food scraps and recyclables and saved the state more than $37 million.

DOC also leads the way on food waste reduction and the redistribution of usable food. By operating a cook/chill facility that prepares bulk quantities of food at a food production plant, DOC significantly reduced the amount of food waste it produces. Meals are sealed in bulk in multi-portion bags, chilled and then distributed to facilities around the state. In addition, DOC donates consumable food to families in need through the ComLinks Gleaning Program. This program has redistributed millions of pounds of fruits and vegetables that would have otherwise gone to waste.

8.4.1 (b) Anaerobic Digestion (Biogas)

Anaerobic digestion is a biochemical degradation process that converts complex organic materials into biogas in the absence of oxygen. Biogas is composed of methane, carbon dioxide, and small amounts of hydrogen sulfide. Once the biogas has been extracted, the remaining slurry may be separated into liquids and solids, usually using a screw press or similar device.

After testing, the liquid portion generally can be used as fertilizer, and the solids can be directly applied to the soil or be further processed through composting.

Some of the potential advantages of using anaerobic digestion include:

- Reduction in odor
- Reduction in pathogen content
- Reduction in solid mass
- Biogas production for heat or electrical power
- Space efficiency

For decades, anaerobic digestion has been used as an accepted way to stabilize biosolids from wastewater treatment. Use of the technology for other organic material streams has grown in popularity in New York State, and today there are 15 digestion facilities in the state that process manure. Some of these facilities also incorporate food scraps. Experience has shown that food scraps, fats, oils and grease can increase biogas production in these systems, as well as help generate income through tipping fees.

Although experience with digesters in New York State and elsewhere in the US—aside from wastewater treatment—has been largely limited to manure and some food processing waste, more technically sophisticated anaerobic digestion has the potential to process source-separated food scraps and other organic waste. In Europe, nearly 90 anaerobic digestion facilities process MSW, managing a total of 2.75 million tons per year. While most of those facilities accept source-separated organic waste, some European plants accept mixed waste and process it to remove contaminants prior to digestion.[65] In Canada, the City of Toronto operates an anaerobic digester for residential food scraps so successfully that it is expanding its system to include a second digester. Anaerobic digesters are getting additional consideration in the US for treatment of food scraps due to the potential for energy generation.

A study prepared by the Tellus Institute for the State of Massachusetts estimates the energy generation potential of anaerobic digestion at 250 kWh per ton of materials, as compared to 105 kWh per ton in landfills and 585 kWh per ton in MWC. Capital costs for these facilities vary depending on the waste stream handled and the pre-processing required.

8.4.1 (c) Direct Land Application

Sometimes organic wastes can be applied directly to agricultural land with little or no prior treatment, as long as the materials meet regulatory requirements for controlling potential contaminants. DEC regulations address and control problems related to land application, such as odors and runoff.

New York State is a prolific dairy producer, and dairy farmers have historically managed animal manure as organic waste. Traditionally, manure was directly applied to the soil as a nutrient source. Similarly, harvesting crops results in leaves, stalks, or other plant waste remaining on the field. This often gets turned into the soil to be used as a source of nutrients and organic matter for the subsequent growing season.

Although these organic residuals can also be composted or processed using other means, direct land application is still a common and acceptable practice and in many cases, serves as a direct source of nutrients for farms. However, this is changing as farms grow and cannot effectively apply the large amount of materials they generate. Limitations on the amount of organics that can be applied per acre continue to support the increased use of anaerobic digesters and composting on dairy farms.

There are also non-farm organic waste streams that can be directly applied to agricultural lands, including biosolids, food processing waste, leaves, grass clippings, and more. These can serve as good sources of nutrients for farms that don't generate enough organic waste on their own and offer cost savings over most commercially available fertilizers. For any land application program, a number of factors must be considered, such as the length of the growing season, weather, storage, transportation, and the nutrient needs of the crops grown.

---

[65] *Assessment of Materials Management Options for Massachusetts Solid Waste Master Plan Review*, Tellus Institute, December 2008, www.mass.gov/dep/recycle/priorities/tellusmmr.pdf.

8.4.1 (d) Vermicomposting

Vermicomposting is a method of degrading organic waste using worms. The worms, which are earthworms commonly known as red worms, red wigglers or manure worms, consume any edible waste and excrete castings or worm manure that are considered to be excellent nutrient-rich, soil amendments. Worms will eat a wide variety of organic materials, such as paper, manure, fruit and vegetable waste, grains, yard trimmings, and biosolids. For the worms to effectively process organic material, it must be moist but not water logged and in small enough component units for the worms to swallow. The wastes cannot contain materials toxic to the worms, which can survive a wide range of temperatures but are most efficient between 55° and 77°F.

Once the worms have consumed the organics, their castings are separated so that they can be applied as a soil amendment and the worms reused to consume the next batch of organic waste. Vermicomposting can work on a small scale (a 12-20 gallon bin is often suitable for a residence) or on a large scale (worm beds can be hundreds of feet in length and handle hundreds of tons of organic waste). An example of a large-scale vermicomposting system in New York State is Organix Green Industries in Ontario County, which accepts up to 10,000 cubic yards of leaves, grass, and food processing waste each year. The incoming organics are shredded and placed in trenches with the worms for six months. The trenches are two-feet deep, four-feet wide and 100-feet long. Organix is currently using only four acres but has sufficient area on site to build 50 worm beds.

8.4.1 (e) In-Sink Food Scrap Disposers

Many communities manage some food scraps in combination with biosolids by allowing or encouraging the use of kitchen sink food disposers or “garbage disposals” in both commercial and residential settings—essentially, sending it to the local treatment facility along with other wastewater. Encouraging or requiring these “garbage disposals” in certain circumstances can further recycling goals. Critical considerations include:

- Sufficient wastewater treatment capacity: Service areas of facilities that regularly overflow to combined sewer outfalls would not be ideal locations for the addition of food scraps to the wastewater stream, and sewage treatment plants that cannot manage the additional biological load should be excluded. Areas served by septic systems are also inappropriate for food waste disposers because they can lead to system failure that impacts surface and groundwater quality.
- Recycling of wastewater treatment plant biosolids: Using food scrap disposers in service areas of the wastewater treatment plants that process biosolids through composting could be cost effective and environmentally beneficial. On the other hand, incentivizing or requiring disposers serviced by a wastewater treatment plant that incinerates (without energy recovery) or landfills its biosolids can actually be environmentally counterproductive

8.4.1 (f) Rendering

Rendering is a process that converts waste animal tissue into stable, value-added materials. Rendering simultaneously dries the waste and separates the fat from the bone and protein, yielding a fat product (possibly including yellow grease, white grease, tallow) and a protein meal (meat and bone meal, poultry byproduct meal, etc.). The protein is then dried and ground prior to storage. The fat product is further refined prior to distribution.

Because one-third to one-half of each animal produced for meat, milk, eggs, and fiber is not consumed by humans, a majority of animal waste comes from slaughterhouses. However, restaurant grease, butcher shop trimmings, expired meat from grocery stores, and carcasses of euthanized and dead animals from shelters, zoos, farms, and veterinary offices can all be suitable feedstock for rendering. Rendering has become more expensive and less available for these materials, so there has been a substantial increase in their composting. Restrictions on the animal parts that can be used for production of feed for ruminant animals, due to fears of mad cow disease, have also resulted in the decrease of rendering capacity in New York State and elsewhere.

8.4.1 (g) Heat Drying

Heat drying is a treatment process that removes almost all of the water from biosolids. Although the chemical composition of treated biosolids remains essentially the same following heat drying, the percent of solids left is 90 percent or greater. Depending on the system employed, the end product will either be a powder-like material or grain-sized pellets. These heat-dried products are typically used directly as a fertilizer or blended with other nutrients to produce higher grade fertilizers.

8.4.1 (h) Chemical Stabilization

Chemical stabilization facilities mix commercial lime and/or lime equivalents with biosolids to achieve pathogen destruction. Alkaline materials like lime or cement kiln dust are mixed with dewatered biosolids, where the combined materials react to generate heat while also raising the pH of the mass. The resultant product is used primarily as a lime substitute in agriculture. Chemical stabilization facilities consist of a mixing device, a bunker where the material is allowed to react, and a curing area to allow the material to stabilize. Chemical stabilization is used by two facilities that treat biosolids in New York State.

8.4.2 Developing sufficient organics recycling capacity

While substantial yard trimmings composting infrastructure exists in New York State, to recover additional organics such as food scraps and non-recyclable paper, additional infrastructure will be needed. In 2008, DEC held a number of forums across the state to bring together food scrap generators and potential users, including food banks and composting facilities. A consistent theme that emerged from the forums is the need of organic waste generators to find beneficial uses for their unused food. It is clear that the lack of capacity for handling food scraps at composting facilities or anaerobic digesters inhibits expansion of food scrap recycling. Using information learned from the forums, DEC is developing a plan to facilitate greater diversion and recycling of food scraps through education, networking and assistance with new infrastructure development.

8.4.3 Organics Collection

Since the technology is effective and can be cost competitive with alternative management options, some of the roadblocks to increased composting of food scraps are aggregation and transportation. There is currently no standard method for collection of these organics. The specifics of each program must depend on the type and quantity of organics being collected, how frequently it would need to be picked up, the type of generator, spatial considerations at the points of generation and management, the distance to the recycling facility, and the cost of collection vehicles.[66]

Municipalities have achieved organics collection without increasing overall program collection costs by implementing source-separated organics collection along with other program changes, instead of as an "add on" to existing systems. Most often, this is accomplished by:

- Adjusting collection schedules: Once recyclables, food scraps and other putrescible organics are removed from the waste stream, the remaining waste can be collected less frequently. For example, in Toronto, organics are collected weekly, while recyclables and the remaining waste are collected on alternate weeks.
- Converting to semi-automated collection: Using toters and semi-automated collection can reduce the number of workers per truck, thereby reducing labor costs as well as worker injuries and resulting in significant savings.[67]

8.4.4 Competition for Biomass

Composting operations sometimes use wood chips or some other biomass as a bulking agent to facilitate the composting process. With the growing imperative to develop renewable energy sources, there is increased interest in using wood chips and other sources of biomass to generate electricity or be converted into fuel. Already, these efforts are increasing demand for wood chips, causing composting operations to compete for what was once a free and plentiful material. Further demand for wood chips as a fuel could exacerbate this problem and create a significant market dislocation for composting operations.

[66] A comprehensive summary of the various techniques and types of equipment currently being used to collect and transport food scraps, "Source Separated Organics Collection" by Craig Coker, was published in the January, 2009 edition of *BioCycle* magazine (see www.biocycle.net). Additional information is available at the "Compostable Organics Out of Landfills by 2012" website, http://www.cool2012.com/community/collection/.

[67] Making Recycling Work: A Roundtable on the Future of Recycling Proceedings Report, Center for Environmental and Economic Partnership.

8.4.5 Facility Siting

Finding an acceptable site for an organic recycling facility can be difficult, given state regulatory requirements and local zoning constraints. Even if an ideal location can be found from an operations perspective, public opposition can be significant, particularly in densely populated urban settings. Persistence and a willingness to include facility design elements above and beyond the required criteria may be needed.

8.4.6 Findings

- Organics comprise 30 percent of the MSW in New York State.
- Recycling organics has multiple benefits, including reducing the generation of GHGs, creating valuable soil amendments, creating jobs and reducing reliance on waste disposal.
- Organic materials are diverse, and there is a wide variety of technologies to recover them.
- Costs to compost or otherwise recycle organic materials vary widely, depending on the technology applied, the feedstock recycled, the cost of land, and other factors.

8.4.7 Recommendations

This Plan seeks to progressively reduce the amount of materials disposed in landfills or through MWCs. Achieving that goal necessitates an increase in the recycling of organic materials for value-added end uses like soil amendments. To maximize the environmental and social benefits of the recycling system, organic materials should be directed, where possible, to their highest and best use. (See additional recommendations in Sections 8.1 and 8.2.)

As New York State seeks to improve recycling and move *Beyond Waste*, the state and its solid waste management planning units must implement the wide range of actions listed below. Fully realizing these recommendations will require additional resources—both financial and human—at the state and local level.

8.4.7 (a) Programmatic Recommendations

- Promote and demonstrate organics recycling systems and activities within state agencies:
    - Work with DOT, OGS, DEC Operations staff, and the Office of Parks and Recreation (OPR) to increase state use of locally available compost, mulch and soil amendments as directed in EO 4.
    - Continue to work with OGS in support of its efforts to implement organic recycling programs at state agencies, with a goal of diverting all state-generated organic materials to recycling**.**
    - Work with staff at DOC to assess any obstacles to accepting food scraps from other state facilities at nearby correctional facilities with existing composting operations.

- Work with all state agencies, including the State University of New York (SUNY) system of colleges and universities, to recycle food scraps through implementation of EO 4; focus on on-site systems where possible.
- Publicize organic recycling efforts ongoing in the state via the website, ESD's Recycling Markets Database, agency publications and other communications.
- Identify interested school systems and assist them in demonstrating the advantages of on-site composting systems. Work with New York State-based Go Green Initiative participants to implement new systems.

- Use information and contacts from food scrap forums across the state to identify new opportunities for food waste generators (food processors, restaurants, and retailers) to work with processors and end users.
- Help existing facilities that compost yard trimmings, institutional organics, biosolids or on-farm organic residuals to determine the feasibility of accepting food scraps or food processing waste at their facilities. Encourage and facilitate demonstration projects at appropriate sites.
- Determine how DEC, ESD, NYSERDA**,** Agriculture and Markets, and EFC can more effectively work together to promote and expand composting and organics recycling:
  - Quantify the statewide available food scrap feedstock, and assess the current and potential capacity for managing materials at their highest value (ESD, DEC and Ag & Markets)
  - Identify and develop a database of wood waste generators and, in particular, utility supplies of waste wood, and coordinate with compost facility need (ESD, NYSERDA)
  - Allocate existing or develop new funding sources for composting and organics recycling infrastructure needs
- Continue to provide technical and regulatory assistance for entities (private and public) interested in developing small and large-scale organic recycling systems and operators interested in demonstrating the viability of incorporating food scraps into existing yard trimmings or biosolids composting facilities.
- Require planning units to more closely evaluate the remaining organic portion of their waste streams in LSWMPs and, where feasible, develop ways to recycle these materials.
- Complete a technology assessment of composting and organics recycling technologies, including technology and financing options, to aid planning units in evaluating food waste recovery systems.
- Evaluate the progress toward organics recycling in biennial state solid waste management plans and recommend additional policy approaches, including phased-in disposal prohibitions where readily available alternatives would allow for the diversion of significant amounts of food residuals from either specific sectors (institutional/commercial/industrial, for example) or from all sources, including residential.

- Evaluate and implement, where appropriate, strategies to promote the establishment of organics recycling facilities in the environmental quality review and regulatory process for other solid waste management facilities.
- Maximize the diversion of food scraps to feed animals by providing funding to a non-governmental organization to:
    - Develop and distribute written guidance on the regulatory requirements governing consumable food used for animal feed, including an outline of what food residuals are amenable to animal feed and how they can best be used
    - Work with Cooperative Extension agents to identify farms and local food sources and facilitate relationships for the productive use of food scraps
    - Hold forums across the state to disseminate information and facilitate relationships between the sources and farmers
- Work with the NERC to take full advantage of its On-Farm Compost Marketing Project, including connecting farms with NERC's technical assistance services and disseminating the Compost Marketing Toolkit.

8.4.7 (b) Regulatory Recommendations

- Restrict the disposal of recognizable quantities of yard trimmings from solid waste disposal facilities through special permit conditions or revision to the Part 360 regulations
- Review existing state regulations to remove or address contradictory regulatory requirements that limit the creation or expansion of composting and other organics recycling facilities.

8.4.7 (c) Legislative Recommendations

- Amend state law to list categories of food scraps and residuals as a designated recyclable, and phase in restrictions on the disposal of organics where sufficient infrastructure is readily available to recycle these materials
- Expand the ESD's investment authority to allow for support of anaerobic digesters and other technologies that can cost effectively convert organic residuals to biogas and other energy products in addition to generating a valuable end product.

8.5 BENEFICIAL USE DETERMINATIONS (BUDS)

A BUD is a jurisdictional designation made by DEC in regard to a material that has been used and is no longer usable for its original purpose but can be directed to an alternative use considered to be beneficial compared to disposal. Some BUDs, referred to as pre-determined BUDs, are set forth in Part 360, the state's solid waste regulations, and others are designated by DEC on a case-by-case basis. Once a material satisfies the conditions for a pre-determined BUD or DEC grants a case-specific BUD, the material ceases to be considered a solid waste (for the purposes of Part 360). Since the inception of the BUD program in 1988, DEC has reviewed more than 950 BUD petitions and granted 533 BUDs.

While not specifically identified in the solid waste management hierarchy, DEC generally considers BUDs to be preferable, by definition, to waste disposal from an overall environmental perspective because the materials generally offset the use of virgin material. While deemed as "reuse" of materials in the Part 360 regulations (i.e., The essential nature of the proposed use of the material constitutes a reuse rather than disposal), not all BUD uses are counted as recycling, particularly when they do not represent the highest and best use of a material. Some BUDs are granted for fuel-related uses or for low-value end uses, such as landfill daily cover, and the GHG and overall environmental benefits of these BUDs are not as significant as reuse or recycling a material into a new product that can be recycled or reused for its original purpose.

A BUD is not subject to State Environmental Quality Review or State Administrative Procedure Act requirements. However, DEC applies certain regulatory criteria in making these designations. The criteria include:

- Is the material intended to function or serve as an effective substitute for an analogous raw material or fuel? Is the proposal consistent with the solid waste management policy?
- Does the use of the material adversely affect human health and safety, the environment, or natural resources?
- Does a market for the proposed product or use exist?

According to DEC's annual survey, more than two-million tons of material was beneficially used in 2008. This figure includes materials used under case-specific BUDs and the pre-determined coal combustion ash BUDs; other pre-determined BUDs are not tracked or reported. Landfills in the state reported the beneficial use of an additional 2.1 million tons of materials as alternative daily cover (ADC), a predetermined BUD.

Only 3 percent of the two-million tons of BUD materials reported originated from MSW sources; the vast majority were from industrial sources (58 percent) or construction, demolition, remediation, or dredging projects (38 percent). Approximately 53 percent of the BUD materials reported were used in some form of soil or soil-like application, and 26 percent of BUD materials were used as alternative fuel. Only 36 percent of BUD materials represent recycling-related uses, while 8 percent of BUD materials are used in a landfill setting. Figures 8.2 and 8.3 below show a breakdown for case-specific BUDs by major categories of waste and by beneficial use.

Only the BUDs that represent recycling-related uses are included in the total statewide recycling rate. However, BUDs for use as ADC or alternate grading material in landfills and for alternate fuels are not. This distinction has caused confusion because BUDs have often been equated with recycling.

8.5.1 Pre-Determined BUDs

As of 2009, 16 pre-determined BUDs have been designated in the solid waste regulations. Examples of pre-determined BUDs include: compost, newspapers when used as animal bedding, tire chips when used as aggregate for road base or asphalt pavements, non-hazardous contaminated soils excavated as a part of construction and used onsite as backfill, and wastes that are approved by DEC for use as alternative daily cover at landfills.

Pre-determined BUDs provide a significant market for C&D debris materials. Current BUD regulations allow for specific uses of: unadulterated wood, wood chips and bark; uncontaminated glass; recognizable and uncontaminated soil; nonhazardous contaminated soil, and recognizable, uncontaminated concrete and concrete products, asphalt pavement, brick, glass, and rock.[68] Processed mixed C&D debris (containing wood, plastic, insulation, wallboard, etc.) may also be used as ADC at landfills if it meets certain performance criteria.

Some pre-determined BUDs are self-implementing in that the user needs no prior approval (e.g., use of newsprint as animal bedding), while others may require DEC authorization (e.g., use as ADC at a landfill). The predetermined coal ash BUDs are the only pre-determined BUDs with an annual reporting requirement.

DEC periodically reviews the list of predetermined BUDs to re-evaluate their suitability as unregulated activities. For example, in a recent review, DEC concluded that the use of coal fly ash as a feedstock for high-temperature kilns for the manufacture of cement could significantly impact air emissions, depending on the source and composition of the fly ash. Therefore, in 2009, DEC initiated a rulemaking procedure to eliminate the pre-determined BUD for this activity and instead require a case-specific BUD to ensure appropriate oversight and evaluation of individual sources of fly ash in each petition as described below.

More recently, in June 2010, EPA proposed changes to its rules regarding disposal of coal combustion residuals, or CCRs per EPA, that could impact their beneficial use. CCRs include coal combustion bottom ash and fly ash and flue-gas desulfurization (FGD) residuals. As part of its proposed rule, EPA has also requested public comment and information on the beneficial use of CCRs. DEC will review all BUDs, pre-determined or case-specific as discussed in the following section, for coal ash and FGD residuals for consistency with EPA final rule and any guidance or information that results from the final rule.

[68] In the context of DEC's C&D debris regulations, "recognizable" means readily identifiable by visual observation and "uncontaminated" means not mixed or commingled with other solid wastes and not having come into contact with spilled petroleum products, hazardous waste, or industrial waste.

8.5.2 Case-specific BUDs

In situations where a particular proposed use is not specifically identified as a pre-determined BUD, generators and potential users can petition DEC for a case-specific BUD. Unless otherwise directed by DEC, a case-specific BUD petition must include a physical and chemical characterization of the solid waste and the proposed product, a demonstration that there is a known or probable use or market, and a solid waste control plan. Following a review of the petition, DEC determines whether the proposed use constitutes a beneficial use based on a showing that all regulatory criteria have been met. For example, a petition that seeks a BUD for substitution of a waste material for a raw material in a manufacturing process will be evaluated to determine whether the proposed use is a legitimate substitution or whether the predominant nature of the use is comparable to disposal. If a BUD involves the use of materials in place of soil, DEC may reference test results, where appropriate, for consistency with the recently-promulgated 6 NYCRR Part 375 soil cleanup objectives. The number of case-specific BUDs, by waste stream and by beneficial use, are found in Figures 8.2 and 8.3.

Generally, case-specific BUDs are for waste material used as:

- A substitute for a component material in the manufacture of a product
- A substitute for a commercial product
- An alternative fuel

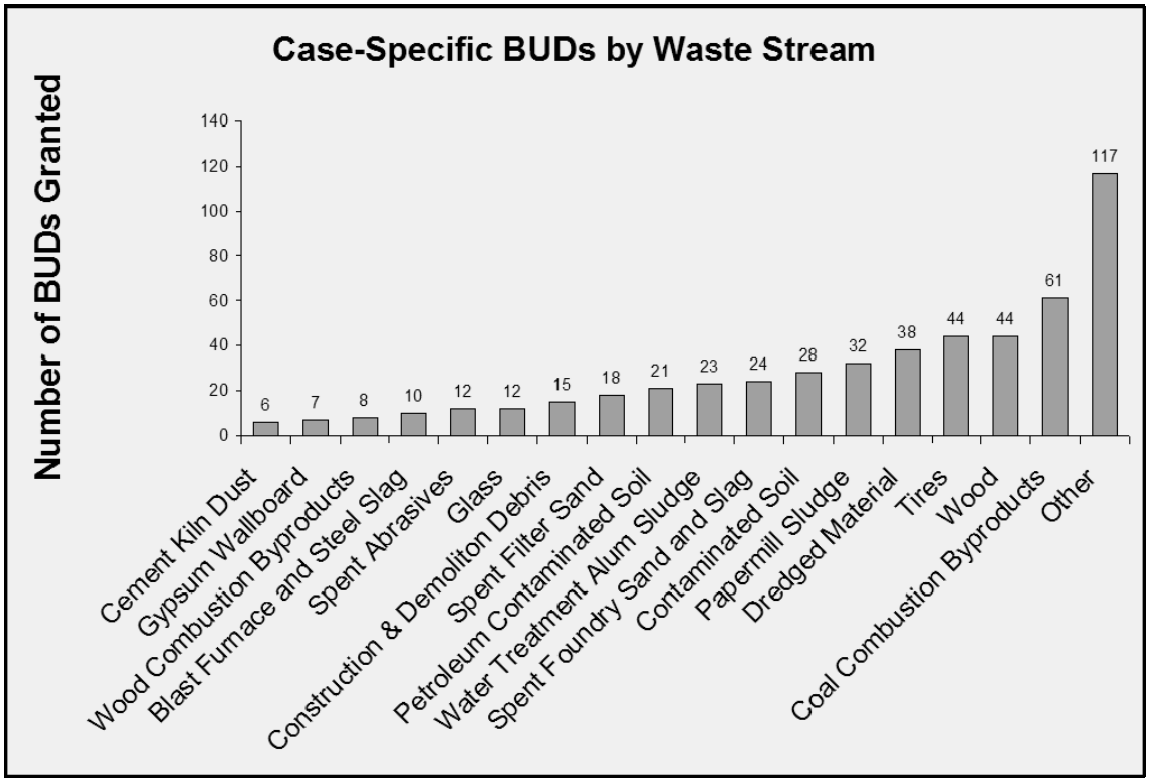
Some examples of case-specific BUDs that have been granted include the use of:

- Dried paper mill sludge as animal bedding and poultry litter
- Foundry sand as an aggregate in the production of concrete and as construction fill material
- Tire chips in civil engineering applications such as construction fill
- Non-recyclable waxed cardboard as an alternative fuel

Most case-specific BUDs require the user to perform periodic tests to reaffirm the physical and chemical characterization of the material and the product. DEC always reserves the right to revoke a case-specific BUD based on non-compliance with conditions on which the BUD was based or if new information points to the potential for an adverse effect. Facility inspections or follow up with generators or end users may also reveal the need to revoke a BUD.

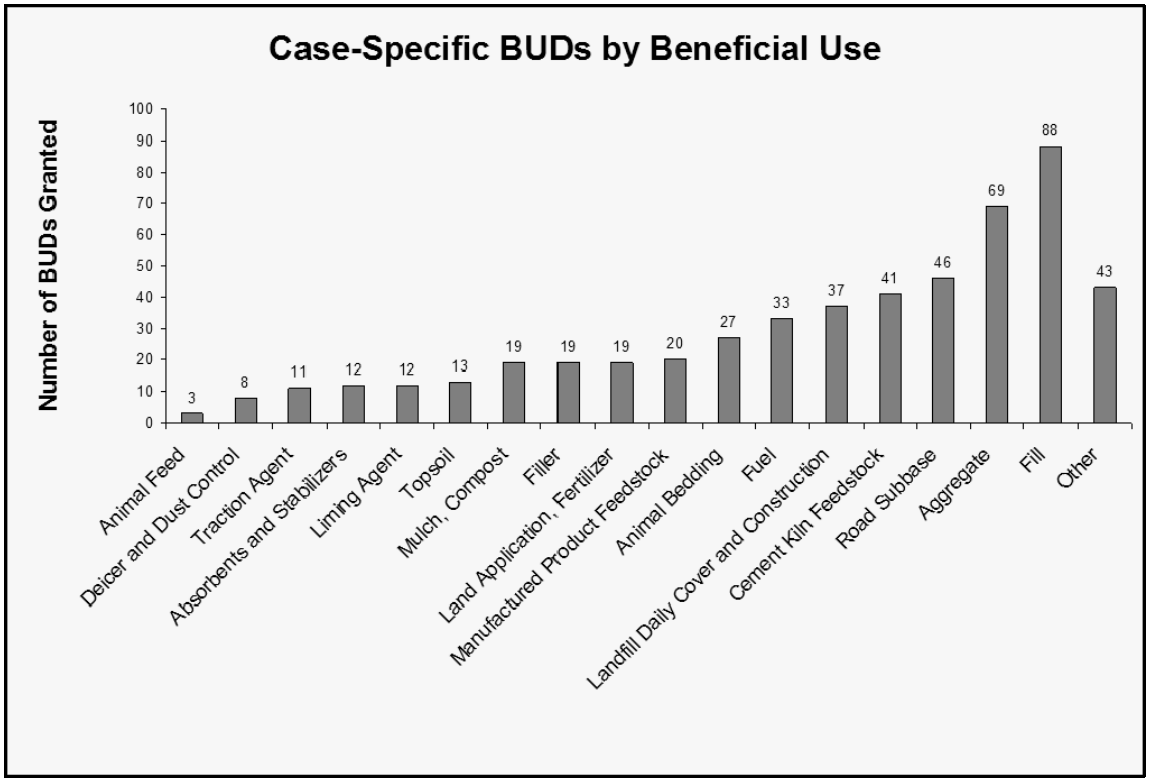
8.5.3 BUD Data and Trends

FIGURE 8.2



Note: "Other" includes miscellaneous byproducts from manufacturing or refining processes, such as spent catalysts or dusts; asphalt shingles; ceramics; food scraps; yard trimmings, and non-recyclable paper and plastic. Individually, each of these miscellaneous materials constitute less than five percent of the case-specific BUDs total. Some solid wastes granted case-specific BUDs prior to the 1993 version of Part 360 (e.g., certain uses of coal ash) have been subsequently addressed in regulation as pre-determined BUDs.

FIGURE 8.3



Note: "Other" includes various specific applications such as the construction of barnyard pads, track surfaces and tire walls and use as abrasives.

8.5.4 Toxics Along for the Ride

"Toxics along for the ride" (TARs), as termed by EPA, is one of four factors used by EPA to determine when recycling of hazardous secondary materials is legitimate. TARs refers to concentrations of hazardous constituents, such as mercury, lead, or other materials that are present in solid wastes proposed as effective substitutes for conventional raw materials or products but that are not essential to, normally part of or positively contributing to the material's beneficial use. However, it is important to note that the mere detection of such constituents does not disqualify a material from beneficial use.

EPA provided guidance on this issue in the December 2008 regulation defining solid waste (40 CFR Parts 260, 261 and 270) for the hazardous waste program. This guidance is intended to avoid "sham recycling" where users of secondary materials incorporate hazardous constituents into a product to avoid proper hazardous waste disposal. DEC has adopted the "TARs factor" concept for use in its solid waste BUD program. When evaluating a BUD, toxic constituents must be identified and compared to those found in analogous products or feedstocks. If the BUD material contains toxic constituents that are not present in analogous feedstocks or if the product contains toxics in greater concentrations than analogous products, DEC will determine on a case-by-case basis whether the difference in concentration is significant based on the facts of the activity. This is consistent with

EPA's approach, which considers the relevant principles and facts under which a specific proposal is analyzed.

In most cases, if the level of hazardous constituents in the BUD product or feedstock is significantly greater than the analogous product or feedstock, it should not be considered a legitimate application. However, in certain circumstances, the BUD can be considered legitimate even if there are "toxics along for the ride." The factors that should be evaluated in this case include whether the BUD materials are likely to be released into the environment or damage human health and the environment, and whether the BUD material provides value or contributes to the effectiveness of the material.

DEC follows EPA guidance to carefully evaluate BUDs to place limits on the concentration or mass loading of hazardous constituents to deter sham recycling and to avoid adverse effects to human health and safety and the environment.

The December 2006 revision to 6 NYCRR Part 375, "Environmental Remediation Programs," contains soil cleanup objectives (SCOs) which vary depending on the proposed use of the property being remediated. These SCOs do not directly apply to the BUD program but can be used as benchmarks where appropriate to measure the impact from chemical constituents in waste soils and dredged material and have proven to be a helpful tool in evaluating BUD petitions. DEC is required by statute to update the Part 375 soil cleanup objectives every five years.

8.5.5 Upland Management of Navigational Dredged Material

Dredging of harbors and waterways is necessary to provide the proper channel depth for navigation, which allows transportation and commercial shipping on New York State waterways. Disposal of dredged material in upland areas (i.e., areas that are not in water and are not considered part of the riparian zone) is subject to the disposal requirements of Part 360, unless used beneficially (e.g., in place of commercial fill, aggregate, or topsoil). The cost of properly managing dredge spoils is a major impediment to dredging projects. Contaminants of concern in dredged material include a variety of organic chemicals and heavy metals, petroleum compounds and lead and mercury. Pesticide residues may persist from agricultural runoff into waterways, and industrial discharges have contributed polychlorinated biphenyls (PCBs), dioxins and furans in certain locations.

BUDs for dredged material are granted on a case-specific basis, though efforts continue to develop policies and regulations to streamline reviews. Sandy, gravelly sediments, for example, seldom contain significant contamination. The 2010 proposed revisions to Part 360 will include pre-determined BUDs for use of dredged material comprising sand and gravel and specific procedures for petitioning for case-specific dredged material BUDs.

The most significant volumes of navigational dredged materials are generated in the New York/New Jersey Harbor, where an estimated four-million cubic yards of material must be dredged annually to properly maintain channels. Currently, much of this material is not beneficially used locally and is exported, instead, by rail for use or disposal elsewhere. Lakes Ontario and Erie also require significant channel maintenance. Inland, major rivers and the New York State Barge Canal are maintained through periodic dredging, and innumerable lakes, ponds, and private marinas are

dredged for commercial shipping, recreational boating or aesthetic purposes. In-water disposal of dredged material, including once-common ocean disposal, has become severely restricted. Much dredged material is placed in shoreline (riparian) disposal sites in accordance with state or federal dredging permits.

More widespread beneficial use of dredged materials, where environmentally safe, would alleviate the strain on disposal capacity in these riparian sites and landfills and, in many instances, foster more timely maintenance of waterways. Careful planning of future shoreline development and siting of new facilities such as marinas or structures such as seawalls and piers could anticipate the natural movement and deposition of sediments and reduce the frequency and volume of maintenance dredging.

DEC has participated in various interstate and international groups such as the New York Dredge Team (with the US Army Corps of Engineers, New Jersey Department of Environmental Protection, EPA) and the Great Lakes Dredge Team, affiliated with the Great Lakes Commission. Within DEC, the Division of Solid and Hazardous Materials (DSHM) works with the divisions of Water (DOW), Environmental Permits (DEP), Environmental Remediation (DER), and Fish, Wildlife & Marine Resources (DFWMR) in reviewing significant projects and the ongoing development of guidelines and procedures. Involvement with these entities, both inside and outside DEC, gives the department access to progressing science with regard to sediment and dredged material, including treatment technologies for contamination that could allow for more widespread beneficial use.

8.5.6 Fill

Use of excavated soil from one construction site as fill at another project site is a common beneficial use and is addressed by several pre-determined BUDs or, where appropriate, by case-specific BUDs for excavated soils from historic fill areas. For more on historic fill, see Section 7.3.4.

8.5.7 Crushed Container Glass

Municipal and private MRFs collect many tons annually of returnable and recyclable glass containers. Traditionally, the crushed-glass cullet has been sold for container re-manufacture, but glass containers are in decline and the markets that remain have strict specifications that many MRFs cannot meet due to contamination. (For more on glass issues, see Section 8.3.8.) As a result, more recyclers are turning to BUDs to market their mixed-color glass.

ESD has invested in many glass BUD projects and is supporting higher-value beneficial uses for glass, including as stormwater runoff drainage material and as a sand blast medium.

One of the pre-determined BUDs allows use of uncontaminated glass as a substitute for conventional aggregate in asphalt or sub-grade applications. Contaminants include metal rings, paper labels, plastic caps, ceramics, non-container glass or other solid wastes, soil, or excessive food residues.

8.5.8 Biofuels

Interest in, and production of, biodiesel from waste cooking oils and grease has greatly increased statewide. While handling and transfer of waste cooking oils and greases or other biomass may require permitting under Part 360, some producers of these biofuels operate under the "manufacturing exemption" definition of solid waste. NYSERDA has worked with DEC in advising biofuel producers of approvals needed to ensure safe and environmentally protective operations.

As the practice grows in popularity and as other materials are proposed, solid waste regulation may be needed for many biofuel producers to ensure the protection of environmental quality, though other environmental regulations for chemical bulk storage or air quality may also apply. The 2010 proposed revisions to Part 360 would clarify the status of certain biofuel processes. For example, the proposed regulations will clarify that gasification, plasma arc and pyrolysis facilities for the purpose of producing fuels from MSW are regulated as MWCs and not considered exempt or BUD activities.

8.5.9 Agricultural Uses

DEC has experienced an increase in the last several years in BUD petitions to use alternatives to traditional materials in agriculture, especially in upstate New York. Paper mill sludge, when thermally dried or mixed with lime to absorb water, has proven a successful bedding material for cattle in place of traditional sawdust. Spent paper mill sludge bedding can be land applied, usually onsite at the farm, contributing to soil nutrients. Wood products from furniture makers have also been put to use as animal bedding on farms.

Soils in many areas of New York State may require regular application of lime to raise pH for improved crop growth, and DEC has granted BUDs for alternatives such as coal ash or cement kiln dust (CKD) on a case-specific basis. An evaluation of background soil concentrations and careful limits on trace heavy metals in ash or CKD are necessary to prevent the accumulation of heavy metals in soils.

8.5.10 Access to Markets

The logistics of developing and accessing markets and generating marketable quantities of BUD material continue to hamper beneficial use. Many approved uses never materialize due to a failure to match the generator with end users. In addition to testing requirements that are intended to protect public health and the environment, BUD petitioners are required to demonstrate a market. However, unforeseen circumstances can prevent actual use of waste materials. Industry groups continue to help in this area by sponsoring clearinghouses for available materials. Interstate groups such as the NEWMOA sponsor databases concerning BUDs or equivalent approvals by member states to facilitate beneficial use of various byproducts and wastes.

8.5.11 Relationship of BUDs to Recycling Rate

When DEC calculates New York State's total recycling rate, it includes certain C&D and industrial BUD materials based on a review of the applications and reports that are submitted. Generally, uses that involve substitution for another material, such as mixed color glass or chipped tires that are used in place of virgin aggregate or wood chips used in landscaping, are counted toward the state's total recycling rate. However, BUD materials that are used in fuel-related applications or as ADC, alternative grading material, or temporary roadways at landfills are not included in the total recycling rate calculation. Virtually no BUD materials are counted toward the MSW recycling rate.

8.5.12 Findings

A tremendous amount of solid waste–more than 4 million tons in 2008—is put to use through implementation of DEC's BUD program. However, DEC needs to update the regulations and develop policy to divert even more material to productive use and provide more clarity on how DEC views the beneficial use of waste materials as a fuel, as fill, and in landfill-related uses (e.g., ADC and grading materials) in the context of proper solid waste management.

8.5.13 Recommendations

8.5.13 (a) Programmatic Recommendations

- Develop a DSHM policy regarding appropriate use of 6 NYCRR Part 375 soil cleanup objectives in the review of waste soils and soil-like materials for beneficial use in topsoil and fill
- Make additional BUD records directly accessible through the DEC website
- Develop memoranda of understanding (MOUs) with other divisions or agencies as needed to streamline BUD procedures or establish standards for beneficially used materials
- Expand beneficial use applications for mixed color recovered glass by conducting pilot projects to demonstrate acceptability of glass as a filter medium under DEC DOW's *New York State Stormwater Design Manual*, and also acceptance by DOH for use in residential septic systems. Funding for pilot projects will be sought from development authorities, EPA, or other sources.
- Encourage the use of BUD materials, particularly mixed-color recovered glass and tire-derived rubber, through the implementation of the green procurement requirements of EO4 (See www.state.ny.us/governor/executive_orders/exeorders/eo_4.html.)

8.5.13 (b) Regulatory Recommendations

- Include the following changes in the 2010 proposed Part 360 revisions:
    - Remove certain pre-determined BUDs

- Establish additional pre-determined BUDs, especially for use of cooking oil for biodiesel, use of foundry by-products in concrete, and use of clean dredged materials as aggregate
- Authorize DEC to issue additional pre-determined BUDs or rescind an existing predetermined BUD without requiring an amendment to Part 360. This is intended to transition case specific BUDs to predetermined BUDs without needing to change Part 360. Eliminate those that are no longer appropriate
- Create recordkeeping and recording categories for BUDs that provide clarity with regard to those that are considered recycling and those that are not (e.g., fuel-related and landfill-related uses).
- Include new regulations on historic fill and additional operational conditions for its use that protect neighboring areas, particularly in communities of disproportionate impact.

9. DISPOSAL

"WASTE NOT, WANT NOT." *Anonymous*

While significant strides have been made by the state and its communities, businesses and residents to increase recycling and reduce waste, the data indicate that there is still much room for improvement. Twenty years after the state adopted a solid waste management hierarchy that places waste prevention, reuse and recycling ahead of disposal, nearly 65 percent of waste managed in the state and approximately 80 percent of MSW ends up in disposal facilities. (See Table 9.1; for a description of each stream, see Section 7; for a discussion of the data that support these figures, see Section 8.3.1.)

TABLE 9.1 WASTE DISPOSAL IN NYS

	MSW		Industrial		C&D		Biosolids		Total	
	Million Tons	%	Million Tons	%	Million Tons	%	Million Tons	%	Million Tons	%
Landfill-Waste	6.7	43	1.6	73	2.9	48	0.3	33	11.5	46
Landfill-ADC	0.2	0.1	0.5	23	1.6	26	<0.1	1.0	2.3	9
Combustion	2.8	18	0.1	4.0	<.01	0	0.4	44	3.3	13
Export for Disposal	6.0	39	<0.1	0	1.6	26	0.2	22	7.9	32
Total	*15.7*	*100*	*2.2*	*100*	*6.1*	*100*	*0.9*	*100*	*25*	*100*

While this Plan details a set of strategies to achieve substantial reductions in waste disposal and increase reuse and recycling, when these strategies are implemented, there will still be residual wastes requiring disposal. This section describes the various disposal methods and facilities used by New York State's communities and the network of transfer stations that consolidate waste for disposal. The analysis provided here is based on environmental characteristics alone and does not address economic, contractual or planning issues that communities in New York must consider when evaluating an appropriate disposal method for residual waste.

DEC estimates presented in this section are based on data provided in solid waste management facility annual reports for amounts of waste handled by the following three primary management methods—municipal waste combustion (MWC), landfilling and export.

These estimates include imported waste that is managed by facilities in New York State; the amount exported for disposal in Table 9.1 includes the amounts reported by transfer stations that export waste, as well as an adjustment of approximately 1.3 million tons based on importing states' data. The amount combusted has been adjusted downward from 3.9 million tons to account for the

amount of ash generated. Each of these waste management methods will be explored individually and in more detail later in this section.

Although DEC includes MWC as a "disposal" method because it is a strategy to be employed after waste prevention, reuse and recycling have been maximized, MWC is in fact one part of a treatment and disposal process. After energy is recovered from waste through combustion, metals are recovered and the residual ash is landfilled, either directly or beneficially used as ADC. The Part 360 regulations provide opportunities for facility operators to propose other, more productive uses of the ash.

Landfilling, as used in this section, refers to in-state land disposal of solid waste regardless of whether it was generated in or out of state, while export includes all out of state disposal (landfill or MWC) of waste generated within New York State.

9.1 TRANSFER AND PROCESSING PRIOR TO DISPOSAL

Disposal facilities in the state receive waste from local collection and are also fed by a network of transfer stations and C&D debris processing facilities that collect, consolidate, store, process and/or transfer waste in preparation for transport to disposal. Solid waste transfer stations are subject to either the permitting or registration requirements of Part 360. C&D debris processing facilities are subject to either the permitting, registration or exemption provisions of Part 360, depending on the size of the facility and other factors.

In 2008, there were approximately 165 permitted transfer stations in New York State that collectively managed about 11.6 million tons of waste. About half of these facilities are located in the downstate area (DEC regions 1, 2 and 3) as shown in Figure 9.1. Permitted transfer stations can only receive residential, commercial and institutional waste unless otherwise approved by DEC.

Many transfer stations are located in densely populated areas and particularly in a few communities of disproportionate impact, also known as environmental justice communities. The nature of their operations often burdens the host community with noise, odors and truck traffic. Transfer station location is primarily determined by local land use and environmental policy, with the Part 360 regulations prohibiting the siting of these facilities in certain environmentally sensitive areas.

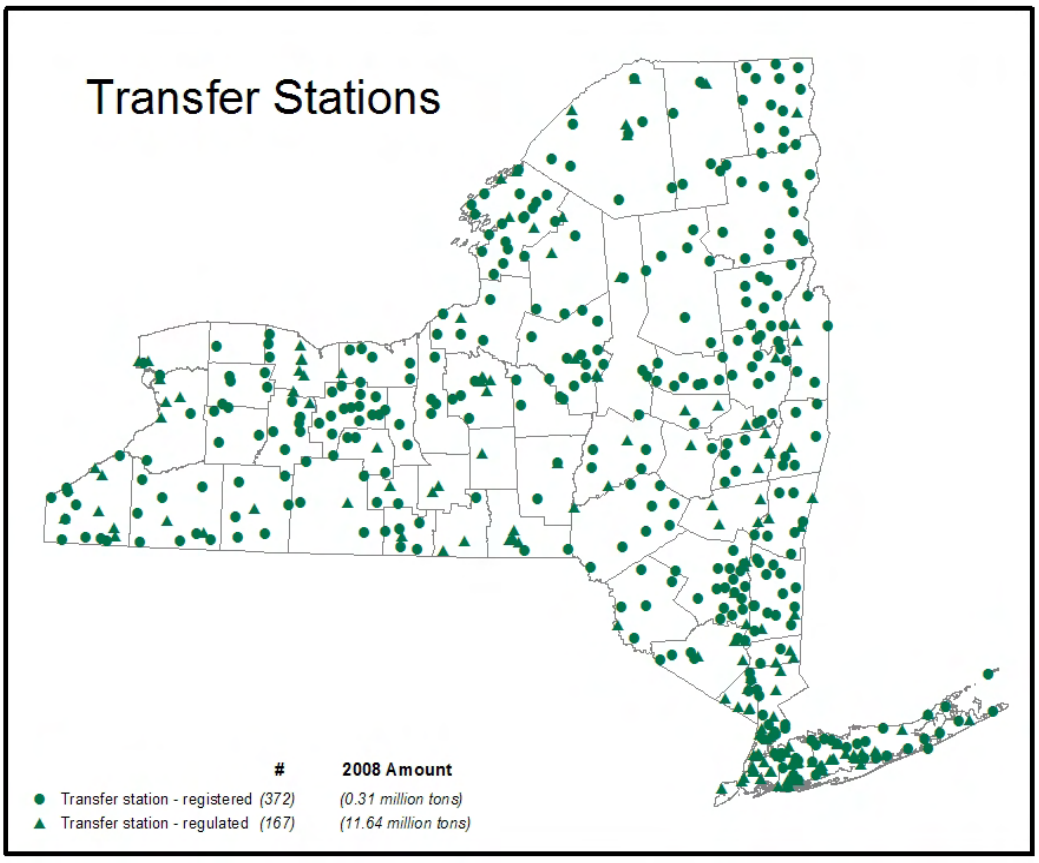
For example, the clustering of transfer stations in New York City's communities of disproportionate impact resulted from two key factors—a policy decision by the city about its tipping fees and the city's existing zoning requirements. In the late 1980s, New York City raised the tipping fee for commercial waste at its marine transfer stations and at the Fresh Kills Landfill in an effort to extend the life of the landfill and encourage commercial waste carters to find other disposal outlets. The private sector responded to this change by developing land-based transfer stations to export commercial waste. To comply with local zoning requirements, those transfer stations needed to be in manufacturing zones which, in the city, either include or surround communities of disproportionate impact.

Because land use is a local decision, DEC's Part 360 regulations do not affect or supersede local zoning requirements. DEC's siting restrictions primarily focus on environmental concerns and

operational requirements rather than proximity to residences, although they are intended to protect public health. Significant environmental impacts, including siting issues, are addressed in the State Environmental Quality Review (SEQR) process, with DEC's Environmental Justice policy and enforcement efforts also playing a role in avoiding environmental and public health impacts of facility clusters.

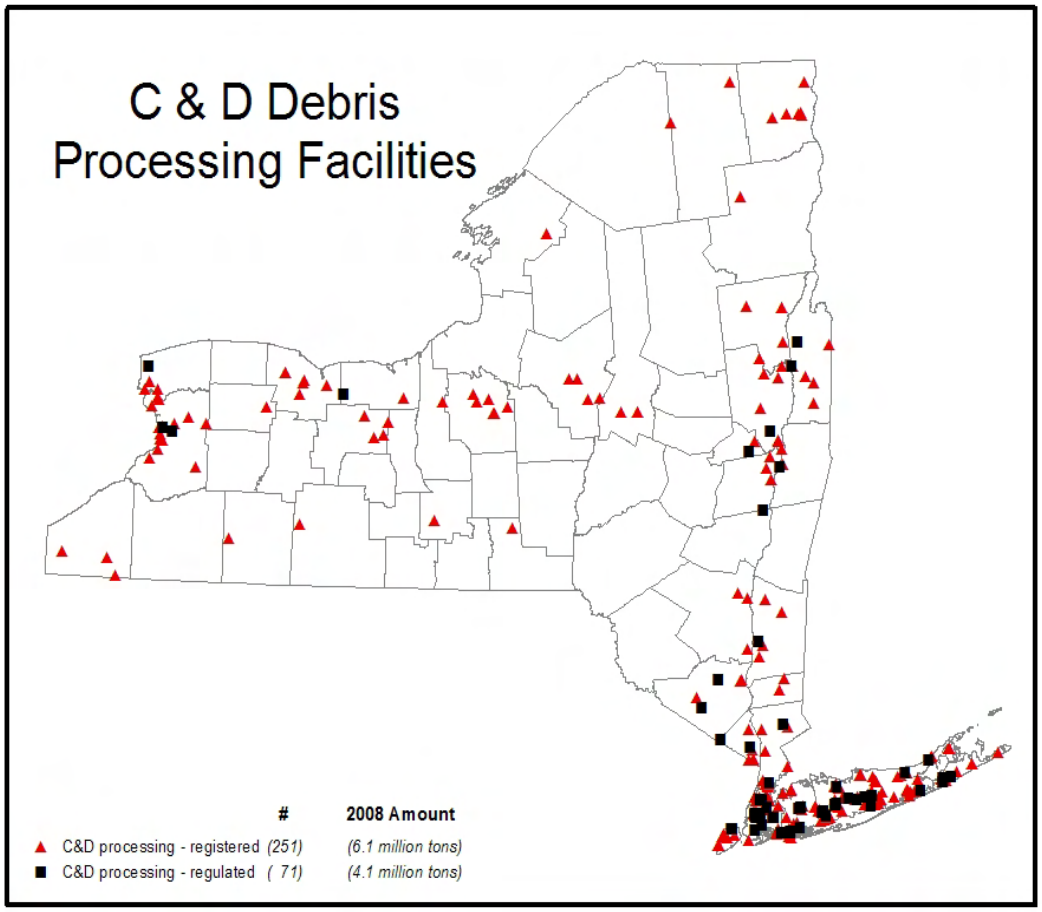
In addition to the facilities required to obtain permits, in 2008 there were also approximately 370 registered transfer stations that collectively managed more than 310,000 tons of waste. Registered transfer stations must be owned or operated by or on behalf of a municipality and receive less than 12,500 tons of solid waste annually. They are fairly evenly distributed throughout the state with the exception of the New York City area where there are very few.

FIGURE 9.1 – SOLID WASTE TRANSFER STATIONS IN NYS



Another 71 facilities had permits to process C&D debris in New York State in 2008. As depicted in Figure 9.2, nearly 75 percent of them were in DEC regions 1 and 2. Facilities clustered in a few New York City communities managed 68 percent of the C&D processed in the state with another 25 percent processed on Long Island. These permitted processors managed more than 4.1 million tons of C&D in 2008. There were also about 250 registered C&D debris processing facilities which managed approximately 6.1 million tons of material. Registered C&D processors can receive only recognizable, uncontaminated concrete and masonry waste, asphalt pavement, brick, soil, and rock or uncontaminated and unadulterated wood. Facilities that receive and process only land-clearing debris are exempt from DEC regulation.

FIGURE 9.2 – C&D DEBRIS PROCESSING FACILITIES IN NYS



9.2 DISPOSAL CAPACITY OVERVIEW

DEC estimates that in 2008, approximately 11.5 million tons of solid waste were landfilled, 2.3 million tons were used as ADC, 3.3 million tons were combusted, and 8 million tons were exported for disposal, for a total of about 25 million tons disposed as presented in Table 9.1.[69] The capacity of each of the state's disposal facilities is presented in Table 9.2.

If the state continues to dispose of waste at the same rates it did in 2008, and all MWC facilities continue to accept waste at the same rate, the remaining disposal capacity in the state can be equated—for illustrative and planning purposes—to an overall average of about 21 to 25 years of remaining, approved landfill site life. However, three significant variables can impact disposal capacity projections. They are:

1. Facilities dedicated to specific planning units or regions: About ten of the MSW landfills and one MWC facility are operated by public agencies or authorities that essentially serve only the constituents within their planning units. They provide some degree of integrated solid waste management and some have flow control laws to support their self-sufficient systems. These facilities generally have ample capacity for the waste within their jurisdictions (ranging from 1 to 106 years); however, they would not be expected to provide disposal capacity for the rest of the state. Excluding those facilities from the state's overall available capacity and the amount of waste they have typically taken in from the total amount of waste generated would cut the remaining 20 to 25 years of remained approved site life to about 14-18 years for the rest of the state's communities. (See Table 9.10.)
2. Export restrictions: If policies are put in place or significant economic or market shifts occur that restrict waste export, the remaining landfill site life at New York State's facilities could be reduced by as much as one-third—to approximately 9-12 years statewide. This could increase to 15-18 years if facilities dedicated to specific service areas lifted their restrictions.
3. Increased diversion: If the state is successful in moving *Beyond Waste* and achieving the goals of this Plan, the useful life of existing landfills could be extended significantly unless waste imports also increased dramatically.

[69] To eliminate double counting, DEC made the following adjustments to the disposal data reported in the MWC, Landfill and Export sections: MSW ash is included in the amount landfilled and removed from the amount combusted; combusted biosolids are included; and imported waste is included.

Table 9.2: Landfills and MWCs in New York State

Name	Activity Number	County	2008 Waste Quantity (tons per year)	Existing Annual Permit Limits (tons per year)	Existing & Entitled Capacity Under Permit (tons)	Proposed Capacity Not Under Permit (tons)
Landfill - municipal solid waste						
Albany Rapp Road Landfill	01S02	Albany	239,785	275,100	478,351	4,214,552
Allegany County Landfill	02S15	Allegany	50,490	56,680	249,600	
Allied Waste Niagara Falls Landfill	32S11	Niagara	508,759	800,000	9,242,609	
Auburn Landfill No. 2	06S14	Cayuga	72,014	96,000	761,301	
Bristol Hill Sanitary Landfill	38S14	Oswego	39,165	100,000	3,352,607	
Broome County Landfill	04S07	Broome	187,000	232,000	10,554,066	
Chaffee Landfill	15S14	Erie	385,570	600,000	6,084,000	
Chautauqua Landfill	07S12	Chautauqua	262,877	408,000	2,243,724	
Chemung County Sanitary Landfill	08S02	Chemung	118,356	120,000	1,243,383	
Chenango County Landfill	09S16	Chenango	26,184	41,550	1,104,009	
Clinton County Landfill	10S20	Clinton	170,237	175,000	7,644,201	
Colonie (T) Sanitary Landfill	01S26	Albany	164,083	170,500	4,004,593	
Cortland County Landfill Westside Extension	12S10	Cortland	22,676	44,500	709,513	
Delaware County SWM Facility	13S18	Delaware	19,337	52,800	508,111	
DANC Landfill	23S13	Jefferson	272,591	346,320	3,505,060	
Franklin County Regional Landfill	17S21	Franklin	51,509	125,000	574,861	
Fulton County Landfill	18S20	Fulton	86,873	134,000	9,450,845	
High Acres Western Expansion Landfill	28S32	Monroe	765,157	1,074,500	44,400,000	

Hyland Landfill	02S17	Allegany	279,739	312,000	7,708,367	
Madison County WS Extension Landfill	27S15	Madison	49,738	61,000	7,769,992	
Mill Seat Sanitary Landfill	28S31	Monroe	554,322	598,650	6,893,846	
Modern Landfill	32S30	Niagara	786,889	815,000	22,140,000	
OHSWA Landfill	33S15	Oneida	253,261	312,000	21,388,497	
Ontario County Sanitary Landfill	35S11	Ontario	673,483	1,200,000	7,349,795	
Seneca Meadows Landfill	50S08	Seneca	1,750,079	1,866,000	37,611,560	
Steuben Sanitary Landfill	51S21	Steuben	105,477	151,000	2,422,279	
Sullivan County Landfill	53S03	Sullivan	62,795	226,000	140,130	4,988,032
Subtotals:			**7,958,445**	**10,393,600**	**219,535,298**	**9,202,584**
Waste Combustion - MSW MWC						
Babylon Resource Recovery Facility	52E13	Suffolk	219,899	273,750		
Covanta Niagara	32E01	Niagara	801,016	821,250		
Dutchess County Resource Recovery Agency	14E01	Dutchess	142,844	166,440		
Hempstead Resource Recovery Facility	30E06	Nassau	969,328	975,000		
Huntington Resource Recovery Facility	52E15	Suffolk	336,280	350,400		
MacArthur Resource Recovery Facility	52E10	Suffolk	172,361	177,025		
Onondaga County Resource Recovery Facility	34E01	Onondaga	348,613	361,350		
Oswego County Energy Recovery Facility	38E01	Oswego	62,424	73,000		
Wheelabrator Hudson Falls	58E01	Washington	170,328	152,500		
Wheelabrator Westchester	60E01	Westchester	692,923	674,730		
Subtotals:			**3,916,016**	**4,013,445**		
Totals:			**11,874,462**	**14,407,045**	**219,535,298**	**9,202,584**

9.3 MUNICIPAL WASTE COMBUSTORS (MWCS)

The third order of preference in the solid waste management hierarchy is "to recover, in an environmentally acceptable manner, energy from solid waste that cannot be economically and technically reused or recycled." Thus, the law states a preference for MWCs that generate energy, also known as waste-to-energy (WTE) or energy-from-waste (EFW) facilities, rather than landfills for the management of residual solid waste that still requires disposal after waste reduction, reuse, and source separation of recyclable materials. In 2008, combustors managed approximately 14 percent of New York State's MSW and about 8 percent of all materials and waste (including MSW, C&D debris, industrial waste, and biosolids).

Recent research and analysis supports the hierarchy that exists in statute, as discussed more fully in other sections of this Plan, in which waste prevention and reuse/recycling maintain the top two positions and MWC and land disposal occupy the bottom positions. This recognizes that waste prevention, reuse and recycling offer greater energy conservation, GHG reduction and other environmental benefits than either disposal option.

The 1987 Plan anticipated a network of 37 MWC facilities across the state that were in the planning, construction, or operational stage at the time. For many reasons described later in this section, this projected development did not fully materialize, and only 10 MWCs are currently operating in the state. However, the 1987 Plan goal of phasing out incineration of MSW without energy recovery was accomplished. The four major MSW incinerators operating at that time—one in Huntington and three in New York City—as well as the estimated 4,300 smaller incinerators serving apartment houses, schools, supermarkets, etc. have long been shut down.

Modern MWCs reduce the amount of waste requiring disposal and also produce energy (about 585 kWh per ton) using specially designed furnaces equipped with the requisite air pollution control equipment necessary to comply with today's rigorous air emissions standards. The process reduces incoming, uncompacted solid waste volume and weight by 90 percent and 75 percent, respectively, with the ash residue disposed in lined landfills. In 2008, MWCs supplied approximately 1.8 million megawatt hours of electricity to the state's electrical grid— less than 1.4 percent of the state's electricity needs or enough electricity to provide power to more than 175,000 households for one year. In addition, two MWCs in the state also generated and sold nearly three billion pounds of steam to local industry—enough to produce sufficient electricity for another 10,000 homes. In Europe, MWCs are reaching even greater levels of energy value by increased efficiency and incorporating existing district heating systems which distribute excess steam or hot water to multiple buildings for space and hot water heating. Such efficiency upgrades and district heating systems are now being considered at proposed facilities in North America.

MWCs can also be designed to capture and recover metals that are not diverted by source separation. In 2008, post-combustion magnetic separation (processing ash using screens and magnetic separators to remove any remaining metal) recovered more than 95,000 tons of ferrous metals for recycling, or approximately 2.4 percent of the incoming waste stream. Two MWCs in the state also separate and collect non-ferrous metals using Eddy current technology.

Although the 1972 EQBA provided funding for several of the MWCs in New York State, the growth of MWC was hampered in the late 1980s and into the 1990s in the state and nationally by a combination of legal, economic, environmental, and environmental justice issues. The most recently constructed MWC facility in New York State, in Onondaga County, received its permit to construct in 1992. Strong environmental group and community opposition to MWCs created significant political barriers to further development. In the less populated areas of the state, MWC also faces some practical barriers because it is more capital intensive to develop and operate than landfills and, therefore, has difficulty competing with existing landfills that have ample capacity and low tip fees. Uncertainty on the viability of flow control may have also curtailed development by making it difficult to guarantee the necessary throughput to cover debt service and operating costs. That uncertainty was partially resolved in a 2007 Supreme Court ruling on flow control. (See Appendix D.)

More MWCs were developed in the higher population density areas of the state such as Long Island and Westchester County than in any other part of the state, in large part because of economic and statutory differences. (For the locations of MWCs in the state, see Figure 9.4.) In 1983, the Long Island Landfill Law restricted development and ultimately required closure of existing MSW landfills to protect Long Island's drinking water supply, leaving its towns and cities to choose between MWC (usually with local ash landfills) and long-haul to mostly out-of-state landfills for disposal of the waste remaining after waste reduction, reuse, recycling and composting. While the four MWCs in operation on Long Island process more than 1.6 million tons per year, many towns and cities still rely on long-haul disposal, with another 1.6 million tons of waste per year exported off Long Island to MWCs and landfills.

Table 9.3 lists the operating MWC facilities in New York State and shows their statistics for 2008. The 10 MWC facilities operating in the state received about 3.9 million tons of solid waste in 2008, about 434,000 tons of which (or 11 percent of the total combusted) was imported. MSW represented about 97 percent of the waste combusted at these facilities, with the remaining 3 percent made up primarily of industrial waste with a small amount of C&D debris. About 95,470 tons (about 2.4 percent) represented scrap metal that was recovered for recycling.

These facilities are regulated by Part 360 solid waste regulations, by DEC's Division of Air Resources and federal government regulations. In addition to the general requirements for all solid waste management facilities, "solid waste incinerators or refuse-derived processing facilities or solid waste pyrolysis units" are subject to facility-specific requirements, including: detailed plans and specifications for construction, operation, maintenance and eventual closure of the facility; personnel and staffing; emergency preparedness and prevention; staff training, and ash residue testing and disposal.

In addition to the ten MWC facilities which recover energy from waste, a number of combustors in the state burn a total of 443,000 tons of biosolids from wastewater treatment facilities without recovering energy.

TABLE 9.3 2008 MWC SUMMARY REPORT

Facility Name (DEC Permit)	MSW Received (tons)	MSW Processed (tons)*	MSW By-passed (tons)	Ash Residue Produced (tons)	Electricity (megawatt hours)	Ferrous Metals Recovered (tons)	Steam Sold (thousand pounds)	Part 360 Permit Expiration
Babylon RRF***	219,899	219,722	14,298	55,190	101,976	3,693		08/06/2014
Hempstead RRF	969,328	964,727	291	230,375	566,701	19,676		06/30/2015
Huntington RRF	336,280	331,505	33	87,306	189,082	4,559		04/04/2011
MacArthur RRF (Islip)	172,361	162,437	12,177**	60,213	53,215	6,598		11/04/2009 (renewal under review)
Dutchess County RRA****	142,844	143,618	162	44,010	44,201	5,704		09/13/2011
Wheelabrator Westchester	692,923	690,184		179,298	378,340	18,049		04/11/2012
Wheelabrator Hudson Falls	170,328	170,995	27	52,450	82,584	4,098		07/27/2020
Onondaga County RRF	348,613	348,263	18	88,726	219,491	11,775		11/16/2011
Oswego County ERF*****	62,424	61,889	535	24,251	3,637		153,437	07/28/2014
Covanta Niagara	801,016	797,609	8,173	197,537	217,345	21,318	2,829,362	03/31/2015
Total	**3,916,016**	**3,890,949**	**35,713**	**1,019,357**	**1,856,572**	**95,470**	**2,982,799**	

Source: Data reported to DEC. * MSW processed can exceed MSW received because waste may have been received in the prior year.
**** MSW received exceeded the annual permit capacity; excess waste is exported.**
****RRF: Resource Recovery Facility** ******RRA: Resource Recovery Agency**
*****ERF: Energy Recovery Facility**

Strong public concern for environmental protection, expanded state and federal regulatory programs, and improved MWC technologies have led to enhanced operational efficiencies and significantly reduced emissions from MWCs during the past 20 years. While high costs and lack of community support may limit the development of new MWCs and other thermal technologies, when properly designed and operated, MWC is the preferable method of disposal of waste that remains after waste prevention, reuse, recycling and composting programs have been maximized. These facilities also produce energy, which represents a small contribution to meet the demand for electricity and efforts to reduce New York State's dependence on fossil fuels.

9.3.1 Energy Generation

While more energy is conserved by reducing waste and reusing and recycling materials than is generated by combusting them, an MWC will generate energy from the waste that remains for disposal. An MWC can offer both electricity and steam for consumer use, while also supplying electricity for its own operational needs. In fact, 1.4 percent of the state's electricity that MWCs provide is in addition to the electricity used for their own operations. The efficiency of energy generation varies depending on the type of combustion technology used at an MWC. Appendix L presents the combustion technologies used by the state's 10 MWCs. Based on the data presented in Table 9.3, MWCs using the mass burn water wall technology generate more electricity and less ash per ton of waste than the other MWC technologies in use in the state (mass burn rotary or modular combustion). In any case, long-term electric and/or steam revenues are critical to the financial viability of a MWC project.

MSW is not as efficient an energy source as are fossil fuels, such as oil, gas and coal. This is because fossil fuels are more homogeneous and contain higher BTU values and because the sole purpose of fossil fuel power plants is to extract energy. MWCs, however, serve the dual purpose of generating electricity and reducing waste volume. (New York considers only source separated, combustible, untreated and uncontaminated MSW or C&D debris as an eligible renewable energy source for the purposes of the renewable portfolio standard. Both state regulations [6 NYCRR Part 204-1.2(b)(67)] and Chapter 497, Laws of 2009 exclude the combustion or pyrolysis of MSW from the definition of renewable energy sources.) The energy value of MSW is 4,500–6,000 BTU/lb, while coal has an energy value of 8,000–13,000 BTU/lb and natural gas has a value of approximately 24,000 BTU/lb.

A more appropriate comparison is between MWC and other energy generating technologies for residual waste, such as landfill gas to energy. Landfill gas is generated during a longer time frame after a significant amount of waste is in place, while MWC generates energy immediately using incoming waste. A landfill gas to energy facility will not extract as much energy value from the residual waste stream because certain materials with high BTU values for MWC (e.g., plastics) will not break down into methane in a landfill, and, therefore, their embedded energy will be lost. And, landfill gas collection systems do not completely capture all methane gas produced, contributing to the inefficiencies in that system. (For a full discussion of landfill gas collection and management, see Section 9.4.7; for a more complete analysis of the GHG implications of MWC vs. landfilling, see Section 4.) Taking these factors into account, a landfill gas-to-energy project can provide about 105 kWh per ton of MSW as compared to 585 kWh per ton from MWC and 2,250 kWh per ton of energy

saved through recycling.[70] A recent study comparing MWC and landfill gas to energy on a life-cycle basis found that MWC can generate an order of magnitude more electricity than landfill gas to energy, given the same amount of waste handled.[71]

9.3.2 Compatibility with Recycling

A common issue that is raised during consideration of a new MWC is whether combustion and recycling are incompatible, as it can be argued that both compete for the same high BTU value materials. The implication is that a robust recycling program will reduce the quality or quantity of waste necessary for the effective operation of an MWC or, conversely, that the operational needs of a MWC will diminish recycling efforts. In fact, however, communities with MWCs tend to have slightly higher recycling rates than average. Nationally, in 2004 the average actual recycling rate of MWC communities across the country was 34 percent, as compared to the national average of 31 percent.[72]

Given that recycling is a preferred management strategy under the statutory hierarchy, compatibility is an important consideration. A significant factor in achieving compatibility with recycling is the proper sizing of an MWC, considering the amount of materials that can be diverted through comprehensive reduction, reuse, recycling and organics recovery programs as described in the LSWMP or CRA for the facility's service area. DEC influences the proper sizing of MWCs through the Part 360 permit application requirements, which require a year-by-year analysis of the projected waste stream and the permit conditions that include acceptance rate limits.

When appropriately sized and permitted, MWCs can co-exist with very strong recycling programs, as evidenced in Onondaga County. In the permits for the Onondaga RRF, the sizing of the facility was limited to what was calculated to be residue after the Onondaga County Resource Recovery Agency reached aggressive recycling diversion goals. That provision, in combination with a management structure that includes flow control and a publicly owned facility that invests tip fee revenues into an integrated waste prevention, recycling and composting program, has yielded one of the strongest MSW recycling rates in the state at 51 percent. (For more on Onondaga County, see the profile in Appendix C.)

Another significant factor is the financial incentive or disincentive created by disposal contracts. Contracts that commit communities to deliver a certain amount of waste to a facility, known as "put or pay" contracts, have in some instances created a disincentive for communities to reduce the amount of waste going to disposal. These types of contracts are often used for MWCs and have also been used for transfer stations and other facilities in the state.

---

[70] *Assessment of Materials Management Options for Massachusetts Solid Waste Master Plan Review*, Tellus Institute, 2008, www.mass.gov/dep/recycle/priorities/tellusmmr.pdf.

[71] "Is it Better to Burn or Bury Waste for Clean Electricity Generation?" P. Ozge Kaplan, Joseph DeCarolis, and Susan Thorneloe; *Environmental Science and Technology*, Vol. 43, No. 6, 2009.

[72] *Understanding Why Recycling and Waste-To-Energy are Compatible in the U.S.,* Jonathan V.L. Kiser, 2005, www.energyrecoverycouncil.org/userfiles/file/IWSA_2007_Directory.pdf.

The capacity of an MWC, its steam boiler capacity and permit limits are based on the amount of MSW projected to be combusted and the heating value (BTUs per pound) of the MSW. While certain combustible recyclable items, such as plastic, paper, and cardboard, can improve the BTU value of the waste stream, separating out non-combustible materials such as metal and glass also improves the BTU value of the remaining waste. However, because throughput at MWCs is limited to 110 percent of the capacity at which emissions are tested, combusting disproportionate amounts of recyclable materials with a significantly higher BTU value is counter-productive and will actually result in a reduction of the total tonnage of MSW that can be charged into a combustion unit.

Success in recycling in New York State has a stronger correlation to the level of investment in recycling outreach, education and infrastructure in the facility's service area than the type of facility, the facility's financing, facility permit conditions, and flow control or other legal support structures. In particular, public outreach and education to gain public support for and participation in recycling programs is critical to good performance.

9.3.3 Air Emissions

The past poor performance and air pollution caused by incinerators without proper controls have resulted in today's strict emission standards and numerous emission controls being used in all active MWCs in New York State and nationwide. To ensure compliance with standards, DEC requires MWCs to perform their own continuous emissions monitoring for NOx, SO_2, CO, opacity and O_2, and to perform annual stack tests to gauge levels of other pollutants.[73]

In its book, *Waste Incineration & Public Health*, the National Academy of Sciences (NAS) found that the application of improved combustor design, operating practices, air pollution control equipment and changes in waste feed composition have resulted in a dramatic decrease in the emissions that used to characterize uncontrolled incineration facilities. However, operating data analyzed from off-normal operations (startup, shutdown, equipment malfunction, etc.) in the early 1990s indicated that production of dioxins and furans during these upset conditions could rapidly increase. Based on its findings, the NAS identified 13 specific best practices for reducing emissions. Although the instances of these off-normal operations are infrequent, the stringent limits and operating requirements in facility permits embody the best practices outlined by NAS. DEC MWC permits require waste screening and operator training. DEC air permits require continuous monitoring for the pollutants identified above as well as for temperature. Federal Title V permits also require compliance assurance monitoring, such as monitoring voltages of the electrostatic precipitators and the injection rate of carbon, to help assure removal for pollutants which do not have continuous monitors.

[73] Most MWCs in NYS are required to monitor: NOx; SO_2; CO; Total Hydrocarbons; PM; HCl; Hg; Dioxins/Furans; PCBs; PAHs; Formaldehyde; Hexavalent Chromium; Total Fluorides; Various metals (Arsenic, Be, Cd, total Chromium, Cu, Pb, Mn, Ni, Vanadium, and Zinc), and Ammonia.

A variety of pollution control technologies are now used to significantly reduce the gases and particulate matter (PM-2.5) emitted into the air, including:

- Combustion Controls – to minimize the formation of organic compounds
- Urea or Ammonia Injection – to control NOx emissions
- Carbon Injection – to reduce mercury emissions
- Scrubbers – to neutralize acid gases through use of a liquid spray
- Fabric Filters – to remove very tiny ash particles, down to submicron size, including heavy metals such as lead, cadmium, chromium, etc., attached to particulates

Pollution control technologies used in the state's 10 MWCs are identified in Appendix L. In addition to use of these technologies, prohibiting certain waste from entering the MWC waste stream (e.g., batteries and fluorescent light bulbs) has also resulted in lower stack emissions for certain compounds.

As demonstrated in Table 9.4, these emissions have been dramatically reduced as a result of the EPA-required maximum achievable control technology (MACT) retrofits. This data includes the 1990 and 2005 emissions for 66 large and 22 small MWC plants nationwide.

The EPA data represented in Table 9.5 demonstrates that, nationally, MWCs operate below EPA standard emission limits for key pollutants.

TABLE 9.4 EMISSIONS FROM LARGE AND SMALL MWC UNITS

Pollutant	1990 Emissions (tpy)	2005 emissions (tpy)	Percent Reduction
CDD/CDF, teq basis	440	15	99+%
Mercury	57	2.3	96%
Cadmium	9.6	0.4	96%
Lead	170	5.5	97%
Particulate matter	18,600	780	96%
HCl	57,400	3,200	94%
$S0_2$	38,300	4,600	88%
NOx	64,900	49,500	24%

***Dioxin/furan emissions are in units of grams per year toxic equivalent quantity (teq), using 1989 NATO toxicity factors; all other pollutant emissions are in units of tons per year**
Source: EPA Memorandum, "Emissions from Large and Small MWC Units at MACT Compliance," August 10, 2007

TABLE 9.5 COMPARISON OF 2001 EMISSIONS FROM 95 US MWC PLANTS W/USEPA STANDARD

Pollutant	Average Emission	EPA Standard	% of EPA Standard	Unit
CDD/CDF*	0.05	0.26	19.2%	ng/dscm
Mercury	0.01	0.08	12.5%	mg/dscm
Cadmium	0.001	0.02	5%	mg/dscm
Lead	0.02	0.20	10%	mg/dscm
Particulate Matter	4	24	16.7%	mg/dscm
HCl	10	25	40%	ppmv
SO2	6	30	20%	ppmv
NOx	170	180	94.4%	ppmv

Source: "Comparative Impacts of Local Waste to Energy vs. Long Distance Disposal of Municipal Waste" presented at AWMA Annual Meeting, New Orleans, LA, June 2006
ng/dscm = nanogram per dry standard cubic meter; ppmv = parts per million volume
***Represents dioxin and furan compounds (i.e., mono- to tri-chlorinated dibenzodioxins [CDDs] and dibenzofurans [CDFs])**

In addition to achieving EPA standards, as part of the SEQR process, DEC requires MWCs to prepare a Health Risk Assessment (HRA) in accordance with an established protocol, to be approved by DEC and DOH, that includes a description of the project, the air contaminants that will be modeled, the basis and documentation for emission factors, the air dispersion model that will be used, human exposure pathways to be evaluated, and the public health guidelines that will be referenced. The HRA is used to determine whether the project will have any adverse effects on public health that need to be mitigated. Once constructed, the MWC is required to conduct emissions tests which are used by DEC to determine whether the actual emission rates exceed the values used in the HRA. Once full-scale operations are underway, MWCs begin to perform the requisite daily continuous emissions monitoring and annual air emissions tests to ensure that they are operating within environmentally protective parameters.

9.3.4 Ash Management

While MWC significantly reduces the volume of waste to be disposed of in landfills, in the US the ash is typically landfilled, either directly or beneficially used as ADC. In 2008, MWCs in New York State generated approximately one million tons of ash residue. More than three-quarters of this ash was

disposed in one of the state's three double-lined ash monofills[74], monofill areas at the Town of Brookhaven Cleanfill, or in MSW landfills. Approximately 200,000 tons per year are being used beneficially as ADC at several landfills in the state. (See Table 9.7.)

MWCs generate two primary types of ash residue. Coarse bottom ash is generated in the primary combustion zone, while a finer fly ash is captured in pollution control equipment. While the base constituents of fly ash are somewhat similar to those of bottom ash, fly ash contains higher concentrations of volatile metals than those found in bottom ash and in some cases, may require management as a hazardous waste if managed separately. It is common industry practice in the US to manage bottom ash and fly ash together as combined ash, with fly ash comprising approximately 10-15 percent of the combined ash stream. However, this serves to limit the development of potential higher-value uses of the bottom ash.

In May, 1994, the U.S. Supreme Court ruled that MWC ash is subject to hazardous waste determination requirements, and in the February 1995 *Federal Register*, EPA issued its interpretation that these requirements take effect when the ash exits the combustion facility. In June of 1995, EPA issued *Guidance for the Sampling and Analysis of Municipal Waste Combustion Ash for the Toxicity Characteristic* (EPA 530-R-95-036), which explained to MWCs how to sample and analyze ash to determine whether or not the ash is a hazardous waste.

In New York State, combined ash is subject to an initial testing regimen that begins at a MWCs startup with weekly testing for volatile matter and semi-annual testing for leaching potential and compositional analysis. Combined ash from all of the MWCs in New York State has been tested for more than a decade in accordance with EPA protocol. These tests have demonstrated that combined ash is a non-hazardous solid waste and can be managed pursuant to the Part 360 regulations, and they have formed the basis for granting facility-specific variances to reduce the testing frequency. The average TCLP data for cadmium and lead for MWCs in New York State since 1994 has ranged from 0.08 ppm to 0.61 ppm for cadmium and 0.36 ppm to 1.51 ppm for lead. The TCLP hazardous waste regulatory limit is 1.0 ppm for cadmium and 5.0 ppm for lead.

9.3.5 Siting Issues and Restrictions

Siting MWCs has been a lengthy and controversial process. The high costs and lack of community support for MWCs and other thermal technologies has limited their development. MWCs are required to evaluate a host of environmental impacts, including those related to siting, through the State Environmental Quality Review Act (SEQRA). The review includes impacts on traffic, aesthetic resources, community character, noise, odors, and public health. DEC has issued guidance to aid project proponents in addressing climate impacts under a SEQRA analysis (see http://www.dec.ny.gov/regulations/56552.html). The extent to which significant environmental impacts can be mitigated is weighed in the decision to permit MWCs and to place conditions on a permit.

[74] The three monofills are: Babylon North and Babylon Southern in West Babylon and Sprout Brook in Peekskill.

9.4 LANDFILLING

The fourth and final solid waste management method in New York State's hierarchy is land burial, in the category of "other methods approved by the department." Although landfilling should be the management method of last resort, given the state policy goals expressed in the solid waste management hierarchy, landfills—either in state or out of state—handle the largest proportion of New York State waste sent for disposal. Approximately 53 percent of the total waste disposed of from New York State generators is landfilled within the state, while about 13 percent is processed in MWCs (with the residual ash land disposed), and 34 percent is exported, primarily to out-of-state landfills. When only MSW is considered, more of the waste disposed is exported than landfilled within the state (42 and 41 percent, respectively).

The Part 360 regulations of 1988 and revisions thereafter established some of the most stringent, protective, and costly permitting requirements in the nation with regard to siting, design, construction, operation, closure and post-closure care for landfills. While significant progress has been made in landfill design and operation to mitigate the negative impacts of landfilling, and much less waste is landfilled in New York State now than in 1988 compared to other waste management methods, there is still much room for improvement in diverting waste from disposal and reducing reliance on this least preferable waste management approach.

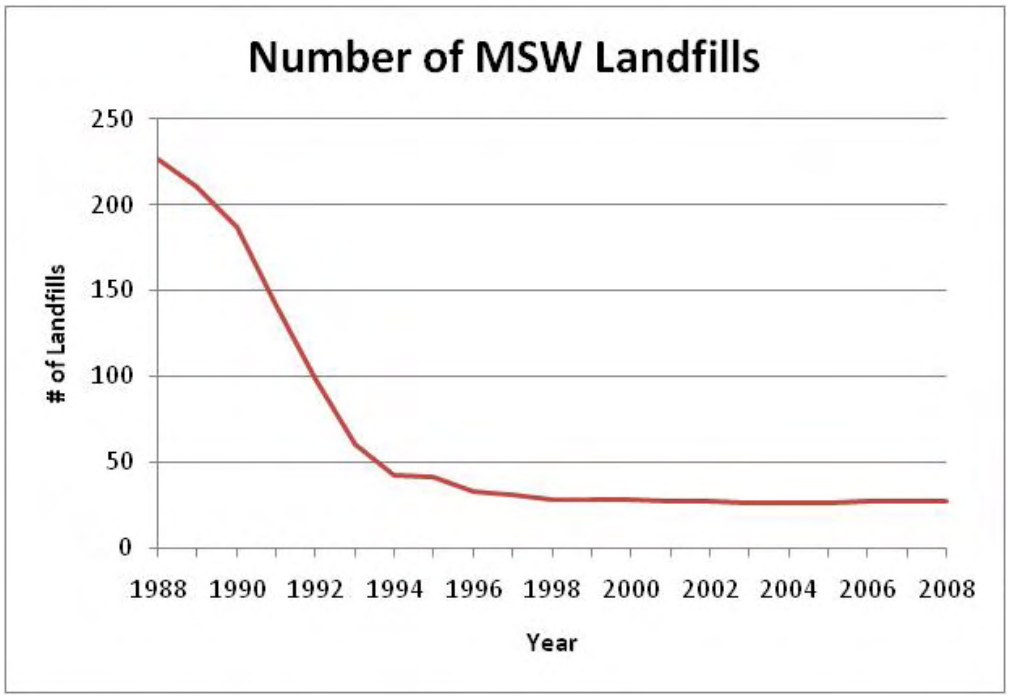
The goals and recommendations expressed throughout this Plan are intended to correct this trend and reduce reliance on landfilling as a waste materials management strategy, as was the intention of the 1987 Plan and the adoption of the solid waste management hierarchy. Continuing reliance on waste disposal, and landfills in particular, misses opportunities for environmental improvement and economic growth. The state's preference for waste prevention, reuse, recycling and composting reflects the fact that these strategies offer greater energy conservation, GHG reduction and other environmental benefits. Once these strategies are maximized, however, some residual waste will still remain and need to be disposed.

The dramatic reduction in the number of MSW landfills since 1988 is shown in Figure 9.3. The old, small, local, unlined municipal landfills, which used to be known as "town dumps," are no longer in operation, in large part due to the regulatory structure DEC put in place in 1988 and the federal requirements for MSW landfills promulgated in 1991 (40 CFR Part 258).

The Part 360 regulations and DEC's enforcement, combined with changes in the industry and state financial assistance for municipal landfill closure, effectively led to replacement of open dumps with larger, regional, highly engineered and controlled facilities.

In 2010, the state is developing revisions to the Part 360 regulations, which will improve environmental protections even further, reflecting advances in technology and practice during the last two decades and setting the course for facility design, construction and operation for the next 10 to 20 years. Revisions include enhanced operational requirements, including provisions for improved odor control, resource efficiency, liner construction, cover systems and post-closure care and maintenance.

FIGURE 9.3



Of the 63 active landfills in the state, 62 are subject to the Part 360 regulation's permitting requirements, and one active coal ash landfill is not directly subject to Part 360 regulation (see Section 9.4.5). In addition to the requirements applicable to all landfills, the regulations include specific requirements for Long Island landfills, C&D debris landfills and industrial waste monofills. Industrial waste monofills are generally dedicated to accepting one specific type of material, such as paper mill sludge, coal ash or MWC ash.

THE EVOLUTION OF NEW YORK STATE'S DOUBLE-LINED LANDFILLS

In the late 1980s, several factors converged to heighten attention on landfill design. Landfills became more difficult to site; the "Garbage Barge" focused the nation on the looming disposal capacity crisis; and improperly designed and operated landfills created a general lack of confidence in waste disposal facilities and their ability to protect groundwater. It was clear that to permit modern disposal facilities, more attention had to be paid to protecting groundwater by using appropriate natural geology and designing rigorous liner and leachate collection systems.

It was in this context that DEC promulgated the 1988 Part 360 solid waste management facility regulations. These regulations, among the most stringent in the nation, require that all municipal solid waste landfills use double composite liners and dual leachate collection and removal systems. These regulatory requirements go well beyond the "belts and suspenders" of the double liner concept; they include a comprehensive regulatory approach for governing the siting, design, construction, operation, closure and post-closure of all solid waste disposal facilities. After more than two decades of extensive groundwater monitoring, the growing database demonstrates that New York State's double-lined landfills are indeed working as planned, with no groundwater quality impacts attributable to leakage from their engineered barrier systems.Even at the time of enactment, it was understood that modern landfill design would be extremely costly.

The 1988 rule-making documents estimated the cost associated with new landfills to range from $300,000 to $500,000 per acre. Today the costs are well beyond this range, and it is acknowledged that the disposal facilities in the state represent a significant investment in waste management. Even as new facilities were built, raising the cost of waste disposal, municipalities and other owners or operators of hundreds of non-compliant and contaminating dump sites were held responsible for their cleanup and closure - adding to the regulated community's true cost of regulatory compliance. Since the mid 1980s, DEC has worked with communities and facility owners to close more than 300 unlined open dumps. The state's Landfill Closure Assistance Grant Program, initiated in 1990, has provided more than $307 million to municipalities to assist with the closure costs of older landfills that were impacting water quality and the environment.

Today New York State can boast that all of the MSW landfilled in NYS is being handled in the 27 conservatively designed and operated double-lined landfills listed in Table 9.2.

9.4.1 Total Landfill Capacity

The amount of waste landfilled in New York State steadily decreased between 1988 and 1992. This was the result of two key factors. First, many communities, particularly downstate (DEC regions 1,2, and 3), increased exports. Second, recycling began to take a foothold and expand across the state. The in-state landfill disposal decrease continued until about 2002 but increased sharply for the next couple of years as exports decreased and imports increased. Landfilling in New York State has essentially levelled off since 2004.

In addition to the 63 active landfills in New York State, there is also one permitted and constructed MSW landfill that has remained inactive and two MSW landfills that were permitted but never constructed. The active landfills received about 11.4 million tons of solid waste in 2008. The number of each type of landfill and the amounts of waste they received in 2008 are shown in Table 9.6; their locations are depicted in Figure 9.4. Figure 9.5 presents the distinct regional differences in the quantities of waste landfilled, with approximately 80 percent of all landfilling in 2008 occurring in DEC regions 1, 8 and 9.

TABLE 9.6

Type of Landfill	Number of Active Landfills	Amount of Waste Received in 2008[75] (millions of tons)
Municipal Solid Waste (MSW)	27	8.0
Long Island	3	1.7
C&D Debris	14	0.4
Industrial	16	1.1
MWC Ash Monofills	3	0.3
Total	*63*	*11.5*

[75] The amounts presented here do not include materials used as alternative daily cover but do include imports.

FIGURE 9.4

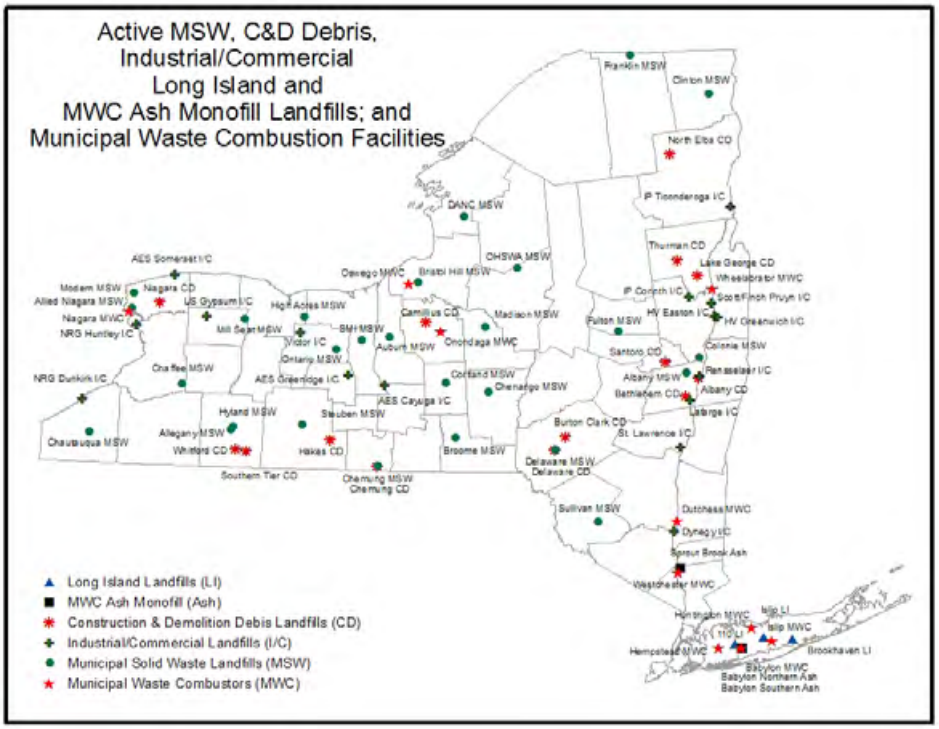
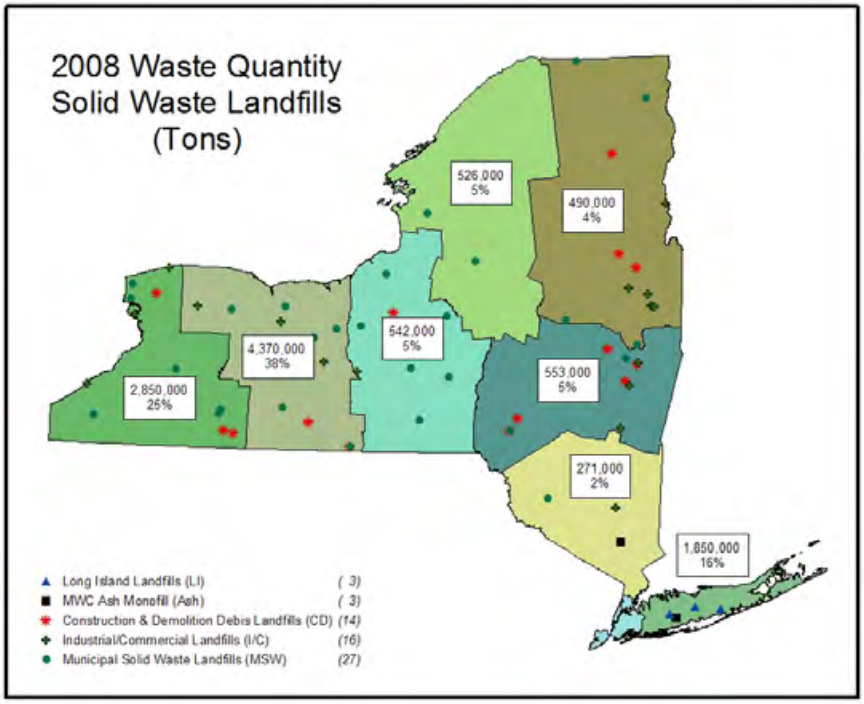


FIGURE 9.5



9.4.2 MSW Landfills

The 27 active MSW landfills are located in DEC regions 3 through 9, as shown in Figure 9.6. These double-lined landfills receive MSW and can accept C&D debris and industrial waste. About 78 percent of the MSW that was land disposed went to landfills in DEC regions 8 and 9, where all 6 private MSW landfills are located. There are no active MSW landfills in DEC Region 2 (New York City) since the 2001 closure of Fresh Kills—the world's largest landfill, based on measurement of waste-in-place. There are also no active MSW landfills in DEC Region 1 (Long Island) due to the enactment of the Long Island Landfill Law in 1983, which essentially eliminated direct landfilling of MSW in Nassau and Suffolk counties.

There are 64 planning units in New York State, only about half of which have disposal facilities (landfills and/or MWCs) within their boundaries. New York City is the most notable planning unit without any disposal facilities, though several towns on Long Island also lack such capacity. Most of New York City's waste and approximately 1.3 million tons of waste from Long Island is exported out of state. The remaining planning units without disposal facilities, however, rely primarily on other in-state disposal capacity.

FIGURE 9.6

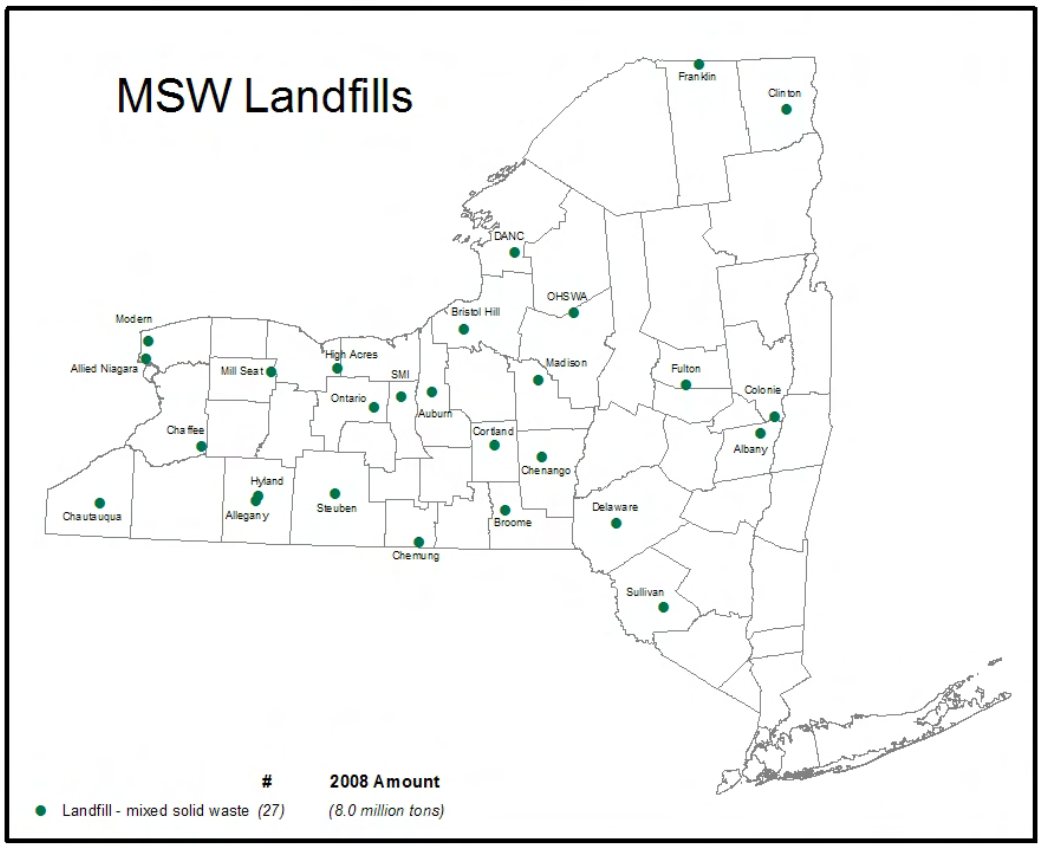


Table 9.2 shows the amount disposed in 2008 and the remaining capacity for the active MSW landfills. These 2008 disposal amounts are shown by individual landfill and DEC region on the maps in figures 9.7 and 9.8.

FIGURE 9.7

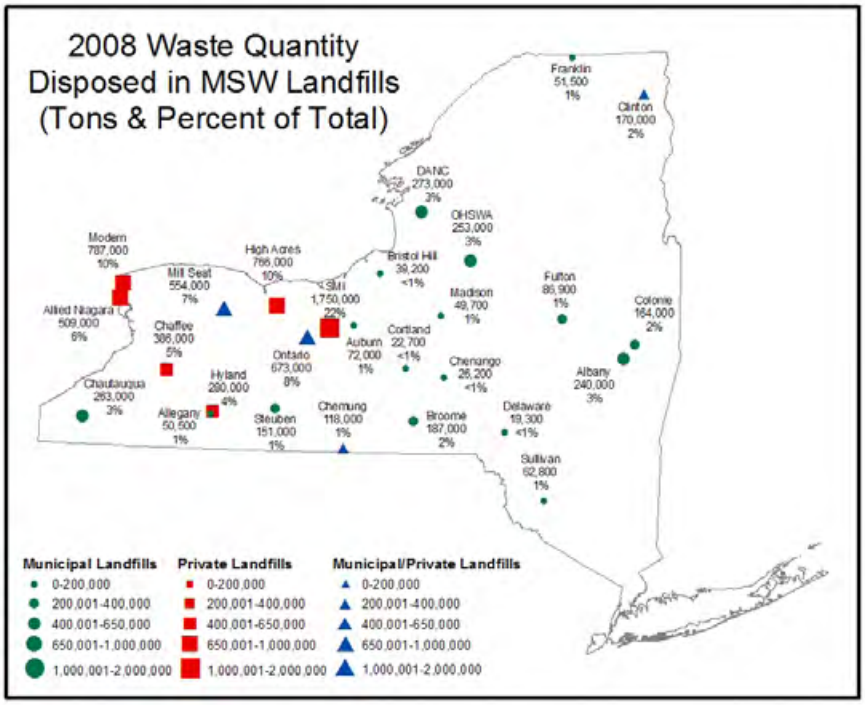
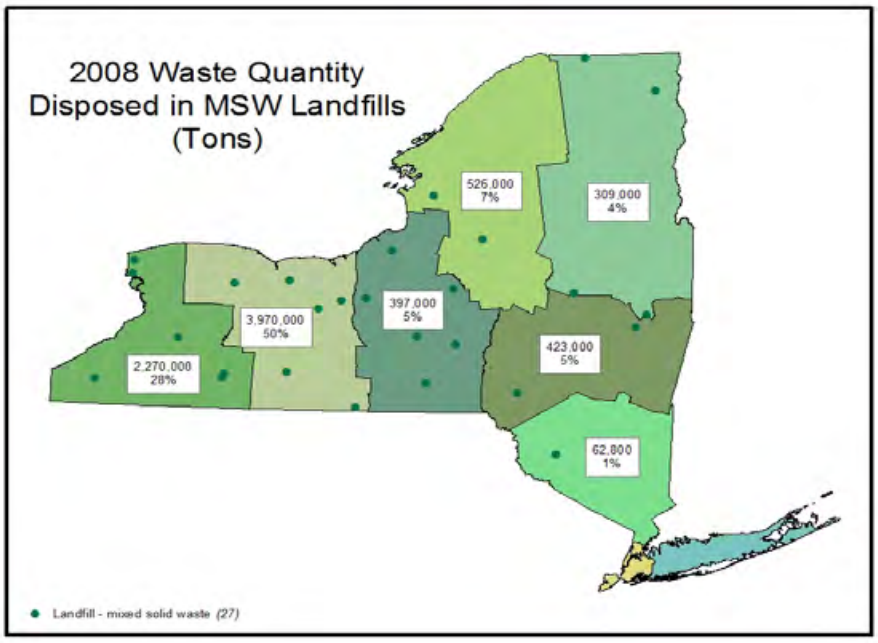
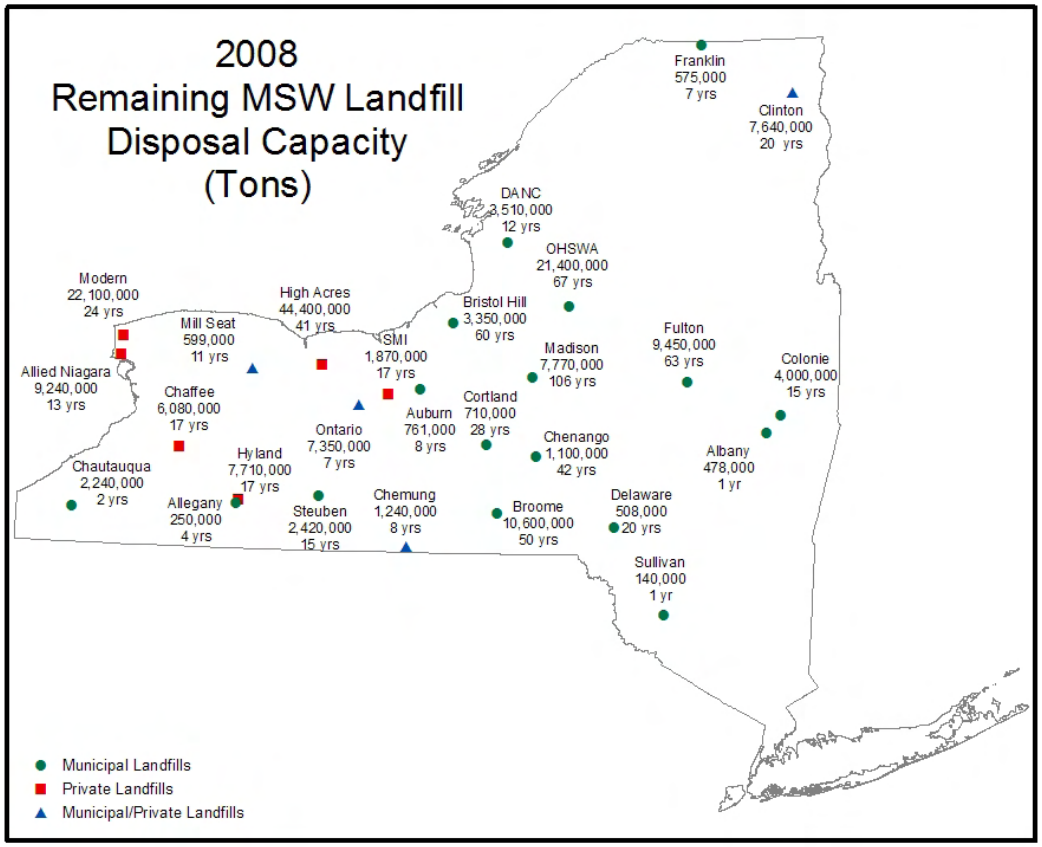


FIGURE 9.8



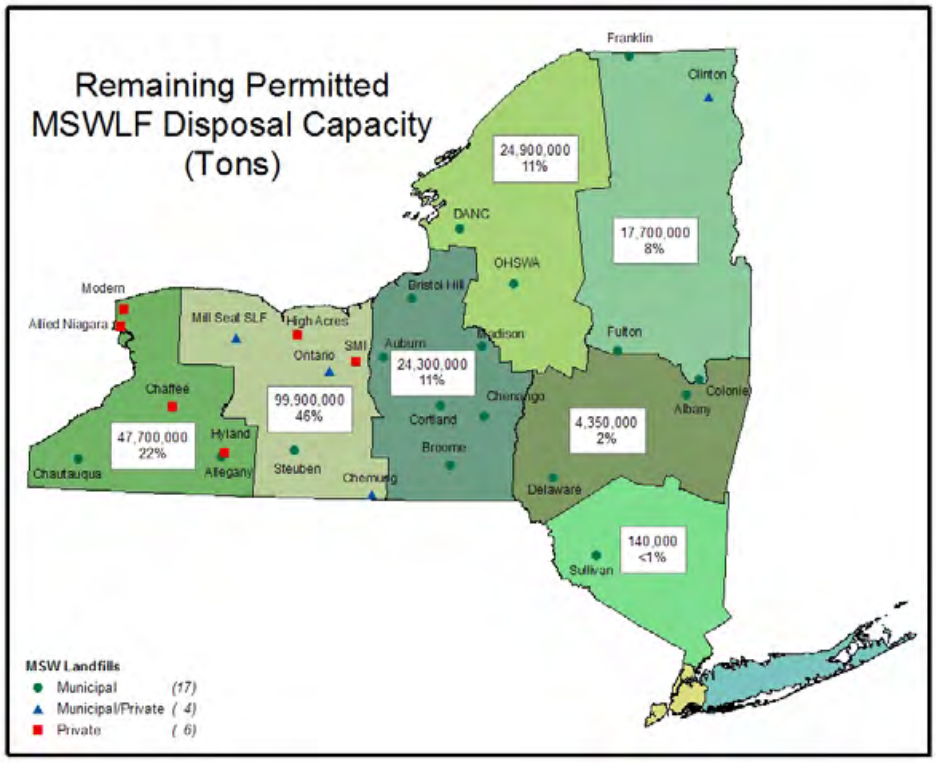
The remaining disposal capacity is also depicted by individual landfill and DEC region on the maps in figures 9.9 and 9.10. About 68 percent of the remaining MSW landfill capacity in New York State is currently located in DEC regions 8 and 9.

FIGURE 9.9



Six of the 27 active MSW landfills operating in the state are privately owned and operated. The remaining 21 are publicly owned. Of the 21 public facilities, 4 are owned by county agencies and operated on their behalf by private waste management firms, while the remaining 17 are owned and operated by municipalities (counties, cities, towns, or public authorities).

FIGURE 9.10



Despite their smaller number, privately operated landfills play a dominant role in MSW landfilling in New York State. The 6 privately owned and operated landfills received about 4.5 million tons of waste, or 56 percent of the waste disposed of at MSW landfills in 2008. The 4 publicly owned, privately operated landfills received about 1.5 million tons of waste in 2008. Altogether, the privately operated MSW landfills (6 privately owned and 4 publicly owned) received about 6 million tons or about 75 percent of the total waste disposed of at MSW landfills in the state.

The 27 active MSW landfills and 10 MWCs provide disposal service for most of the 64 planning units in the state as well as a number of out-of-state communities, with New York City among the largely downstate exporting communities. The MSW landfills essentially operate according to one of four generalized service area models. An example of each model is depicted on maps in figures 9.11 through 9.14. It should be noted that landfill operators can, and sometimes do, change from one of these models to another, depending on market conditions, operational restrictions, or other factors.

1. Publicly owned and operated landfills planned and designed to primarily serve their own planning unit - These are located in planning units that have made conscious decisions and significant investments to be essentially self-sufficient and take responsibility for management of waste generated within their own borders for the long term. This provides the planning unit with relatively stable and secure control over their own long-term disposal options. This is typical of most of the landfills in DEC Region 7, although there are examples of this model in each of DEC regions 4 through 6 as well. An example is provided in Figure 9.11.

FIGURE 9.11

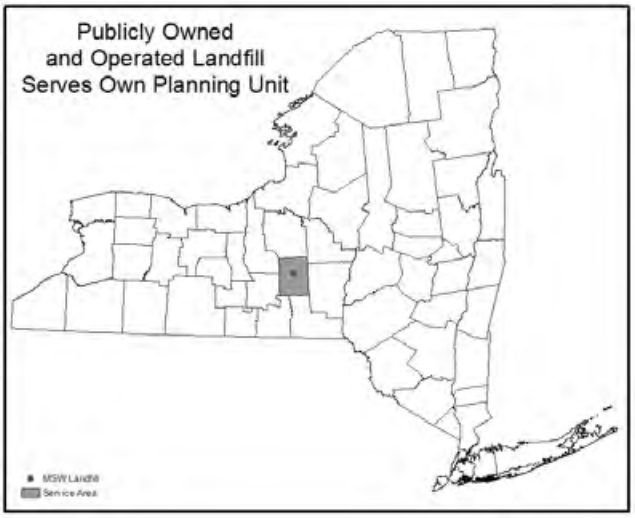
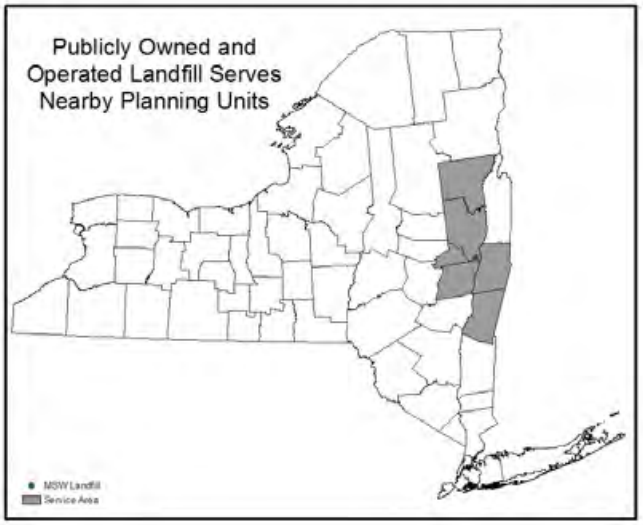


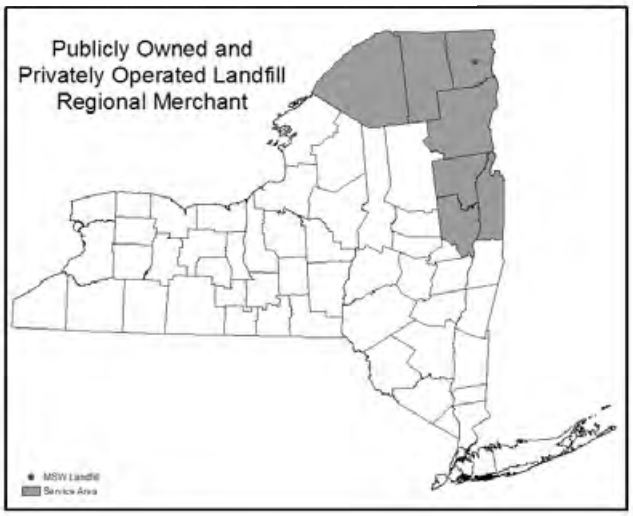
FIGURE 9.12



2. Publicly owned and operated landfills that primarily serve their own planning unit and also provide service to one or more neighboring planning units - As with model 1 above, this model also provides the planning unit with control of their own disposal options. Although it reduces the service life of the landfill, it affords the planning unit opportunity for additional revenue sources. One or more of these operates in DEC regions 4 through 9. An example is provided in Figure 9.12.

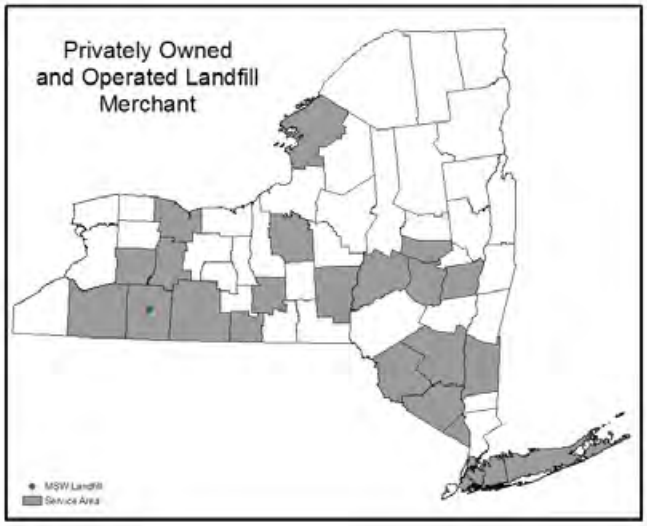
3. Publicly owned landfills, often privately operated, which act as merchant facilities serving a limited and usually nearby group of planning units - This model can provide the planning unit and private operator with greater revenues, and it helps other planning units that need disposal services. But it also increases the planning unit's and facility operator's waste management responsibilities, including potential long-term liabilities. These can be found in DEC regions 5 and 8. An example is provided in Figure 9.13.

FIGURE 9.13



4. Privately owned and operated merchant facilities in DEC regions 8 and 9 that serve a much larger and more diverse area - In some cases, publicly owned but privately operated facilities may follow this broad service-area model. This model provides the greatest potential revenues for the planning unit and private operators, and it helps many planning units needing disposal services. But it can also significantly increase the facility's and planning unit's short and long-term waste management responsibilities and potential liabilities. An example is provided in Figure 9.14.

FIGURE 9.14



9.4.3 Long Island Landfills

Landfills located in Nassau and Suffolk counties on Long Island are subject to special requirements and restrictions under the ECL and corresponding Part 360 regulations. They can receive either "clean fill" only (as defined in the ECL and Part 360 regulations) or residual waste resulting from recycling and composting facilities or MWCs. In the case of MWCs, residuals include ash and materials that cannot be combusted, either because the facility is experiencing downtime or because the materials are non-processible and designated as such by regulation or permit condition. There are three permitted facilities considered by DEC to be Long Island landfills that primarily receive C&D debris and similar "inert" materials. Two receive only "clean fill," and one, the Town of Brookhaven Landfill, can also receive the residual wastes described above. These landfills received about 1.7 million tons of waste in 2008, about 1.3 million tons of which was C&D debris or "clean fill." There are also two MWC ash monofills in the Town of Babylon which are discussed in Sections 9.3.4 and 9.4.6.

9.4.4 C&D Debris Landfills

There are 14 active C&D debris landfills in New York State, most of which are relatively small and located in upstate New York. Collectively, these C&D landfills received almost 374,000 tons of C&D debris in 2008, which represents only about 13 percent of the total C&D debris landfilled in the state. This does not include C&D materials that are beneficially used in landfills as ADC. Much more significant quantities of C&D debris are disposed of in Long Island landfills (1.3 million tons or about 45 percent of C&D debris landfilled) and MSW landfills (almost 1.2 million tons or about 42 percent).

The C&D debris landfills are shown in Figure 9.15. Figure 9.16 shows the quantities disposed at C&D debris landfills in each region, including the Long Island landfills.

FIGURE 9.15

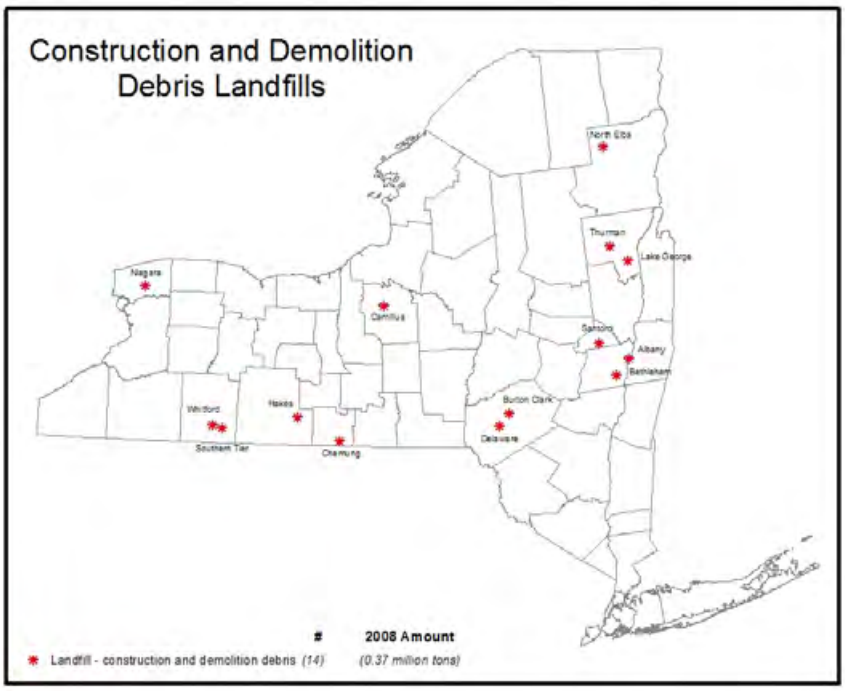
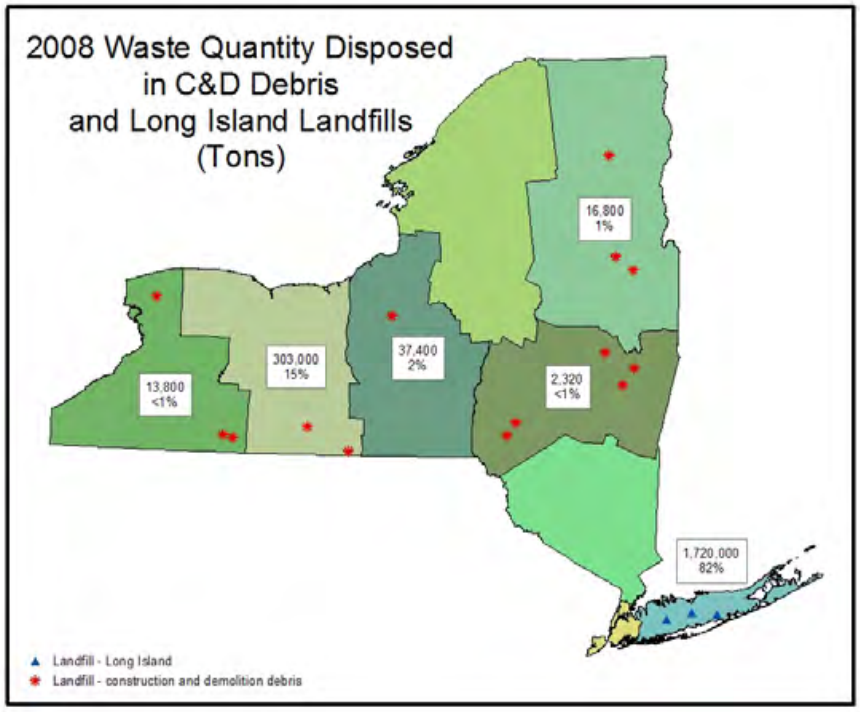


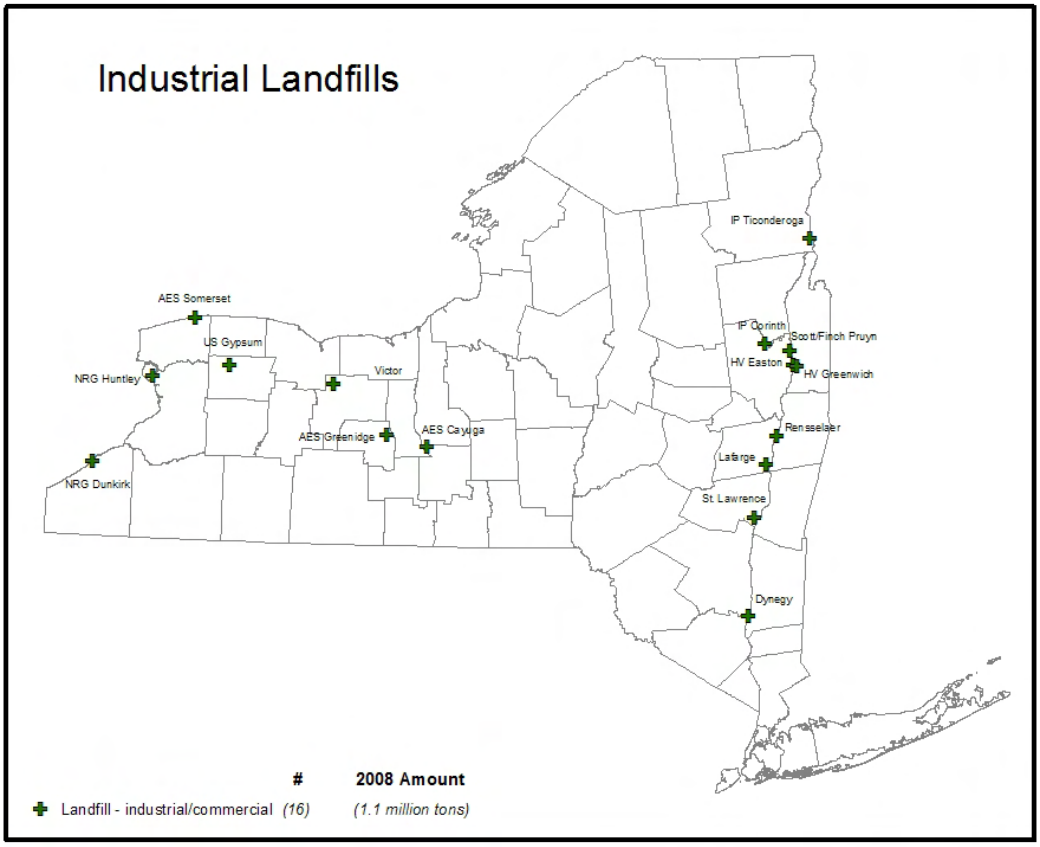
FIGURE 9.16



9.4.5 Industrial Landfills

The 16 active industrial landfills are shown in Figure 9.17. They include coal ash monofills and paper mill sludge monofills. They are all located near water bodies due to the needs of these industries. The paper mill sludge monofills are mostly located in the Hudson River Valley in the eastern portion of the state, while the coal ash monofills serving coal-fired power plants are primarily in the western part of the state. One coal ash landfill is not permitted by DEC pursuant to the Part 360 regulations but is subject to the requirements of a Certificate of Environmental Compatibility and Public Need, issued pursuant to Article VIII of the Public Service Law.

FIGURE 9.17



9.4.6 Municipal Waste Combustion (MWC) Ash Monofills

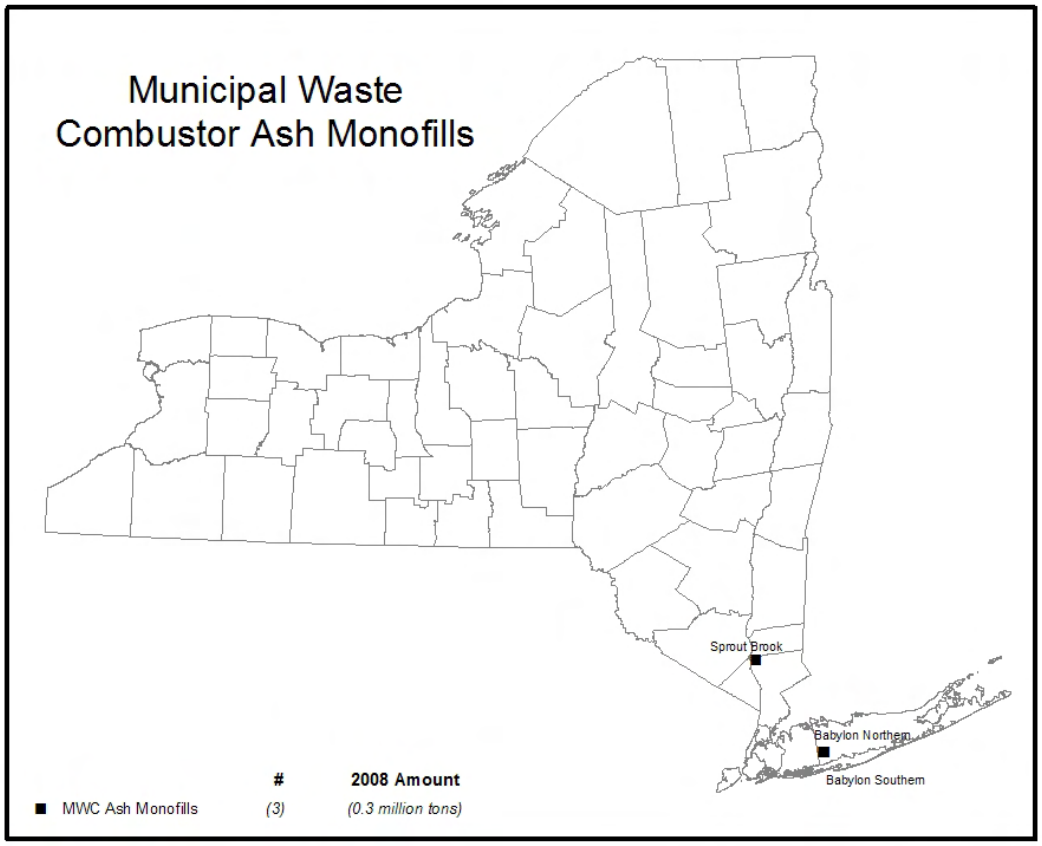
There are only three permitted MWC ash monofills. Two are in DEC Region 1, and one is in DEC Region 3, as shown in Figure 9.18. All three are publicly owned and operated. One of the landfills in DEC Region 1 did not receive ash in 2008 but is expanding and will resume ash disposal upon completion of construction. The monofill in DEC Region 3 reached capacity near the end of 2009 and is in the process of closing. MWC ash is also disposed at MSW landfills and at the Brookhaven Landfill on Long Island.

MWC ash is also used as alternative daily cover (ADC) at a number of MSW landfills in the state. As shown in Table 9.7, about 318,000 tons of ash was disposed at the ash monofills, about 546,000 tons of MWC ash generated within New York State was disposed of at in-state landfills, about 45,000 tons was imported to an MSW landfill, and about 211,000 tons was used as ADC.

TABLE 9.7

Ash Disposed of in Ash Monofill Landfills	Tons
Sprout Brook LF	179,296
Babylon North "U" Bypass	138,490
Babylon Southern Ashfill	0
Subtotal	*317,786*
Ash Disposed of in MSW Landfills	
Allied Waste Niagara Falls Landfill	2,061
Modern Landfill	91
Bristol Hill SLF	14,611
Mill Seat SLF	166
Seneca Meadows LF	171,411
Subtotal	*188,340*
Ash Imported and Disposed of in MSW Landfills	
Seneca Meadows LF	45,339
Ash Disposed of in LI Landfills	
Brookhaven Waste Management Facility	358,412
Ash used as ADC at MSW Landfills	
Allied Waste Niagara Falls Landfill	84,585
Ontario County Sanitary Landfill	74,570
Mill Seat SLF	12,831
Madison County West Side Extension LF	9,856
Bristol Hill SLF	9,741
Seneca Meadows LF	6,854
Franklin County Regional Landfill	5,433
Delaware County SWMF	4,506
Sullivan County Landfill	2,075
High Acres Western Expansion Landfill	622
Hyland Landfill	42
Chemung County Sanitary Landfill	5
Subtotal	*211,119*

FIGURE 9.18



9.4.7 Landfill Gas

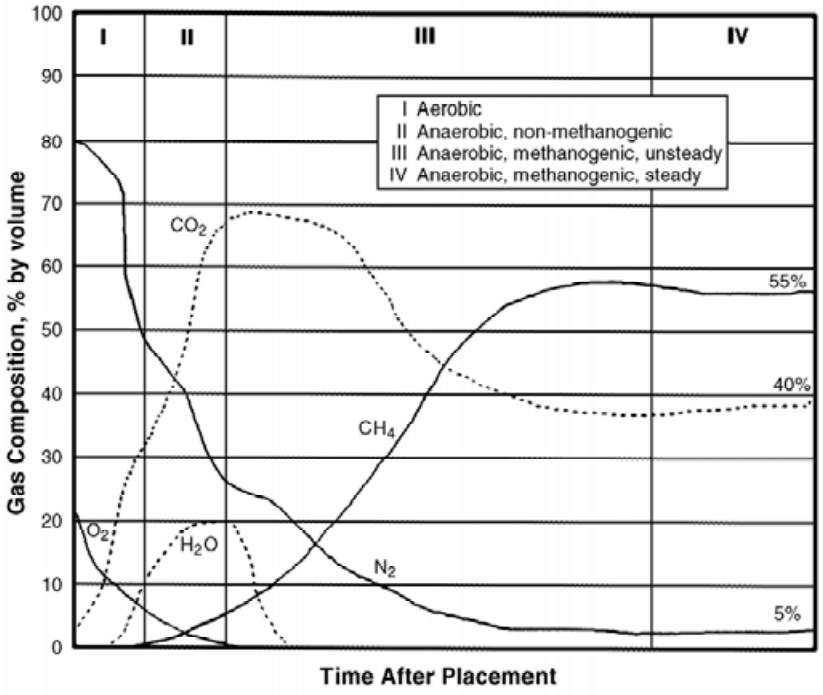
As concern about climate change grows, so does the urgency in combating its effects by reducing GHG emissions. Landfill gas contributes 1.8 percent of the state's 2008 GHG inventory, primarily because about half the gas generated at a landfill is methane, a potent GHG whose warming potential is 23 to 72 times more powerful than CO2, depending on the time horizon analyzed. [76] This impact cements landfilling at the bottom of the state's solid waste management hierarchy in the 21st century, and reducing these emissions is a critical strategy for New York State in combating climate change. (For more detail, see Section 4.)

Landfill gas is generated by the anaerobic (oxygen-starved) degradation of organic waste. It is typically composed, on a volume basis, of about 50 percent methane (CH4), 49 percent carbon dioxide (CO2) and 1 percent other gases. The amount of gas produced depends on many factors, particularly waste composition and site conditions. (See Section 4.1.5 for more details.) Landfill gas generation follows a pattern of four characteristic phases in which the volume of gas increases due to biodegradation of the waste under anaerobic conditions until it reaches peak production and then slowly decreases with time as the amount of organic waste is consumed. (See Figure 9.19.)

[76] *Climate Action Plan Interim Report*, NYS Climate Action Council, November 2010.

During the first phase of decomposition, aerobic bacteria consume oxygen while breaking down organic waste. Phase I decomposition can last for days or months, depending on how much oxygen is present when the waste is disposed of in the landfill. Phase II decomposition begins the anaerobic processes that start after oxygen in the disposed waste has been used up. The landfilled waste becomes highly acidic in Phase II. During Phase III, the landfill becomes a more neutral environment in which methane-producing bacteria begin to establish themselves. Phase IV decomposition begins when both the composition and production rates of landfill gas remain relatively constant. Under favorable conditions, the methanogenesis stage for a waste mass can be reached in two years. Phase IV landfill gas usually contains approximately 45 percent to 60 percent methane by volume, 40 percent to 60 percent carbon dioxide, and 2 percent to 9 percent other gases, such as sulfides. Gas is produced at a stable rate in Phase IV, typically for about 20 years. However, the actual timeframes for landfill gas production can vary. Gas can continue to be emitted for 50 or more years after waste is placed in the landfill.[77]

FIGURE 9.19. TYPICAL LANDFILL GAS GENERATION OVER TIME (TCHOBANOGLOUS, ET AL., 1993)



Note: Time scale (total time and phase duration) of gas generation varies with landfill conditions (i.e., waste composition and anaerobic state).

Several options are available for the management of landfill gas, depending on the landfill's size, age and waste composition. Owners and operators of larger MSW landfills constructed or operated since November 8, 1987 must comply with the requirements of 6NYCRR Part 208, Landfill Gas Collection and Control Systems for Certain MSW Landfills.[78] Owners and operators of these landfills

[77] EPA-600/R-05/123a, September 2005, Guidance for Evaluating Landfill Gas Emissions From Closed or Abandoned Facilities.

[78] Landfills with a design capacity of at least 2.5 million cubic meters and with non-methane organic compound (NMOC) emissions of at least 50 megagrams per year are subject to Part 208.

must design, construct and operate a collection and control system if the calculated non-methane organic compounds (NMOC) emission rate exceeds 50 megagrams per year and must monitor methane concentrations at the landfill surface to ensure they do not exceed 500 parts per million. Of the 27 operating MSW landfills in New York State, 14 are subject to this requirement. They are highlighted in Table 9.9. For smaller landfills where gas collection is not mandatory, carbon offset trading and renewable energy credits have created incentives for the collection and destruction of landfill gas and its conversion to energy.

Fourteen of the 27 operating MSW landfills, 7 closed landfills, and 1 Long Island Landfill have gas-to-energy production systems

Gas is collected using either a passive or active gas collection system. An active gas collection system typically includes horizontal collection laterals and/or vertical collection wells. Gas is extracted from the landfill by vacuums created by large blowers directing the gas to a large enclosed flare or gas-to-energy facility. A passive system typically consists of a number of shallow wells which penetrate a few feet into the waste mass or connect to a gas-venting layer in the cover system and vent directly to the atmosphere or sometimes to small flares mounted to the vents. Most of today's larger, active MSW landfills use an active collection system.

DEC regulations (6NYCRR Part 208) require that the gas from larger landfills be collected and destroyed. Facilities can meet Part 208 requirements by combusting the gas, either using flares or engines that generate electricity. Gas combustion, with or without energy recovery, converts the methane from all of these systems into CO2, resulting in lower GHG impacts. GHG reductions are also realized in systems that use the landfill gas for energy production because the combusted gas displaces fossil fuels for energy production. In some cases, such as the Fresh Kills Landfill on Staten Island, the gas is cleaned and marketed to commercial gas supply systems. In New York State, 23 of the 27 municipal solid waste landfills have active gas collection systems in place. Approximately half of the landfill gas captured from both active and inactive landfills is used for energy generation. (See Tables 9.8 and 9.9.)

FIGURE 9.20

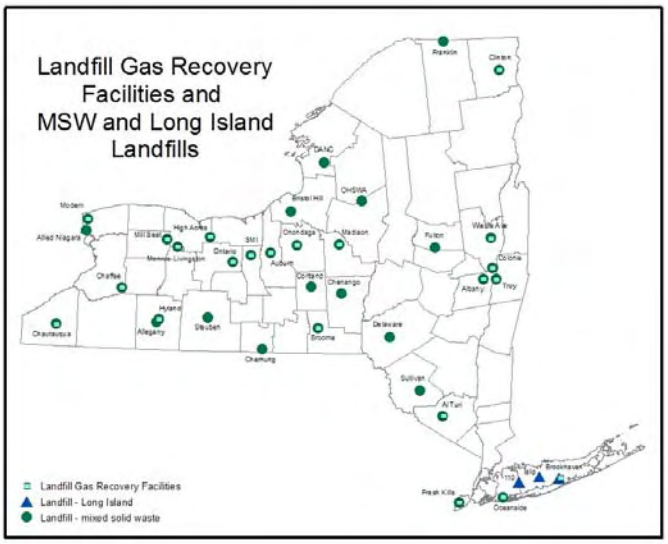


Table 9.8 shows information, compiled from the 2008 annual reports, about gas collected from landfills for energy recovery in New York State. Twenty MSW landfills and one Long Island Landfill currently have gas-to-energy production systems. Of the 21, 7 are closed, and 14 are operational. Figure 9.20 shows the locations of the landfill gas-to-energy facilities and their associated landfills. Altogether, they have collected a total of about 15.5 billion cubic feet of gas and produced almost 564,000 megawatt-hours of electricity. The gas collected from two of the landfills is not used to produce electricity on site. The gas from Fresh Kills Landfill is conditioned and marketed to a supplier of natural gas, while the City of Auburn uses its landfill gas for sludge drying at its nearby wastewater treatment plant.

Table 9.9 shows the amount of landfill gas that was collected and flared or used to generate energy from the active MSW landfills and one Long Island landfill. At these 28 landfills, the amount of gas flared (about 11.1 billion cubic feet) was about 2 percent less than was used for energy production (about 11.7 billion cubic feet) in 2008. This is an improvement compared to 2006 when the amount flared was 42 percent more than was used for energy production. In 2008, about 92 percent of the waste disposed at the active landfills listed in Table 9.9 went to landfills that actively collected gas for energy recovery or flaring. Approximately 80 percent of the waste disposed at the landfills listed in the table went to landfills that used the collected gas for energy generation. About 12 percent went to landfills that collected but only flared the gas, and the remaining 8 percent went to landfills that neither flared nor recovered energy. Thus, there may be significant opportunities for additional energy recovery at these sites. Energy generation from landfill gas is limited by the substantial costs to facilities, as well as logistical and regulatory hurdles related to connecting landfill energy recovery facilities to the electricity grid.

Several gas-to-energy production systems listed in Tables 9.8 and 9.9 began operation during 2008. The system at the Hyland landfill began in August of 2008, and the systems at the Clinton County Landfill and the DANC Landfill both began operation in October 2008. Since 2008, gas-to-energy production systems have begun operation at two MSW landfills. The system at the Madison County Landfill began operation in June 2009, and the system at the Fulton County Landfill began operation in June 2010.

In the case of small, old, inactive MSW landfills (25 acres or less), it has generally been assumed that recovery of methane for energy production is not feasible due to economies of scale. Little has been done to develop small-scale landfill gas recovery systems or to seriously evaluate their potential. Although individual landfills of this type may produce relatively small quantities of methane compared to larger and newer facilities, because of their sheer number—which is estimated to be more than 1,500 statewide—their cumulative contributions to GHG emissions may be significant. Due to the problems inherent in recovery of landfill gas on a small scale and the need for basic research in this area, it is likely that grant monies or other incentives will be needed to encourage research and development.

TABLE 9.8 2008 LANDFILL GAS-TO-ENERGY FACILITY ANNUAL REPORT DATA

Region	Facility Name	Activity Number	Landfill	Amount Gas Recovered for Energy (cubic feet)	Amount Electricity Generated (megawatt-hours)	Amount Low BTU Gas Produced (cubic feet)	Amount Condensate Generated (gallons)
1	Brookhaven Landfill Gas Recovery Facility	52F06	Brookhaven (52S02)	185,000,000	284		175,000
1	Oceanside Landfill Gas Recovery Facility	30F13	Oceanside (30S06)	110,440,000	3,617		12,105
2	NYCDOS/GSF FRESHKILLS GAS PLANT	43F21	Fresh Kills (43S02)	2,875,596,000		1,490,748,000	142,021
3	Ameresco	36F02	Al Turi (36S04)	101,025,000	3,726		15,410
4	Hudson Valley Community College LFG	42F01	Troy (42S17)	22,103,348	933		2,449
4	Minnesota Methane Albany LGRF	01F01	Albany (01S02)	359,850,000	12,521		
4	Town of Colonie Sanitary Landfill	01F	Colonie (01S26)	797,463,000	38,241		
5	Clinton County Landfill	10S20	Clinton County (10S20)	144,242,589	6,994		
5	Saratoga Springs Landfill Gas Project	46F01	Wieble Avenue (46S17)	6,720,000	417		
6	DANC		DANC (23S13)	194,073,483	9,410		
7	Auburn Landfill Gas	06F01	Auburn (06S14)			109,255,383	
7	Broome County LGRF	04F	Broome (04S07)	328,220,000	13,478		38,321
7	Onondaga Energy Group	34F01	Onondaga/Tripoli (34S12)	67,300,000	2,193		15,600
8	High Acres Gas	28F02	High Acres (28S32)	1,552,100,000	70,605		1,451,952
8	Mill Seat LGRF	28F03	Mill Seat (28S31)	864,400,000	41,087		603,944
8	Monroe-Livingston Gas	26F01	Monroe-Livingston (26S09)	306,738,169	11,648		85,050
8	Ontario LGRF	35F	Ontario (35S11)	1,014,669,687	47,917		
8	Seneca Energy; Inc.	50F02	SMI (50S08)	2,792,137,640	145,342		462,211
9	Chaffee Landfill	15F01	Chaffee (15S14)	800,129,000	41,627		23,713
9	Hyland Landfill	02F01	Hyland (02S17)	249,684,545	12,106		
9	Model City Energy	32F01	Modern (32S30)	2,218,131,000	101,805		
			Total:	*15,208,534,227*	*563,951*	*1,600,003,383*	*3,027,776*

Note: 1. The Hyland Landfill gas-to-energy facility began operation in August 2008. The Clinton County Landfill and the DANC Landfill began operation in October 2008.

TABLE 9.9 2008 LANDFILL GAS COLLECTED FROM ACTIVE MSW AND LI LANDFILLS

Region	Landfill Name	Activity Number	Amount Gas Flared (cubic feet)	% Gas Flared	Amount Gas Recovered for Energy (cubic feet)	% Recovered for Energy of Total Gas Collected	Comments
4	Albany Rapp Rd.		1,360,579,877	79%	359,850,000	21%	3 Open Flares
9	Allegany County	02S15					No flare
9	Allied Niagara Falls	32S11					No flare - Nonputrescible Waste
7	Auburn Landfill No. 2	06S14					1 Open Flare - variable amounts flared
6	Ava	33S15	24,440,000	100%	-	0%	4 Open Flares
8	Bath	51S21	303,711,000	100%	-	0%	1 Open Flare
7	Bristol Hill	38S14					No flare
1	Brookhaven	52S02	446,000,000	71%	185,000,000	29%	1 Open Flare, 1 Enclosed Flare
7	Broome County	04S07	216,260,000	40%	328,220,000	60%	1 Open Flare
9	Chaffee	15S14	290,371,000	27%	800,129,000	73%	1 Open Flare, 1 Enclosed Flare
9	Chautauqua	07S12	1,173,109,935	100%		0%	
8	Chemung County	08S02	376,400,000	100%		0%	6 Open Flares
7	Chenango County	09S16					5 Open flares
5	Clinton County	10S20	756,400,000	84%	144,242,589	16%	1 Flare
4	Colonie	01S26	3,379,860	0%	797,463,000	100%	2 Open Flares
7	Cortland County Westside Ext	12S10					No flare
6	DANC	23S13	622,000,000	76%	194,073,483	24%	2 Open Flares
4	Delaware County SWMF	13S18	197,000,000	100%		0%	1 Open Flare
5	Franklin County Regional	17S21	143,000,000	100%		0%	1 Open Flare
5	Fulton County	18S20	227,959,000	100%		0%	1 Open Flare
8	High Acres Western Exp	28S32	1,900,038,000	55%	1,552,100,000	45%	2 Enclosed Flares
9	Hyland	02S17	618,425,000	71%	249,684,545	29%	1 Open Flare
7	Madison County West Side Ext.	27S15	259,288,000	100%		0%	1 Open Flare
8	Mill Seat	28S31	1,012,500,000	54%	864,400,000	46%	1 Enclosed Flare
9	Modern	32S30	-	0%	2,218,131,000	100%	1 Enclosed Flare
8	Ontario County	35S11	132,870,000	12%	1,014,669,687	88%	1 Open Flare, 2 Enclosed Flares
8	Seneca Meadows	50S08	534,000,000	16%	2,792,137,640	84%	2 Enclosed Flares
3	Sullivan County	53S03	552,000,000	100%		0%	2 Open Flares
		Total:	*11,149,731,672*		*11,718,611,710*		

Note: 1. The amount of gas collected does not equal the amount generated because landfills experience uncontrolled emissions. For a more complete discussion, see Section 4.

2. Highlighted landfills are subject to the requirements of 6NYCRR Part 208, Landfill Gas Collection and Control Systems for MSW landfills.

9.4.8 Siting Issues and Restrictions

Siting landfills is a complicated and controversial process that has, at times, taken more than a decade. This is due, in part, to siting restrictions and to the intervention of parties opposed to landfill siting in their communities. Among the most common issues are the restrictions related to regulated wetlands. These are often applicable to proposed landfill projects because of the widespread nature of wetlands in New York State and because the low-permeability soils which promote wetland formation are also preferred for landfills because they limit the potential for groundwater contamination. Additional siting factors are considered under SEQRA and include impacts on traffic and aesthetic resources, such as scenic views, noise, odors, and public health concerns. DEC has issued guidance to aid project proponents in addressing climate impacts under SEQRA analysis (see http://www.dec.ny.gov/regulations/56552.html). The extent to which significant environmental impacts can be mitigated is weighed in the decision to permit waste disposal capacity.

9.4.9 Landfill Expansions

In 2009, landfills were fewer in number and larger in size due to the challenges of siting new landfills in greenfield sites, the time and cost involved in developing a new landfill, the objectives of many municipalities to use existing facilities outside their boundaries rather than construct and operate their own facilities, and the goals of private enterprises to provide and expand service to a wide array of customers. Today, landfill expansions, which typically take one to five years to develop, are much more common than new landfill sites because of litigation, local zoning prohibitions, real property acquisition costs and lengthy regulatory and public review processes that make new greenfield site development ever more daunting. Also in their favor, landfill expansions use existing infrastructure, are much less expensive to design and construct, and generally impact fewer natural resources than new landfills. Largely due to efficiencies of expanding existing landfills, even municipalities that actively manage their waste and operate their own landfills have generally sought to expand existing landfills to provide long-term disposal solutions rather than site new facilities. This trend toward expansions and optimizing capacity at existing land-disposal operations helps establish an existing and perhaps sustainable landfill disposal infrastructure such that the state's land resources can be conserved to the maximum extent possible.

9.4.10 Bioreactor Landfills

A bioreactor landfill is one in which conditions, particularly moisture and temperature, are carefully managed to enhance waste mass decomposition, increase gas production, and conserve air space. DEC encourages the development of bioreactor landfills as an emerging approach to reduce the potential for long-term contamination, as long as appropriate leachate and gas controls are in place.

Secondary benefits to bioreactor landfills include optimized landfill operations via conservation of permitted disposal capacity, and thus the preservation of land resources for uses other than landfilling. The bioreactor also increases or enhances gas production, and thus the potential for

better landfill gas-to-energy production. The magnitude of waste currently interred in the state's modern facilities helps to make gas collection and recovery systems economically viable. Collectively, these benefits should encourage today's landfill operators to modernize operations to minimize the potential for long-term contamination.

The 1993 revision of the Part 360 regulations includes provisions to facilitate the development of bioreactors. One of the goals of this rule-making effort was to develop a regulatory framework that is flexible and also encourages environmentally sound and resource-conscious landfill management. At this time, there are no bioreactor landfills operating in New York State. For more information on bioreactor landfills, see http://www.mswmanagement.com/may-june-2000/landfill-bioreactors-regs.aspx.

9.4.11 Future MSW Disposal Capacity [79]

Looking at the state as a whole, at the end of 2008, there were about 220 million tons of permitted MSW landfill capacity for future disposal. Approximately 75 percent of that capacity is available to the marketplace, generally at merchant facilities, and 25 percent of capacity is designated for particular jurisdictions. At 2008 waste disposal rates, the remaining capacity permitted in the state can be equated, for illustrative and planning purposes, to an overall average of about 21 to 25 years of remaining, approved landfill site life. However, once acceptance restrictions are taken into account, 9 to 12 years of capacity are readily available to the rest of the state.

TABLE 9.10 MSW LANDFILL PERMITTED CAPACITY SITE LIFE SCENARIOS (YEARS)

	Current Conditions Continue	No Waste Import/Export
Permitted Landfill Capacity (All MSWLFs)	21-25	15-18
Permitted Capacity w/o Self-Sufficient or Limited Service Area MSWLFs	14-18	9-12

To provide a more in-depth analysis, Figure 9.9 and Table 9.11 provide the site life remaining at each of the MSW landfills in the state at the end of 2008. A more realistic analysis of disposal capacity must consider site-specific capacity at the landfills that serve or could serve that planning unit. Approximately one-third of the MSW landfills, representing less than 10 percent of the total approved MSW landfill capacity, have less than 10 years of site life remaining before they reach their current permitted capacity. Several of these facilities have proposed expansions. Another 12 representing almost half of the remaining permitted capacity in the state have 10 to 30 years remaining. Another quarter, representing about 45 percent of the remaining permitted capacity, have more than 30 years left to fill. Therefore, two-thirds of the MSW landfill operators or the planning units in which they are located — representing almost 95 percent of the permitted landfill

[79] It should be noted that capacity projections are a snapshot in time. As landfill expansion applications are approved, the remaining capacity picture changes. DEC has provided estimates based on the assumption that current operations and conditions will continue into the future.

capacity in the state — have ample time to attempt to reduce waste and increase recovery or plan for future expansion.

TABLE 9.11

MSW Landfill	Site Life beyond 2008 (Years)	Existing & Entitled Capacity (Tons)	Percent of Total Landfill Capacity
0 - 10 Years			
Albany	1	478,000	6
Sullivan	1	140,000	
Chautauqua	2	2,240,000	
Allegany	4	250,000	
Franklin	7	575,000	
Ontario	7	7,350,000	
Auburn	8	761,000	
Chemung	8	1,240,000	
11 - 30 Years			
Mill Seat	11	6,890,000	49
DANC	12	3,500,000	
Allied Niagara	13	9,240,000	
Colonie	15	4,000,000	
Steuben	15	2,420,000	
Chaffee	17	6,080,000	
Hyland	17	7,710,000	
SMI	17	37,600,000	
Clinton	20	7,640,000	
Delaware	20	508,000	
Modern	24	22,100,000	
Cortland	28	710,000	
31 - 50 Years			
High Acres	41	44,400,000	26
Chenango	42	1,100,000	
Broome	50	10,600,000	
51 - 100 Years			
Bristol Hill	60	3,350,000	16
Fulton	63	9,450,000	
OHSWA	67	21,400,000	
100 + Years			
Madison	106	7,770,000	4

Denotes Self-Sufficient or Limited Service Area MSW Landfills

9.5 IMPORT/EXPORT FOR DISPOSAL

While some planning units have enacted flow-control measures as part of integrated waste management systems within their communities, more often than not, waste is moved from the planning unit or community where it was generated to another where it is disposed. While many New York State communities dispose of their waste within the state, as shown in Figure 9.21, a significant amount of waste is also transported for disposal across state borders, both out of and into the state. Figure 9.22 illustrates the progressive increase in waste exports in time.

The state's increasing reliance on waste export from many of its densely populated areas represents a significant public policy issue. While DEC acknowledges that the flow of waste is dictated by economic and market forces as well as regulatory and policy directives, it is important to recognize that relying on other jurisdictions to manage one-fifth of the total waste stream and one-third of MSW is problematic and potentially unreliable. Principles of sustainability and responsibility dictate that materials be managed in the most efficient and environmentally sensitive manner, with consideration of the risks and impacts of out-of-state transportation. Although complete self-sufficiency is unlikely, it is a worthy goal to which the state and its communities should aspire to reduce its vulnerability to the decisions of other states and jurisdictions and to achieve sustainable materials management. Nevertheless, a planning unit's decision to export waste for disposal out of state, or even out of the planning unit, must be based on a number of relevant factors, such as local conditions amenable to infrastructure development, economics, proximity to disposal facilities outside of the unit, and the availability of efficient, long-distance transportation methods.

Achieving the goals of this Plan—preventing waste, increasing reuse, recycling and composting and reducing waste disposal—will help reduce reliance on export. For example, increasing the statewide MSW recycling rate to 45 percent and reducing waste generation to 2.9 pounds per person per day would result in six-million tons of waste reduced statewide—roughly equivalent to the amount of MSW exported annually. Fully realizing the potential of this Plan would reduce waste generation to below one pound per person per day, even further reducing pressure for export. If the state is successful in moving *Beyond Waste* and achieving the goals of this Plan, existing in-state disposal capacity could be extended, and out-of-state export could be curtailed significantly.

FIGURE 9.21

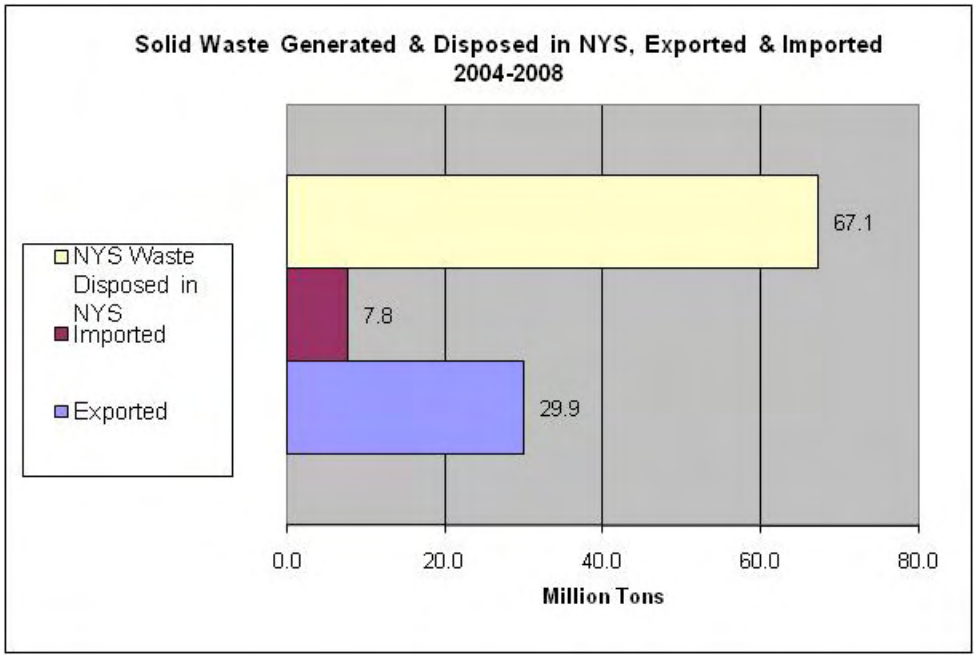
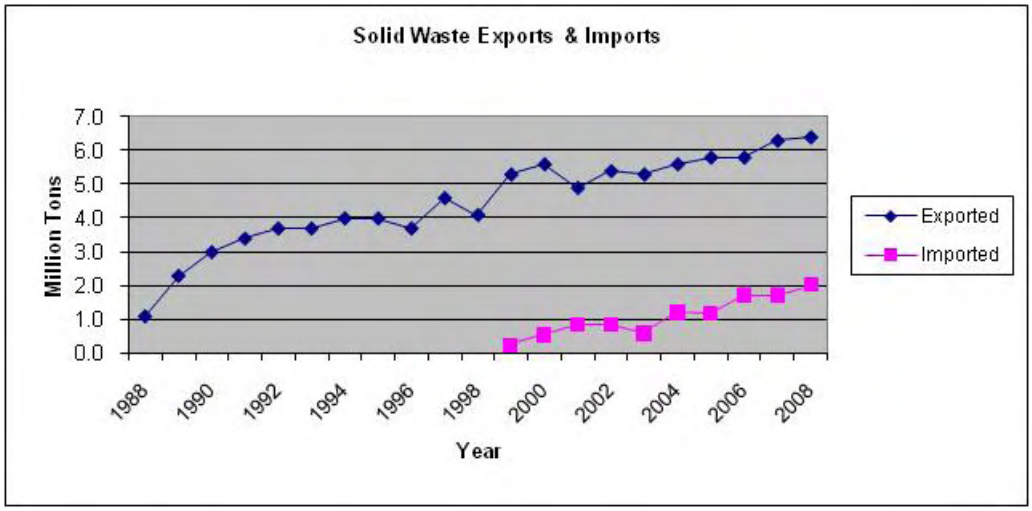


Figure 9.22 demonstrates the trends in the total amount of solid waste transported out of the state during the past 20 years and into the state during the past 10 years. New York State continues to be a significant net exporter to disposal facilities in other states, as the figure shows, with both exports and imports generally rising with time. It should be noted that the older data is not as comprehensive as that from recent years, and import data was not collected prior to 1998. The newer data is more reliable due to enhanced reporting requirements and improved data management methods employed by solid waste management facilities and by DEC, although further improvements are still needed as discussed in section 8.3.1.

FIGURE 9.22



9.5.1 Exports

This section focuses on waste transported for disposal and not on recyclables.[80] The data presented here includes: MSW, C&D debris, and industrial waste but excludes biosolids. MSW represented about 74 percent of the solid waste exports in 2008 and about 60 percent of the imports. Export data presented in this section is based on information provided in solid waste management facility annual reports submitted to DEC.

During the past decade, more than a quarter of all solid waste generated and destined for disposal in New York State annually has been exported. Exports appear to have increased significantly in the past 20 years, and they are still rising. Perhaps the most significant reason for the increase since 2000 is that the immense Fresh Kills Landfill on Staten Island ceased receiving waste at that time. New York City began gradually decreasing the amount of waste disposed at Fresh Kills and increasing out-of-state exports several years prior to that the landfill's closure.

Much of the waste exported from New York State is generated in New York City (DEC Region 2). Since 2005, almost 75 percent of the state's exported waste originated in New York City. Most of the rest was exported from the neighboring downstate areas of Long Island (DEC Region 1) and the lower Hudson Valley (DEC Region 3). Altogether, waste exports from these three DEC regions account for about 99 percent of the state's export total.

[80] It is important to note that, in addition to conventional recyclables, approximately 86,823 tons of yard trimmings were exported from Long Island for composting in other states in 2008.

As illustrated in figures 9.23 and 9.24, the primary states to which New York State waste has been exported for disposal in recent years were, from greatest quantity to least:

1. Pennsylvania – exports from New York State have consistently ranged between 2 and 3 million tons per year since 2004.
2. Ohio – exports increased significantly from about 200,000 tons in 2004 to more than 1.7 million tons in 2008.
3. Virginia – exports increased from about 1.2 million tons in 2004 to more than 1.5 million tons in 2008.
4. South Carolina – exports increased significantly from virtually none in 2004 to more than 500,000 tons in 2008.
5. New Jersey – exports amounted to just under 200,000 tons.

These five states receive about 99 percent of New York State's exported waste.

FIGURE 9.23

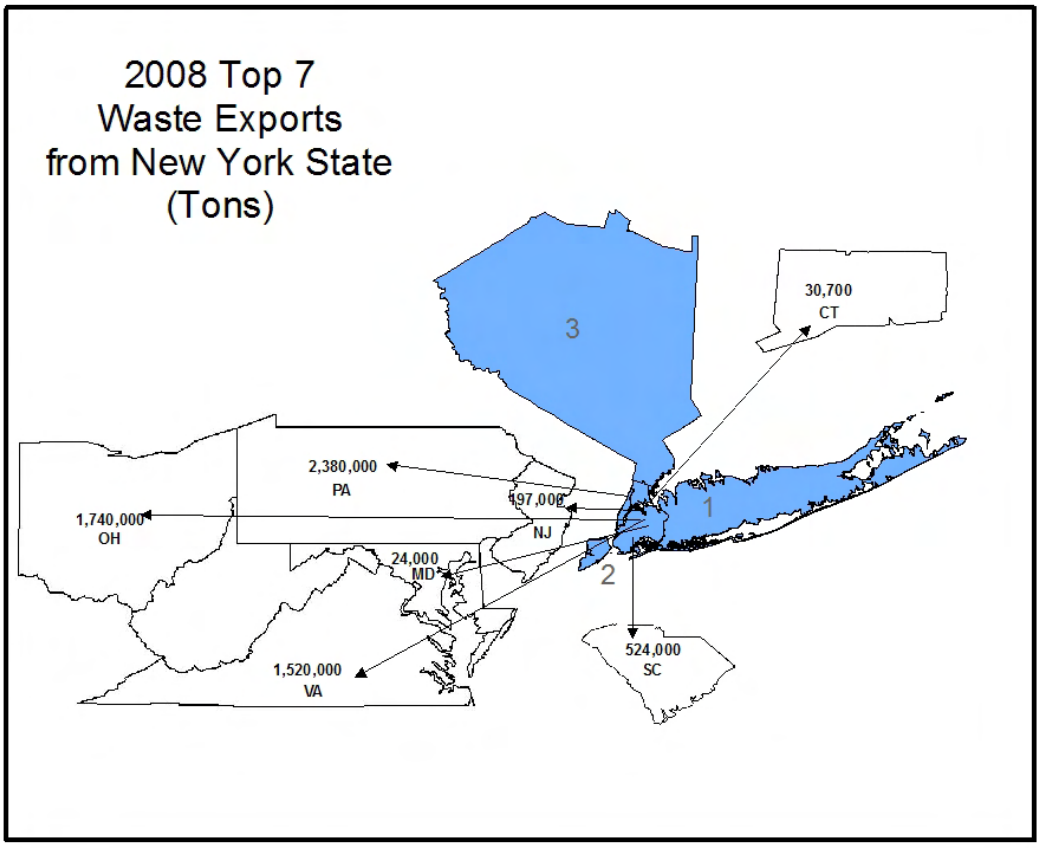
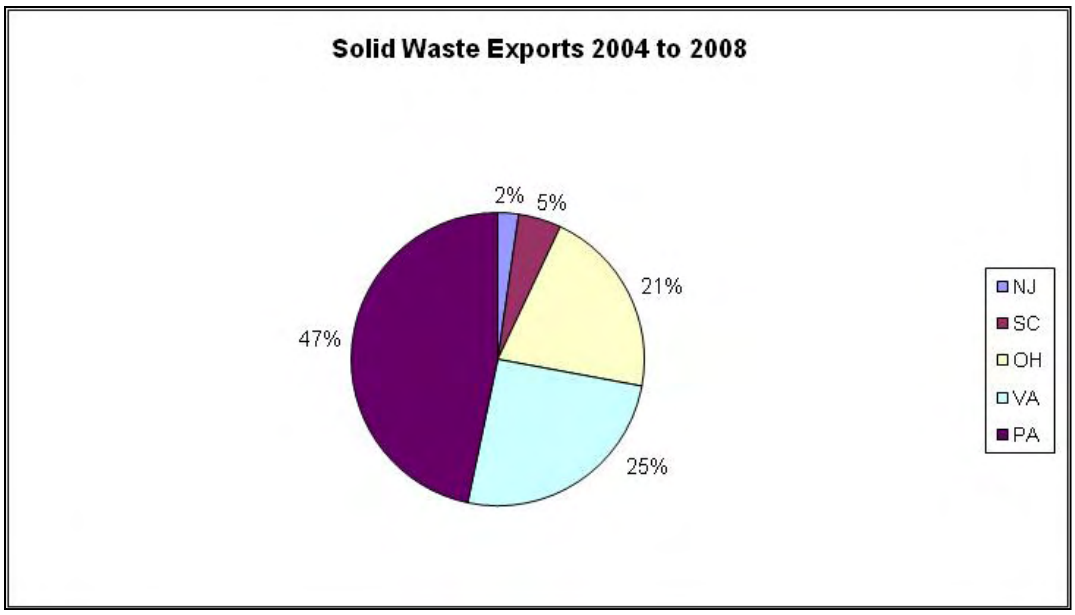


FIGURE 9.24



Solid waste exports for disposal far outweigh imports and will continue to do so for the foreseeable future, primarily due to long-term export contracts that are in place for New York City's residential solid waste. Despite excluding New York City's exports, imports and exports for the rest of the state seem to be comparable. Exports from the rest of the state, which have been primarily from DEC regions 1 and 3, have generally been about the same as imports during the past several years. Table 9.12 shows this, as well as a breakdown by waste type, for 2008. It should be noted that the data in Table 9.12 is based on information reported by solid waste facilities in New York State. As mentioned earlier, the primary states to which waste from New York is exported report about an additional 1.3 million tons from New York. Imports have been accepted, for the most part, at facilities in DEC regions 3, 5, 8 and 9.

TABLE 9.12

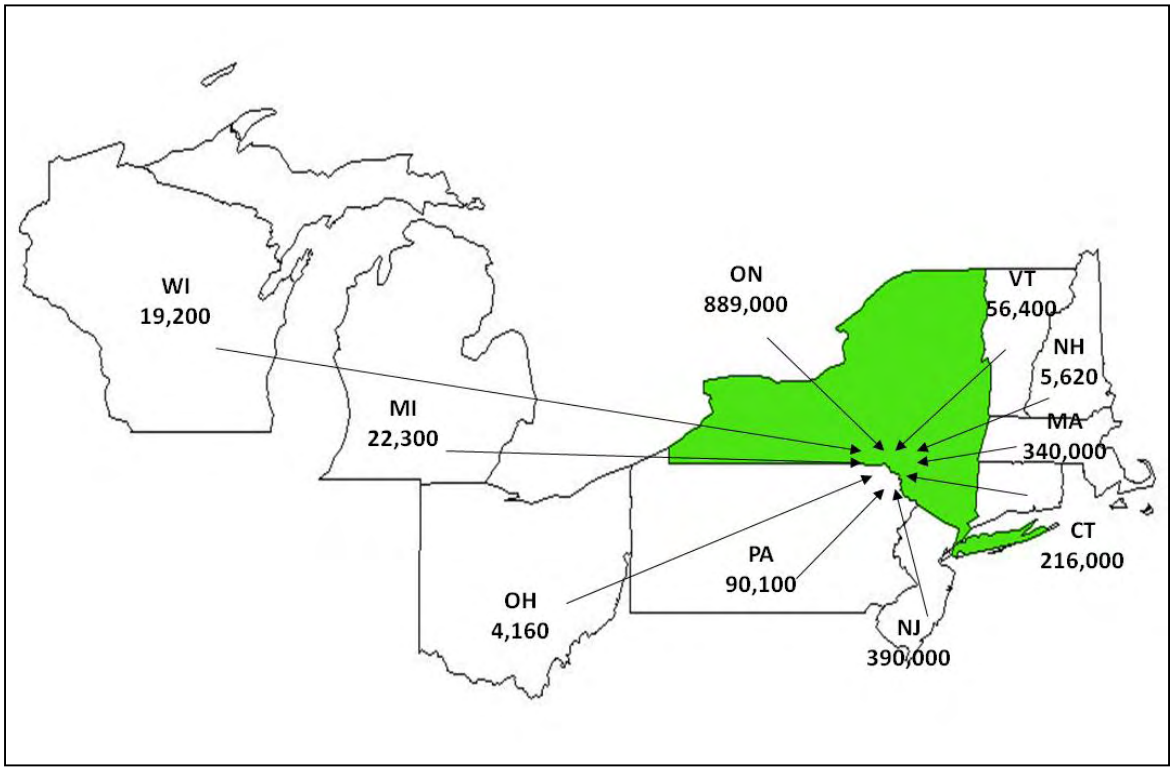
Waste Type	2008 Exports from NYS (in Millions of Tons)			2008 Imports
	Total	*NYC*	*Other NYS*	
MSW	4.7	3.7	1.1	1.2
C&D	1.6	1.0	0.6	0.5
Industrial	<0.1	<0.1	<0.1	0.2
Biosolids	0.2	0	0.2	0.07
Total	*6.5*	*4.7*	*1.9*	*2.0*

9.5.2 Imports

Although New York State is a net exporter of solid waste, waste import quantities have also increased substantially during the past decade. Since 2005, imports have accounted for more than ten percent of all solid waste disposed at landfills and MWCs within New York State. As illustrated in Figure 9.25 for 2008, the major states/provinces from which waste is imported are:

1. Ontario – Imports from this province have increased since 2005 from about 300,000 tons to almost 900,000 tons in 2008.
2. New Jersey
3. Massachusetts
4. Connecticut
5. Pennsylvania

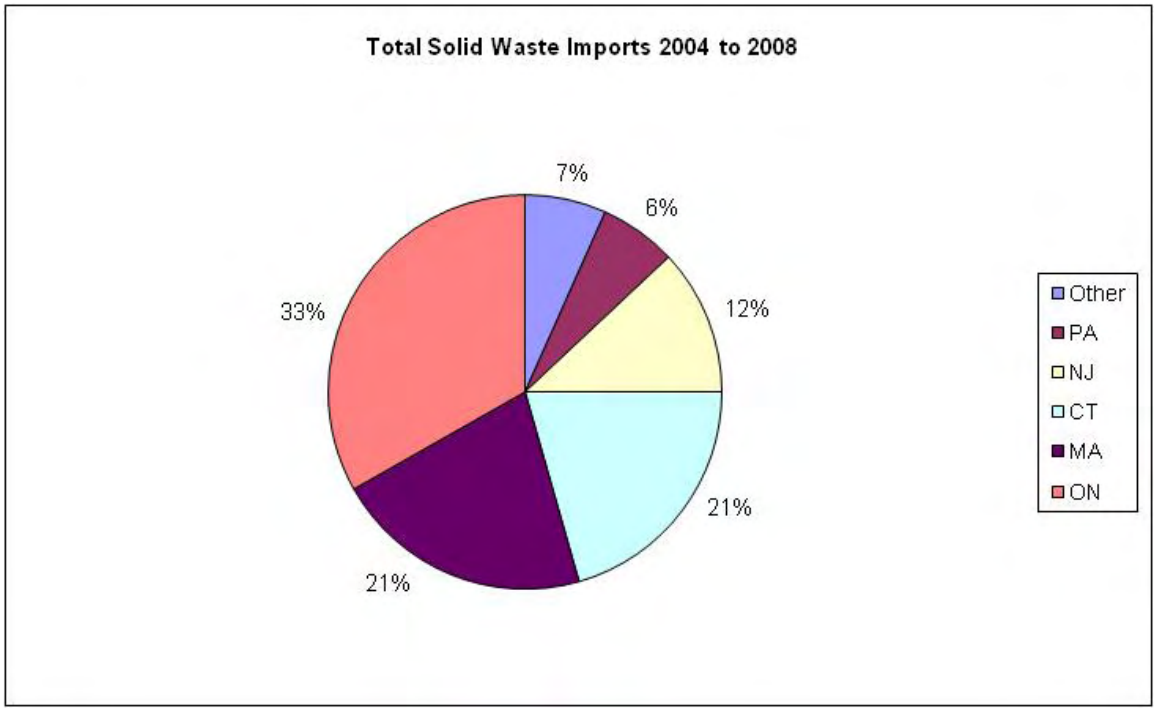
FIGURE 9.25



As illustrated in Figure 9.26, about 75 percent of waste imported into New York State since 2005 has come from Ontario, Connecticut and Massachusetts. The top five import states, which include these three plus New Jersey and Pennsylvania, are the source of about 95 percent of the waste imported into New York State. While imports from most states have either remained relatively constant or vary slightly from year to year, imports from Ontario in particular have increased steadily since 2005

and have accounted for approximately 33 percent of all imports into New York State since that time. Most imported waste is received by privately operated landfills and MWCs.

FIGURE 9.26 PERCENTAGES OF SOLID WASTE IMPORTED FOR DISPOSAL FROM OTHER STATES



9.5.3 Interstate Transport Limitations

Communities and businesses that generate or receive waste make waste management decisions based on a variety of economic, legal, and political factors. Only about half of the 64 planning units in the state have disposal facilities (landfills and/or MWCs) within their boundaries. The rest essentially rely on disposal capacity in other in-state planning units or out-of-state facilities. Therefore, free movement of waste is critical to these planning units and the facilities that serve them. Restrictions on waste exports would potentially impact about 22 percent of New York State's waste that is currently destined for disposal.

9.5.4 Data Collection and Reporting

As mentioned earlier, the information presented in this section is based on the data provided to DEC in solid waste management facility annual reports. Unfortunately, there have been inherent discrepancies and inconsistencies in data reporting and transcription. Data collection and reporting improvements have been made both by DEC and the facilities, resulting in more complete and accurate data. Better monitoring of facilities has also resulted in the submission of more reports,

and measurements are more accurate as most facilities now use calibrated weighing scales rather than estimating loads based on truck counts or volumes.

Nevertheless, data on exported waste available to DEC is incomplete in that annual reports are submitted to DEC only by regulated solid waste management facilities in New York State. DEC currently does not capture information about waste that is transported directly out of state without going through such a facility, resulting in underreporting of exported waste. The degree of underreporting is uncertain. The difference between New York State's annual export estimates and those reported by other states, most notably Pennsylvania, has been up to 3-million tons. Efforts have been underway to obtain better information, but more comprehensive reporting mechanisms and other improvements are still needed.

To prepare the 2008 export estimate, DEC included: (1) reported exports from transfer stations and other facilities in New York State and (2) data from state agencies in the five states that receive most of New York State's waste exports, as reported by transfer and disposal facilities in those states. Adding data collected from other states resulted in an estimated increase of 1.5 million tons of solid waste exports.

9.6 EMERGING TECHNOLOGIES

Many municipalities, companies, universities and research institutions are working to develop the next generation of MSW conversion technologies as a waste management alternative to landfilling or conventional mass burn MWC. These technologies use advanced thermal, biological, or chemical processes to convert the organic portion of the waste stream into a syngas which can be used to produce electricity, synthetic fuels, and/or chemical products.

Thermal conversion technologies include pyrolysis, gasification, and plasma arc gasification. As of fall 2009, there were four proposals for gasification plants in the state in the permit application process. Biological and chemical conversion technologies include anaerobic digestion, fermentation to ethanol, acid hydrolysis, and catalytic cracking. While some consider anaerobic digestion an "emerging energy from waste technology," DEC considers it a biological organics recovery system, and, therefore, it is discussed in Section 8.4.

Emerging technologies are attracting the attention of researchers, consultants, facility owners, and municipalities seeking alternatives to current residuals management techniques. Communities in California, Florida and New York City have commissioned studies on alternative thermal, thermochemical and biochemical conversion technologies. They are finding that thermochemical and biochemical conversion technologies possess unique characteristics which have varying potentials to reduce the amount of material that is ultimately landfilled.

However, there are still many questions regarding implementation of these technologies on a commercial scale, including:

- Can the technology be scaled up successfully and for long-term operations?

- Will costs and revenues be as proposed by the project sponsor for the life of the project?
- Will the system be available, and the project sponsor solvent, at the time contracted for delivery and operation?
- Will the project sponsor be available throughout the life of the project for servicing and operation assistance?
- Will the system perform as expected during the life of the project?
- Will the system have good reliability and greater than 85 percent availability when waste is delivered?
- Will the environmental impacts be as described by the project sponsor?

In March 2006, the New York City Economic Development Corporation released its study, *Focused Verification and Validation of Advanced Solid Waste Management Conversion Technologies*. The study found that anaerobic digestion and thermal processing technologies are in commercial operation overseas for MSW, and these technologies could be successfully applied in New York City. According to the report, the environmental findings showed that, in general, anaerobic digestion and thermal processing technologies have the potential to offer better environmental performance than MWCs, including lower air emissions, increased beneficial use of waste, and reduced reliance on landfilling. The economic findings also showed that costs for these technologies (on a commercial scale) were comparable to costs for current export practices.

Other studies, however, have found that some thermal treatment facilities have demonstrated higher air emissions than mass-burn MWCs. Test burns at a pyrolysis facility in Riverside County, CA yielded emissions of key pollutants (ozone precursors NOx and reactive organic gas and dioxins) at higher levels than conventional mass-burn MWCs.[81]

Also to be considered are the potential energy consumption needs of certain emerging technologies that can offset their value as a source of electricity. For example, plasma arc facilities use electricity to create the ultra high-temperature environment needed to generate the arc. Reportedly, 40 percent of the energy produced at a plasma facility would be required to operate it, and only 60 percent would be available for resale.

It is also important to note that many emerging technologies have been plagued by operational problems and have had difficulty growing from bench to commercial scale. There are two examples of MSW gasification facilities, one in Germany and one in Australia, which have closed due to operational issues, including technical problems, equipment breakdowns, and air emissions exceedences.[82]

---

[81] *Status Update by South Coast Air Quality Management District on IES Romoland's Permit*, presented at the September 20, 2005 California Integrated Waste Management Board Meeting, September 20, 2005.

[82] Source: *Incinerators in Disguise,*. Greenaction for Health and Environmental Justice and Global Alliance for Incinerator Alternatives (GAIA), April 2006.

In summary, while thermal treatment technologies are emerging, they have not yet been successfully demonstrated in the U.S. in an economically viable, environmentally protective commercial-scale operation. Both existing and proposed Part 360 solid waste management regulations contain provisions for Research, Development and Demonstration (RD&D) requirements that will allow for permitting of emerging waste management methods as these new technologies evolve.

10. AGENDA FOR ACTION

The Plan seeks to fundamentally change the way discarded materials are managed in New York State. The action agenda presented here is a compilation of the recommendations detailed throughout the Plan and represents the path that will move the state toward sustainable materials management by progressively reducing the amount of materials that go to waste. Taking this path will have a tremendous positive impact on our economy and our environment—conserving energy and natural resources, creating economic opportunities and jobs, and reducing greenhouse gas emissions.

This Plan is ambitious. To meet its promise, the state and its solid waste management planning units must receive the support they need to implement the wide range of actions detailed throughout the Plan and summarized below. New York State's citizens must embrace its concepts as well. Fully realizing these recommendations will require additional resources—both financial and human—at the state and local level. Options for generating new resources are presented in Section 10.1.3 below.

10.1 LEGISLATIVE RECOMMENDATIONS

While some of the goals of the Solid Waste Management Act of 1988 (Act) have been met, as evidenced by the growth in recycling programs since its passage, it is undeniable that higher levels of achievement are possible. With continued growth in the volume of solid waste generated, an evolved understanding of the environmental impacts of waste disposal and emergence of new materials management options, there is a clear need for new priorities. Moving forward requires an updated statutory framework that sets the stage for growth and supports the paradigm shift needed to move *Beyond Waste*.

This section includes the critical elements of a new legal structure to prevent waste and increase recycling, including an updated solid waste management act, product and packaging stewardship programs, and options for generating new resources. Together, these legislative recommendations are intended to achieve the following objectives:

- Prevent waste generation
- Use materials in the waste stream for their highest and best use
- Maximize reuse and recycling
- Engage state agencies, authorities, businesses, institutions, and residents in sustainable materials management programs
- Maximize the energy value of materials management
- Engage manufacturers in end-of-life management of the products and packages they put into the marketplace

10.1.1 Updated Solid Waste Management Act

Making truly significant progress to prevent waste and increase recycling will require a new statutory structure. Updates to the act proposed here represent an integrated package of recommendations that address many issues raised throughout this Plan. Together they create a framework that will support the state's efforts to move *Beyond Waste.*

A critical element of a new framework is an updated solid waste management act to guide the actions of the state's many involved agencies and its varied municipalities. An updated act should address the following key issues:

1. *Set new goals and define new metrics:* New and aggressive reduction, composting and recycling goals will guide New York State and its citizens, businesses, local governments, and planning units in striving for reductions in waste and increases in recycling. Statutory goals should mirror the statewide goals proposed in this Plan, beginning with a shift to a more effective way of measuring success. Instead of attempting to measure the percentage of waste diverted from the waste stream, the new metric will gauge the amount of waste destined for disposal on a *per capita* basis, with a goal of progressively reducing that amount to reach a goal of 0.6 pounds per person per day disposed by 2030. Using this metric, the state will be able to assess the impact of waste prevention, reuse and product and packaging stewardship and more effectively assess progress in moving *Beyond Waste*. To measure recycling progress, the state will track *per capita* diversion of recyclables and organic materials. DEC will evaluate the effectiveness of the new metric and the state's progress against the disposal reduction goal in biennial Plan updates, which will assist the State Legislature and solid waste managers in making short and long-term policy decisions that promote both effective and environmentally responsible materials management.
2. *Update and clarify recycling and green purchasing requirements for state agencies and authorities:* The 1988 Act required all state agencies and authorities to implement recycling programs; however, many agencies have not met their obligations. Executive Order 4 (EO4) is a valuable step forward in integrating waste prevention, recycling and sustainability into state operations. (See www.state.ny.us/governor/executive_orders/exeorders/eo_4.html) Codifying state agency waste prevention, recycling, purchasing, and sustainability requirements of EO4 would ensure that the state continues to lead by example.
3. *Clarify the solid waste management hierarchy:* Research indicates that the existing hierarchy is still a valid and useful tool for prioritizing waste management strategies. An updated act should maintain core elements of the existing hierarchy, which places a preference for waste prevention, reuse, and recycling above disposal, and a preference for municipal waste combustion (MWC) over landfilling. It should clarify, however, that reuse is preferable to recycling, that composting and organics recycling are equivalent to recycling, and that product stewardship is the preferred approach to implementing the hierarchy. The updated act should make clear that the hierarchy is a statement of policy that communities should use as a guidepost, while using more advanced tools to evaluate the economic,

environmental and GHG impacts of various alternatives to determine the best path *Beyond Waste*.

4. *Generate and allocate new resources to move Beyond Waste:* Meeting the goals and objectives of this Plan will require significant investment in planning, reuse, recycling and composting infrastructure, market development, education, outreach and enforcement. This investment will necessitate an infusion of new revenue, such as one or more of the potential revenue sources discussed in Section 10.1.3 below.

5. *Reinforce recycling requirements for all generators:* There must be no ambiguity in the message that all New Yorkers are required to recycle, whether they are at home, at work, at school, in public spaces, or in transit stations. An updated act must clarify that recycling programs must be made available to and employed by all generators in all settings in the state; that is, that source-separation requirements extend beyond the residential sector to commercial, institutional and industrial generators and to public spaces, events and other gatherings. Establishing and enforcing programs in these areas will ensure that source-separation/recycling messages are regularly and uniformly conveyed and clearly understood.

6. *Supplement the "economic markets" clause in the current law (Section 120-aa of Article 6 of General Municipal Law) with a designated list of recyclables:* The 1988 Act required that communities establish recycling programs for materials "where economic markets exist." This clause has proven to be cumbersome in practice, creating confusion and potentially undermining the value of recycled materials because a reliable supply of material is critical to justifying private capital investment in secondary materials markets. In fact, most programs have continuously collected the same materials for much of the past two decades despite periodic dips in market values. Even in 2008, during what was the most dramatic recycling market collapse in recent history, no communities in the state reported cancelling recyclables collection. Experience also shows that when the same items are widely understood as recyclable for long periods, public participation is more successful. After more than 20 years of experience in recycling, DEC and ESD can identify the materials that are common to most programs in the state and that have had consistently viable markets. They include paper, glass, metal, plastic, and yard trimmings. These would comprise an initial list of designated recyclable materials in the updated act; other potentially recyclable materials would be subject to the "economic markets" clause. DEC should be authorized to add or remove materials by regulation as the market and collection/processing systems evolve. The updated act should then provide for an expedited mechanism for communities to petition DEC for an exemption from recycling requirements for designated recyclables and a mechanism for DEC to provide statewide waivers in times of severe economic hardship or based on other critical concerns. Any mechanism enacted should include public notice, hearing and a commissioner's decision.

7. *Increase DEC's authority and resources to enforce recycling requirements:* Planning units and municipalities have had the responsibility of enforcing source-separation requirements but

have had difficulty allocating resources for this important task. An updated act should supplement local enforcement of source-separation requirements with explicit authority for DEC to enforce against generators who do not source separate designated recyclables. Increasing DEC's authority and resources in this area would help municipalities both get the attention and engage the cooperation of reluctant recyclers.

8. *Ensure that every permitted facility maximizes recycling and reuse and otherwise affords opportunities to manage waste at the highest possible point in the hierarchy within the facility's service area:* An applicant whose facility is not explicitly part of an integrated system should contribute in other ways to encourage recycling, reuse, organics recycling, household hazardous waste (HHW) collection and other means of reducing the amount of waste disposed in the community in which it is located and by the communities within its service area.

9. *Establish disposal restrictions on bulk quantities of designated recyclable materials and other materials, including hazardous products, where recovery options are readily available or achievable:* An initial material eligible for restriction would be yard trimmings because ample composting infrastructure already exists, and many solid waste management facilities are already subject to permit conditions that restrict its disposal. To be most effective, such restrictions should be placed on waste generators and collectors as well as disposal facilities. Other states, including Wisconsin and Massachusetts, report that disposal bans are an effective educational and enforcement tool and help ensure that materials are properly managed or recovered where alternatives to disposal exist. They also provide a feedback mechanism so that the state and the municipality will be notified if materials targeted for recycling are not being effectively source separated. The act should direct DEC to develop protocols for disposal facilities to aid in compliance with restrictions, such as performing random inspections of incoming materials and distributing notices to facility users. Facilities should report the appearance of such materials and any information on their origin to DEC and the appropriate planning unit.

10. *Require local solid waste management planning:* The 1988 Act enabled local governments to create planning units to manage materials regionally. To foster more consistent program implementation, all local governments should be required to be members of a planning unit, and local solid waste management plans (LSWMPs) should be required for each planning unit.

11. *Authorize local governments to franchise private materials management services:* Franchising offers an opportunity for local governments to control materials collection and recycling and disposal systems without actually operating them to ensure that local systems are consistent with the state's sustainable materials management strategy. However, local governments must be authorized by state law to franchise these services.

12. *Expand the Waste Transporter Program to place specific requirements on transporters of municipal solid waste (MSW), recyclables, construction and demolition (C&D) debris and historic fill : E*nforce source-separation requirements, account for wastes that are currently largely unaccounted for, and ensure that communities that export waste comply with source-separation requirements and disposal restrictions. An expansion of the program should:

    a) Require transporters to provide recycling services to all customers or otherwise demonstrate that their clients are complying with recycling requirements. At a minimum, transporters should be required to provide all services required by local or state recycling laws in effect for the service area, including the collection of source-separated recyclables (SSR) from all generating sectors (residential, commercial, institutional, industrial);

    b) Prohibit the comingling of SSR with MSW, the delivery of SSR to solid waste disposal facilities, and the comingling or delivery for disposal of any waste prohibited by law, regulation or permit condition from being disposed of at a solid waste management facility;

    c) Allow for transportation of waste only to facilities authorized to accept the waste or materials being handled;

    d) Establish a means to account for the amount and composition of waste that is transported directly out of state; and

    e) Establish means to ensure that exported waste complies with source-separation requirements, disposal restrictions and other regulations or standards that apply to waste generated in New York State, so that export is not used as a way of avoiding the costs and constraints that accompany management in New York State.

13. *Provide technical fixes:* Several solid waste laws require amendments to resolve technical and definition issues. Several definitions in existing statute date back to the 1960s and are not reflective of current conditions. For example, the vehicle dismantler law contains some requirements that are not consistent with current best practices, the law banning the sale of creosote treated lumber does not allow for reuse or resale of post-consumer creosote treated lumber in commercial or industrial settings, and the law providing funding investment authority to ESD does not allow for support of anaerobic digesters and other technologies that can cost effectively convert organic residuals to biogas and other energy products in addition to generating a valuable end product.

10.1.2 Product Stewardship

Product stewardship is a centerpiece of the *Beyond Waste* Plan because it can help New York State overcome many of the critical hurdles that have hindered success. It can influence the design of products and packaging to reduce materials use, reduce toxicity and improve recyclability. It can

generate resources to optimize collection and recycling systems and improve efficiency. Ultimately, it can reduce the amount of waste disposed of and help New York State move *Beyond Waste*. (For more information, including the successful use of product stewardship in other jurisdictions, see Section 5, Product Stewardship.) The following legislative initiatives should be advanced to implement product stewardship in New York State.

1. *Packaging Stewardship:* The product stewardship concept is particularly appropriate for consumer product packaging because conventional approaches to recycling are not reducing the amount of packaging heading to disposal. Packaging stewardship encourages manufacturers to embrace materials efficiency and to design for recyclability, which helps local recycling programs capture more materials. And, when manufacturers must pay for the amount of packaging they use, they have a financial incentive to use less.
2. *Product-Specific Stewardship:* The following potential products are well suited to a stewardship approach. An unannotated list is presented below, with detailed justification for inclusion of each of these products provided in Section 5.
    - Household Hazardous Waste
    - Pharmaceuticals
    - Mercury-containing Products
    - Paint
    - Automobiles
    - Carpets
    - Office Furniture
    - Roofing Shingles
    - Appliances
    - Tires
3. *Product Stewardship Framework:* In many Canadian provinces, multiple product stewardship programs are implemented through a single law that establishes the structure of product stewardship in the province and creates a process and criteria for identifying products for stewardship and adding them as they meet the criteria. Known as a product stewardship framework, this approach maximizes efficiency by structuring stewardship programs in a consistent manner. For more on framework, see Section 5.2.5 and Appendix F.

10.1.3 Revenue-Generating Programs

Achieving the goals of this Plan—reducing waste generation, increasing reuse and recycling and reducing disposal—will require a significant commitment of funding to the state and especially to local governments. In addition to more resources, the state needs greater flexibility in allocating

resources to respond to emerging issues and critical needs. Likewise, municipalities need access to a less restricted base of financial support than currently provided through the Environmental Protection Fund (EPF) to create and implement the next generation of integrated materials management plans and programs. To advance this critical element of the Plan, DEC will:

1. Develop a package of preferred funding mechanisms and develop legislation to advance the package. Potential mechanisms include:

    - *Increasing state funds dedicated to reduction, reuse and recycling:* In 1993, New York State inaugurated the EPF to support environmental programs in special need of regular and sustained funding. The EPF has been the most consistent, long-term funding for municipal waste reduction and recycling, HHW and secondary materials marketing programs. In New York State, bond acts have been used to generate hundreds of millions of dollars for environmental infrastructure investments in the past (1972, 1986 and 1996). Each of these included significant allocations for municipal recycling and solid waste management. Given current needs for wastewater treatment, clean energy and materials management infrastructure, stakeholders have suggested that an investment on the scale of a Bond Act is warranted. Other states have used unclaimed bottle deposits to fund community recycling programs because the containers not redeemed are either recycled or disposed of in local systems;

    - *Assessing Solid Waste Disposal Fees:* More than 30 states assess some type of fee on the disposal of solid waste, serving as both a disincentive to disposal and a source of revenue to meet various funding needs. Fees vary by state from $.25 per ton to $8.25 per ton. With the exception of Massachusetts, all of New York State's neighbor states assess a solid waste disposal fee. Fees can be structured in a number of ways to achieve specific objectives, such as to direct proceeds back to local municipalities to support integrated programs or exempt facilities whose tip fees are already dedicated, in part, to waste prevention, reuse, recycling and composting programs;

    - *Implementing Plastic Bag Fees:* Many communities, countries and companies are considering assessing fees on the use of plastic carryout bags to raise revenue and to curb the use of this problematic product. Such fees are in place in Washington, DC, and Seattle, WA, and Ireland. Enacted fees range from $.05 to $.25 per bag; and

    - *Assessing Permit Fees:* Many states raise revenues by assessing fees on solid waste management facility permits. According to a survey conducted by the Northeast Waste Management Officials Association (NEWMOA), New York State is the only state in the region that does not collect fees from solid waste facility permit applicants. Other DEC programs, including Water and Air, assess permit fees.

2. Propose a new grant program, using revenue sources identified above, to provide consistent, annual funding to planning units to implement waste prevention, reuse,

recycling and organics recovery programs intended to address the long-standing need for enhanced resources for planning unit program implementation; be easily implementable; deliver funding in a timely manner; provide an equitable distribution of funds to municipalities, and foster consistent implementation of sound LSWMPs; and

3. Propose a targeted funding program, using revenue sources identified above, for specific priority areas identified by the state as having the greatest potential for advancing the state's goals in moving *Beyond Waste*. The fund must be flexible enough to allow funding to planning units, the private sector, state agencies or a combination of the three.

10.1.4 Expand the Returnable Container Law

The Returnable Container Law (also known as the Bottle Bill) remains the most effective recycling program in the state, capturing, on average, 73 percent of the targeted cans and bottles sold annually. In the 25 years since it was enacted, the beverage industry has expanded to include bottled water, sport drinks, fruit juices, tea and other non-carbonated beverages, none of which were covered by the original law. In 2009, the New York State budget included an expansion of the state's Bottle Bill to capture water bottles and redirect 80 percent of unclaimed deposits into the state's general fund. To support enhanced materials recovery and revenue generation, DEC will advance proposed legislation to expand the Returnable Container Law to include all beverage containers.

10.1.5 Mercury-containing Products

Expansion of mercury-containing product sale restrictions is necessary to be consistent with the model legislation developed by NEWMOA and implemented in other states. To accomplish this, DEC will advance proposed legislation that is consistent with the model legislation developed by NEWMOA, with very limited exemptions.

10.2 REGULATORY RECOMMENDATIONS

This section outlines the regulatory changes that can be made within existing statutory authority and that are necessary to support implementation of this Plan and achievement of its goals and recommendations. Passage of the legislative recommendations outlined above will likely require development of implementing regulations not discussed here.

10.2.1 Revisions to the Part 360 Solid Waste Management Facility Regulations

In addition to technical and structural changes that have been in discussion for some time, DEC will advance a revision to the Part 360 regulations that include the following key components:

- Update requirements for construction and operation of solid waste management facilities to better protect human health and the environment;

- Revise and update the Beneficial Use Determination (BUD) Program regulations to: remove certain pre-determined BUDs; establish additional pre-determined BUDs, especially for use of cooking oil for biodiesel, use of foundry by-products in concrete, and use of clean dredged materials as aggregate; authorize DEC to issue additional pre-determined BUDs or rescind an existing predetermined BUD without requiring an amendment to Part 360; and create recordkeeping and recording categories for BUDs that provide clarity with regard to those that are considered recycling and those that are not (e.g., fuel-related and landfill-related uses);
- Add new requirements for the management of historic fill, including additional operational conditions for its use that protect neighboring areas, particularly in communities of disproportionate impact;
- Restrict disposal of yard trimmings and source-separated recyclables in solid waste management facilities and other recyclable and organic materials as recycling infrastructure is developed or product stewardship programs are established;
- Take a regulatory approach to ensure consistent implementation of the requirements to source separate recyclables, particularly in areas served by private collectors;
- Establish separate tracks and waiting lists for EPF funding for recycling coordinators, educational activities, reuse programs, and other high-priority projects;
- Revise grant regulations to allow for targeting of EPF funds, through a request for proposals or similar process, to address critical priorities identified annually, such as education, outreach, enforcement of source-separation requirements, reuse, composting, organics infrastructure development, market development and stabilization, volume-based pricing (PAYT/SMART) program evaluation and implementation, conduction of state-sponsored waste composition analyses, etc.;
- Enact new regulations to improve the safe and appropriate collection, handling and recycling of electronic waste, and implement the Electronic Equipment Recycling and Reuse Act; and
- Review existing state regulations to remove or address contradictory regulatory requirements that limit the creation or expansion of composting and other organics recycling facilities.

10.3 PROGRAMMATIC RECOMMENDATIONS

This section outlines the programs and initiatives that the state will pursue within current statutory and regulatory authority in implementation of this Plan. These recommendations are compiled from other sections of this Plan, including Materials Management Planning, Roles and Responsibilities (Section 3), Financial Assistance (Section 6), and Materials Management Strategies (Section 8). Taken together, these activities represent a comprehensive sustainable materials management program. The state's ability to implement these initiatives and achieve the goals of this Plan will depend on its ability to increase available staff and financial resources.

10.3.1 State Agencies and Authorities Lead by Example

As the state works with municipalities, institutions and businesses to reduce waste and increase reuse and recycling, it is imperative that it demonstrate sustainable materials management within its own operations. To that end, the state will:

- *Work aggressively to implement the requirements of Governor Paterson's EO4, including:* Goals for waste prevention and paper-use reduction; sustainable operations plans, including minimizing waste and maximizing reuse, recycling and composting in all contexts (within state facilities, on state construction projects, etc.); green products purchasing program, including purchase of reused and recycled content products and local compost; and incorporating "design for deconstruction" concepts in sustainable building design and construction projects. (See www.state.ny.us/governor/executive_orders/exeorders/eo_4.html);
- *Promote and demonstrate organics recycling systems and activities by state agencies:* Continue the DEC/OGS partnership to implement organic recycling programs at state agencies with a goal of diverting all state-generated organic materials to recycling**;** expand the Department of Correctional Services' (DOCS) composting program to accept food scraps from other state facilities where possible; and work with all state agencies, including the State University of New York (SUNY) system of colleges and universities, to recycle food scraps focusing on on-site systems where possible;
- *Incorporate reuse into government procurement and asset management programs:* State agencies will be authorized and required to ensure that gently used furniture, equipment and supplies are directed to reuse and that government buildings are deconstructed instead of demolished by creating incentives for deconstruction in state projects. To the extent that barriers to the purchasing of used products exist, they will be reexamined and, if not serving a valid public purpose, be removed; and
- *Develop memoranda of understanding (MOUs) within DEC divisions or with other agencies* as needed to streamline BUD procedures or establish standards for beneficially used materials (e.g., to provide the Division of Environmental Remediation (DER) with the authority to make BUDs for materials used as backfill and cover on Superfund and Brownfield sites).

10.3.2 Comprehensive Materials Management Planning

Comprehensive planning is one of the key elements of successful materials management programs. A comprehensive program will:

- Expand DEC's local solid waste management planning technical assistance program and provide guidance and tools to help municipalities, advocates, and other stakeholders address challenging planning issues, including:
    - Recycling market development and stabilization

- Flow control or other private sector oversight programs (e.g., waste transporter licensing or permitting and reporting)
- Recycling and waste composition data collection and use
- Technology transfer and data/information sharing
- Materials recovery infrastructure analysis and needs assessment
- Incentives, education and enforcement
- Program implementation uniformity

- Require planning units to evaluate and implement, to the maximum extent practicable, the following programs, policies and initiatives as they develop new LSWMPs, modify existing LSWMPs, and otherwise plan for and implement programs:
  - Education and enforcement
  - Incentives, including volume-based pricing structures (e.g., PAYT/SMART Program)
  - Waste prevention and reuse programs and infrastructure
  - Public space, event, institutional and commercial recycling
  - Recovery of additional materials, including residential mixed paper, food scraps and other organics
  - Long-term recycled material supply agreements and/or processing contracts with multiple market outlets
- Evaluate current planning unit membership and structure to ensure that original structures are functioning, and, if not, support efforts to adjust structures or create new planning units to best carry forward the next stage of planning and program implementation;
- Develop an on-line reporting system to collect more timely and accurate recycling and disposal data from solid waste and recycling facilities and planning units; work with industry to develop uniform methods for more accurate data gathering and reporting using the new statewide performance metrics based on *per capita* amounts collected for recycling and disposal; and
- Evaluate the progress toward this Plan's goals in biennial state plan updates and recommend additional policy approaches as necessary.

10.3.3 Provide Outreach and Technical Assistance

Municipalities, businesses, institutions and agencies in the state will need guidance and assistance to develop sustainable materials management programs. To meet that need, the state will:

- Use the New York State Pollution Prevention Institute[83] (P2I) to provide education to manufacturers regarding the benefits of using lifecycle assessment as a tool in the design and implementation of product stewardship programs;
- Develop written guidance on organic waste prevention for specific affected sectors (e.g., grocery stores) based on similar documents available from Cornell University's Waste Management Institute and successful strategies being employed by other states and organizations (e.g., *MA Supermarket Composting Handbook* and several documents by NERC) and distribute the guidance to all known facilities in that industry in the state and other interested parties (e.g., local recycling coordinators, etc.);
- Encourage use of the Food Bank Network. Organize meetings in each food bank region of the state, inviting representatives of relevant state and local agencies, local recycling coordinators, and institutional and commercial generators of excess food to identify and evaluate potential new suppliers, raising funds to expand activities, educating commercial and institutional generators about food donation options, and addressing regulatory, economic and other barriers to increased food redistribution;
- Use information and contacts from food scrap forums across the state to identify new opportunities for food waste generators (food processors, restaurants, and retailers) to work with processors and end users; Continue to provide technical and regulatory assistance for entities (private and public) interested in developing small and large-scale organic recycling systems and for operators interested in demonstrating the viability of incorporating food scraps into existing yard trimmings or biosolids composting facilities;
- Identify interested school systems and assist them in demonstrating the advantages of on-site composting systems. Work with New York State-based Go Green initiative participants to implement new systems;
- Issue technical guidance documents to assist local governments in planning for and implementing sustainable materials management programs, including guidance on organics recycling and other sustainable materials management programs, alternative treatment technologies, and updates to other technical guidance documents issued by DEC;
- Maximize the diversion of food scraps to feed animals by providing funding to a non-governmental organization to: develop and distribute guidance on the regulatory requirements governing consumable food used for animal feed; work with Cooperative

[83] The Pollution Prevention Institute is a collaborative of several universities and technology development centers funded through the Environmental Protection Fund. For more information, see http://www.nysp2i.rit.edu/

Extension agents to identify farms and local food residuals sources and facilitate relationships and hold forums across the state to disseminate information and facilitate relationships between the sources and farmers;

- Work with the NERC to take full advantage of its On-Farm Compost Marketing Project, including connecting farms with NERC's technical assistance services and disseminating the Compost Marketing Toolkit;
- Develop additional resources, tools and information for local governments and planning units relating to volume-based pricing (PAYT/SMART) and promote their use. The resources will, at a minimum, outline the basic elements of effective PAYT/SMART programs, highlight the varying types of volume-based pricing programs that can be developed to address the unique characteristics of each municipality and planning unit and provide model policies for easy adaptation;
- Continue to work with and support the efforts of charitable organizations which play an important role in providing necessary support for the state's indigent population, and encourage other relevant state agencies to do the same;
- Develop guidance for planning units on performing waste composition and characterization analyses to ensure consistency in analyses undertaken across the state so that the characterization data can support state and local planning; identify funding sources to incentivize local waste characterization efforts and develop a program and system to conduct periodic state-sponsored waste composition and characterization analyses;
- Network with other agency stakeholders to facilitate immediate response to disasters and to mitigate the impacts of disasters through better planning;
- Work with the P2I to conduct outreach to businesses regarding lifecycle considerations for "green products;"
- Identify products and packaging that pose particular post-consumer management challenges for attention from the P2I, where research and development projects can be devised to improve these packaging and product designs; and
- Facilitate forums on C&D debris management to bring government and private entities together to identify strategies for overcoming barriers to increased material recovery, including market development, policy tools and economic incentives.

10.3.4 Educate the Public

Public participation in waste prevention, reuse and recycling is key to achieving sustainable materials management in New York State. To improve participation, the state will:

- Launch an aggressive public education campaign to promote waste prevention, reuse, composting, recycling and the proper management of hazardous components of the waste stream. DEC will seek funding to develop and implement the campaign, which will also

include production of tools such as templates and informational materials for local governments to use in their own outreach efforts;

- Organize workshops and other meetings and expand web-based and other outreach materials to communicate with key constituencies to promote waste prevention, reuse, recycling and composting;
- Publicize innovative reuse, organic recycling and other model programs in the state via the DEC website, ESD's Recycling Markets Database, agency publications and other communications;
- Build regional DEC staff outreach and education capacity to assist planning units in improving recycling;
- Encourage design for reuse and disassembly and process optimization within the remanufacturing industry. Through the P2I in collaboration with RIT-CIMS and other outreach efforts, the state will educate manufacturers on the feasibility and benefits of designing for reuse and remanufacturing, as well as optimizing the process of actually remanufacturing products;
- Encourage regional or national collaboration to develop consistent data collection and reporting protocols and systems through partnerships with NERC, NEWMOA, EPA and others as appropriate; and
- Encourage public understanding of the role of local solid waste management planning units, how the units function, and how the public can participate in local materials management planning.

10.3.5 Combat Climate Change

Mitigating the impacts of climate change represents one of the most pressing environmental challenges for the state, the nation, and the world. Management of discarded materials represents an opportunity to reduce GHG emissions and combat climate change. In addition to other recommendations of this plan—which collectively reduce waste and increase reuse, recycling and composting to combat climate change—the state will:

- *Ensure that landfills in New York State pursue every possible mechanism for achieving GHG reductions:* DEC's Part 208 and Part 360 regulations and financial incentives provided by the carbon market have resulted in the installation of landfill gas collection and destruction systems at most active MSW landfills. DEC will continue to assess the facilities and markets in New York State to ensure that landfills maximize gas collection and destruction;
- *Maximize conversion of landfill gas to energy:* DEC will continue to work with electric utilities and other entities involved in the electrical grid system's governance and operation to minimize the costs to connect, while still ensuring sound engineering; and

- Support monetization of the GHG benefits of materials management strategies through carbon offset credit trading or other methods of carbon valuation.

10.3.6 Develop Reuse and Recycling Infrastructure and End-Use Markets

Expanding the universe of materials diverted from disposal will require additional processing, reuse and recycling infrastructure and new or stronger markets for the materials processed. To address market and infrastructure issues, the state will:

- Work with the New York Product Stewardship Council, NYSASWM, and other stakeholders in the state to develop consensus and support to move a product stewardship agenda;
- Explore regional or national approaches to product stewardship through NEWMOA, the Association of Territorial and State Solid Waste Management Officials (ATSWMO), the National Product Stewardship Institute and other multi-state organizations;
- Determine how DEC, ESD, NYSERDA**,** Ag & Markets, and the EFC can more effectively work together to promote and expand composting and organics recycling through efforts to: quantify the statewide available food scrap feedstock, and assess the current and potential capacity for managing materials at their highest value (ESD, DEC and Ag & Markets); identify and develop a database of wood waste generators and, in particular, utility supplies of waste wood and coordinate with compost facility needs (ESD, NYSERDA); and allocate existing or develop new funding sources for composting and organics recycling infrastructure needs;
- Develop critical recovery infrastructure through inter-agency collaboration (with ESD, NYSERDA, and EFC) and public-private partnerships, including the following:
    - Organic material recycling facilities
    - New or upgraded material recovery facilities in select areas
    - Regional glass processing facilities
    - Plastics recovery facilities capable of processing both rigid plastics #1-7 and film plastics
    - C&D debris processing facilities to generate materials suitable for high-value end uses
- Expand market development initiatives to target glass, plastic film, plastics #3-7, organics, tires and C&D materials as a means to create green jobs and encourage local recycling-based manufacturing and use of secondary materials;

- Evaluate and implement where appropriate strategies to promote establishment of recycling and organics recycling facilities in the environmental quality review and regulatory processes for other solid waste management facilities;
- Continue to support existing materials exchanges and seek additional resources to fund or otherwise support commercial and residential online exchanges (e.g., NY WasteMatch, NY Biomass Trader, NY FoodTrader, NY C&D Material Trader, Pencil Box, ReSwap, FreeCycle), reuse centers, technical assistance, networking forums, quality control, data management, and other means to foster the reuse sector;
- Encourage local use of processed, mixed glass, chipped tires and other appropriate recycled materials in engineering applications;
- Establish a New York State Center for C&D debris recycling through ESD to: research issues and solutions relative to C&D debris recycling in New York State; act as a central information access point; promote deconstruction and building materials reuse; provide C&D job site training programs; identify potential investments for ESD's Environmental Services Unit; and recommend policy options to support greater C&D debris recycling;
- Encourage deconstruction and building materials reuse by removing disincentives in state policy and funding programs and, with additional resources, foster the growth of deconstruction through funding, incentives, and support;
- Encourage and facilitate food scrap recycling demonstration projects at appropriate existing composting facilities;
- Implement the Electronic Equipment Recycling and Reuse Act, a statewide electronic equipment product stewardship program that requires manufacturers to establish convenient collection systems that achieve designated waste-reduction performance objectives; and
- Expand beneficial use applications for mixed-color recovered glass by conducting pilot projects to demonstrate acceptability of glass as a filter medium under DEC's Division of Water's *Stormwater Design Manual's Criteria for Acceptable Practices* and also acceptance by the New York State Department of Health (DOH) for use in residential septic systems.

11. IMPLEMENTATION SCHEDULE AND PROJECTIONS

Note: There are constraints on DEC's ability to accomplish the recommended actions listed here. Many of the recommendations require the collaboration of other state and local government entities and the private sector. Legislative recommendations require approval by the Governor and passage by the State Legislature; regulatory recommendations must be approved by the Governor's Office of Regulatory Reform (GORR), and many of the programmatic recommendations require the allocation of staff and financial resources that are not yet available.

11.1 IMPLEMENTATION SCHEDULE SUMMARY

Recommendation	Lead & Partner Entities	Action Plan	Timeframe	Outcomes
Legislative				
Updated Solid Waste Management Act (including provisions for funding/incentivizing elements of the Plan)	DEC with Governor's Office and State Legislature	Draft legislation, and work toward introduction and passage	Seek introduction in 2011; work for passage by 2012	Reduce waste disposal to 1.9 lbs./person/day in 10 years and to 0.6 by 2030; increase recycling to 11.5 million tons/year; reduce GHG by 11.3 million metric tons of CO_2E; conserve 135 trillion BTUs of energy by 2030
Packaging Stewardship Program	DEC with Governor's Office and State Legislature	Participate in national dialogue; draft legislation, and work toward introduction and passage	Seek introduction in 2013; work for passage by 2015	Reduce or recycle 3.8 million tons/year; reduce GHG by 8.8 million metric tons of CO_2E; conserve 82 trillion BTUs of energy by 2030
Product-Specific Stewardship Programs	DEC with Governor's Office and State Legislature	Participate in national dialogue on key products; draft legislation, and work toward introduction and passage	Seek introduction and passage of one bill/year, beginning 2011	Reduce or recycle 747,000 tons/year by 2030; reduce disposal of products containing mercury and other toxic materials
Product Stewardship Framework Program	DEC with Governor's Office and State Legislature	Participate in national dialogue; draft legislation, and work toward introduction and passage	Seek introduction in 2013; work for passage by 2015	Reduce volume and number of products containing mercury and other toxic materials requiring disposal

Recommendation	Lead & Partner Entities	Action Plan	Timeframe	Outcomes
Revenue-Generating Program	DEC with Governor's Office and State Legislature	Develop package of dedicated revenue-generating proposals that do not rely on the general fund; draft legislation, and work toward introduction and passage	Seek introduction in 2011; work for passage by 2012	Generate significant resources dedicated for state and local government investment in sustainable materials management
Returnable Container Law	DEC with Governor's Office and State Legislature	Draft legislation to expand the Law to all containers, and work toward introduction and passage	Seek introduction in 2012; work for passage by 2013	Enhanced materials recovery and revenue generation
Mercury-Containing Products	DEC with Governor's Office and State Legislature	Draft legislation, and work toward introduction and passage	Seek introduction in 2012; work for passage by 2013	Consistency with the model legislation developed by NEWMOA and implemented in other states
Regulatory				
Update Part 360 Solid Waste Management Facility Regulations	DEC	Prepare proposed revisions; achieve GORR approval; release for public comment; enact final rule	Submit proposed regulations to GORR by early 2011; enact final rule by 2012	Improved facility operations; increased recycling and beneficial use of materials; reduced GHG emissions; protection of the public and environment from negative impacts of processing and recycling of electronics
Promulgate regulations under new legislation	DEC	Prepare regulations to implement new legislation	As legislation is enacted	Realize outcomes of subject legislation
Programmatic				
State agencies and authorities lead by example	OGS with DEC and other agencies and authorities	Implement EO4; develop and implement agency sustainability plans	Ongoing	Reduction in agency waste generation by 10 percent per year
		Consistently implement recycling programs at state facilities and events	Ongoing	Increased materials recycling; reduced waste disposal
		Promote and demonstrate composting and organics recycling	Pilot projects expand in 2011; complete implementation by 2015	Increased capture of organic materials to 90 percent of state operations' generation

Recommendation	Lead & Partner Entities	Action Plan	Timeframe	Outcomes
Comprehensive Materials Management Planning	DEC with local SWM planning units	Seek staff and resources to implement state Plan	Reorganize staff to reflect plan priorities in 2010; add staff as resources become available	Timely biennial Plan updates and modifications
		Work with planning units to craft next generation of LSWMPs	Ongoing	Timely plans for and implementation of sustainable materials management systems across the state
		Expand local solid waste management technical assistance program	Develop three technical assistance documents and web-based information per year from 2011-2013 and update as needed thereafter	Assistance and cost savings to local planning,
		Gather and compile better data; improve current reports; broaden reporting requirements, and develop on-line reporting	Update reporting forms in 2010; create additional reporting requirements in 2011; prepare for and implement on-line reporting in 2012-2013	Stronger data on which to base and ease local planning efforts and to update and modify the state Plan
Provide outreach and technical assistance	DEC, ESD and regional partners	Develop guidance on waste prevention in specific commercial sectors	Supermarket guidance in 2011; one additional sector per year or more, as staffing permits	Greater levels of waste prevention in ten commercial sectors
		Encourage the use of food banks and other reuse options	Ongoing	Increased diversion of usable food to the hungry
		Organize regional C&D debris management and recycling forums	ESD to lead two forums per year in 2011 and 2012	Increased diversion of C&D materials for reuse and recycling by 50 percent in 10 years
		Assist public and private entities in developing organics recycling and composting systems	Develop technology assessment and web-based information in 2010-2011; provide ongoing assistance as staffing permits	Expanded organics recycling infrastructure

Recommendation	Lead & Partner Entities	Action Plan	Timeframe	Outcomes
		Develop tools and resources to support local sustainable materials management programs	Develop two guidance documents per year	Assistance and cost savings to local government in planning for and implementing sustainable materials management programs
Educate the public	DEC with Local Governments and Businesses	Launch public education campaign; develop outreach materials for local governments	Develop campaign in 2011-2013; launch by 2015	Stronger public understanding of, support for and participation in sustainable materials management
		Publicize innovative materials management programs	Ongoing	Stronger public understanding of evolving sustainable materials management strategies
Combat climate change	DEC with local governments and businesses	Landfill gas collection and destruction systems at active landfills; maximize conversion of landfill gas to energy;	Ongoing	Reduction in GHG emissions to combat climate change
	DEC with local governments, businesses and other states	Support monetization of the GHG benefits through carbon valuation	Ongoing	Carbon offset credit trading or other methods of carbon valuation to reduce GHG emissions and combat climate change
Develop reuse and recycling infrastructure and end-use markets	ESD, DEC with NYSERDA and EFC	Develop critical recycling infrastructure for materials, including mixed-color glass, organic materials, and plastics	Target existing funds, where possible, in 2011 and 2012; develop investment strategy for new revenues in 2012	New infrastructure for increased recycling, particularly for more difficult types of glass, organic, plastic and other materials
		Expand market development initiatives to target glass, plastic film, plastics #3-7, compost, tires and C&D debris	Maximize existing ESD resources in 2011; work to increase resources in 2011 and thereafter	Expanded markets for key materials; additional materials diverted to recycling
		Facilitate food scrap recycling demonstration projects	Identify and facilitate one demonstration project per year	Expanded food scrap recycling and composting infrastructure

Recommendation	Lead & Partner Entities	Action Plan	Timeframe	Outcomes
		Expand beneficial-use applications for mixed-color glass	Demonstrate viability of glass in two new applications by 2013	Expanded markets for mixed-color glass

11.2 Legislative Recommendations

Recommendation	Schedule										Outcomes
Update Solid Waste Management Act	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Set new goals and define new metrics	Introduce legislation	Passed and Effective		Review in biennial update		Review in biennial update		Review in biennial update		Review in biennial update	Ability to measure and evaluate efforts to reduce statewide waste disposal
Update and clarify recycling and green purchasing requirements for state agencies and authorities	Introduce legislation	Passed	Effective								Progressive reduction of state agency and authority waste disposal with greatest initial impacts from 2013-2016
Clarify the solid waste management hierarchy	Introduce legislation	Passed and Effective									Maintenance of consistent overarching guide for progressive reduction in statewide waste disposal
Generate and allocate new resources	Introduce legislation	Passed	Portions become Effective	Portions become Effective	Allocation begins	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Significantly enhanced statewide materials management and support for progressive reduction of statewide waste disposal with greatest overall impacts from 2015-2030
Reinforce recycling requirements for all generators	Introduce legislation	Passed and Effective									Progressive reduction in statewide waste disposal with greatest initial impacts from 2013-2016
Supplement the "economic market" clause with a designated list of recyclables	Introduce legislation	Passed	Effective	Review and expand list as needed		Review and expand list as needed		Review and expand list as needed		Review and expand list as needed	Progressive reduction in statewide waste disposal, with greatest initial impacts from 2013-2016. Additional impacts expected periodically as additional materials are added
Increase DEC's authority and resources to enforce recycling requirements	Introduce legislation	Passed	Effective	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	State sharing of local burden in meeting Plan goals
Ensure that every permitted facility maximizes reuse and recycling	Introduce legislation	Passed	Effective	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Increased participation in reducing statewide waste disposal at both municipal and private facilities
Establish disposal restrictions on bulk quantities of designated recyclables	Introduce legislation	Passed	Effective	Review in biennial update		Review in biennial update		Review in biennial update		Review in biennial update	Increased participation in reducing statewide waste disposal at both municipal and private facilities

Recommendation	Schedule										Outcomes
Update Solid Waste Management Act	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Require local solid waste management planning	Introduce legislation	Passed and Effective	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Assurance that state and local resources are invested in sustainable management practices over time
Authorize local governments to franchise private materials management	Introduce legislation	Passed and Effective									Added flexibility to local governments in materials management planning
Expand waste transporter program	Introduce legislation	Passed	Effective	Review in biennial update		Review in biennial update		Review in biennial update		Review in biennial update	Engagement of transporters in the larger effort to reduce statewide waste disposal
Provide technical fixes	Introduce legislation	Passed and Effective									Support for proper materials management and environmental protection

Recommendation	Schedule										Outcomes
Product Stewardship	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Packaging Stewardship Program			Introduce legislation		Passed	Effective					Reduce or recycle 3.8 million tons/year by 2030; reduce GHG by 8.8 million metric tons of CO_2E; conserve 82 trillion BTUs of energy
Product-specific stewardship programs	Introduce legislation	Passed and Effective (one product)	Passed and Effective (one product)	Passed and Effective (one product)	Passed and Effective (one product)	Passed and Effective (one product)	Passed and Effective (one product)	Passed and Effective (one product)	Passed and Effective (one product)	Passed and Effective (one product)	One material per year to cumulatively reduce or recycle 747,000 tons/year by 2030; reduce disposal of products containing mercury and other toxins
Product Stewardship Framework Program			Introduce legislation		Passed	Effective					Tool for increased reuse and recycling of materials; reduction of GHG; conservation of energy; reduction of disposal of products containing mercury and other toxins

Recommendation	Schedule										Outcomes
Revenue Generating Programs	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Develop a package of preferred funding mechanisms	Introduce legislation	Passed	Portions become effective	Portions become effective							Significant resources dedicated for state and local government investment in sustainable materials management
Propose a new grant program, using revenue sources identified above, to provide consistent, annual funding to planning units		Prepare draft proposed grant program	Prepare draft regulations	Adopt regulations	Begin to disperse funds	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Assistance to local governments to allow for timely implementation of Plan goals
Propose a targeted funding program, using revenue sources identified above, for specific priority areas		Prepare draft proposed grant program	Prepare draft regulations	Adopt regulations	Begin to disperse funds						Incentivized implementation of priority projects for the timely implementation of Plan goals

Recommendation	Schedule										Outcomes
Returnable Container Law	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Expand Returnable Container Law to include all beverage containers		Introduce legislation	Passed	Effective							Enhanced materials recovery and revenue generation

Recommendation	Schedule										Outcomes
Mercury Containing Products	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Expand the mercury-containing product sale restrictions		Introduce legislation consistent with NEWMOA model	Passed	Effective							Significant reduction in the amount of mercury entering the environment

11.3 Regulatory Recommendations

Recommendation	Schedule										Outcomes
Update Part 360 Solid Waste Management Facility Regulations	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Update requirements for construction and operation of solid waste management facilities	Proposed regulations to GOER	Enact final Rule	Effective								Improved facility operations and protection of public health and the environment; increased reuse, recycling and beneficial use of materials; reduced GHG emissions
Revise and update the Beneficial Use Determination (BUD) Program regulations	Proposed regulations to GOER	Enact final Rule	Effective								Increased recycling and beneficial use of materials; reduced GHG emissions
Add new requirements for the management of historic fill	Proposed regulations to GOER	Enact final Rule	Effective								Improved protection of public health and the environment; increased recycling and beneficial use of materials
Restrict the disposal of yard trimmings and source separated recyclables in solid waste management facilities and other recyclable and organic materials, as recycling infrastructure is developed or product stewardship programs are established	Proposed regulations to GOER	Enact final rule	Effective		Review biennially and update as needed		Review biennially and update as needed		Review biennially and update as needed		Conservation of disposal capacity and progressive reduction of waste disposal, with greatest initial impacts from 2013-2016 for yard trimmings and source separated recyclables and from 2015-2025 for organics. Increased recycling, composting and organics processing; reduced GHG emissions
Take a regulatory approach to ensure consistent implementation of the requirements to source separated recyclables, particularly in areas served by private collectors	Proposed regulations to GOER	Enact final rule	Effective		Review progress biennially		Review progress biennially		Review progress biennially		Consistency in performance among collectors of waste, with resulting reduction in statewide waste disposal with greatest initial impacts from 2013-2016; reduced GHG emissions

Recommendation	Schedule										Outcomes
Update Part 360 Solid Waste Management Facility Regulations	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Establish separate tracks and waiting lists for EPF funding for recycling coordinators, educational activities, reuse programs, and other high-priority projects	Proposed regulations to GOER	Enact final rule	Portions effective	Portions effective							Improved statewide materials management through specific program assistance to local governments for plan implementation, with greatest overall impacts from 2015-2020
Revise the grant regulations to allow for targeting of EPF funds to address critical priorities identified annually	Proposed regulations to GOER	Enact final rule	Portions effective	Portions effective	Identify annual priority area	Identify annual priority area	Identify annual priority area	Identify annual priority area	Identify annual priority area	Identify annual priority area	Enhanced statewide materials management and progressive reduction of statewide waste disposal with greatest overall impacts from 2015-2025; reduced GHG emissions
Enact new regulation to improve the safe and appropriate collection, handling and recycling of electronic waste, and implement the Electronic Equipment Recycling and Reuse Act	Proposed regulations to GOER	Enact final rule	Effective								Public and environment protection from negative impacts of processing and recycling of electronics; reduced materials management burden on local government; reduced disposal statewide
Review existing state regulations to remove or address contradictory regulatory requirements that limit the creation or expansion of composting and other organics recycling facilities	Proposed regulations to GOER	Enact final rule	Effective								Increased composting and organics processing; reduced GHG emissions

Recommendation	Schedule										Outcomes
Implement Regulations on New Legislation	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Prepare and implement regulations on new legislation	Draft new rules as needed	Draft new rules as needed	Draft new rules as needed	Draft new rules as needed	Draft new rules as needed	Draft new rules as needed	Draft new rules as needed				Path established for reaching legislative goals

11.4 Programmatic Recommendations

Recommendation	Schedule										Outcomes
State Agencies and Authorities Lead by Example	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Work aggressively to implement the requirements of Governor Paterson's EO4	Annually review and monitor progress	Annually review and monitor progress	Annually review and monitor progress	Annually review and monitor progress	Annually review and monitor progress	Annually review and monitor progress	Annually review and monitor progress	Annually review and monitor progress	Annually review and monitor progress	Annually review and monitor progress	Increased participation by state government in meeting Plan goals; reduced agency waste generation of ten percent per year
Promote and demonstrate organics recycling systems and activities by state agencies	Expand pilot projects in Albany	Expand pilot projects in additional areas of the state	Expand pilot projects in additional areas of the state	Expand pilot projects in additional areas of the state	Expand pilot projects in additional areas of the state	Expand pilot projects in additional areas of the state	Expand pilot projects in additional areas of the state	Expand pilot projects in additional areas of the state	Statewide full-scale operation	Statewide full-scale operation	State leadership established in the capture of organic materials recycling 90 percent of state operations' generation
Incorporate reuse into government procurement and asset management programs	Convene working group	Initiate review	Draft proposal	Adopt changes							Plan goals advanced through state materials management leadership and significant purchasing power, resulting in new markets; increased materials reused; reduced waste disposed; reduced agency waste generation of ten percent per year

Recommendation	Schedule										Outcomes
State Agencies and Authorities Lead by Example	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Develop memoranda of understanding (MOUs) within DEC divisions or with other agencies as needed to streamline BUD procedures	Convene working group and initiate review	Draft and finalize MOU	Adopt changes								Increased materials reused, recycled and beneficially used; reduced waste disposed

Recommendation	Schedule										Outcomes
Comprehensive Materials Management Planning	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Expand DEC's local solid waste management planning technical assistance program	Reorganize staff and develop technical guidance, including developing a new LSWMP, model recycling laws and hauler laws	Develop technical guidance, including data collection and reporting, flow control, contracts	Develop technical guidance, including education and enforce-ment	Develop technical guidance, including biennial LSWMP comp-liance reports	Review and update technical guidance biennially		Review and update technical guidance biennially		Review and update technical guidance biennially		Assistance and cost savings to local government, allowing for timely planning and placement of sustainable materials management systems and programs across the state; increased recycling, composting and organics processing; reduced GHG emissions; progressive reduction in statewide waste disposal
Require planning units to evaluate and implement a wide array of policies and initiatives as they develop new LSWMPs, modify existing LSWMPs	Review and approve LSWMPs	Review and approve LSWMPs mods	Review and approve LSWMPs, mods and compliance reports	Review and approve LSWMPs and mods	Review and approve LSWMPs, mods and compliance reports	Review and approve LSWMPs and mods	Review and approve LSWMPs , mods and compliance reports	Review and approve LSWMPs and mods	Review and approve LSWMPs, mods and compliance reports	Review and approve LSWMPs and mods	Significantly enhanced proper statewide materials management and progressive reduction of statewide waste disposal with greatest overall impacts from 2015-2025; reduced GHG emissions
Evaluate current planning unit membership and structure	Contact planning units of concern	Work with identified planning units	Work with planning units of concern	Continue to work with planning units of concern	Structure and system for adjustment in place						Efficiencies and cost reductions in local planning
Develop an on-line reporting system	Evaluate options	Develop program	Initiate program	Refine system	Refine system	Maintain system	Maintain system	Upgrade system	Maintain system	Maintain system	More comprehensive and consistent data on which to base local planning efforts and to update and modify the state Plan; easier delivery system for transmission of data
Evaluate the progress toward this Plan's goals in biennial state Plan updates		Review in biennial update		Review in biennial update		Review in biennial update		Review in biennial update		Review in biennial update	Timely biennial state Plan updates with revisions consistent with current data, research and available resources

Recommendation	Schedule										Outcomes
Provide Outreach and Technical Assistance	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Use the New York State Pollution Prevention Institute (P2I) to provide education to manufacturers regarding the benefits of using life-cycle assessment				Develop program	Initiate program	Provide education	Provide education	Provide education	Provide education	Provide education	Increased engagement by the industrial sector in reduction in statewide waste disposal; understand the environmental impact of the entire lifecycle including opportunities for increasing the reuse and recycling of materials; reduced GHG; conservation of energy; reduced generation of hazardous waste
Develop written guidance on waste prevention for specific affected sectors	Supermarket guidance prepared	One additional sector guidance prepared	One additional sector guidance prepared	One additional sector guidance prepared	One additional sector guidance prepared	One additional sector guidance prepared	One additional sector guidance prepared	One additional sector guidance prepared	One additional sector guidance prepared	One additional sector guidance prepared	Partnership with private sector in reducing statewide waste disposal through the issuance and implementation of guidance documents on waste prevention in ten commercial sectors
Encourage use of the Food Bank Network through meetings in each food bank region of the state	Initiate meetings and develop strategies	Continue meetings	Continue meetings and refine strategies	Review progress in biennial update		Review progress in biennial update		Review progress in biennial update		Review progress in biennial update	Increased diversion of usable food to the hungry, with corresponding reduction in food waste disposal
Use information and contacts from food scrap forums across the state to identify new opportunities for food waste generators to work with processors and end users	Initiate meetings and develop strategies	Expand meetings and outreach	Continue meetings and develop guidance	Expand meetings and outreach		Review progress in biennial update		Review progress in biennial update		Review progress in biennial update	Information network created to facilitate statewide organic waste disposal; expanded recycling infrastructure

Recommendation	Schedule										Outcomes
Provide Outreach and Technical Assistance	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Continue to provide technical and regulatory assistance for entities interested in developing organic recycling systems and for the demonstration of the viability of incorporating food scraps into existing yard trimmings or biosolids composting facilities	Identify interested entities through LSWMP process and review of annual reports, and provide assistance	Identify interested entities through LSWMP process and review of annual reports, and provide assistance	Identify interested entities through LSWMP process and review of annual reports, and provide assistance	Identify interested entities through LSWMP process and review of annual reports, and provide assistance	Provide routine assistance	Provide routine assistance and review progress in biennial update	Provide routine assistance	Provide routine assistance, and review progress in biennial update	Provide routine assistance	Provide routine assistance, and review progress in biennial update	Leadership established in organics recycling; expanded infrastructure
Identify interested school systems, and assist them in demonstrating the advantages of on-site composting systems	Initiate contact with schools to gauge interest	Identify interested schools	Provide targeted technical assistance to pilot schools	Expand program to additional schools	Expand program to additional schools	Expand program to additional schools	Provide routine assistance	Provide routine assistance	Provide routine assistance	Provide routine assistance	Schools engaged in the progressive reduction in statewide waste disposal; expanded organics recycling
Issue technical guidance documents to assist local governments in planning for and implementing sustainable materials management programs	Update guidance on organic recovery technologies and alternative treatment technologies	Update guidance on reuse, recycling collection and handling	Update guidance on MWC, landfills and transfer stations	Review status and need in biennial update		Review in biennial update		Review in biennial update		Review in biennial update	Assistance and cost savings to local government allowing for timely planning and placement of sustainable materials management systems and programs across the state; increased recycling, composting and organics processing; reduced GHG emissions; progressive reduction in statewide waste disposal
Maximize the diversion of food scraps to feed animals		Develop guidance of the regulatory require-ments governing food uses for animal feed	Identify farms and sources	Conduct forums across the state	Refine guidance	Review in biennial update		Review in biennial update		Review in biennial update	New source of animal feed with corresponding reduction in waste disposal; expanded organics recycling infrastructure; guidance document

Recommendation	Schedule										Outcomes
Provide Outreach and Technical Assistance	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Work with the NERC to take full advantage of its On-Farm Compost Marketing Project	Disseminate Compost Marketing Toolkit	Connect farms with NERC's technical assistance services	Connect farms with NERC's technical assistance services	Connect farms with NERC's technical assistance services		Review in biennial update		Review in biennial update		Review in biennial update	New compost markets; reduction in statewide waste disposal; expanded organics recycling infrastructure
Develop additional resources, tools and information for local governments and planning units relating to volume-based pricing (PAYT/SMART), and promote their use	Develop technical guidance, including basic elements of effective PAYT systems	Develop model policies for easy adaption by planning units	Develop a series of case studies	Develop a technical assistance and peer-mentoring program for interested planning units	Identify as target priority area for funding	Conduct assistance program; review and assess progress and need for additional policy objectives in biennial update	Conduct assistance program	Conduct assistance program; review and assess progress and need for additional policy objectives in biennial update	Conduct assistance program	Review and assess progress and need for additional policy objectives in biennial update	Assistance and resource savings to local government and engagement of individual consumers in effort to reduce statewide waste disposal with greatest overall impacts from 2015-2025; expanded organics recycling infrastructure; reduced GHG emissions; four guidance documents related to volume-based pricing
Continue to work with and support the efforts of charitable organizations	Disseminate general charitable organization information	Review and update current available info	Review and update current available info		Review and update current available info		Review and update current available info		Review and update current available info		Engagement of not-for-profit organizations in reducing statewide waste disposal
Develop guidance for planning units on performing waste composition and characterization analyses, and develop a program and system to conduct periodic state-sponsored waste composition and characterization analyses	Develop general statewide waste composition data and tool for use by planning units to develop planning unit specific waste composition estimates	Develop in-field waste comp best practices info	Develop case study data for New York	Develop a technical assistance and peer-mentoring program for interested planning units	Identify as target priority area for funding	Conduct waste comp study in one area of state		Conduct waste comp study in one area of state		Conduct waste comp study in one area of state	Assistance and cost savings to local government; stronger data on which to base local planning efforts and to update and modify the state Plan ; four guidance documents on waste composition in support of local and periodic statewide waste composition studies

Recommendation	Schedule										Outcomes
Provide Outreach and Technical Assistance	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Network with other agency stakeholders to facilitate immediate response to disasters and to mitigate the impacts of disasters through better planning	Meet annually and assess readiness	Meet annually and assess readiness	Meet annually and assess readiness	Meet annually and assess readiness	Meet annually and assess readiness	Meet annually and assess readiness	Meet annually and assess readiness	Meet annually and assess readiness	Meet annually and assess readiness	Meet annually and assess readiness	Improved protection of public health and the environment
Work with the Pollution Prevention Institute (P2I) to conduct outreach to businesses regarding life-cycle considerations for "green products"				Develop program	Initiate program	Provide outreach	Provide outreach	Provide outreach	Provide outreach	Provide outreach	Engagement with the industrial sector in reducing waste disposal; understand raw material inputs and utilize environmentally-friendly alternatives; increased reuse and recycling of materials; reduced GHG; conservation of energy
Identify products and packaging that pose particular post-consumer management challenges for attention from the Pollution Prevention Institute (P2I) where research and development projects can be devised to improve these packaging and product designs	DEC will convene working group and evaluate target areas	Develop program	Initiate program								Assisting the private sector in supporting reduction of statewide waste disposal; increased reuse and recycling of materials; reduction of GHG; conservation of energy; reduction of hazardous waste
Facilitate forums on C&D debris management	With ESD, hold initial C&D debris forum	With ESD, hold two C&D debris forums	With ESD, hold two C&D debris forums	Develop strategies to enhance recovery	Initiate strategies	Review in biennial update		Review in biennial update		Review in biennial update	Engagement of construction industry and assistance to local government in reducing statewide waste disposal; increased diversion of C&D materials for reuse and recycling by 50 percent in 10 years; 2 guidance documents related to deconstruction and best management practices

Recommendation	Schedule										Outcomes
Educate the Public	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Launch an aggressive public education campaign to promote waste prevention, reuse, composting, recycling and the proper management of hazardous components of the waste stream	Develop campaign	Finalize campaign	Plan logistics for campaign launch	Target campaign as high priority target area for funding	Launch campaign	Continue Phase I	Launch Phase 2	Continue Phase 2			Stronger public support and participation in sustainable materials management; stronger understanding of sustainable materials management strategies; progressive reduction in statewide waste disposal
Organize workshops and other meetings, and expand web-based and other outreach materials	Enhance existing web-based outreach material	Develop additional material; organize one workshop	Organize meeting and workshop	Update material, and organize four meetings/ workshops	Enhance existing web-based outreach material	Update material	Ongoing	Ongoing	Ongoing	Ongoing	
Publicize innovative reuse, organic recycling and other model programs in the state	Develop and distribute info	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	
Build regional DEC staff outreach and education capacity to assist planning units in improving recycling	Reorganize staff, and focus on planning, education	Ongoing staff focus	Ongoing staff focus	Ongoing staff focus	Enhance program; target priority area for funding	Enhance staffing	Ongoing staff focus	Ongoing staff focus	Ongoing staff focus	Ongoing staff focus	
Encourage design for reuse and disassembly, and process optimization within the remanufacturing industry			Convene working group with P2I and evaluate target industry	Develop program	Initiate program	Provide outreach	Provide outreach	Provide outreach	Provide outreach	Provide outreach	Partnership with industrial sector and remanufacturing industry to progressively reduce statewide waste disposal; increased reuse and recycling of materials; reduction of GHG; conservation of energy
Encourage regional or national collaboration to develop consistent data collection and reporting protocols and systems	Initiate dialog with EPA, NERC, NEWMOA, etc.	Continue dialog with EPA, NERC, NEWMOA, etc.	Convene working group, and evaluate ideas	Draft proposal for state and EPA review	Adopt consistent system						Stronger data on which to base local planning efforts and to update and modify the state Plan

Recommendation	Schedule										Outcomes
Educate the Public	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Encourage public understanding of the role of local solid waste management planning units	Develop and distribute general Info	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Stronger understanding of sustainable materials management strategies in support of reducing statewide waste disposal

Recommendation	Schedule										Outcomes
Combat Climate Change	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Ensure that landfills in New York State pursue every possible mechanism for achieving GHG reductions	Continue to assess facilities and gas markets	Ongoing	Ongoing	Review in biennial update	Ongoing	Review in biennial update	Ongoing	Review in biennial update	Ongoing	Review in biennial update	Reduction in GHG emissions to combat climate change
Maximize conversion of landfill gas to energy	Work with electric utilities to minimize costs for connection to the grid	Ongoing	Ongoing	Review in biennial update	Ongoing	Review in biennial update	Ongoing	Review in biennial update	Ongoing	Review in biennial update	Reduction in GHG emissions and combat climate change; new energy source
Support monetization of the GHG benefits of materials management strategies through carbon offset credit trading or other methods of carbon valuation	Continue work through the Climate Change Office to monetize GHG benefits	Ongoing	Ongoing	Achieve inclusion in carbon valuation system							Incentives for sustainable materials management through financial rewards for reducing carbon and combating climate change

Recommendation	Schedule										Outcomes
Develop Reuse and Recycling Infrastructure and End-Use Markets	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Work with the New York Product Stewardship Council, NYSASWM, and other stakeholders in the state to develop consensus and support to move a product stewardship agenda	Work with stake-holders to identify products; introduce product legislation for one product each year for ten years	Work with stake-holders to promote product steward-ship as key strategy	Work with stake-holders to promote product steward-ship as key strategy; introduce frame-work and packaging legislation	Monitor progress, and promote product steward-ship as key strategy	Monitor progress, and promote product steward-ship as key strategy	Frame-work and packaging legislation effective	Monitor progress, and amend as necessary	Monitor progress, and amend as necessary	Monitor progress, and amend as necessary	Monitor progress, and amend as necessary	Stewardship program for one material per year, which will cumulatively reduce or recycle 747,000 tons/year by 2030; reduction in disposal of products containing mercury and other toxins; packaging stewardship program that will reduce or recycle 3.8 million tons/year by 2030; reduction of GHG by 8.8 million metric tons of CO_2E; conservation of 82 trillion BTUs of energy
Explore regional or national approaches to product stewardship	Collaborate with PSI, EPA, NEWMOA and others, and participate in regional and national dialogs and activities	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Increased reuse and recycling of materials; reduction of GHG; conservation of energy
Develop critical organics recovery infrastructure through inter-agency collaboration (with ESD, NYSERDA, and EFC) and public-private partnerships	Convene working group, and initiate review; develop data base of wood waste generators	Evaluate options, and develop strategies for compost facility needs	Develop strategies for organics recycling infra-structure develop-ment	Refine strategies	Assess Impact; identify as target priority areas for funding	Review in biennial update	Identify as target priority areas for funding	Review in biennial update	Identify as target priority areas for funding	Review in biennial update	Progressive reduction in statewide waste disposal; expanded organics recycling infrastructure
Expand market development initiatives to target glass, plastic film, plastics #3-7, organics, tires and C&D materials	With ESD, evaluate strategies	With ESD, develop programs	Enhance one sector per year	Enhance one sector per year	Identify as target priority areas for funding	Enhance one sector per year	Enhance one sector per year	Enhance one sector per year			New opportunities for recycling; price stability for secondary materials; progressive reduction in statewide waste disposal; new infrastructure for recycling glass, organic materials, plastics, and other target materials

Recommendation	Schedule										Outcomes
Develop Reuse and Recycling Infrastructure and End-Use Markets	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Evaluate and implement where appropriate strategies to promote the establishment of recycling and organics recycling facilities in the environmental quality review and regulatory processes for other solid waste management facilities	Evaluate options and strategies	Develop draft program policy	Finalize program policy and initiate	Evaluate program	Evaluate program	Review in biennial update		Review in biennial update		Review in biennial update	Engagement of local government and the private sector in creating new opportunities to progressively reduce statewide waste disposal; expanded organics recycling infrastructure
Continue to support existing materials exchanges, and seek additional resources to fund or otherwise support commercial and residential online exchanges	Develop and distribute materials exchange information; expand web-based information	Ongoing	Ongoing	Ongoing	Ongoing	Identify as target priority area for funding		Review in biennial update		Review in biennial update	Use of the internet to create novel opportunities to progressively reduce statewide waste disposal; expanded markets for key materials; additional materials diverted to recycling
Encourage local use of processed, mixed glass, chipped tires and other appropriate recycled materials in engineering applications	Identify interested entities, and provide guidance and assistance	Ongoing	Ongoing	Ongoing	Provide routine assistance	Review in biennial update		Review in biennial update		Review in biennial update	Reduction in the GHG and energy impacts of transporting materials for construction and industrial use; expanded markets for key materials; additional materials diverted to recycling

Recommendation	Schedule										Outcomes
Develop Reuse and Recycling Infrastructure and End-Use Markets	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Establish a New York State center for C&D debris recycling through ESD	ESD to initiate efforts to establish C&D debris center	Center established and becomes central informa-tion point; center begins job-training program	Center begins pro-motion of decon-struction and building materials reuse and identify-ing market develop-ment opportun-ities	Center recom-mends policy options		Review in biennial update		Review in biennial update		Review in biennial update	State leadership on fundamental challenges; lower costs for building contractors and haulers; increased diversion of C&D materials for reuse and recycling by 50 percent in 10 years
Encourage deconstruction and building materials reuse by removing disincentives in state policy and funding programs		Convene working group, and identify issues	Evaluate options and alterna-tives	Develop program	Initiate program						Increased diversion of C&D materials for reuse and recycling by 50 percent in 10 years
Encourage and facilitate food scrap recycling demonstration projects at appropriate existing composting facilities	Identify interested entities through LSWMP process and review of annual reports, and provide assistance	Identify interested entities, and provide guidance and assistance	Ongoing	Ongoing	Provide routine assistance and identify as target priority area for funding	Provide routine assistance, and review progress in biennial update	Provide routine assistance	Provide routine assistance, and review progress in biennial update	Provide routine assistance	Provide routine assistance, and review progress in biennial update	Progressive reduction in statewide waste disposal; expanded organics recycling infrastructure
Implement the Electronic Equipment Recycling and Reuse Act	Initiate program; system and infra-structure in place	Initial reporting information analysis	Regula-tions Effective	Program imple-mentation and review	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Public and environment al protection from negative impacts of processing and recycling electronics; establishment of collection and processing infrastructure

Recommendation	Schedule										Outcomes
Develop Reuse and Recycling Infrastructure and End-Use Markets	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Expand beneficial use applications for mixed-color recovered glass by conducting pilot projects to demonstrate acceptability of glass as a filter medium and for use in residential septic systems	With ESD, support pilot project for mixed-color glass use	Monitor pilot projects	Approve use of mixed-color glass in two new applica-tions								Progressive reduction in statewide waste disposal; expanded markets for mixed-color glass