Waste or Resource?

Rethinking Solid Waste Policy

State of Maine

Waste Management and Recycling Plan

January 2009

The Maine State Planning Office is directed by the Legislature to develop state policies that promote a balance between economic growth and natural resource conservation. To fulfill that charge within the scope of its mission, the Waste Management and Recycling Program continues to ensure sufficient land disposal capacity within our borders to meet the needs of today's waste management system and the economy that depends upon it. At the same time, we encourage the development of waste-to-resource systems that reduce waste destined for disposal, with the dual aims of alleviating our impacts on Maine's health and environment and enhancing Maine's economy and quality of place.

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January 2009

The State Planning Office would like to thank the Department of Environmental Protection and members of the Maine Waste Solid Management Advisory Council for their input and assistance in developing this plan.

Cover photo features one of a series of posters from the *Maine Recycles* public awareness campaign launched in 2008 and designed to encourage Mainers to recycle more.

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DEFINITIONS AND ACRONYMS

The following definitions are provided to assist the reader in reviewing this document:

Broker's Survey – *a biennial survey conducted of private sector recycling brokers and end-users to determine level and effort related to management of commercial recyclables.*

Construction/Demolition Debris (CDD) – *these are the wastes generated by building, remodeling and/or destruction activities and may include such wastes as wood and wood products, concrete and brick, gypsum board, shingles and other common components of buildings. It may include such items as wood, large metal appliances and construction materials. These are solid wastes that do not typically fit into a 30 gallon trash container.*

Front-end Process Residue (FEPR) – *residual of municipal solid waste resulting from the processing of solid waste processing prior to incineration or landfilling, and includes, but is not limited to, ferrous metals, glass, grit and fine organic matter.*

Household Hazardous Wastes (HHW) – *items generated by households that are corrosive, toxic, ignitable, or reactive, and as such are hazardous to humans and/or the environment if disposed of improperly.*

Incinerator Ash – *this is the residue from the combustion of municipal solid waste at waste-to-energy facilities. It may also contain fly ash from the facility's operation and is designated as a 'special waste'.*

Municipal Solid Waste Annual Reports – *these are the reports submitted to the State Planning Office by municipalities, as required through 38 MRSA § 2133. These reports convey their efforts related to municipal solid waste management and provide detail on the tonnage of solid wastes they have overseen and a description of the various solid waste management practices utilized.*

Municipal Solid Waste (MSW) – *solid waste emanating from household and normal commercial activities.*

Special waste – *wastes that generated by other than domestic and typical commercial establishments that exist in such an unusual quantity or in such a chemical or physical state that require special handling, transportation and disposal procedures.*

Universal Wastes – *a category of wastes that including: PCB containing lighting ballasts; Cathode Ray Tube (CRT) containing devices; fluorescent lamps; other lamps containing hazardous wastes; and, mercury-added devices from commercial sources.*

Waste-to-energy facilities (W-T-E) – *incinerators which receive municipal solid waste, and through combustion, recover energy and convert it into electricity, while reducing the volume of waste requiring disposal.*

Preface

Declaration of Policy

The Legislature finds and declares it to be the policy of the State, consistent with its duty to protect the health, safety and welfare of its citizens, enhance and maintain the quality of the environment, conserve natural resources and prevent air, water and land pollution, ***to establish a coordinated statewide waste reduction, recycling and management program.***

The Legislature finds and declares that it is the policy of the State ***to pursue and implement an integrated approach to hazardous and solid waste management, which shall be based on the following priorities: reduction of waste generated at the source, including both the amount and toxicity of waste; waste reuse; waste recycling; waste composting; waste processing which reduces the volume of waste needing disposal, including waste-to-energy technology; and land disposal.***

The Legislature finds that it is in the best interests of the State to prefer waste management options with lower health and environmental risk and to ensure that such options are neither foreclosed nor limited by the State's commitment to disposal methods. The Legislature declares that ***it is in the public interest to aggressively promote waste reduction, reuse and recycling as the preferred methods of waste management.***

The Legislature finds that environmentally suitable sites for waste disposal are in limited supply and represent a critical natural resource. At the same time, new technologies and industrial developments are making ***recycling and reuse of waste an increasingly viable and economically attractive option which carries minimal risk to the State and the environment and an option which allows the conservation of the State's limited disposal capacity.***

The Legislature further finds that needed municipal waste recycling and disposal facilities have not been developed in a timely and environmentally sound manner because of diffused responsibility for municipal waste planning, processing and disposal among numerous and overlapping units of local government. The Legislature also finds that direct ***state action is needed to assist municipalities in separating, collecting, recycling and disposing of solid waste,*** *and that sound environmental policy and economics of scale dictate a preference for public solid waste management planning and implementation on a regional and state level* (bold added here for emphasis).[1]

Such was the clarity of our beginnings and, for 20 years, Maine has worked to implement this policy. During this time, the state has made significant progress in reducing, reusing, and recycling its municipal solid waste.

- The state's recycling rate has more than doubled; recycling more than five and a half million tons of solid waste over this period.
- Public recycling services have expanded to serve over 98% of our population.

[1] 38 Maine Revised Statute Annotated, Chapter 13

- Businesses have adopted and implemented recycling programs that support the state's objectives.
- We've reduced toxics in the solid waste stream by banning from disposal in Maine solid waste disposal facilities: mercury-added products, cell phones, and cathode ray tubes (CRTs) found in computer monitors and televisions, and requiring the recycling of hazardous consumer products known as 'universal wastes'.
- The number of municipalities offering collection programs to divert and safely manage household hazardous waste (HHW) has grown to 140 municipalities in 2007. Additionally, two permanent HHW collection facilities have been established to better serve the on-going household hazardous waste management needs of Maine's residents.
- Nearly 100% of the state's unlicensed, unlined, substandard landfills have been capped and closed, significantly reducing their impacts on Maine's environment.

In the decade since the last waste management plan, recycling progress has slowed. The statewide recycling rate leveled off as our growing economy and changing lifestyles resulted in waste generation levels that outpaced our efforts and support of recycling. The amount of solid waste being disposed increased 60 percent.

The legislated date to achieve the state's 50% goal is January 1, 2009. The 2007 state recycling rate is 34.8%, fifteen percentage points short of the goal. The state remains committed to reaching the 50% goal in light of its value on reducing overall solid waste management costs, the positive impact on the environment, and a lessening of the need for additional solid waste disposal facilities.

The state waste reduction goal challenges Mainers to reduce waste generation by 5% every two years. As waste generation continues to climb in Maine, we have not achieved this goal. However, we are seeing a modest trend in waste reduction from decreases in the weight of consumer goods, for example when products get smaller, are made of more lightweight materials, or use lighter weight packaging.

In 2005, a state policy review task force called for Maine to move beyond a 50% recycling goal. Recycling is increasingly critical as a foundation for sustainable production. As the current stewards of this system, we have the obligation to counter the notion of useless waste as an unavoidable conclusion of normal everyday living. Our work for the coming years is to return these "resources" to either their natural or industrial systems.

The Purpose of this Plan

The intent of the ***Declaration of policy*** placed into law in 1989 is unambiguous; as is the direction it provides the plan.

While this plan does offer specific resource management objectives and suggestions to achieve them, and has analytical and informational functions, it is deliberately a forward looking policy document for policymakers and program managers at the state, regional, and municipal level. The plan is intended to encourage them to make full use of the waste hierarchy when crafting decisions about program implementation, to provide them with the policy standards to apply to those decisions and to persuade them to pursue and achieve the state's 50% recycling goal; one of the fundamental legislative reinforcements of the hierarchy.

The plan takes a look at the development of Maine's waste management system in order to assess the effectiveness of current state efforts. The plan also:

- looks at how solid waste is currently being managed in Maine;
- provides an update on issues cited in the last plan ten years ago; and
- identifies issues that warrant monitoring and new trends.

Finally, it describes strategies for how Maine might move forward managing municipal solid waste into the next decade.

In addition, the plan is the basis for:

- communicating Maine's waste management priorities and policies;
- assessing statewide disposal capacity, recycling progress, and waste management strategies; and
- guiding public benefit determination for environmental licensing.

Appendix A provides the statutory references for the plan.

The Plan's Format

This plan update contains edited excerpts from the most current *Solid Waste Generation and Disposal Capacity Report*. The capacity report has been expanded in scope and is now revised on an annual basis. Certain requirements of the plan and the report overlap including determination of existing and potential disposal capacity, and projected demand for capacity.

The goal of this "link up" is to develop mechanisms through which the State Planning Office can readily scrutinize the progress and effectiveness of Maine's solid waste policies and programs against the most current numbers and projections supplied by the capacity report.

This change in format is in keeping with the move to a standing Solid Waste Management Advisory Council from the once-every-five-year task force and the change to the annual report; to develop a more timely, policy-guided review of any changes and trends of Maine's solid waste management practices and translate the information gained into appropriate action.

I. Waste Characterization

Municipal Solid Waste Generation[2]

The amount of municipal solid waste (MSW) generated by Mainers is the starting point for the calculations and projections in this plan. It provides the basis for determining the statewide recycling rate as well as all the projections that follow.

Municipal Solid Waste
This plan considers municipal solid waste and its residues (primarily ash and front-end process residue generated by waste-to-energy facilities). MSW is waste typically generated by households and businesses and managed by municipalities. It includes household garbage and other waste (corrugated cardboard, newsprint, office and mixed papers, food waste, plastics, glass, metals, and textiles) as well as construction and demolition debris, appliances, furniture, tires, wood waste, and yard waste.

Waste Generation Calculation
The State Planning Office uses three pieces of data to determine the statewide generation of municipal solid waste:

1. data provided by municipalities in their annual solid waste reports to the State Planning Office;
2. data provided by public and private disposal facilities in their annual license reports to the Maine Department of Environmental Protection; and
3. data provided by commercial recyclers and end-users in a voluntary survey.

The Office combines the amount of waste processed and disposed and the tonnage recycled, composted, and reused to create a reliable estimate of waste generation in Maine.

A. Statewide Municipal Solid Waste Generation

Maine residents, businesses and visitors generated 2,066,448 tons of municipal solid waste in 2007, up from 1,989,266 tons in 2006. Waste generation is a function of population growth, lifestyles, economic activity, and production practices.

Between 1993 and 2003, municipal solid waste generation in Maine increased over 55%. While we can attribute some of this growth to increased economic activity, we also recognize that improved data collection plays a part. During this period, for each successive reporting year, the Office was able to capture more precise waste generation numbers. However, as can be seen in Figure 1, over the last four years, waste generation increases have slowed. Again, improved accuracy in data plays a part.

[2] Excerpted from the *2007 Solid Waste Generation and Disposal Capacity Report*, Maine State Planning Office, January 2009 (edited)

Nevertheless, a fundamental change in the waste stream is occurring; a change that impacts waste tonnages. Products and product packaging today are increasingly made from lighter weight materials. This saves on both manufacturing and transportation costs. Shifting from glass to plastic packaging, downsizing packaging, and switching from metal to plastic product components are occurring across industries. For example,

- newspapers are smaller and lighter weight;
- aluminum and plastic containers are being manufactured with less material;
- glass is disappearing from supermarket shelves; and
- computer components are often now made of plastic rather than metal.

These changes impact waste stream composition. Plastic, which used to be 7% of the waste stream by weight, now comprises 12-13%, displacing glass and metal. Where 24 aluminum cans used to weigh a pound, now there are 34 cans to a pound. Newspaper is now a smaller percent of the waste stream by weight.

Changes in society also contribute to decreasing the weight of what we dispose. Smaller families, reading their morning newspaper on-line, and eating more restaurant meals, generate less waste. A trend of growing-your-own or buying local produce may also reduce food waste in places.

At the same time, we continue to see increases in disposable, single-use, convenience packaging. Today's on-the-move lifestyle takes advantage of ready-made meals, and also the demands of higher food hygiene standards. Everything from plastic utensils and beverage cups to throwaway floor mops to disposable underwear and socks for travelling represents a growing share of household waste, particularly if you consider its volume. Disposable products and packaging, while increasing in amount also appear to weigh less; a contributing factor to Maine's slowing waste generation tonnages.

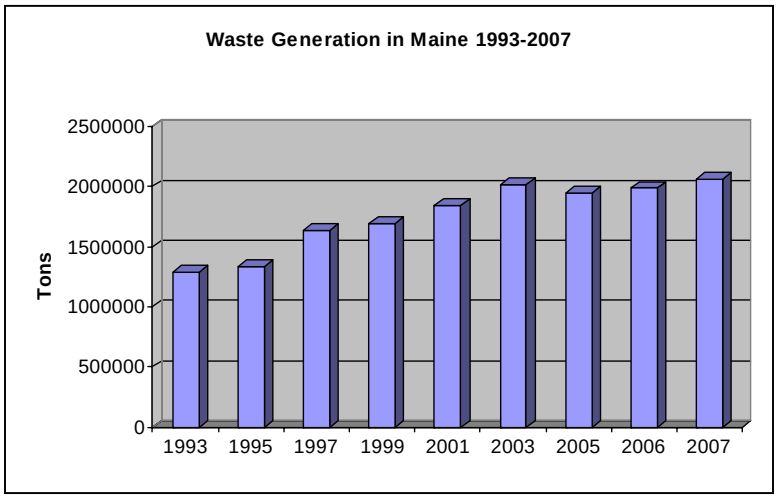

Figure 1: Maine Waste Generation, 1993-2007
Source: State Planning Office

B. Per Person Waste Generation

Municipal solid waste generation, when calculated on a 'per person' basis, shows that each Maine resident generates approximately 3,200 pounds of MSW a year, or about 8.8 pounds of waste per person per day.[3] Maine's per person generation is higher than the 2007 national average of 4.6 reported by the U.S. Environmental Protection Agency.

One reason why Maine's per person number is higher than the national average is that Maine includes both bulky waste and construction and demolition debris (CDD) in its definition of MSW, which the U.S. EPA does not. If we exclude these wastes from our numbers, the Maine per-person rate drops to approximately 7.5 pounds per day. For comparison, New Hampshire's 6.9 pounds per person per day in 2007 includes CDD,[4] also higher than the national average.

Another explanation for the higher weight per person is the high success in tracking and capturing commercially-generated solid waste tonnages, as well as the considerable additional impact of visitors on solid waste generation. Maine sees tens of millions of overnight stays and hundreds of thousands of extended stays by nonresidents per year. For example the Mount Desert area with a year round population in the thousands, sees over three million visitors per year that have an enormous impact on MSW generation numbers.

C. Types of Waste

1. Composition of Household Wastes

The plan depends upon the *EPA Waste Characterization Study* of the same data year in order to assess the types and amounts of Maine-generated MSW (See Figure 2 below).

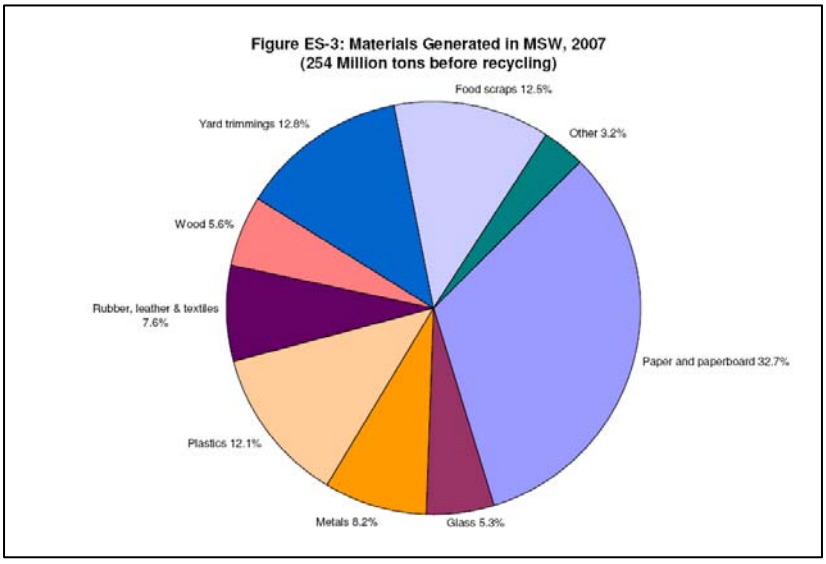

Figure 2: Municipal Solid Waste Characterization
EPA Waste Characterization Study 2007

[3] Based on an estimated 2007 Maine population of 1,315,398, US Census
[4] New Hampshire Department of Environmental Services

We can apply these percentages to the amount of Maine's MSW, but we must subtract CDD as the EPA chart does not include that waste stream.

Subtracting out the 2007 CDD tonnage leaves 1,748,958 tons of MSW generated. By applying the percentages of the chart to Maine's tonnage, we can estimate the types and amounts of MWS as shown in Table 1.

Table 1: Maine Recyclables Generated (in tons) - 2007	
paper and paperboard	571,910
yard waste	223,867
food scraps	218,620
plastic	211,624
household metal	143,415
textile, rubber and leather	132,920
wood waste (other than CDD)	97,942
glass	92,695
other	55,967

It is worth comparing these numbers with the recovered numbers reported in Table 6. While the categories do not match up precisely, they are close enough in definition to warrant their use here. Table 2 shows the percent recovered for selected recyclable materials.

Table 2: Recovery Rates of Selected Recyclable Materials 2007			
Waste type	**Amount generated**	**Amount recovered**	**% recovered**
Paper/ paperboard	571,910	286,164	50%
Yard waste	223,867	29,948	13.3%
Food scraps	218,620	214	minimal
Plastic	211,624	15,181	7%
Household Metal	143,415	86,936*	61%
Textile/rubber/leather	132,920	9,498	7.1%
Wood waste	97,942	**	
Glass	92,695	49,520	53.4%

* includes white goods ** no corresponding definition

This comparison confirms current trends in recycling data. The mature recycling commodities – glass, metals, and fiber – have the highest recovery percentages, while plastics is gaining share in generation but lags behind in recovery due to the complexity of chemistries that relates directly to weakness in recycling efforts. It also highlights where Maine can make the most gains by concentrating on fiber, plastics, construction demolition debris, and the organic fraction.

Another way to look at Maine's waste stream is to look at the source of the waste. Maine has a larger commercial share than the US average because of our MSW definition inclusive of CDD (see Table 3).

Table 3: Breakdown of Sources of Waste - 2007			
Type of Waste		**Percent of MSW Generated**	
Residential	Includes waste from single-family and multi-family dwellings	Maine 46%	US 55-65%
Commercial	Includes waste from businesses, schools, institutions, and the MSW portion waste generated by industrial sites (e.g. office waste)	Maine 54%	US 35-45%

2. Composition of Construction/Demolition/Debris

In 2007, Maine generated an estimated 317,490 tons of CDD. Based on waste composition models, as shown in Figure 3, we can assess the types and amounts of the CDD waste stream.

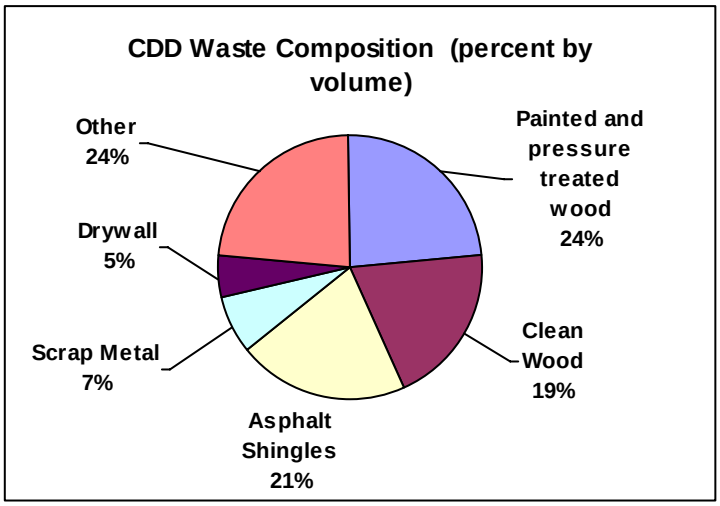

Figure 3: Vermont CDD Composition Study 2003

Using the percentages of Figure 3, it is estimated that Maine generated the following amounts and types of CDD, shown in Table 4:

Table 4: Types of CDD generated – 2007 (in tons)	
Painted and other wood	76,198
Clean wood	60,323
Asphalt shingles	66,673
Metals	22,224
Drywall	15,875
Other[5]	76,198

[5] "other" includes carpet, plastic floorings, insulation, plastic conduit, joint compound, containers, and paper products, and mixed materials products that could not be categorized.

Again referring to Table 6, Maine recovered 25,626 tons of CDD and other wastes for a recycling rate of just over 8% of our CDD stream.

State Recycling Goal

A. Recycling Trends

The goal of the state of Maine is to recycle 50% of the state's waste each year. Maine recycled 34.8% of its municipal solid waste in 2007. This reflects a decrease from the 2006 recycling rate of 36.2 % and falls below the recycling rate of 35.5% experienced in 2003. The Office estimates that the overall result is accurate to within two (2) percentage points.

Approximately 33% of Maine's recyclables are handled by municipal/public recycling programs. The balance of recycling efforts statewide is the result of private business-generated and managed recyclables, handled by private sector waste management companies.

Maine's recycling rate grew rapidly in the first ten years following the enactment of the Maine Solid Waste Management Act – from an estimated 17% in 1987 to 42% in 1997. It has since leveled off, declining slightly each year since the high of 42%. Figure 4 shows the state's recycling rate over time.

The rapid rise in recycling rates from 1987 to 1997 was due to a concentrated effort by private sector, local public programs, and the state acting in partnership, with recycling having not only a priority statutory identity, but state level presence and support. During this time, the state invested $12.5 million in local grants for recycling collection and processing equipment, provided for statewide public education, and conducted hundreds of training workshops for local officials. Since 1998, state funding has been available at a fraction of previous levels ($475,000 in 1998, $600,000 in 2003) and local programs compete with other municipal services for their share of property tax dollars.

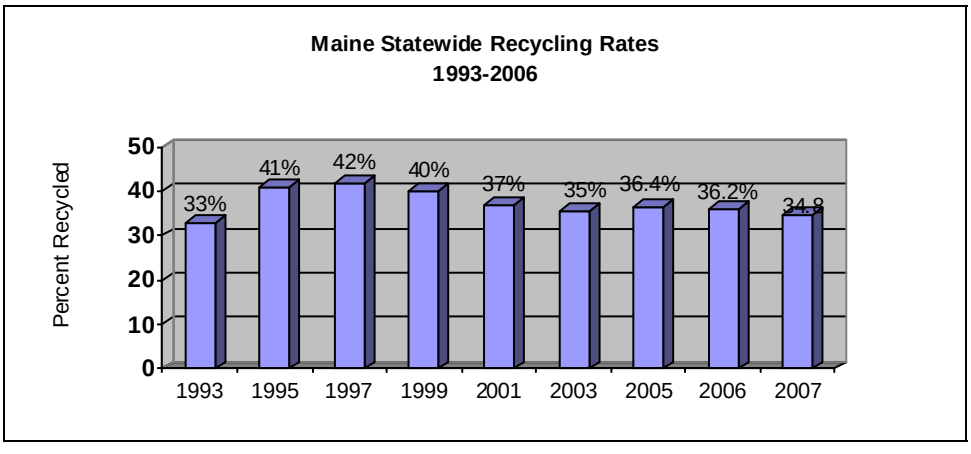

Figure 4: Maine Recycling Rates, 1993-2007
Source: State Planning Office

At the same time, there has been an upward trend in municipal solid waste being generated. Figure 5 shows the tons of waste disposed compared to the tons recycled. The growth in waste generation prevents the recycling rate from increasing despite greater tonnages being recycled.

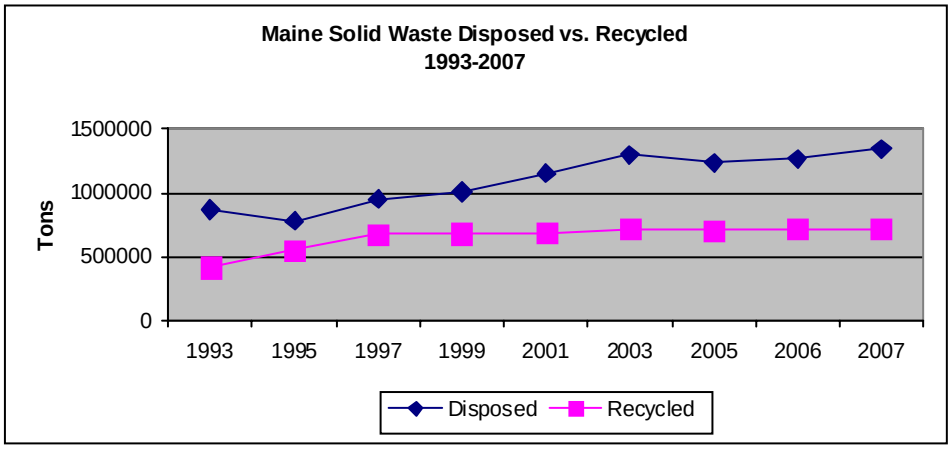

Figure 5: Maine Solid Waste Disposed vs. Recycling, 1993-2007
Source: State Planning Office

There are four broad reasons why recycling rates are falling behind generation rates.

First, recycling has not advanced aggressively into other components of the waste stream that are growing, such as the organic fraction and construction and demolition debris.

Secondly, even though markets for traditional recycling commodities have grown throughout the first half of this decade with strong revenues and encouraging price signals, municipal programs have not sought to follow their lead and increase recycling efforts. This is primarily due to yearly budget constraints that prevent investment to take advantage of market opportunities.

Thirdly, municipal programs typically view recycling as an "add-on" to their MSW program and may lack confidence in recycling as an integral part of their management system, creating a divide between what they are required to do by law and what they may desire to do.

And lastly, municipal recycling programs are often not extended to cover small businesses (i.e. less than 15 employees, the threshold for required recycling under state law) so a large amount of material is missed, falling in the gap between large scale commercial recovery and municipal/residential resource recovery efforts.

B. EPA Definition

We can also compute the state recycling rate using the U. S. EPA's definition for MSW, which excludes CDD. When the 2007 statewide recycling rate for Maine is calculated using the EPA guidelines, our statewide recycling rate becomes 38.8%. Table 5 shows the two methodologies for calculating the state's recycling rate and Figure 6 shows a comparative trend line.

Table 5: Maine Statewide Recycling with and without CDD 2007				
Maine Definition (*CDD included*)			EPA Definition (*CDD not included*)	
MSW with CDD generated	2,066,448		MSW w/o CDD generated	1,748,958
MSW with CDD recycled	718,613		MSW w/o CDD recycled	692,987
Recycling Rate	34.8%*		Recycling Rate	39.6%*

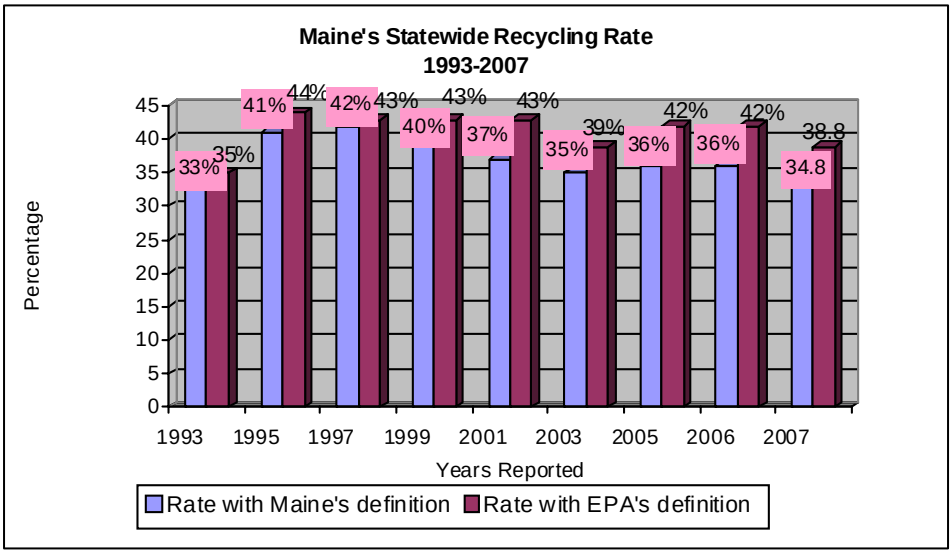

Figure 6: State Recycling Rate with and without CDD included
Source: State Planning Office

Conclusion: Waste Characterization

Waste generation increases appear to have slowed. Societal changes and reduced packaging contribute to this. Mainers are recycling more each year. Nevertheless, we continue to throw away more. Our recycling rate cannot keep pace with waste generation.

Table 6: Type and Amount of Materials Recycled 1997-2007

Materials:	2007	2005	2003	2001	1999	1997
high grade paper	72,846	72,965	3,951	43,125	11,570	31,470
corrugated cardboard	117,324	117,144	88,166	202,129	198,442	214,536
newspaper	26,453	32,300	33,442	32,069	42,612	44,710
magazines	8,532	8,723	1,881	13,259	6,104	3,702
mixed paper	11,131	5,226	13,919	14,766	12,860	12,207
other paper	7,668	8,900	3,166	27,376	12,671	6,465
other grades	42,210	36,805	132,475			
Total paper	286,164	282,063	277,000	332,724	284,259	313,090
clear glass	10,656	11,058	6,334	11,706	8,324	10,590
brown glass	23,544	24,377	11,270	12,200	12,545	7,060
green glass	11,878	12,622	3,142	6,700	26,167	11,767
all other glass	3,442	3,598	21,672	620	440	1,734
Total glass	49,520	51,655	42,418	31,226	47,476	31,151
white goods	82,493	78,401	68,125	115,219	142,640	122,895
aluminum	2,454	2,163	2,109	6,100	1,862	1,332
tin cans	1,989	1,089	3,154	9,754	18,833	10,693
non ferrous	25,655	23,213	18,847	22,491	18,652	21,572
other (various materials)	72434	68,432	68,984			
Total Metal	185,025	173,298	161,219	153,564	181,987	156,492
HDPE	8,530	9,377	3,420	2,274	4,410	4,160
PET	5,277	4,766	8,725	9,042	6,521	6,021
LDPE film	576	526	711	4		
polystyrene		8	0	554	6	6
Other	798	631	531	1,917	1,211	1,042
Total Plastic	15,181	15,308	13,387	13,791	12,148	11,229
wood waste	86,544	93,582	92,154	40,443	41,103	38,402
leaves	29,448	29,938	33,376	26,340	27,421	24,528
food waste	214	142	2,623	23,744	24,582	23,240
Total Organic	116,206	123,662	128,153	90,527	93,106	86,170
tires	30,545	30,374	35,467	19,621	32,530	30,559
CDD, other wastes	25,626	23,425	49,714	38,848	39,469	44,209
Mercury-added/UW	848	487	327	242		
Total Hard to Manage	57,019	54,286	85,508	58,711	71,999	74,768
Textiles	2,196	1,724	2,260	3,827	6,023	1,726
Other nonbulky MSW	7,302	6,935	7,638	3,445	2,740	5,252
TOTAL TONS RECYCLED:	718,613	708,931	717,583	687,815	699,738	679,878

II. Solid Waste Management Infrastructure Capacity

Recycling Capacity

Maine cities and towns by law are responsible for providing for municipal solid waste disposal. Title 38, Chapter 13, section 1305 states, "Each municipality shall provide solid waste disposal services for domestic and commercial solid waste generated within the municipality…"

Individual municipalities and regions are not required to achieve a 50% recycling rate; but they are required to demonstrate progress towards the goal. Recycling progress varies from community to community, but overall programs removed 90,000 tons of paper and plastic and metal and glass containers from the state's waste stream that would otherwise need disposal, and recycled an additional 137,000 tons from other waste streams in 2007.

Based on what we generate today, municipal and private sector recycling programs would need to handle 300,000 tons more of material to achieve a 50% recycling goal. This number will grow each year to match projected increases in waste generation.[6]

Over the next 20 years, simply to maintain a 35% recycling rate will require public and private programs to double their recycling handling abilities. As waste generation increases, the volume of recyclable materials at a 35% rate will increase from 700,000 tons in 2007 to 1.6 million tons in 2027.

To achieve and maintain a 50% recycling goal by 2009 would mean processing 30 million tons from the waste stream over the 20-year period as shown in Figure 7 (increasing from 700,000 tons in 2007, to 1 million tons in 2009 and 2.4 million tons by 2027).

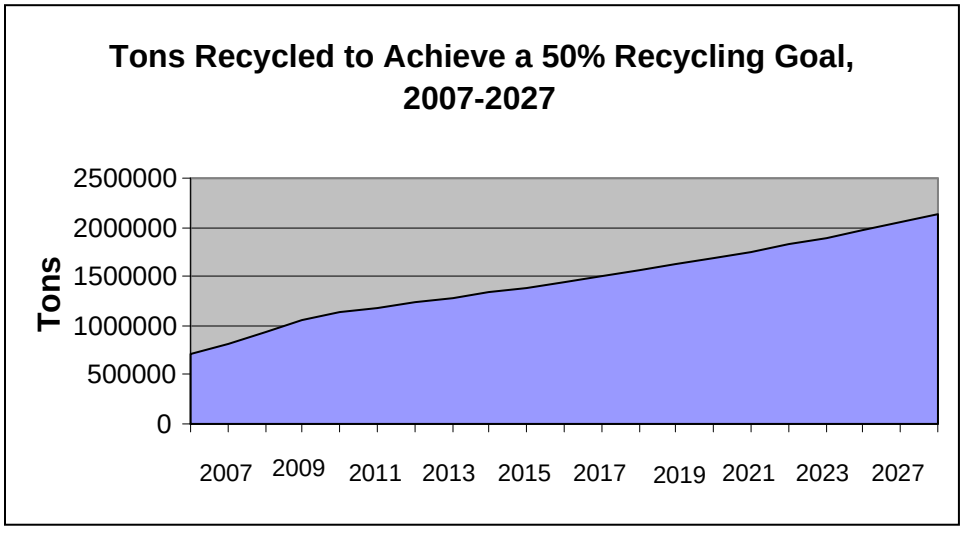

Figure 7: Tons Recycled to Achieve a 50% Recycling Goal
Source: State Planning Office

[6] Based on an assumed 4% annual growth in municipal solid waste generation.

Currently municipalities do not have the capacity to handle these kinds of new volumes; neither the physical (buildings and equipment) nor human (staffing) capacity. Municipal recycling programs currently handle, on average, 90,000 tons of fiber, packaging, products and container recycled materials per year. The Office estimates that they have additional capacity for another roughly 25 to 30,000 tons annually.[7]

The private sector can likely handle additional tonnages or be in a position to respond with capital investment needs to grow their tonnages if the economics warrant it.

There are concerns over where this volume would come from. Higher yields and participation rates can be stimulated with public awareness programs, incentives such as pay as you throw, and technological advances including single sort. Many communities are taking these kinds of actions, but greater effort is needed to generate the tonnage to achieve a 50% recycling goal.

Today there is sufficient down time at most the regional recycling centers[8] that most of the changes needed to meet future capacity needs at those facilities can be met by additional labor time and increases in personnel. There will always be the requirement to have sufficient funds to repair/maintain and replace equipment, but not necessarily the demand to expand processing capacity (i.e. adding more and bigger balers). An alternative would be to add new stationary or mobile infrastructure in order to change over single sort recycling systems, which partially eliminates the need for additional personnel.

We can look at *ecomaine* for a real world example. They are actively seeking more recycling tonnage to go from their 2007 level of approximately 25,000 tons to 40,000 tons. At the higher figure they can run their new MRF at capacity for a single shift. To double that tonnage over 17 years will take some refinement of their current operation to improve throughput, eventually adding a second shift to as their projected throughput builds from 40,000 to 80,000 tons. That one additional shift at that one facility represents 25% of the future recycling capacity needs of Maine's municipalities.

The gradual increase in material levels over the next several years will mean that municipalities will also see pressure to move towards more efficient collection/aggregation systems whether that be improvements in curbside systems or the move from drop off to curbside, or larger more efficient drop offs that eliminate bottle necks and over handling.

It is anticipated that future municipal recycling infrastructure costs will be for collection, containment, and storage, for the traditional recycling stream, and expanding into organics diversion through composting and to accommodate increased CDD recycling.

It will take significant infrastructure capital investment, by both the public and private waste management sectors to achieve our 50% recycling goal. Maine should begin to prepare now to build the infrastructure needed to manage an increase in recycling.

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[7] This does not include the ecomaine recycling collection and processing expansion that is predicted to add 15,000 tons a year of recyclable material or expansion of other single stream materials recovery efforts.

[8] A regional recycling center is defined here as 2 or more communities, several balers or at least one horizontal baler, a tipping floor to handle large amounts of incoming materials, sufficient bale storage for a truckload of more than one type of material, with a transport and marketing system in place and sufficient personnel and auxiliary equipment.

Processing and Disposal Capacity

In 2007, Maine's solid waste disposal facilities included: one state-owned landfill, two commercial landfills, eight municipally-operated landfills, (including Greenville in closure negotiations) 23 municipal construction and demolition debris (CDD) landfills, and four waste-to-energy facilities. Several processing facilities/operations were available for managing construction and demolition debris.

Assumption: Capacity figures provided for the state-owned and commercial landfills assume that operations of those facilities achieve a one-to-one ratio of tons-to-cubic yards using best management practices for landfill compaction.

A. Landfills

Landfills receive a variety of wastes, and that variety differs among the facilities, depending upon what their approval allows for acceptable wastes. Included in that variety of wastes is: raw garbage, construction and demolition debris, residues and ash from waste to energy facilities, contaminated soils, sludge, ash from bio-mass operations, and other special wastes. This report focuses on municipal solid waste, including construction and demolition debris as well as the residues from the processing of those wastes, but in reviewing landfill capacity, the tonnages of the other special wastes that are accepted by the landfills do consume capacity, and for that reason, those wastes and their impact on landfill capacity is included in this report.

1. State-owned Landfill[9]

In 2007, the state-owned landfill in Old Town, known as Juniper Ridge, received a total of 472,600 tons of in-state generated waste, of which 151,073 tons were municipal solid waste and CDD and another 158,877 tons were residues from processing or incineration of MSW. The balance of the waste buried at the landfill included various types of sludge, contaminated soils and approved wastes from other in-state commercial and industrial generators (non-MSW wastes).

Assessment of Facility

Available disposal capacity remaining at Juniper Ridge at the end of 2007 was approximately 8,462,000 cubic yards, which translates into space for approximately 7.15 million tons of solid waste. At projected fill rates[10], the present licensed capacity should provide 10-12 years of disposal capacity for the state.

Starting in 2009/2010, however, with the closure of the Pine Tree Landfill and the initiation of processing at the planned construction/demolition processing facility in

[9] The State Planning Office owns 1500 acres of land in T2 R8 (near Lincoln), upon which a special waste landfill was permitted in the mid 1990s. Known as Carpenter Ridge, it has a landfill design for about two million cubic yards of waste. It was acquired by the former Maine Waste Management Agency and has been held by the state for disposal capacity when it is needed.

[10] The State Planning Office projects that wastes delivered to Juniper Ridge will average 550,000 tons per year, but will increase to 850,000 tons per year starting in 2010, with wastes diverted from the planned closure of the Pine Tree Landfill in 2009, and from additional residues and wastes generated from CDD processing operations within the state.

Westbrook (as permitted by Casella Waste Systems, Inc.) an expected additional 300,000 tons of wastes will be delivered to the Juniper Ridge Landfill for disposal. With the addition of these wastes, the consumption of the space at the landfill is expected to change, from approximately one ton of waste per cubic yard of space to 0.8 tons of waste per cubic yard. This change impacts the planned life of the landfill, leaving approximately 10 years of remaining capacity, at the end of 2007.

2. Commercial Landfills

Maine has two commercial landfills grandfathered under the 1989 Solid Waste Management Act that banned the development of new commercial disposal facilities. Having the commercial landfills has provided competition and disposal options for municipal solid waste, construction and demolition debris, and special wastes. The two commercial landfills are:

- Crossroads Landfill, located in Norridgewock, owned by Waste Management, Inc.
- Pine Tree Landfill, located in Hampden, owned by Casella Waste Services, Inc.

The Crossroads Landfill is permitted to take special waste, municipal solid waste, and construction and demolition debris. It provides recycling and disposal services on a contract basis for municipalities and businesses. It currently serves 30+ Maine communities in Western Maine. In 2007, the landfill accepted 336,854 tons of solid waste. Of that tonnage, 182,525 tons were Maine generated municipal solid waste and CDD and 19,922 tons of residues from the processing of MSW. The balance of wastes included Maine generated special wastes (59,974 tons), and CDD and special wastes generated outside of Maine (74,433 tons).

The Pine Tree Landfill is permitted to take special waste, by-pass municipal solid waste, and construction and demolition debris. In 2007, the Pine Tree Landfill accepted 557,793 tons of solid waste. Of that tonnage, 39,058 tons were Maine generated municipal solid waste, CDD and 158,133 tons of residues from its processing. The balance of wastes included Maine generated special wastes (35,971 tons) and MSW by-pass, CDD and special wastes generated outside of Maine (324,631 tons). Through an agreement reached among the Town of Hampden, Maine Department of Environmental Protection and the landfill's owner, the landfill will cease accepting solid waste by the end of December 2009.

Assessment of Facilities

The total disposal capacity currently licensed at these two commercial landfills is approximately 5.0 million cubic yards. The majority of this capacity is at the Crossroads Landfill, with an estimated 3.9 million cubic yards of capacity remaining at the end of 2007. Table 7 shows estimated remaining disposal capacity at the commercial landfills.

Table 7: Capacity at Maine's Commercial Landfills – end of 2007				
	2007 Fill Rate (tons)	**Remaining Capacity (Cubic Yards)**	**Remaining Capacity (tons)**	**Estimate in years of life remaining based on 2007 fill rates**
Crossroads Landfill	336,854	3,900,000	3,900,000	10-12 years
Pine Tree Landfill	557,793	1,000,000	970,000	< 2 years
Total	894,647	4,900,000	4,870,000	

3. Municipal MSW Landfills

In 2007, 107,248 tons of solid wastes and 59,100 tons of ash were disposed at nine municipally-operated landfills. Table 8 provides information on each individual landfill, including fill rates and estimated available remaining capacity.

Assessment of Facilities

Among the seven municipally-operated MSW landfills (excluding Greenville and West Forks), there is just over 2.4 million cubic yards of remaining available capacity that can accept 1.56 million tons of municipal solid waste. This capacity is sufficient to carry those communities for 15 years (on average), supposing a relatively flat growth in the volume of municipal solid waste requiring disposal.

The actual remaining life varies for each landfill, resulting in 'unevenness' of municipal capacity across the state. This variation, as to when a particular community or region may exhaust their current disposal capacity, is independent and possibly irrespective of any possible statewide disposal capacity concern, but will be of significant concern to those regions.

Bath and Brunswick are two of the state's oldest secure landfills. Brunswick serves only its own residents and businesses. Both communities are adopting programs to extend the life of their landfills, such as 'pay-as-you-throw' (PAYT) and single stream recycling collection. The Hatch Hill Landfill in Augusta serves eight communities and was recently expanded. None of these facilities is expected to expand beyond their current footprint.

Together, the Presque Isle and Tri-Community (Fort Fairfield) landfills serve nearly 50 communities in Aroostook County. Both are currently seeking expansions that will serve those communities for an additional fifty years.

As part of an arrangement with the Mid Maine Waste Action Corporation, the City of Lewiston brings its waste to the MMWAC incinerator in Auburn. MMWAC, in exchange, disposes its incinerator ash at the Lewiston landfill. In addition, the Lewiston Landfill accepts CDD and other wastes.

Table 8: Municipal Landfill Tonnages – 2007				
	2007 Fill Rate (tons)	**Remaining Capacity Cubic Yards (est.)**	**Remaining Capacity (tons)**	**Years of life remaining based on 2007 fill rates at .65 tons/yard[11]**
MSW Landfills: [12]				
Bath	23,552	422,000	274,300	11 years
Brunswick	4,850	140,000	91,400	19 years
Greenville see footnote	600	56,000	36,500	60 years
Hatch Hill (Augusta)	25,961	937,000	609,000	20 years
Presque Isle	20,140	149,900	85,800	4 years
Tri-Community (Fort Fairfield)	31,145	703,800	457,500	18 years
CFWF (West Forks)see footnote	1000 (est.)	8,000	5,000	<1 year
Total Tons:	**107,248***			
Total Remaining Capacity (est.)		**2,416,700**	**1,559,500**	
	2007 Fill Rate (tons)	**Remaining Capacity Cubic Yards (est.)**	**Remaining Capacity (tons)**	**Years of life remaining based on 2007 fill rates at 1 ton/yard**
Ash Landfills:				
ecomaine	40,320	915,700	915,700	20-30 years
Lewiston	18,780	268,750	268,750	12 years
Total Tons:	**59,100**			
Total Remaining Capacity (est.)		**1,184,450**	**1,184,450**	

4. Municipal CDD Disposal Facilities

In 2007, 17 municipal disposal facilities reported accepting locally-generated construction and demolition debris (CDD)**,** inert fill, brush, and trees. Local facilities furnish a 'short-transport' option for the management of these wastes. A total estimated 28,000 tons of materials were buried at these sites during 2007; this is a decrease from the 34,839 tons landfilled in 2005, as shown in Figure 8.

[11] Different ton-cubic yard conversion rates are used for different facilities. Household, baggable waste at municipal landfills typically converts at 0.65 tons per cubic yard. Ash is heavier than municipal solid waste, so SPO uses a 1:1 conversion rate with one ton equaling one cubic yard. Commercial landfills, with heavier equipment for compaction and more varied waste streams, also typically achieve a 1:1 conversion rate.

[*] 83,043 tons were municipal solid waste or construction demolition debris. The balance was other wastes, including special wastes.

[12] The CFWF landfill ceased operations in 2008. The Greenville landfill is in closure negotiations.

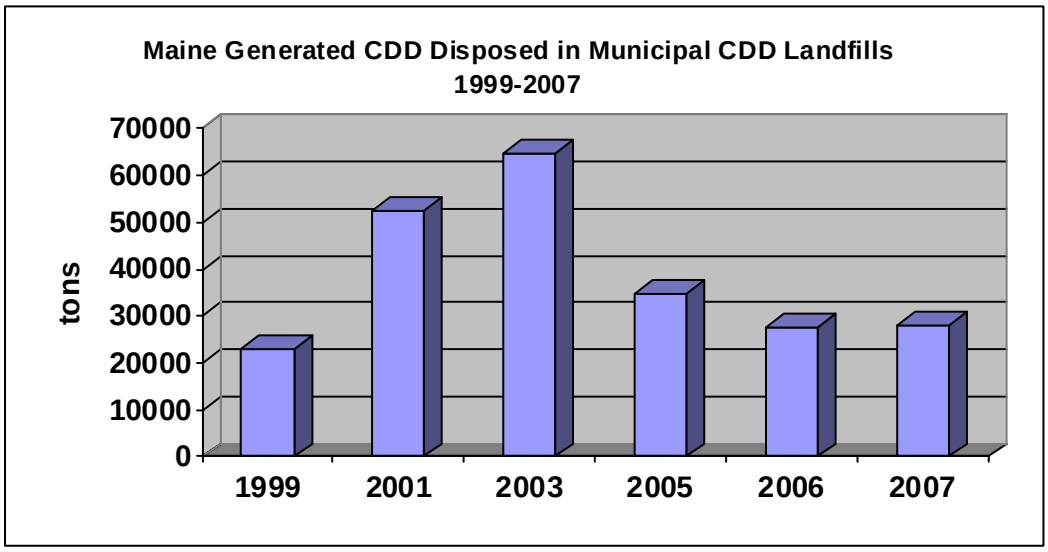

Figure 8: Maine CDD Disposed in Municipal CDD Landfills, 1999-2007
Source: State Planning Office

Assessment of Facilities

The remaining capacity at individual CDD facilities varies. Although statewide numbers indicate landfill space exists for an overall capacity sufficient for another 10-12 years, a number of these facilities will be full before then, creating 'pockets' where CDD disposal options will need to be reconsidered. Four of the facilities have an estimated six years or less of capacity at current fill rates and licensed footprints. One site, located in Marion Township in Washington County, is expected to be full in 2-3 years and the owners of that facility were pursuing development of a replacement disposal site, but those plans have been shelved for 2009.

CDD disposal capacity and management continue to be problematic. These materials are unacceptable at waste-to-energy facilities and cannot be recycled or reused without investment in equipment, labor, and sufficient land area to aggregate and process them. Markets for processed CDD and bulky wastes do exist but the small scale at which most Maine towns operate limits access to those markets. Communities' low volume and dispersed facilities do not often produce the economics of scale needed for sustainable recycling markets.

Maine has several commercial CDD processors: KTI Biofuels in Lewiston; Commercial Paving and Recycling (CPRC) in Scarborough; and Plan-it Recycling in Gorham. KTI is a fixed operation. It accepts only clean wood products (from in-state and out-of-state) for processing for use as biomass fuel. CPRC used to provide mobile services but now operates strictly from its Scarborough facility, hauling in material and shipping out the finished product. Plan-It Recycling also operates from a fixed location. Casella Waste Systems has permitted a CDD processing operation that would accept up to one thousand tons of CDD per day in Westbrook and anticipates building that facility in 2009, providing an additional outlet for Maine-generated CDD. There are also several commercial wood chippers that move from site to site to manage smaller amounts of wood waste.

B. Waste-To-Energy Facilities

In 2007, 32% of Maine's municipal solid waste was sent to a waste-to-energy (W-T-E) facility. Maine's W-T-E facilities received, 826,291 tons of MSW, down from 867,606 tons of MSW in 2006 as shown in Figure 9. Of this, 671,823 tons were generated in-state and 154,468 tons were imported, both a decrease from 2006.

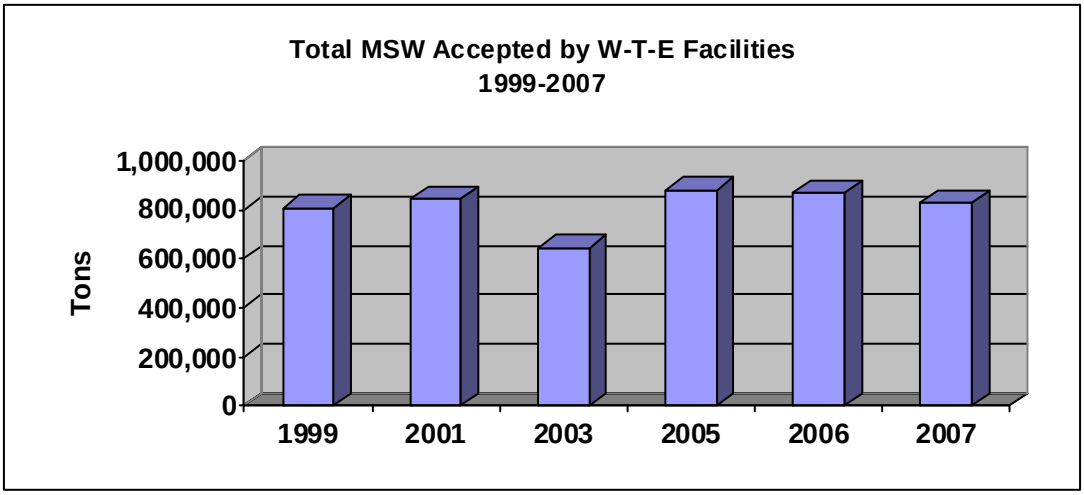

Figure 9: MSW Accepted by W-T-E Facilities, 1999-2006
Source: Facility License Reports, Maine DEP

Table 9 shows the processing capacity of the four waste-to-energy facilities:

Table 9: Maine W-T-E Capacity

Waste-to-energy Facility	Annual Processing Capacity (tons/year)	Tonnage Received in 2007
ecomaine	170,000	157,637
Maine Energy (ME)	310,000	280,210
Mid Maine Waste Action Corporation (MMWAC)	70,000	92,696
Penobscot Energy Recovery Corporation (PERC)	304,000	295,749
Total of W-T-E Facilities	**854,000**	**826,292**

The facilities provide both a product (electrical power) from combustion as well as a reduction of the MSW tonnage requiring disposal, thus reducing the need for landfill capacity. They produce a combined capacity of approximately 62 megawatts a day of electricity and reduce the volume of waste requiring landfilling by about two-thirds.

The four waste-to-energy facilities, while combusting MSW and producing electrical power, also produce several streams of materials and residues: by-pass waste, front-end process residue, and ash. These residues, which require disposal in landfills, comprise approximately one-third of the waste processed by waste-to-energy facilities (see Figure 10 and Table 10).

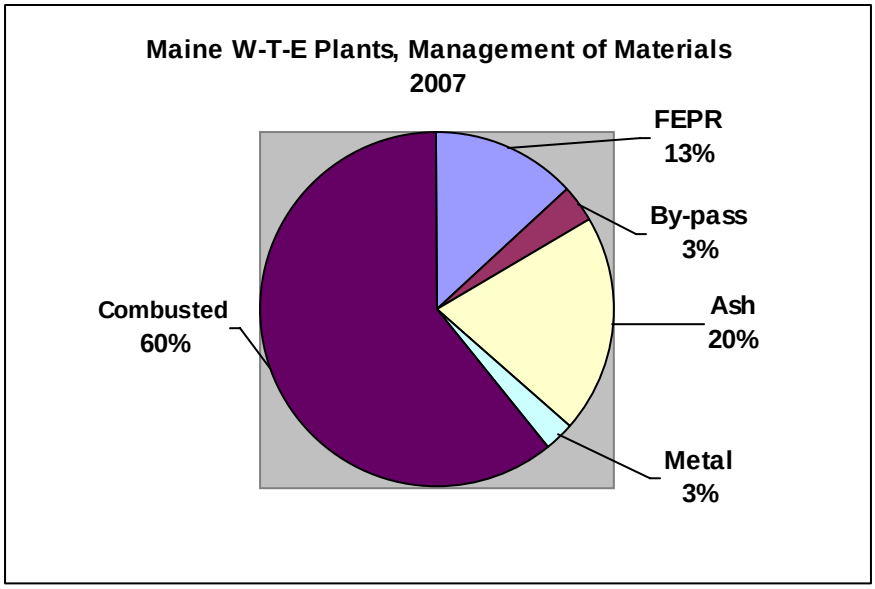

Figure 10: Maine W-T-E Plants, Management of Materials
Source: Facility License Reports, Maine DEP

Table 10 - W-T-E – All Waste Streams - Combined Tonnages		
	2006	**2007**
Delivered MSW tonnage	867,606	826,292
By-pass	36,183	27,014
FEPR	122,512	110,016
Metal	22,044	22,032
Combusted	504,078	503,226
Ash	169,000	164,003

1. By-pass Waste

By-pass waste is that portion of the municipal solid waste stream intended for delivery to and incineration at a waste-to-energy facility but is diverted because the facility could not accept it. Solid waste is 'by-passed' if there are operational interruptions or facility shut-downs or if the facility reaches its operational capacity and cannot accept waste that it is contractually-obligated to receive. The by-pass waste is typically delivered to a landfill for disposal.

2. Front-end Process Residue

Front-end process residue (FEPR) is removed prior to incineration, and may include ferrous metals, glass, grit, and fine organic matter. While metals are recycled, most FEPR is landfilled. In the past, FEPR was used in conjunction with landfill closure programs, but this is no longer a viable outlet. The FEPR waste stream consumes landfill capacity, since alternatives to landfilling

it do not readily exist. While some composting of FEPR has been done, the resulting product typically contains contaminants that restrict its use to limited landfill cover applications only.

Maine Energy (MERC) and Penobscot Energy Recovery Company (PERC) use a 'refuse derived fuel' technology and generate front-end process residue as a by-product of their operations. These facilities dispose of the front-end process residue at the Pine Tree Landfill, though a portion was delivered to other disposal facilities. Mid-Maine Waste Action Corporation (MMWAC) and *ecomaine* use a 'mass burn' technology and do not produce FEPR.

3. Waste-To-energy Facility Ash

Ash is a by-product of incineration, is classified as a special waste, and is landfilled. The ash from MERC and PERC was buried at the commercial landfills and Juniper Ridge. The ash from MMWAC was buried at the City of Lewiston's landfill and e*comaine's* ash was buried at their landfill.

Assessment of Facilities

Three of these facilities are at or close to their 20th year of operation. The plants' maintenance programs, along with upgrades, have kept these facilities functioning well, and should continue to do so for the foreseeable future. The facilities are essentially in "as new" operating condition.

Facility upgrades occur in response to environmental regulations, primarily aimed at air emissions reductions. All of the Maine W-T-E facilities perform at or better than their license requirements.

Looking at future supply stream, 2018 is an important date in the planning process. On that date the majority of the municipal disposal contracts held with PERC and MERC will expire.

To produce the electrical generation contracted for, waste-to-energy facilities need to operate at maximum capacities. The seasonal nature of waste generation causes tonnage overage problems during the summer months and the need to 'attract' additional tonnage during the winter months. Facilities bypass waste when they reach their daily operating capacity and import waste to make up for shortfalls (see Section IV.C on Imported/Exported Municipal Solid Waste).

C. Imported/Exported Municipal Solid Waste

Movement of solid waste across state lines is protected under interstate commerce laws. Municipal solid waste is considered a commodity and is subject to fluctuations accruing to supply and demand at the regional and national level.

During 2007, 456,580 tons of municipal solid wastes were imported to Maine, while exports

totaled 60,491 tons. The amount of MSW imported to Maine is stabilizing while the amount exported[13] fluctuates as shown in Figures 11 and 12.

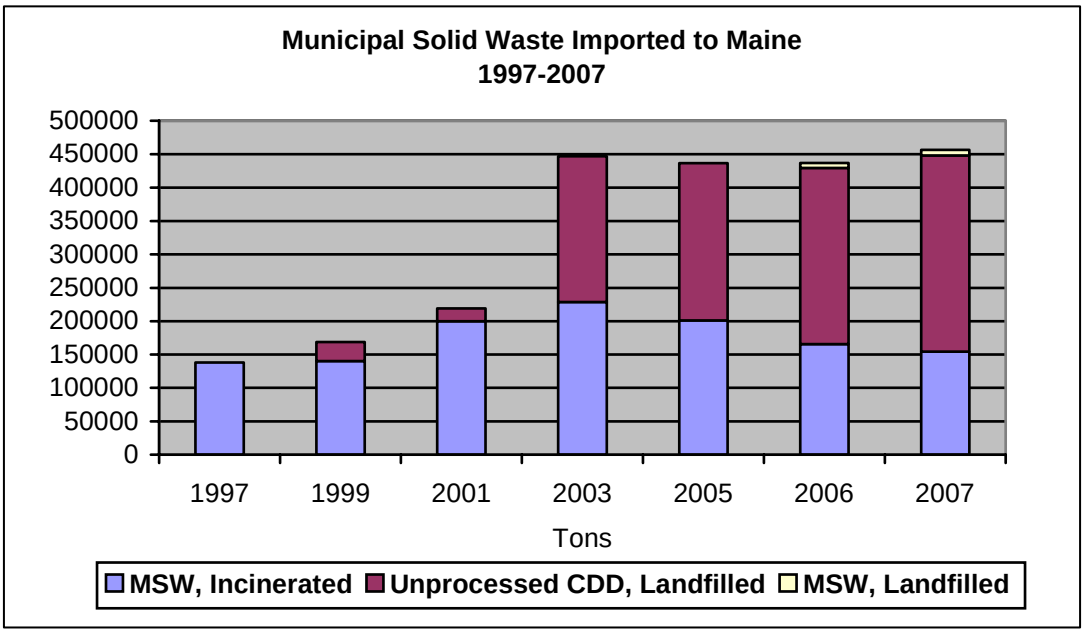

Figure 11: Municipal Solid Waste Imported to Maine, 1997-2007
Source: State Planning Office

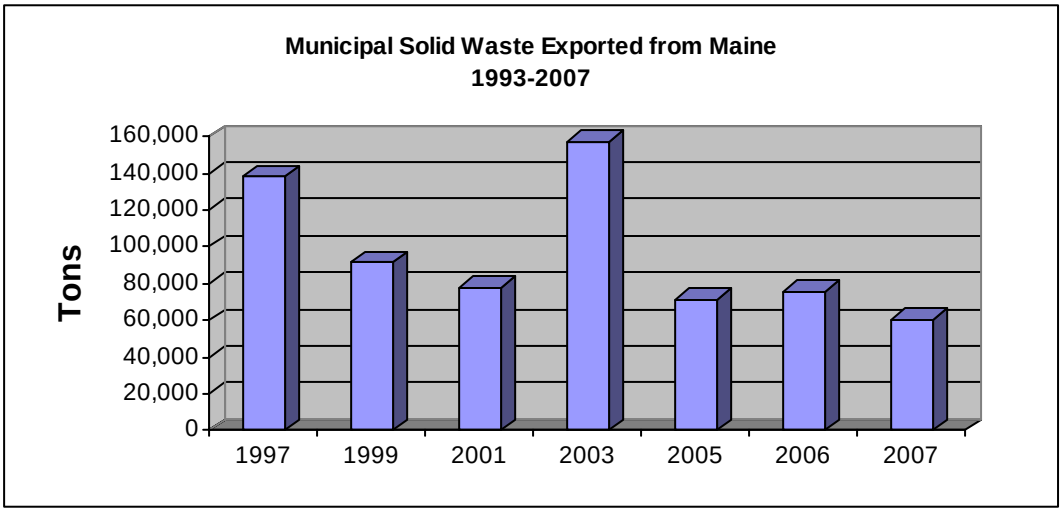

Figure 12: Municipal Solid Waste Exported from Maine
Source: State Planning Office

Imported waste in 2007 consisted of approximately 33% municipal solid waste that was incinerated and 66% construction and demolition debris that was landfilled (see Table 11).

[13] Exported waste was delivered to landfills in New Hampshire and New Brunswick for disposal.

Table 11: Imported Waste by Facility		
	2006	**2007**
MSW – Maine Energy (MERC)	136,472	117,320
MSW – PERC	29,323	37,148
MSW Landfilled – commercial landfills	7,547	8,576
CDD Landfilled – Pine Tree	259,310	290,493
CDD Landfilled – Crossroads	4,385	3,043
Total Imported	**437,037**	**456,580**

Projected Waste Processing and Disposal Demands and Capacity

Based on our projections, Maine will require approximately 34 million cubic yards of landfill capacity over the next 20 years to properly manage the municipal solid waste that is directly landfilled, along with the residues generated by the four waste-to-energy facilities and other processing facilities that also require landfilling. Over this same time, we project there will be 39 million cubic yards of capacity. With approval of the proposed additional disposal capacity, Maine has sufficient capacity to meet its needs for the next 20 years.

A. Statewide Disposal Capacity

1. Capacity Needed

Disposal capacity is a factor of need versus availability. Maine generated just over two million tons of waste in 2007. Assuming a 4% annual increase, we will generate over 4.6 million tons in 2027. With a 34.8% recycling rate, 1.6 million tons per year will be recycled, 0.86 million tons will be sent to a W-T-E facility, leaving 2.4 million tons that will require landfilling.[14] That landfilled waste includes unprocessed solid waste, residues from waste to energy facilities and processing operations, and special wastes such as ash. Figure 13 shows Maine's projected capacity needs over the next 20 years.

To handle this projected tonnage over the next 20 years, Maine will need 34 million cubic yards of landfill capacity based on four assumptions.

1. Continued growth in MSW generation at 4% per year (with no waste reduction assumptions built in and recycling at 34.8%). This four percent increase is conservative and it is possible that actual increases may be softened or eliminated by improved recycling and waste reduction efforts, or an uncertain economy. However, given that development of disposal capacity is not a quick or easy process, having adequate capacity anticipates that time lag and reduces the possibility of a shortage of capacity.
2. Recycling tonnages increase as waste generation increases to maintain a 34.8% recycling rate.[15]

[14] Including out-of-state waste.

[15] Note that even to maintain a 34% recycling rate will require that Maine increase the tons recycled from 700,000 to 1.4 million tons over the next 20 years.

3. Imports decrease as Maine MSW replaces capacity at W-T-E facilities as generation increases and landfills close.
4. Exports remain at 2007 levels.

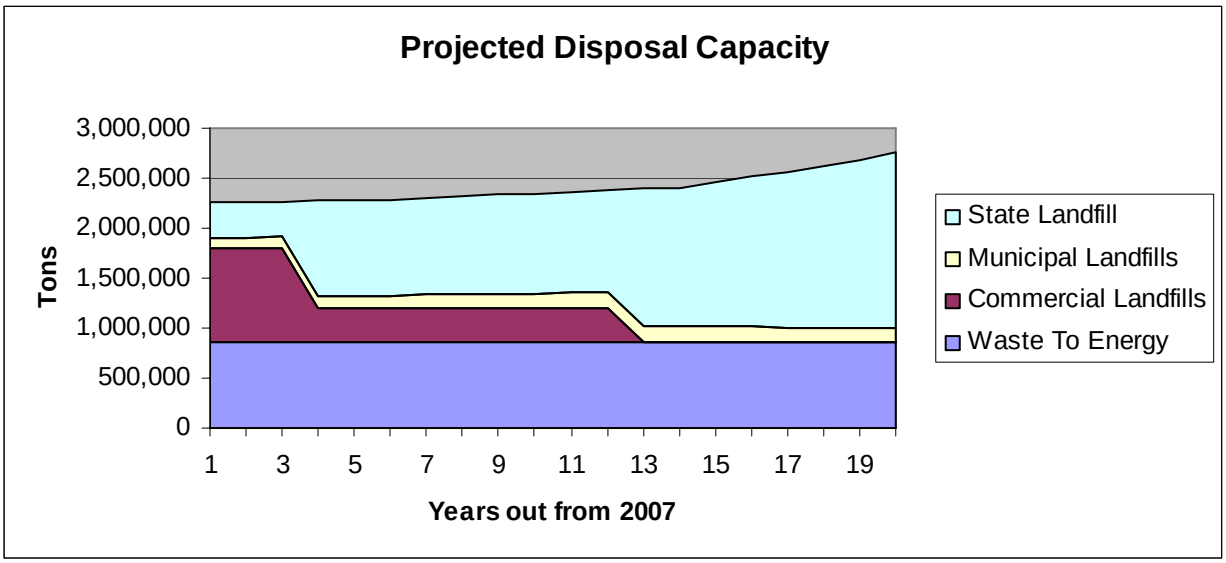

Figure 13: Maine Projected Capacity Needs in Tons, 2007 – 2027
Source: State Planning Office

2. Projected Capacity Available

The projection of solid waste disposal capacity is based on these parameters:

- continued operation of and reliance upon the four W-T-E facilities;
- no significant change in municipally-operated landfills;
- additional capacity is approved for the Presque Isle and Tri-Community landfills;
- closing Pine Tree Landfill;
- Crossroads Landfill ceasing operations around 2017; and
- a license amendment and expansion permit for Juniper Ridge is approved.

Currently, we estimate that Maine has 17 million cubic yards of disposal capacity for municipal solid waste and the residues from waste to energy facilities, as follows:

- 2.4 million cubic yards in municipal landfills (1.9 million tons)
- 1.2 million cubic yards in municipal landfills (1.2 million tons of ash)
- 0.85 million cubic yards in municipal CDD landfills (170,000 tons)
- 4.9 million cubic yards in commercial disposal facilities (4.7 million tons)
- 8.5 million cubic yards in Juniper Ridge Landfill (7.4 million tons)

The amount of available disposal capacity will be affected by both increases and decreases in capacity as follows.

Projected Consumed Capacity

The planned closure of Pine Tree Landfill in 2009 will have an impact on Maine's current solid waste management system, in that approximately 150,000 tons of *in-state* generated special wastes and construction and demolition debris waste that was annually disposed of at that landfill will be diverted to the Juniper Ridge Landfill. In addition, the residues from the processing of construction/demolition debris at Casella Waste System's planned processing facility in Westbrook will also be directed to Juniper Ridge, an additional 150,000 to 200,000 tons expected. The planned closure responds to state policy adopted in 1989 that sought to restrict additional private sector development of disposal capacity.

Projected Planned Capacity

The State Planning Office is seeking an additional 22.5 million cubic yards (18 million tons) of disposal capacity at the state-owned Juniper Ridge Landfill. The effort to permit the proposed capacity expansion at Juniper Ridge is currently underway and is planned to be submitted to the Department of Environmental Protection in early 2009. That review is expected to take several years and if approved and permitted, will provide disposal capacity to the state for an additional 15 to 20 years over its current life.

Impact of Recycling on Disposal

Recycling will continue to divert significant tonnages from disposal. The State Planning Office estimates that over 20 years, recycling will divert 20 million tons (cumulatively) from disposal at today's 34.8% rate.

Out-of-state Waste

The types and amount of out-of-state waste will likely shift in response to changes in Maine's waste generation and management systems.

The waste-to-energy facilities that currently take out-of-state waste will continue to rely upon it to fulfill their boiler needs and power contracts. However, the State Planning Office anticipates that as Maine-generated solid waste tonnages needing disposal increase, waste-to-energy facilities' need for imported municipal solid waste will decrease. The state's commercial landfills will continue to accept unprocessed CDD from out-of-state for economic reasons. But as those facilities fill up and close, imported waste will drop.

For purposes of this report, we estimate a 4% annual reduction in MSW imported and decreases in unprocessed CDD to a nominal amount by 2015, or an estimated 4 million cubic yards (cumulatively) over 20 years.

3. Projected Disposal Capacity, Available vs. Needed

Based on the above analysis, Maine will have an estimated 39 million cubic yards of landfill capacity over the next 20 years, more than meeting our need for nearly 32 million cubic yards as shown in Table 12.

Table 12: Projected Disposal Capacity Available vs. Needed 2007-2027

Landfill Capacity Available (cubic yards)			Capacity Needed (tons)	
Municipal Landfills	2,416,700		Total waste generated	65,000,000
Municipal CDD Landfills	850,000		Imported Waste	4,000,000
Commercial	4,900,000		Recycled	(22,000,000)
Juniper Ridge	8,462,000		Exported	(1,200,000)
Juniper Ridge expansion	22,500,000		Diverted to, combusted at W-T-E	(12,000,000)
Total Landfill Capacity Available:	**39,128,700**		**Total Landfill Capacity Needed:**	**33,800,000**

Source: State Planning Office

While Maine has sufficient landfill capacity to meet its needs, we must not become complacent. Siting new disposal capacity is a costly and highly volatile undertaking. Maine should do all that it can to make the existing capacity last beyond the next two decades. This will require state and local investment in waste reduction and recycling.

In addition, while the state makes use of the remaining capacity at commercial and municipal landfills in these projections, the state does not have any direct control over the rate at which the capacity is consumed at those facilities. In 2007, the state prohibited the disposal of out-of-state wastes in municipal landfills but does not control access to that capacity from waste streams generated within the state.

B. Regional Capacity Issues

Regionally, Maine is divided into "waste sheds" with waste feeding into regional disposal facilities. Some waste sheds are geographically large like PERC (170+ communities) and the Crossroads landfill (30+ communities), some receive municipal solid waste from a single community or a small region, such as the two landfills on the mid-coast in Brunswick and Bath. While this report typically looks at statewide disposal capacity, the State Planning Office has identified some regional or local areas where disposal capacity is uneven or in flux.

1. Regions in Flux

Aroostook County

The Presque Isle Landfill is currently seeking approval of an expansion that is part of an engineered solution to ongoing environmental issues that will, if the entire proposal is pursued and approved, provide in excess of 50 years capacity. Closure of the existing site by the end of 2010 is also being discussed in the context of negotiations on a schedule of compliance.

The Tri-Community Landfill in Fort Fairfield is also seeking a landfill expansion at this time, which will serve those communities for another 15-20 years. These efforts will require significant local resources but should not disrupt the solid waste capacity in the region.

Washington County

The Marion Regional CDD Landfill in Marion Township is reaching capacity and is expected to close in 2008-9. A new construction and demolition debris landfill for that region was in the planning stages in 2008, but the plans have been scrapped for 2009. The potential sources and volumes of the waste, potential costs, intermittent participation in the process by the local communities and their lack of buy-in to the project were given as the reasons. The fate of the project is uncertain.

York County

In 2006, local officials undertook an effort to purchase and close the Maine Energy W-T-E facility. This facility, which serves about 36 communities in York County, is located in downtown Biddeford. Proposals were put to the voters in Biddeford and Saco to raise the money to buy the facility but were turned down.

The loss of disposal capacity in Southern Maine would disrupt Maine's waste management system, but it would not precipitate a crisis. The loss could be absorbed through a combination of aggressive waste reduction and recycling efforts by communities in the service area, transporting waste to other instate and out-of-state disposal facilities[16], and, with a possible license amendment to Juniper Ridge to accept "bagged" or household MWS, transporting waste there.[17] The state, municipalities, and the private sector would need to work in partnership to find the best solution for the long term.[18] These solutions must take into account the environmental impacts of the long distance transport of the waste.

Conclusion: Infrastructure Capacity

Maine has a mature infrastructure for both recycling and disposal. Recycling infrastructure, nearing two decades of use, will need upgrading and expansion to accommodate the increase in materials to meet the 50% recycling goal. Maine's combination of W-T-E facilities and state-owned, commercial, and municipal landfills provide sufficient disposal capacity for 20 years.

[16] The cost-benefit of transporting wastes long distances would have to be considered.

[17] Any change in the type of waste accepted at Juniper Ridge would require approval from the Maine Department of Environmental Protection.

[18] Another consideration for this region is the contract renewal for electrical generation payments. A lower price could increase tip fees and impact volumes at the ME facility.

III. Assessing the Effectiveness of Current State Policies

Recent Policy Discussions

The three previous state solid waste plans were products of the times in which they were written. The 1990 plan signaled the start of Maine's "modern" era of waste management. The 1993 plan was essentially a progress report written just after a large infusion of public bond funds into the state's municipal recycling infrastructure. The 1998 plan noted the success of the ten-year-old policies, the high point in the state's recycling rate, and what had occurred in the three years since the demise of the Maine Waste Management Agency. This plan is no exception and reflects the last five years, during which:

- In 2003, the Legislature authorized the state acquisition of the Juniper Ridge Landfill. In directing the state to purchase the landfill, the Legislature hoped to achieve two public policy goals: providing statewide land disposal capacity, and aiding a financially troubled paper company and the jobs it represented for the Penobscot region. Maine became the one of only two states to own a landfill and the only state to directly own a landfill without creating an intermediary authority.

- In the fall of 2005, 35 people representing the interests of state, regional, and local government, public entities, citizens groups, environmental organizations, the private sector and the general public came together as the Solid Waste Policy Review Task Force.[19] They reviewed current policies and concluded that the state should maintain the ban on commercial disposal facilities, continue to apply the waste management hierarchy, and expand efforts to achieve the 50% recycling goal.

- The Legislature's Natural Resources Committee was prompted to form a Blue Ribbon Commission to examine questions on how Maine manages its municipal solid waste. The Commission met in several locations throughout the summer and fall of 2006 and reported out legislation for consideration by the Second Regular Session of the 123rd Legislature (LD 1908).[20]

- At the direction of the Legislature, a new, permanent state Solid Waste Management Advisory Committee was formed to replace the Solid Waste Policy Review Task Force. This committee met for the first time in June 2008.

The 123rd Legislature passed several pieces of significant solid waste legislation that in sum acted to strengthen the solid waste hierarchy.

[19] The report of the Solid Waste Policy Review Task Force, April 2006, can be found on-line at: http://mainegov-images.informe.org/spo/recycle/docs/wastepolicytaskforce_finalreport04-24-06.pdf.
[20] The report of the Blue Ribbon Task Force, date, can be found on-line at: http://www.maine.gov/dep/rwm/solidwaste/blueribbon/.

Years of Decisions, Decades of Consequences

Coming into 1987, the state faced a solid waste disposal crisis. That crisis was the backdrop for our current policy. There was a potential landfill capacity shortage. Recycling, as a waste management strategy, was accounting for well under ten percent of the waste stream. There was no integrated waste management approach.

In less than three years, we as a state, by actions of the Legislature, decided how we wanted to manage our municipal solid waste. To a great degree, the structure of our current system is a reflection of those few basic decisions made 20 years ago.

The priority objectives were to:

1. bring the state's landfill disposal into compliance and end the use of unlined landfill disposal;
2. prevent the state from becoming a disposal site for MSW produced by the "BosWash" megalopolis to our south; and
3. place into law a policy to pursue a coordinated statewide waste reduction, recycling, and management program implemented through an integrated approach generally referred to as the waste management hierarchy.

To assist in achieving these objectives, the Legislature placed the following into law:

- a ban on new commercial disposal facilities;
- state authority to acquire and to oversee land disposal capacity;
- reinforced municipal responsibility for disposal services; and
- a statewide 50% recycling goal.

These laws were applied through a comprehensive set of solid waste rules over all processing and disposal activities and facilities coupled with financial and technical assistance programs.

A. Ending the Use of Unlined Landfills

To address the looming environmental, financial, and legal problems posed by grandfathered landfills, the Maine Legislature established closure dates for unlicensed landfills and created the Solid Waste Landfill Remediation and Closure Program to close landfills that pose hazards to public health and the environment. Under the landfill closure program, in full swing by the late 1980s, the hundreds of small, open, unlined landfills that had been the standard means of local disposal for all manner of wastes for a century rapidly disappeared from the landscape.

Outcome: Bringing Municipally-owned Land Disposal Operations into Environmental Compliance

In the last two decades, the number of open, operating, unlined, publicly-owned MSW landfills has shrunk from over 300, ranging in size from covering hundreds of acres to only two acres, in Greenville and West Forks, which are in near term closure negotiations.

Just eight licensed municipal landfills are currently in operation, with individual remaining capacity ranging from 6 to 30 years at current fill rates. Only a few

municipalities built their own replacement landfills, many joining with neighboring towns to develop regional facilities.

These landfills are supplemented by some two dozen municipally-owned landfills restricted in size to less than six acres and to the disposal of construction and demolition debris only (CDD.)

Today, landfills overall provide 25% of the disposal needs for Maine's unprocessed municipal solid waste and provide disposal services for the ash and process residue of the waste-to-energy facilities.

B. Controlling Out-of-state Waste

The Legislature placed restrictions on expansions of existing commercial landfills and banned the construction and operation of all new commercial disposal facilities.[21] The ban on new commercial disposal facilities was put in place to shield the state from the importation of 'out-of-state' waste.

Outcome: Banning New Commercial Disposal Facilities
In 2008, the number of commercially-owned and operated solid waste landfills remains at two, the same number as 20 years ago, due to the continuous enforcement of the commercial landfill ban.

C. Ensuring Sufficient Disposal Capacity

In the 1980s, the federal government provided funding to states to invest in alternative solid waste management and disposal systems for energy production. The city of Auburn constructed a waste-to-energy facility using mass burn technology to serve its needs and the needs of several surrounding communities, forming the Mid Maine Waste Action Corporation (MMWAC).

Portland area communities had previously joined together to form the Regional Waste Systems (RWS). Regional Waste Systems (now *ecomaine*) also built a mass burn waste-to-energy facility. Private companies[22] built two refuse-derived fuel facilities large enough to serve regions in York County (in Biddeford) and in Bangor-Brewer (in Orrington) and signed long-term contracts with those towns to provide the waste needed by those facilities. 180 communities have 23% ownership in the PERC facility in Orrington with their interests represented by a Municipal Review Committee, the MRC.

Over 32% of Maine's MSW, almost 700,000, tons is now delivered to and processed for its fuel value in one of the four waste-to-energy (W-T-E) facilities, prior to landfilling. In 2007 the four W-T-Es required landfill space for 301,000 tons of ash, residue and by pass wastes.

From the outset, one of the state's priorities was to make sure that the operations of the four in-state W-T-Es would not be affected by a sudden loss of in-state land disposal capacity for their by-products of ash and front-end process residue.

[21] Publicly-owned disposal facilities were exempted from this ban.
[22] Both W-T-E facilities were built prior to the ban on commercial disposal facilities.

In order to ensure that there would be sufficient disposal capacity available, the 1989 Solid Waste Management and Recycling Act gave the state the authority to own, design, develop, and operate new solid waste disposal facilities.

That authority, coupled with municipal reluctance to take on the debt and the social and environmental liabilities associated with land disposal, has meant the state has taken on the role of provider of last resort for disposal capacity in Maine.

The state-owned special waste landfill would be a safety net to be brought on line when disposal capacity was needed.

The state purchased land then owned by Lincoln Pulp and Paper on Carpenter Ridge in T2 R8. It was then successfully permitted as a state-owned special waste landfill that remains to this day ready to be developed when it is needed.

The state's strategy to provide capacity for land disposal within Maine has increased by a factor of five with this recent acquisition of Juniper Ridge with 10 million cubic yards adding to the 1.9 million cubic yards of capacity currently permitted at the Carpenter Ridge site.

> *Outcome: Sufficient Disposal Capacity*
> Maine has in-state disposal capacity for municipal solid waste and special waste for the next 12-30 years. This is the direct result of the continued investment in W-T-E upgrades and acquisition and development of Juniper Ridge.[23]

D. Fostering the Solid Waste Management Hierarchy

The 1989 law established a hierarchy of Maine waste management systems. The Legislature also established ambitious waste recycling goals. It instituted both incentives, in the form of credits, grants, and loans, (not currently available) and disincentives, in the form of deposits and fees (removed or expired), to encourage appropriate waste management practices. It also provided in statute for financial and technical assistance to municipalities and businesses to further these practices.

The hierarchy guides state and local decisions regarding solid waste funding and grants, investments in, and the permitting of, solid waste management facilities, the operation of such facilities, and the management of residential and commercial waste.

> *Outcome: Toxics Reduction Success*
> In order to reduce the toxicity of the waste stream, the state has aggressively pursued eliminating the use for and of the overwhelming majority of mercury-added products. Today, mercury-added products from all sources are banned from disposal within Maine and must be recycled. Maine also enacted a first-in-the-nation program for the collection and recycling of electronic waste. Devices, such as computer monitors and TVs containing cathode ray tubes, cellular phones, and other electronic wastes from all

[23] The range in the time frame is based on current projected fill rates and reflects status under current license restrictions versus the potential expanded build out of the facility.

sources are banned from disposal within Maine and must be recycled, the responsibility for proper management shared among the manufacturer, government, and consumer.

In addition to these state-initiated, targeted, pollution prevention programs, many municipalities now offer once-a-year collection for the category of MSW known as household hazardous wastes (HHW). In 2007, 140 municipalities offered such opportunities to their residents. Maine now has two permanent facilities for HHW collection located in Lewiston and Portland open to all Maine citizens. These efforts target a small but toxic part of the municipal waste stream for action.

The Toxics Use Reduction Act (TURA) program created by the Maine State Legislature to reduce the amount of toxic substances introduced annually into Maine's environment from industrial generators, has also had several notable accomplishments including:

1. significant reductions at existing facilities in toxic use, release, and hazardous waste categories;
2. continued success with outreach and education particularly to smaller facilities without full-time environmental staff and in need of greater technical assistance (outreach examples include assisting smaller companies in switching from toxic cleaners and solvents to less hazardous or non-hazardous chemicals);
3. implementation of cost accounting (comparing the costs of utilizing toxic chemicals and generating hazardous waste with the economical benefits of reducing such use and generation) along with introducing worker safety concepts that reduce worker exposure to toxics; and
4. an emerging opportunity in the TURA program to track new toxics coming into the marketplace and to utilize the technical assistance tools adapted by DEP staff to address them.

Outcome: Recycling Success

Through steady local, state, private and public support for recycling and composting and long-term growth of these management systems, in-state markets have developed for the recycling and compost resources diverted from the waste stream, and are further supported by similar gains in regional, national, and global markets.

Over twenty million dollars of state and local match bond funding have resulted in recycling programs and facilities that now consistently manage the municipal share of the approximately 33% of our MSW currently recycled, accomplished through a series of local collection and regional processing programs.

Over 98% of Maine residents and the commercial sector have access to public or private recycling programs that have grown from just 24 programs in place twenty years ago to 320 working programs today. Over 60% of Maine communities have reached a 35% recycling rate or better. Over 22% have reached a fifty percent or better.

One third of Maine's MSW, over 700,000 tons, is physically removed from the waste stream, separated and collected and sent to manufacturers both in-state and around the world for use as replacement of virgin raw materials in their manufacturing processes (recycling). Approximately two-thirds of these recyclables are collected by the private

sector from the private sector. The remaining percentage is diverted through municipal programs from residents and local commercial sources.

Though the state made good gains, reaching a high point of 42% in 1997, Maine has yet to reach the 50% recycling goal in statute for 2009, and in 2007 had the same rate as in the mid-1990s.

Outcome: The Hierarchy Applied

As of 2005, waste reduction is now recognized in statute with its own goal. Reuse has gained status through widespread public support for the local institution of municipal reuse centers at transfer stations. On a much larger scale, the Department of Environmental Protection's solid waste rules (Chapter 418) governing the beneficial use of solid waste encourage such opportunities through clear guidelines and standards.

It has been left to municipalities to put the hierarchy into practice as there is no state law mandating the recycling of the majority of the components of Maine's municipal solid waste, other than those discussed above under toxics reduction, or the recovery of its organic fraction. The only state wide disposal bans are on white goods, whole tires in landfills and car batteries, again except for those that apply to toxics reduction.

This local exercise of choice in the degree and method of recycling has determined the wide variation in our largely voluntary recycling system and in our level of support for the hierarchy.

While the goal was to develop a statewide integrated waste management system based on the hierarchy, it was left to local governments to build the links of one approach in the hierarchy to another and how to assure that all resources worth recovering would be removed prior to land disposal.

Waste management programs have tended to flatten the hierarchy in order to focus on the maintenance of a stable range of prices of disposal and stable costs for operations and transportation. The marketplace has responded and disposal prices and costs for now are stable, but this perspective has left us short of our goal and recovery potential. The hierarchy was put in place with an intentional bias; all approaches are not equal.

E. Municipal Responsibility for Solid Waste Disposal

Maine is a home rule state and it is a municipal responsibility to provide disposal services for the residential and commercial activities in their jurisdiction.

The old local dumps have been replaced by a complex set of private and public partnerships, underpinning a system of hundreds of small consolidation transfer stations, largely paid for by municipal bonds, connected by long-term contracts and truck transport to a relatively few disposal facilities. There is now a collection and transportation infrastructure of 240 public transfer stations and several large private facilities serviced by private and public truck transport. There are 320 public recycling programs and over 70 municipalities have set up leaf and yard waste composting sites.

The inter-connected system that has evolved to meet the municipal responsibility has been built by initiative and need, often in concert with private entities. These private/public partnerships have been put together in a wide variety of combinations that manage a large percentage of the collection, consolidation, processing transportation, and disposal of Maine's MSW.

Outcome: Regionalization

One result of the rapid conversion of the state's solid waste management structure was that municipal solid waste programs were among the first public programs to adopt the concept of regionalization to improve cost to benefit performance, and those programs to a noteworthy extent have held together and expanded. Approximately half of Maine's municipalities share solid waste management responsibilities with at least one other municipality, with several regional efforts supported by membership of 20 communities or more. Regionalization helps avoid situations where problems and proposals rise and fall as local issues to which there are no real local solutions.

Local governments remain the key to Maine's MSW management. They have control over the MSW generated within their jurisdictions whether they choose to exercise that control or not. When a proposal for a new municipal facility or an activity is put forward or a change in solid waste management suggested at the local level, the guidelines of the hierarchy, the attainment of the 50% recycling goal and 5% waste reduction goal should attach to the proposal and to the waste stream they intend to manage. The state must remain aware and assert its role as the principle proponent of its own policy.

The state's municipal partners should be encouraged to plan for their future waste management needs to accommodate anticipated growth and development through support for the hierarchy and to achieve the state's recycling and waste reduction goals.

Conclusion: Positive Outcomes of Current Policy

Maine's solid waste policies have largely achieved the Legislature's desired ends.

1. The objective of ending unregulated disposal of solid waste as standard practice was reached well over a decade ago. The Department of Environmental Protection has worked in conjunction with Maine's solid waste professional community to achieve a high level of environmental compliance.

2. The great majority of Maine citizens have the opportunity to recycle as an alternative to disposal.

3. Across the state, on a daily basis, over 5,500 tons of municipal solid waste are collected, consolidated, transported, processed for recycling or combustion, and disposed of in compliance with current regulation. With the commitment of existing public and private efforts, this loosely organized arrangement has the ability to continue to perform its tasks for years to come. Though problems with solid waste arise from time to time, generally they are site or waste stream specific and there is a process in place to manage them.

4. There is sufficient landfill disposal capacity to meet the state's current and projected future needs.

5. For the most part, Maine manages its own municipal solid waste. About three percent of Maine's overall waste stream is currently exported for disposal. This out-of-state disposal is often a local decision made by municipalities near our borders and results in the utilization of land disposal facilities located within New Hampshire or New Brunswick. This is based upon the favorable combination of disposal fees and transport costs, when compared to 'in-state' disposal options.

6. The policy of pursuing an integrated waste management system based on the hierarchy and the four strategies of 1989: the ban on new commercial disposal facilities; municipal responsibility; a recycling goal with measured progress; and state oversight of land disposal capacity are all still in use. The image of Maine as dumping ground for the northeast has not materialized but questions persist for state and local officials about what to do with the out-of-state waste that comes into Maine in response to market forces and legitimate opportunities.

IV. What has Happened Since the 1998 Plan?

Several solid waste issues were identified in the 1998 plan. Among them were:

- The high cost of solid waste management for municipalities;
- The need for secure and stable markets for recycled/composted materials;
- The lack of management options for construction and demolition debris; and
- The desire to promote beneficial use.

The following section is a brief overview of where these issues stand in today.

Costs of Municipal Solid Waste Management

Certainly costs have remained an issue for municipalities. As the 1998 plan predicted, the need to lower municipal costs must coexist with innovations to improve recycling rates. It has had an effect by contributing to and in some ways exacerbating the stagnant character of the state's pursuit of the 50% recycling rate and local enthusiasm for using the waste hierarchy in solid waste decisions.

In 2007, citizens, businesses, municipalities, and others spent an estimated *$200 to $250 million* to reuse, recycle, compost or dispose of the two million tons of municipal solid waste generated within Maine.

Municipalities arranged for the disposal of about 50% of Maine's total municipal solid waste generation, or just over one million tons, and reported spending approximately $90 million per year[24] on the solid waste and recycling services that they provided. Recycling efforts conserved landfill space and provided an avoided disposal cost of approximately $6 million while contributing a net gain of $5 million to those communities from the sale of the recyclables.

On average, according to information from the Maine Municipal Association, Maine communities spend about 10% of their municipal budget to secure and provide necessary solid waste and recycling services. Most municipal expenditures are available on the municipalities' web sites.

Solid waste disposal varies among communities and ranges from municipalities that simply contract with a disposal facility and leave all other responsibilities and costs to their residents and businesses, to communities that pay for the full collection and disposal services as part of the municipal budget.[25]

While the state does not have precise information on municipal costs for MSW management from the early 1990s for comparison, it appears based on municipal information reported to the

[24] In 2005, businesses and citizens spent another estimated $120 to $160 million to secure these necessary solid waste disposal and recycling services.

[25] Most municipal solid waste expenses are paid by the municipality from tax revenue, although some assess user fees to reduce costs (75% of municipalities versus 25% that offer fee-based waste services).

State Planning Office that costs have recently stabilized in terms of both actual dollars spent and as a percentage of municipal budgets, to a range of $95 to $110 per ton. This figure is supplied with the following caution: that many communities to not apply full-cost accounting measures to their solid waste budgets and many do not bear all the costs of all the municipal solid waste streams generated within their jurisdictions.

A. Disposal Fees

Disposal expenses comprise collecting, transporting, and 'tipping' waste. Disposal fees or 'tipping' fees are a key driver of municipal solid waste costs. Current disposal fees range from $40.00 to $158.00[26] per ton at Maine's landfills and incinerators and have stabilized allowing predictability for municipal budgeting and long-term planning.

Tip fees at the four waste-to-energy facilities are stable and reflect the commitment of the municipalities who either own the facility or have long-term contracts for disposal services. A number of regional landfill facilities (Bath, Augusta, *ecomaine*) recently implemented price increases that should hold for the foreseeable future.

The state, in its operating agreement with Casella Waste Systems, established a 'ceiling' for tip fees that sets an upper limit on how much can be charged for wastes delivered to the Juniper Ridge Landfill. It is anticipated that this will act as a check on pricing for the disposal of similar materials at other solid waste facilities. In fact tip fees at the state's W-T-Es have been stable for years. For example, the PERC base tip fee for charter communities has remained at $45.00 per ton for close to fifteen years.

B. Energy Revenues

Revenues from the sale of the electricity largely determine tipping fees at waste-to-energy facilities. The revenues reduce the facility's operating expenses, yielding a reduction in the tip fee charged for solid waste. Should electrical sales revenue drop, tip fees may increase. Conversely, should the electrical sales increase, the possibility exists to lower or maintain tip fees currently being charged.

C. Municipal Expenses

Expenses vary from municipality to municipality due to a variety of factors such as cost of disposal, operation of a transfer station, number of hours the transfer station is open, level of recycling services, and bulky waste acceptance and processing. The more services that a community offers, generally the more expense is incurred.

Communities have also formed regional programs to gain an "economy of scale" advantage, allowing the smaller towns to offer a larger range of services.

The selected towns listed in Table 13 below have variable collection and disposal costs for municipal solid waste that reflects disposal fees and different levels of municipally-provided services. Table 13 shows the variability in costs, not for an "apples to apples" comparison.

[26] This does not reflect spot market prices.

Table 13: Disposal Costs for Selected Municipalities

Municipality/ Region	Disposal Facility	Collection System	Transfer Station	$ Per Person
Brunswick	Town Landfill	Municipal curbside	No	$55.28
Tri-Community	Regional Landfill	Curbside & Drop off	No	$49.37
Hartford	Crossroads Landfill	Contracted curbside	No	$60.28
Temple	Crossroads Landfill	Contracted curbside	No	$68.30
Livermore Falls	Crossroads Landfill	Subscription	Yes	$55.19
Farmington	Crossroads Landfill	Subscription	Yes	$7.46
Minot	MMWAC	Subscription	No	$28.76
Lewiston	MMWAC	Contracted curbside	Yes	$54.02
Norway-Paris	MMWAC	Drop-off	Yes	$63.16
Sabattus	MMWAC	Drop-off	Yes	$36.97
Bangor	PERC	Contracted curbside	No	$40.07
Unity	PERC	Contracted curbside	No	$68.83
Winthrop	PERC	Drop-off	Yes	$68.74
Yarmouth	ecomaine	Drop-off	Yes	$95.45
Casco-Naples	ecomaine	Drop-off	Yes	$122.42
Portland	ecomaine	Municipal curbside	No	$83.30
Cumberland	ecomaine	Contracted curbside	No	$114.24
Saco	Maine Energy	Municipal curbside	No	$42.08
North Berwick	Maine Energy	Drop-off	Yes	$59.35
Sanford	Maine Energy	Cont Curb	Yes	$69.51

Profiles of two differing local recycling programs are provided in Appendix B that show the variations in local costs.

Markets for Recycled Materials

A. Market Stability and Growth Over the Long-term

There is a direct and obvious correlation between markets and recycling success and support for the hierarchy.

Unlike a decade ago, recycled and composted materials have reached a high level of price stability. This is due in part to new North American mills and to the steady rise in offshore markets for fiber and steel, and an increase in prices for virgin raw materials. Figures 14, 15, and 16 show three examples of pricing trends in the fiber market that illustrate the stability and general upward trend in pricing.

The new market stability is reflected best by the price strength relative to recent history for the category of recycled fiber generally known in Maine as mixed paper (see Figure 16).

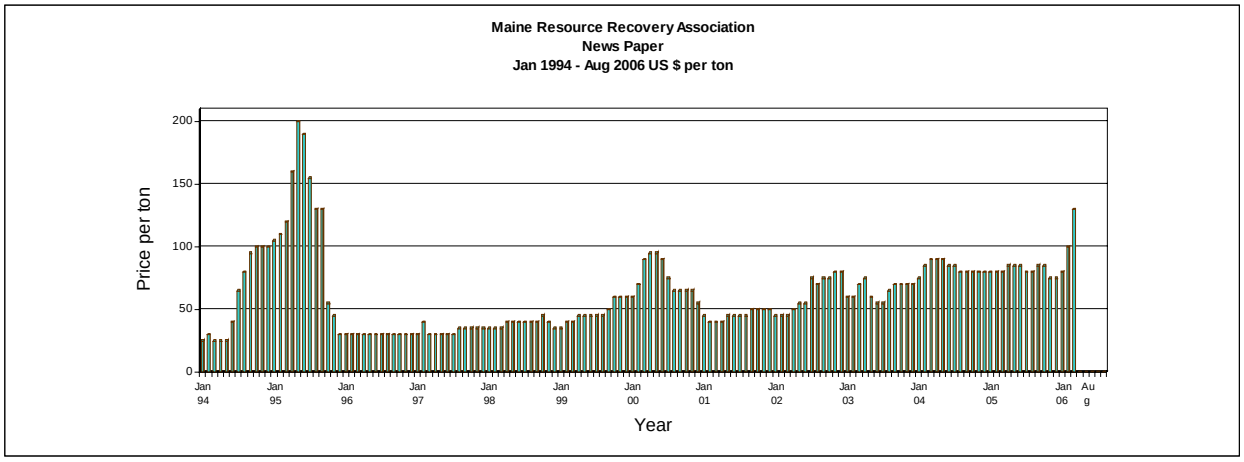

Figure 14: Price Per Ton, Newspaper, 1994 – 2006
Source: Maine Resource Recovery Association

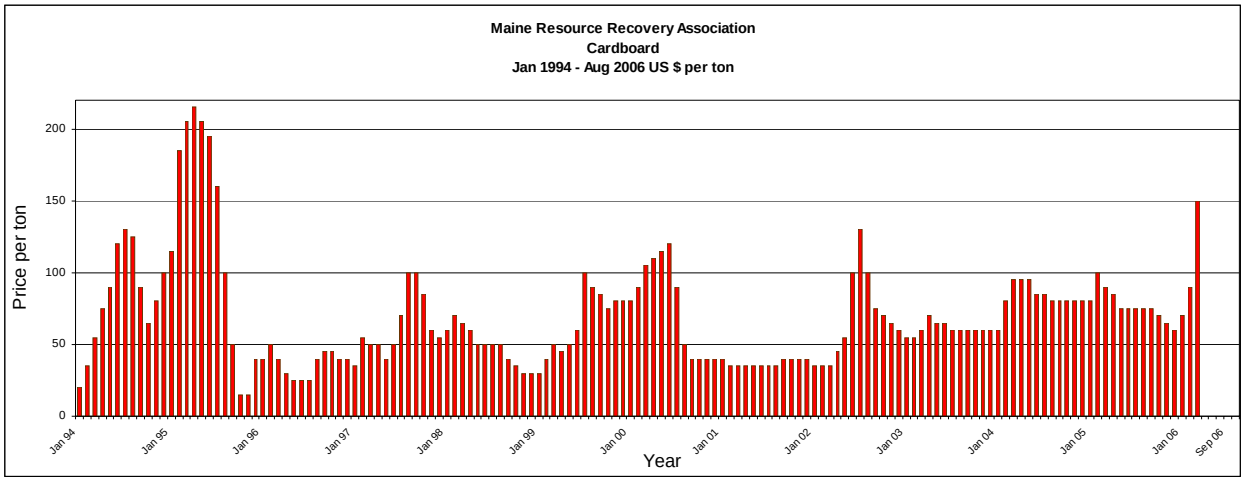

Figure 15: Price Per Ton, Cardboard, 1994 – 2006
Source: Maine Resource Recovery Association

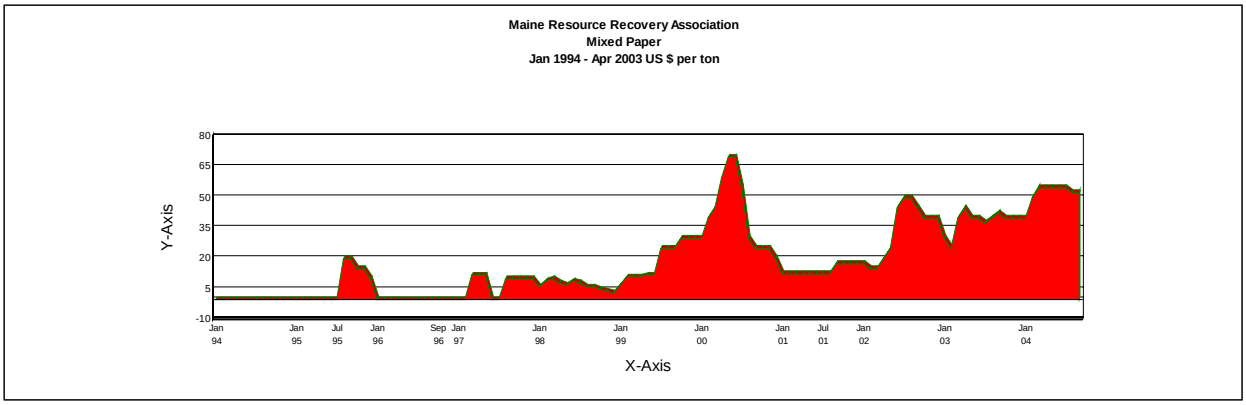

Figure 16: Price Per Ton, Mixed Paper, 1994 – 2004
Source: Maine Resource Recovery Association

Excluding the spike of 1994-95, there is an obvious upward trend in the year-to-year market prices. This is true across the fiber, metals, and plastics markets, but not of glass that is losing market share to lighter weight materials.[27]

Domestic and overseas markets have responded to the industrial growth in Asia. Overseas economies will not produce enough recycled product to meet their own needs for feedstock for at least a decade, meaning they will need to continue to import recycled materials from the U.S. for some time to come.

The challenge for marketers is to commit to move their recovery systems forward to increase supply, at the same time be able to respond to and take advantage of possible changes and opportunities in materials, in products and packaging, manufacturing processes, commodity and product delivery systems, consumer demand, global conditions, and new laws and policies.

In 2008 recycled products remain the number one container ship export from U.S. west coast ports. Recycled product revenues for all products on average exceed $50 per ton. The trend shows the annual cyclical market slowly moving up every year.

As in 1998, nationwide there is still a lack of markets for plastics labeled #3-7. Plastics recycling remains the province of numbers one and two necked containers. There has been some progress in combining the #3-7 resin types of plastics chemistries with other materials to use in structural applications, and they have some value in the low-priced, overseas market.

For the next two decades, the challenge for Maine suppliers will be to make changes to increase supply to take advantage of stable prices. This is particularly true of public, municipally-controlled programs where recovery efforts for fiber and containers have stayed below 100,000 tons annually.

Whatever changes are made, quality controls must be kept at current levels. Maine commodities have always moved in the market even at times of low prices and over supply because of their

[27] The ’94 spike in fiber was caused by a temporary high demand from overseas that was misread and led to a huge oversupply to the market that took several months to correct.

reputation for quality. Quality control is essential to mitigating the effects of low price cycles in the commodities' market.

B. Recent Downturn in Pricing

The global financial crisis of the last quarter of 2008 is reflected in the steep decline in price for recycled materials across the board that has carried into the first quarter of 2009. In this current economic climate there are a few facts worth remembering.

- Recycling markets go through periodic fluctuations; witness the corrugated cardboard boom and bust of the mid '90s, but consistently trend upward over the long term, despite two recessions in the last 20 years.

- This is not a structural problem in the recycling industry. It is an economic problem of supply and demand. Once economies around the world and in the U.S. pick up, recycling markets will return.

- In down markets, quality materials have a much better chance with buyers that are looking to keep their own costs as low as possible and produce defect free product. Maine materials have always enjoyed a reputation for quality in the recycled commodity market.

- Recycling reduces disposal fees that are placed on every ton of material that leaves a facility as waste for disposal.

In a down market, recycling program managers should look for ways to increase volume. This may seem to be a contradiction when demand is dropping off, but the more quality recycled product in the market, the more manufacturers will turn away from virgin raw materials when they decide to buy. Buyers prefer to purchase materials from large suppliers with whom they have a good working relationship. The goal is to keep the buyer.

C. Municipal Compost Supply

Although composting of leaf and yard waste now takes place at many municipal facilities and appears to be steady, there has been little growth over the last several years in the number of public programs despite high local consumer demand for the final product. The growth in organics composting beyond leaf and yard to include food waste and other organics in the waste stream has been very slow to develop.

The State Planning Office sponsored a food composting initiative in 2004, which resulted in one successful on- going permanent project. The Office provided financial and technical assistance to a partnership consisting of the town of Farmington, the University of Maine at Farmington, Franklin Memorial Hospital, and the Sandy River Recycling Association, along with assistance and regulatory oversight by the Maine DEP. The regional program composts food wastes from the university and hospital. It gives the finished product to the town for municipal uses.

Management of Construction and Demolition Debris

A 2008 study done by the State Planning Office found that the common factor in successful Maine recycling programs, the ones that exceed 50%, is that they accepted a large number of items for recycling, and they include construction and demolition materials in their recycling programs, such a waste wood, asphalt shingles, sheetrock, metals, unwanted furniture, and other large items. They also have active reuse programs for home construction products and large household items.

The rate of construction and demolition debris (CDD) disposal and recycling is directly related to the state of Maine's economy and to the cycle of residential and commercial construction.

A. CDD Composition

Wood waste makes up between 33-54% of the total volume of the CDD loads, with clean wood totaling between 17-32% by volume. Second to wood waste is asphalt shingles totaling between approximately 15-26% by volume.

Asphalt, brick, and concrete waste overall is found in very small quantities. An all other CDD waste category would include various wastes such as plastic compound buckets, plastic crates, nail boxes, non recyclable packaging, electronics, rugs, bedding, broken tools, bottles and cans, and other municipal solid waste.

B. Municipal Collection and Management

Maine towns manage CDD primarily through their local solid waste facilities. In 2007, municipalities recycled an estimated 13,000 tons, or approximately 50% of the total CDD recycled in-state for the year. This is an estimated 4% of the total 317,490 tons of CDD waste managed within the state.

Most CDD in Maine is landfilled without processing. An estimated 100,000 tons of municipally-managed CDD was landfilled at either the six municipal MSW landfills, the 23 municipal CDD landfills, the state-owned landfill at Juniper Ridge in Old Town, or the Waste Management Inc, landfill in Norridgewock. Additionally a small amount of mixed MSW/CDD tonnage is exported into New Hampshire and Canada by some of Maine's border communities.

The state's four waste-to-energy facilities also receive a small CDD fraction with their other MSW deliveries. Maine Energy is not designed to process these materials into fuel and must remove and landfill them; MMWAC and *ecomaine*, as mass burn facilities, can burn CDD but are limited by their small fuel feed openings. PERC has recently purchased a small grinder for materials too large or problematic for their fuel processing system.

Additionally, at some transfer stations, the wood portion of CDD waste suitable for fuel is not recycled; it is open-burned, without air pollution controls or energy recovery. This practice is allowed under state statute with some limitations and conditions.

The estimated combined generation of asphalt shingles and sheetrock, two components of CDD that are being recycled at some locations, is over 88,000 tons annually in Maine, while the recovery rate for all CDD is just over 25,626 tons. There is a tremendous opportunity for growth in recovery efforts.

C. Quality Control

"Source separation" is the basic strategy for controlling the quality of the CDD waste for reuse, recycling, or processing. It entails the sorting of usable elements of CDD at the point of generation (i.e. a demolition site) or collection (i.e. a municipal transfer station).

Local facilities have significant control of how the waste is delivered and sorted. They have the ability to manage delivery of relatively clean components of the construction and demolition debris waste stream for reuse, recycling, or processing. CDD storage areas and areas set aside to check load contents are inexpensive to construct and operate, but are heavily dependent on supervision of the customers to ensure adequate separation of potential contaminants.[28]

D. Management Options

There has been considerable discussion around the best management options for Maine's CDD stream. Boiler fuel is the largest potential market for locally-generated, source-separated, wood CDD. Local transfer stations, which manage CDD waste wood for the fuel market by requiring source separation, can typically receive a waste stream that is at least 95% wood.

However, potential recycling opportunities are tempered by the relative lack of sufficient concentrated volume outside Southern and Midcoast Maine to guarantee the financial success for any additional expansion of CDD processing capacity, the lack of sufficient local markets, and negative effects of transport costs. Thus, planning for future in-state CDD processing capacity suffers from a lack of long-term volume predictability. There has also been hesitancy on the part of municipal or public programs to commit to recycling of these materials.

If all municipal CDD were managed to separate wood waste at the point of collection, and assuming that 25% of the CDD waste stream could be processed into wood fuel that met market and regulatory specification, Maine municipalities potentially could generate 75,500 tons of CDD wood fuel annually for which there would be a ready in state market.

In the area of municipal construction demolition debris management, the major change will be the gradual closure of the state's two dozen small (under six acres) CDD landfills. If recycling opportunities do not come forward, the present alternative outside of southern Maine will be to continue to land dispose of CDD, which would be using up local landfill capacity.[29]

Whether or not municipal programs will seek to permit and license new, small-scale, CDD disposal facilities or seek to expand an existing one is an open question, given the costs and potential extensive permitting process for either option. Small-scale CDD landfills may no

[28] Maine Department of Environmental Protection. Report on the Substitution of Wood from Construction and Demolition Debris for Conventional Fuel in Biomass Boilers, April 2007

[29] Managing municipal CDD for maximum CDD wood fuel generation could reduce the amount of Maine landfill capacity currently used for disposal of CDD by 133,200 yds annually.

longer pay for themselves and in fact may have to expand in order to be financially viable. The attempt to site one such new facility in Washington County may suggest the complexity of any such undertaking.

If the two dozen small regional CDD disposal facilities do close, that will mean those programs currently using them will face either transport and disposal to the remaining large centralized landfills; or the development of CDD separation and aggregation storage areas to facilitate shipping to processing facilities where the materials are recovered as previously discussed.

Beneficial Use

The solid waste management hierarchy provides guidance on determining, selecting and implementing possible 'end of life' management options for unwanted products and materials, in descending order from reduction to landfilling. The second option within that hierarchy is 'reuse', which includes beneficial use.

A. What is Beneficial Use?

Beneficial use is the term applied when the substitution of a waste product occurs for a raw material in a manufacturing process, as a construction material, or as a fuel. The 1998 state *Waste Management and Recycling Plan* asserted that beneficial use could have a major impact on diverting certain hard-to-manage waste streams, such as tires, wood waste, and ash, from disposal to a different use or application.

Beneficial use is a practice that takes appropriate secondary materials out of the waste stream and uses them in place of more traditional virgin material. Beneficial use has potential in a number of industries, including construction, transportation, electrical generation, and waste treatment, to provide cost effective replacements for aggregate, fill, cementitious material, drying agents, and many other materials currently in demand. Beneficial use not only provides secondary materials for Maine companies to use, but it also decreases cost and demand for disposal facilities and maintenance.[30] Determination of a certain waste product for beneficial use requires Maine Department of Environmental Protection review and approval.

B. Examples of Beneficial Reuse

The use of waste as substitution for raw materials or other items has been practiced for many years. Some examples of secondary materials and their currently approved beneficial use in Maine include[31]:

1. Multi-fuel Boiler Ash – may be used as: alternative liming material; soil stabilizer; odor absorbent for compost and waste treatment; possible concrete additive/cement replacement.

[30] University of Maine. Beneficial Use of Solid Waste in Maine, 2006.
[31] University of Maine. Beneficial Use of Solid Waste in Maine, 2006.

2. Fly Ash – may be used as: raw material in a cement kiln; additive to cement clinker prior to grinding; addition to concrete mix as a partial replacement for cement; lightweight aggregate; controlled low-strength material (flowable fill); autoclaved cellular concrete; structural fill; landfill cover; water treatment; soil stabilization and modification.

3. Cement Kiln Dust – may be used as: soil stabilization; waste stabilization/solidification, Portland cement replacement; asphalt pavement; controlled low strength material (flowable fill); lightweight aggregate; construction fill.

4. Dredged Material – may be used in: wetland management, restoration, creation, and enhancement; shoreline and sedimentation stabilization; erosion control; wildlife habitat development; water quality improvement; recreation and cultural resources; contaminant stabilization; dike construction; rip rap; and other applications.

5. Lime Mud – may be used as: an agricultural liming material; in waste stabilization and sanitation; as a construction material.

6. Tire Shreds – may be used as: lightweight fill for embankment construction on weak foundations; retaining wall and bridge abutment backfill; to limit frost penetration; drainage layers for roads and landfills. Tire shreds have had three principal uses in Maine once they are processed into suitable sized chips: (1) as base grading materials (as demonstrated in the construction of the Sabattus interchange on Interstate 95); (2) as part of the landfill liner systems, and (3) as fuel in solid fueled boilers licensed to burn them.

7. Oil Contaminated Soil – may be used as: aggregate for hot and cold mix asphalt processes; concrete aggregate; raw material replacement.

8. Street Sweepings – may be reused as road sand; as fill material; as landfill cover; as a raw material replacement.

9. Waste Wood/Brush and Construction or Demolition Waste – these are two of the more commonly 'beneficially used' categories of municipal solid waste. To highlight this, the following is devoted to these wastes:
    - *Clean Wood Waste* – discussed below
    - *Construction or Demolition Debris, including concrete and asphalt shingles* – discussed below
    - *Sheetrock/Gypsum* – discussed below

Since 1998, much of the Department's work in this area has been to develop rules (see Maine Department of Environmental Protection, Rule Chapter 418) to allow for the beneficial use of construction and demolition/debris (CDD), and in particular, to create fuel standards for the use of construction derived wood (CDW) as boiler fuel. Wood from construction or demolition debris (CDD wood) refers to the wood component of the solid waste resulting from construction, remodeling, repair or demolition of structures.

The adopted rule also provides guidelines and standards for the use of tire chips, brick, concrete, porcelain, and glass as fill materials, as well as exempting recycling activities that produce secondary products in substitution for virgin materials in manufacturing.

The demand for the recovered wood waste fraction of CDD, principally the CDW, of the waste stream has increased in recent years and has the potential for growth. Several biomass boilers in Maine are permitted to combust this fuel substitute. As a result of increased demand, there has been a corresponding increase in the number and locations of grinding and screening machinery that accepts the CDD and processes it to capture the usable wood fraction.

Clean Wood Waste
Clean wood waste is recovered from demolition sites, and excess wood from the construction process, may also be used in many other ways. CDD can be used as a fill material or aggregate and may be a reasonable alternative to valuable natural resources in certain applications.

Construction or Demolition Debris
CDD contains many products and items, and if a home is demolished, may include the kitchen sink! Consequently, metal is a common component of CDD and is the most-recycled of CDD materials, due largely to the historic market and demand for recovered metals. The metal recovered from CDD is recycled and used to create new products from the old metal.

Concrete
Concrete can be readily crushed and reused. The most common use of crushed concrete is as road-base gravel, but it is often also used as an aggregate in asphalt or concrete manufacturing. One estimate is that 50 million tons of asphalt and concrete from pavement that is torn up is reused.[32] Of that total, up to fifty percent is reused as Reclaimed Asphalt Pavement, or often referred to as 'reclaim', which when properly placed, provides for a solid surface.

Asphalt Shingles
Asphalt shingles separated from CDD streams can be reused in making hot or cold mix asphalt, or even new roofing materials. Excess or cut shingles from construction sites are more widely used for recycling than used asphalt shingles collected from a demolition site, but both have value. What follows is a description of how one Maine business beneficially uses discarded asphalt shingles:

Commercial Recycling Systems (CRS) of Scarborough, Maine has been successfully recycling asphalt shingles for over seven years. The CRS processing facility currently accepts shingles delivered in both roll-off and dump trailers, containing 12-20 tons per load. Roofing products come from numerous towns, cities, and private roofing contractors in New England.

Collection of the shingles occurs at both municipal and commercial transfer stations, and through direct delivery to the CRS facility. An inspection is performed to make

[32] University of Maine. Beneficial Use of Solid Waste in Maine, 2006.

sure that incoming loads are comprised of shingles only and do not include any wood, flashing, or other debris. After inspection, the shingles are processed into the desired particle size at the facility, with measures taken to both remove roofing nails and minimize asphalt dust. The processed shingles are then incorporated into various road construction products, such as HMA and 'cold patch' at rates based on the product performance requirements. The use of the shingles in the construction materials replaces some or all of the virgin asphalt in the various grades of road building materials, which are produced to meet Maine Department of Transportation product specifications.

Sheetrock/Gypsum

The gypsum material in sheetrock can be removed from the paper backing for use in manufacturing new sheetrock. In addition, the gypsum has many other practical uses as well. Often thought of as having liming abilities, gypsum does not alter the pH of soil or water when added to either.

In looking ahead at methods and practices that reduce the volumes of solid waste destined for disposal, beneficial use continues to be a working option for those materials already permitted and remains an opportunity for further application, given current efforts to consider wastes as resources and divert their 'end of life' management from landfills to 'a second chance'.

Conclusion: Changes over 10 Years

The issues raised in the 1998 state *Waste Management and Recycling Plan* are mostly still of concern today. Municipalities face cost worries, however, waste tip fees have become more predictable and recycling revenues help offset expenditures. Markets for recyclables over the long-term have grown, with spikes and declines that track a global economy. The lack of management options for CDD remains a concern. And, while there are viable options for beneficial reuse, there remain opportunities to do more.

V. Long-term Issues to Watch

Growth in Waste Generation

Maine currently disposes more solid waste than it reduces or recycles. While that fact alone is cause for concern, that we as a state find ourselves in this situation after 20 years of effort to reach 50% recycling goal, the data trend over the last six years shows that the increase in disposal is outpacing any increase in recycling. Though recycling tonnages continue to increase, recycling's share of the MSW stream has declined relative to disposal over the last several years.

This continuing and growing disproportion raises concerns that our current policies and programs are insufficient to guarantee an improved future for Maine citizens when it comes to solid waste management programs that properly reflect the quality of the place we consider Maine to be.

Out-of-state Wastes

A. Why do we Import MSW?

Why not ban out-of-state waste?
Many people wonder why the state doesn't just ban the importation of waste. Movement of solid waste across state lines is protected under the federal commerce clause of the U.S. Constitution. This federal law overrides individual state action to restrict that market at their borders. The law enacted in Maine in 1989 to ban the development of new commercial disposal facilities was in direct response to the limitations imposed by the commerce clause. Those publicly-owned and private disposal facilities that remain in Maine today may accept wastes from beyond Maine's borders as long as that acceptance does not run counter to the regulatory, legal, or contractual provisions under which they operate.

1. Out-of-state Waste Makes Energy and Supports our In-state MSW System

The Fuel Gap

The majority of the state's businesses and residents rely on the four W-T-E facilities to manage their MSW. Since their inception, the four W-T-Es located in Maine have required, either occasionally, or on a seasonal, or permanent year round basis, more fuel (MSW) than is currently available to them from Maine market sources. This *over capacity* creates a demand that their managers have to meet by looking out of state for additional fuel. Given our current level of W-T-E capacity, out-of-state waste is necessary to continue to manage our own MSW. It maintains operational efficiency at the W-T-Es and allows them to meet their contractual responsibilities.

The facilities are not only dependent upon a predictable flow of over 800,000 tons of fuel per year (with a portion of that fuel coming in from out of state); but also upon access to landfills for their own waste streams of by-pass, ash and, for the two refuse-derived fuel plants, front-end process residue (FEPR). Current technology has not achieved any significant resource recovery from either of the two waste streams under present regulatory conditions.

In the long term, we need to decide whether and how the state should sustain this exchange of waste for energy if Maine recommits to and reinforces the hierarchy and with the reality that at least for the next several years the fuel needs of the W-T-Es will need be met by out-of-state sources.

In the meantime out-of-state wastes support the conversion of our own wastes into energy and thus support the hierarchy in preference over landfilling.

Out-of-state Wastes and Biomass Fuel

Maine has by far the largest concentration of biomass steam plants in the northeast region. What Maine lacks is processing capacity for CDD or the waste stream volume to supply wood for those boilers.

Current Market

Only two of the seven boilers approved for construction derived wood (CDW) fuel combustion are presently burning it: Sappi Westbrook and Boralex-Livermore. Roughly two-thirds of the CDW fuel for these plants was fuel processed outside of Maine. If all seven boilers combusted wood waste up to their full capacity allowed by license requirements and by state law,[33] they could generate an annual demand for 1.37 million tons. The Office does not believe that we are likely to attain this full level of demand.

In-state Sources

Maine does not produce enough CDD wastes from which a sufficient amount of CDW can be derived to meet today's fuel demands of in-state biomass boilers, or the fuel demands of new, yet-to-be-proposed technologies, such as gasification, that are under consideration, or the financial requirements for throughput of any future CDD landfills or processing facilities.

At the current rate of capture and processing of wood waste from CDD, Maine municipalities supply less than 1% of the maximum annual projected demand for CDD wood fuel. Processing of in-state commercial waste currently provides an additional 3%. If all municipal CDD were managed to separate wood waste at the point of collection, and assuming that 25% of the CDD waste stream could be processed into wood fuel, Maine municipalities potentially could generate 75,000 tons of CDD wood fuel annually. This is an estimated 6% of the maximum CDD wood fuel permitted for use in Maine biomass boilers today.

Out-of-state Sources

Because of Maine's low volumes of CDD wood waste, there is concern over a potential influx of very large amounts of CDD from out of state to fuel the present seven licensed biomass boilers.

To combust the maximum amount of CDW fuel approved for use, biomass boilers would need to rely upon CDW fuel that originates outside of Maine, or on fuel that is produced in Maine from out-of-state CDD.

[33] DEP licenses for these facilities restrict the annual tonnage of CDW to no more than 50% of its licensed fuel supply.

Recent legislation has written into law that waste, produced by the processing or recycling, or incineration in Maine of out-of-state waste, is considered to be waste generated within the state. Thus those wastes may be received by any facility licensed to receive those types of wastes.

For example, in 2007, 293,536 tons of out-of state, unprocessed CDD was sent to Maine's commercial landfills. If this amount were separated and processed for CDD wood fuel production rather than landfilled, it would create an estimated additional 75,000 tons of CDD wood fuel (roughly 6% of the projected maximum demand) and reduce the landfill capacity used by at least an equivalent amount.

CDD Products and Recyclables (other than Wood)

Most large construction and demolition debris processing facilities produce a variety of recycled products in addition to CDD wood fuel. These facilities remove as much salvageable and reusable material from CDD as is practical in order to recover value from the waste constituents and to minimize the transportation and disposal costs associated with landfilling construction and demolition debris. Materials recovered by these facilities include aggregate from bricks, concrete, asphalt, rocks, and dirt; ferrous and non-ferrous metal; asphalt shingles, un-used gypsum board for reuse, and wood for reuse or for fuel in wood-fired biomass boilers.

Additionally, other CDD components not suitable for recycling may be mixed with the recovered aggregate materials and marketed to operating landfills as a soil substitute to cover waste or for shaping and grading material for landfill closure projects. Generally, 20-35% of a mixed CDD waste stream can be processed into CDD wood fuel.

Typically, the processing facilities offer generators financial incentives to send wood rich loads of CDD separately from wood poor loads or require source separated loads from demolition and building contractors. This allows the processor to use the wood poor CDD loads to create landfill closure material or to by-pass the CDD directly to landfills for disposal.

Maine Processing Facilities

Current in-state processing of CDD wood is performed by mobile shredders that process stockpiles of pre-separated CDD wood into fuel at municipal collection sites, and by five commercial processing plants – Aggregate Recycling Corp (ARC) in Eliot, CPRC Group in Scarborough, KTI Biofuels in Lewiston, Simpson, Inc. in Sanford and Plan-It Recycling in Gorham. Another facility, owned by Casella Waste Systems, is newly licensed to operate in Westbrook, but is not yet operational.

Currently, the wholesale replacement of out-of-state processing capacity by in-state facilities is unlikely since it is significantly less expensive to process locally (nearer the sites of CDD generation) and to pay to transport only the portion of CDD that is processed into wood fuel than to transport mixed CDD into Maine for processing. The degree to which out-of-state CDD processors can increase their operational capacity to meet increased fuel demand is also limited. Out-of-state processors are currently operating at close to capacity.

B. The Impact of Imported CDD on Landfill Capacity

When the state's two commercial landfills reach capacity and are closed, those disposal options for imported CDD will dry up, which will reduce the importation of out-of-state waste for landfilling. [34]

However, given the recent change in law that defines processing waste as waste generated within the state, the residue from the processing of CDD imported from out of state for the purposes of creating fuel for Maine biomass boilers could consume valuable landfill space either at Juniper Ridge or at some future publicly-owned and -controlled disposal facility.

There are five, soon to be six, Maine facilities that may receive out-of-state CDD for processing CDD into fuel. The processing of CDD into wood fuel by these facilities potentially could increase in the future. A possible projection has the processing of CDD into wood fuel generating residues that could use up to 15-20% of Maine's current remaining landfill capacity annually (without an expansion).

Several conditions would have to be present for this scenario to emerge. First, the six processors would need to expand their existing operating capacities to process all the CDW fuel needed. This would require equipment purchases and regulatory consent. There would need to be sufficient building and construction activity to generate the supply of material to be processed. In-state disposal costs would need to be low enough to offset the increased costs of transportation. Finally, there would need to be sufficient demand for the product (i.e. the seven Maine boilers consume CDW fuel up to their licensing and/operational limits). This scenario also assumes that all of these conditions align at the same time and remain constant for a sufficient period of time so that all the necessary investments can be made and permit approvals obtained.

Nevertheless, this situation requires prudent and timely monitoring because of the potential for growth in market supply and demand (based on operational limits of current processing facilities and biomass boilers) that could then escalate the demand on Maine's landfill capacity, a core concern of the state.

Also, it is likely that some of the ash from the biomass boilers will continue to be disposed of in generator-owned landfills to add stability to paper mill sludge, reducing the reliance on public landfill capacity.

Out-of-state Wastes and Bypass

Recent legislation has defined bypass and included bypass waste from Maine waste to energy facilities, recycling and processing facilities under the definition of waste generated within the state. One of the potential consequences of this legislation is that out-of-state waste destined for one of the W-T-Es may be directed on to a licensed public or private disposal facility in Maine.

[34] Through an agreement with the Maine DEP, Pinetree Landfill in Hampden will close in January of 2009. Crossroads in Norridgewock will reach capacity between 2019 and 2023 (this is only an estimate based upon today's fill rates).

In conclusion, the types and amount of out-of-state waste disposed of in Maine will likely shift in response to changes over time in Maine's waste generation and management systems. Without changes to current law both commercial land disposal facilities will eventually fill and close, shutting off those disposal outlets for out-of-state waste. While new CDD processing facilities may bring out-of-state wastes into Maine, they will also serve to improve the recovery of Maine-generated CDD.

The Role of Local Government

Since their local dumps were ordered closed or radically changed to meet new state law and standards in the 1980s, and the affirmation of home rule, municipalities have wrestled with their role in solid waste management and the questions of who has control, who has ownership, and who has responsibility and what those words mean.

The positive result is that over the last two decades each Maine city and town has chosen, built, and managed their individual MSW systems to their liking, as long as they stayed in compliance with state laws and rules. The people in the 495 civil divisions with their own governance have the right to choose the level of services they want to pay for.

The principle negative result of this system of local control is this same variability of service so that communities next door to one another have widely different levels of service and approaches.

Also, the full life cycle costs and benefits of all the components of the waste stream and the various possible means of their management are often not evaluated or even recognized in the typical annual "services versus taxes" municipal budgeting process. Municipalities are only obligated to provide a means of disposal for MSW generated within their borders. Following that minimal scenario, it is rational and acceptable to send solid waste "downstream" shifting the burden geographically or to future generations, in order to minimize immediate local risks and costs. The long-term environmental and social impacts of "downstreaming" solid waste and the cost of siting future disposal facilities generally are not usually factored into annual budget choices by those who manage the MSW at the local level. [An exception should be noted for those eight communities that still operate their own landfills and must have long term plans for preserving landfill space, possible mitigation, monitoring, closure, and post closure disposal.]

The recent U.S. Supreme Court ruling on flow control does give municipalities potential, wide-ranging control over MSW generated within their jurisdictions. It gives local governments standing as both market regulators and market participants with the power to direct MSW into their own facilities as long as they pass a balancing test where the public benefit is greater than the burden, particularly in those circumstances where those bearing the potential burden are the same as those enacting the law. This new situation may have long-term, positive effects on building greater regional cooperation to direct MSW into municipally-owned recycling and composting facilities.

Other Issues

Besides the growing waste generation versus recycling imbalance, out-of-state wastes, and the role of local government, there are three adjoining issues that concern current policy.

A. Limits to Private/Public Partnerships

Certain private/public partnerships have been very successful in terms of sharing power, providing service, and stabilizing prices —witness the PERC-MRC relationships.

Until recently, financial and environmental risks have limited the number and use of municipal landfills to meet the disposal needs of their municipal owners for solid waste generated within their borders or under contract or agreement with adjacent communities. This status quo has been challenged by proposals for municipal partnerships with private companies that are testing the definition of commercial disposal facilities.

The potential short term advantages for municipalities are: relief from the costs of operations; a reduced or no tip fee for its own solid waste; and, a revenue stream from several possible sources depending upon the terms of the contract. Again depending upon the contract, they may get relief from mitigation, closure, and potential pollution costs connected with a facility.

The private company would receive valuable landfill space in a state with limited permitted sites, with predictable costs and revenues to serve their collection and hauling contracts.

This issue raises many questions, principally; where is the source(s) of the private company's MSW, what types, and volumes of the solid waste would be disposed of; does the use violate state law and would it pass the public benefit determination test. Recent legislation has addressed some of these concerns by prohibiting the disposal of out-of-state wastes into municipal landfills.

B. Changes in Public Attitudes

For generations until the 1970s and into the 1980s, most Mainers lived with unlined open burning dumps within their individual communities, often within a short driving distance to or bordering on residential areas.

Today, environmental, health, and property value considerations, the changing social dynamics around solid waste activities, and concerns over what is in the waste stream and where it is generated are at the forefront of the public's perception about solid waste. Newer facilities built and maintained to stringent environmental standards that were once accepted as part of the local landscape, or even seen as an economic boon to a community, are now often under severe and constant public scrutiny.

It should be noted that all large scale development projects face opposition, even those proposals that seem to benefit the environment. But a 2006 survey published in *Waste News* reflected current public sentiment as waste disposal facilities ranked at the bottom of community development preference, below rock quarries, casinos, and airports.

Communities across Maine have worked for more than a decade to become fully involved in defining what it means to be a host community. Up to now there has been little common ground in discussions of options and alternatives to the present facilities.

This has potentially serious implications for our system that is heavily dependent upon maintaining a small number of relatively large regional waste processing (four W-T-Es) or landfill disposal facilities (eight by 2010).

C. The State of Maine as a Market Participant

Finally, we must consider the effects and future implications of the state as a market regulator and as a market participant. The state has become a market participant with its purchase and operation of the Juniper Ridge Landfill, but not in the manner envisioned by the crafters of the 1989 legislation. It was anticipated that given the eventual demise of the state's two commercial landfills and the reluctance of public entities to seek to replace them with new, large-scale, publicly-owned landfills, that the state would be the provider of last resort of the capacity for the waste streams from the four W-T-Es, special wastes, and CDD, in the manner prescribed in statute. Today, however, unlike the states in the southern tier of New England, Maine continues to have overcapacity in W-T-Es and potentially very significant landfill capacity.

The passage of the legislative resolve of 2003 and the purchase of the landfill bypassed the statutory "trigger" and that anticipated process, but provided the state with the opportunity to gain significant capacity with potentially one of the largest landfills in the Northeast.

We must consider how the capacity at Juniper Ridge can be used to support the hierarchy and to the best advantage for the people of Maine.

Juniper Ridge is already perceived by the private and public waste sectors as having an effect on disposal pricing. It was a significant factor in the decision of Casella Waste Systems, who holds the operating services agreement to operate Juniper Ridge, to close the Pine Tree landfill in Hampden and to permit the CDD processing facility in Westbrook, to aid in fulfilling their obligation under the Operating Services Agreement for the Juniper Ridge Landfill.

Also, Juniper Ridge may be directly impacted over time by the recent legislation defining by-pass and in-state processing wastes as wastes generated within the state. Its capacity may be open for use by those waste streams.

Conclusion: Issues to Watch

Such is Maine's MSW management landscape. But all of these issues and concerns can be turned to our advantage if we apply the hierarchy with all the resources, knowledge and tools developed over the last 20 years, and adhere to the 50% goal as we pursue their solutions.

If the hierarchy is to mean what it says, Maine must move from 'waste management' to 'resource management'. To do so by the 2020s, we must consider what is now called solid waste instead to be feed-stocks and resources from which all potential value is extracted; and we put an end once and for all the practice of down-streaming waste to future generations or someone else, somewhere else.

VI. New Trends

The basic common thread for effective waste management is in the waste itself because there is no difference in the MSW from Berwick to St. Agatha. This commonality of generation, characteristics, and results provides the state with an opportunity to take a lead role in the process of identifying, researching, and if found appropriate for Maine, pushing new trends in MSW management that can be generally applied.

Energy and Greenhouse Gas Initiatives

In 2007 the following language was added to the state waste hierarchy:

> Waste reduction and diversion. It is the policy of the state to actively promote and encourage waste reduction measures from all sources and maximize waste diversion efforts by encouraging new and expanded uses of solid waste generated in this state as a resource (`underlining added here for emphasis`).

This new language encourages the state to look at new technologies and methods for managing MSW that are currently not part of the waste hierarchy.

Since the first Earth Day, recycling has played a role in discussions on global resource conservation. Now all aspects of solid waste management have been drawn into discussions on several larger environmental issues, such as global warming related to greenhouse gas emissions reduction, changing energy markets, energy self reliance and conservation, toxics reduction, and the carbon cycle. These issues are on the table as we conduct our own debates about what is the best way for us to manage our solid waste, and have the potential to be the controlling issues of the near future.

Landfills are one of the largest human-formed sources of green house gases. Methane, the principle gas released from landfills, is 21 times more potent a greenhouse gas than CO_2. The state of California has estimated that the recycling and composting of all discards would be the equivalent of removing all emissions from all vehicles on their roads.

Recognizing the relationship between solid waste management and greenhouse gases, the US EPA created two web-based tools to aid in this effort: WARM and ReCon.[35]

The Waste Reduction Model (WARM) helps solid waste planners and organizations track greenhouse gas emissions reductions from several different waste management practices. WARM calculates and totals emissions of waste management practices source reduction, recycling, combustion, composting, and landfilling. The model calculates emissions in metric tons of carbon equivalent, metric tons of carbon dioxide equivalent, and energy units across a wide range of material types commonly found in municipal solid waste.

[35] EPA. Office of Climate Change. Waste Web Page.

The Recycled Content (ReCon) Tool helps companies and individuals estimate life-cycle greenhouse gas emissions and energy impacts from purchasing and/or manufacturing materials with varying degrees of post-consumer recycled content.

Maine recognizes the impact of greenhouse gas as well. Maine citizens, the Legislature, and the Executive branch, through the Maine Department of Environmental Protection, are implementing a plan to actively reduce emissions of greenhouse gases in Maine. According to the Department of Environmental Protection, Maine continues to make significant progress toward its goal of reducing greenhouse gas emissions by 10% below 1990 levels by 2020. Maine continued to lead regional efforts toward establishment of the Regional Greenhouse Gas Initiative (RGGI), becoming the first state to adopt rules to implement the program. In addition to directly reducing greenhouse gas emissions in the electrical power sector, the program will generate significant new funds for electrical efficiency investments.

New Technologies

A. Waste Conversion Technologies

There are three broad categories of waste conversion technologies: 1) thermochemical, such as gasification, pyrolysis, and plasma arc technology; 2) physiochemical, such as distillation of ethanol and the production of biodiesel; and 3) biochemical, such as anerobic digestion and ethanol fermentation and hydrolysis.

While research into these technologies is ongoing, key questions remain: do they reduce the carbon footprint, do they reduce the toxics footprint, and do they continue Maine's strong commitment to protect public health and the environment. In general, their touted benefits are lower carbon emissions, lower air emissions, renewable energy, offset fossil fuels, sustainability, and beneficial use of their residual wastes.

Three technologies are briefly discussed here because they are new and have relevance for Maine and large-scale applications for waste management.

1. Gasification

At present, there are gasification proposals being floated in Maine. Gasification is a term that describes a chemical process by which carbonaceous (hydrocarbon) materials (coal, petroleum coke, biomass, etc.) are converted to a synthesis gas (syngas) by means of partial oxidation with air, oxygen, and/or steam.

A hydrocarbon feedstock is fed into a high-pressure, high-temperature chemical reactor (gasifier) containing steam and a limited amount of oxygen. Under these "reducing" conditions, the chemical bonds in the feedstock are severed by the extreme heat and pressure and a syngas is formed. This syngas is primarily a mixture of hydrogen and carbon monoxide. The syngas is then cleansed using systems that remove particulates, sulfur, and trace metals. The resulting gas mixture is itself a fuel.

Gasification is potentially a very efficient method for extracting energy from many different types of organic materials. The potential advantage of gasification is that burning the gas mixture would be more efficient than direct combustion of the original fuel; such as the current W-T-E technology employed in Maine. More of the energy contained in the fuel is extracted. In addition, the high-temperature process refines out corrosive ash elements allowing cleaner gas production from otherwise problematic fuels, and produces lower emissions of greenhouse gases than current W-T-E systems.

2. Plasma Arc Technology

Plasma arc gasification as a waste treatment technology uses high electrical energy and high temperature created by an electrical arc gasifier to break down the waste primarily into elemental gas and a solid waste slag. The process is intended to be a net generator of electricity, depending upon the composition of wastes, and also to reduce the volumes of waste being sent to landfill sites.

A different type of plasma arc waste conversion that uses plasma to refine gases produced during waste conversion, rather than to destroy waste, has recently shown itself to be successful on a full commercial test scale in Ontario. Its emissions are also lower than other thermal waste processing systems, and by converting waste to CO2 and water, rather than to methane, the greenhouse gas emissions of the process are much less than competing technologies.

There has been a number of large scale plasma projects proposed to come on line over the next several years including proposals in Ottawa, Ontario, St. Lucie County, Florida and the city of Tallahassee also in Florida.

3. Landfill Gas-to-energy Projects

This technology actively manages MSW landfills for their gas recovery potential. The gas is then used to fuel generators to produce electricity. Pipes are placed in the landfill; slight pressure is maintained sufficient to draw the gas into a recovery plant but not enough to draw oxygen in through the landfill cap. The gas is then cleaned and piped to the generator plant, which is either connected to the power grid or into a local application. There is also the potential to recover the waste heat created in certain circumstances.

Maine has recently seen its first power to the grid from landfill gas at the Casella facility in Hampden. The amount of solid waste deemed as the minimum amount to make such a project feasible is decreasing, making the technology available for consideration by smaller landfills such as we have in Maine.

Two of those smaller landfills, Bath and Tri-Community in Fort Fairfield are moving forward into the carbon credit market where small facilities are encouraged to reduce their carbon footprint by capturing and flaring landfill gases in exchange for revenue from the credits.

Single Sort Recycling

While not new, but new to Maine in 2007, this collection and processing technology, called "single sort", offers the ability for recycling programs to collect unsorted, commingled recyclable materials. Its principle benefits are that it is a very efficient collection strategy that also offers convenience that may encourage more people to participate in recycling programs and in turn give the state the opportunity to recycle greater amounts and more items.

Single stream, single sort, fully co-mingled, are all terms used to describe a means for residents and small businesses to mix all recyclables, paper products and containers together in one bin or tote or cart. Those recyclables can then be dropped off into one large undivided container at a recycling drop off facility, or if curbside service is available, collected by one truck with one compartment in which all the recyclables are compacted.

Whether from the drop off facility or by the truck collecting curbside, the mixed recyclables are then transported to a facility, commonly referred to as a "materials recovery facility" or MRF, then and there to be "unmixed". Separation through a combination of machinery and hand labor prepares them for sale as commodities in the market, and finally materials are shipped to mills around the country and the world.

Thus single stream is a collection and processing operation that emphasizes efficiency in collection in exchange for more expensive infrastructure and more complicated and problematic processing operations. *ecomaine* and FCR Goodman are fully committed to this type of system.

The potential and proven benefits include:

- increased ease and convenience to residents;
- increased participation;
- increased recycling reduces disposal costs;
- wider range of materials: most plastics, most paper grades;
- far less labor intensive: no handling past the collection container;
- compaction, if used, results in fewer trips, lowering transport costs; and
- for curbside, faster collection of materials, collection and transportation savings.

The drawbacks to single sort/single stream are:

- reduced revenue from the sale of recyclables, or the imposition of per ton processing fees, as is currently the case in times of down market cycles;
- communities still need to be involved in quality control process – they cannot leave it all up to the Materials Recovery Facility (MRF); they must keep MRFs "honest" about levels of contamination, residuals etc., not passing on contaminants that increase operating costs and disposal at receiving mills; and
- a loss of 20 years of source separation/quality education of residents, which would be difficult to 're-teach' if is not successful.

Additional questions that communities may want to consider are:

- Is there an additional community benefit (public good will) in continuing with the source separated system?
- Is there a compelling reason to change the current program? Such as going to curbside collection, mandatory recycling or PAYT? Or an external community reason such as a budget crisis?
- Once the program is committed to providing material into a centralized single sort facility, how will single stream facilities react to changes in the marketplace? Will the program end up sharing the costs of processing?
- Will materials from MRFs carry the same reputation in the marketplace as Maine products currently enjoy?
- People still have to overcome their resistance to the basic separation of trash from recyclables. If the program already enjoys a high recycling rate what will be the increase in participation?
- Will the percentage really up-tick, with more people recycling more stuff?
- Does the potential increase in recyclables volume cover the costs of upgrading to a more expensive system?

It remains to be seen what kind of increase in recycling tonnage a program achieves. In other areas, single sort alone has brought an increase of 3-7% in the volume of recyclables.

There are ancillary issues to consider such as local control over the recycling program, the sustainability of existing regional programs that employ source separation in the face of competition with single stream providers, and limited competition in the market (i.e. only two vendors are actively engaged in single sort).

If single sort can deliver the expected growth in recycling tonnages as anticipated by those 50 plus communities that have signed onto it, then it is worthy of serious consideration throughout the state. Initial reports from communities that have adopted single sort are encouraging.

The Product Stewardship Model

The product stewardship model, begun in Maine with the mercury-added products recycling law and then expanded under Maine's first in the nation cathode-ray tube (CRT) management legislation, has recently been expanded again to include thermostats and cellular telephones.

The model puts forth that the responsibility for reducing product impacts on public health and the environment is shared among industry, government, and consumers. Each item of the waste stream is examined for its impacts on the environment, its recyclability, or ease with which it can be returned to the technological resource stream, its marketability, and the condition of those markets. Manufacturers are given guidelines and goals to increase the recyclability of the products and to lower toxicity. Generators are pushed to be responsible and follow the program, and the collective government entities expand access and convenience and enforce the program at all points of the system.

For example, cathode ray tubes (CRTs) found in all televisions and computers prior to flat screen technology contain significant amounts (3-8 lbs.) of lead and other toxic heavy metals.

In Maine, before 2003, these items were landfilled and crushed. The lead was exposed and posed a potential threat to land and water and the health of Maine citizens. To alleviate this risk, the Maine DEP developed legislation that requires the manufacturers to pay for the transportation and recycling of these items generated from Maine households.

The Department also created the regulatory and program structure to achieve this goal efficiently. Municipalities are required to provide the means for home owners to recycle the CRT-containing units. The State Planning Office provided over 1.3 million dollars in grant funding to assist municipalities in developing the CRTs collection infrastructure.

Homeowners are required to separate these items out from their other MSW and deliver them to the appropriate facility or program. Once all program elements were in place, CRTs were banned from disposal and required to be recycled by state law. In Maine to date, several thousand tons of TVs and computer monitors have been recycled through this program.

Product stewardship initiatives are currently being developed in the northeast by the Product Stewardship Institute, of which the Maine DEP is a participating member, and at similar organizations on the west coast, on several products including among others, paint, pesticides, telephone books, carpeting, and pharmaceuticals. By engaging them at the onset of the process, product stewardship efforts encourage manufacturers to take increasing responsibility to reduce the entire life-cycle impacts of a product and its packaging beginning with product design through to its end-of-life management.

Product stewardship is an approach that has the potential to be widely applied to many current products and those new products or new combinations of materials currently making their way into Maine's MSW stream.

Personal Responsibility

Finally, debates over infrastructure and operations involving hundreds of millions of dollars overshadow and at the same time sidestep the issue of personal responsibility. Products are brought to market and purchased without regard to their disposition after their original use. Generally, there is a disconnection between the consumption of goods and services and the full, life cycle costs; social, environmental, as well as financial of those goods and services.

Municipal solid waste management comes down to mitigating the effects wrought by the choices we make as consumers and the consequences of the actions we take as individuals to manage our own waste. As we move into the next decade, the decisions we make as voting citizens, must shift from personal denial to personal responsibility.

Conclusion: New Trends

Waste management is more than putting garbage at the curb and forgetting it. Economic and environmental considerations dictate that we find new ways to manage our waste and responsibility for this is shared across society. In the future, in Maine and elsewhere, MSW can no longer be considered separately from global environmental issues.

VII. Where Do We Go from Here?

Past plans (’90, ’93, ’98) focused on the prospects and positive performance of the emergent recycling efforts during those building years. Our perspective is different when we are looking at a mature system and at figures showing us moving away from achieving our stated priorities.

As the current stewards of Maine’s MSW program, we know how to protect public health and minimize and mitigate damage to the environment and these will remain our core obligations. But once again as in 1987 we have had extensive public discussion on how we manage our solid waste, and again we have the opportunity to decide what is fitting for Maine. What is our vision of the future, what are our goals for the decades to come? Will it be reactive to external challenges, or will it be forward thinking? We can chart our own course.

This section of the plan describes how Maine might achieve and then move beyond the 50% recycling goal.

Assumptions
The starting point for these strategies is the baseline assumptions of Maine’s MSW management out to 2027 at the current 35% recycling rate and a 4% annual increase in waste generation.

Discussion of the growth rate
The 4% annual increase may or may not be viable for all planning scenarios. It is used here because it is based on the growth rate of the previous two decades and because using such a scenario is protective of the state’s landfill capacity and of the process required to seek and secure additional new capacity if it be required.

However, the current situation from the latter part 2008 and into 2009 saw flat or declining tonnages at some of Maine’s disposal facilities. The economy, particularly the consumer economy, may not come back to present levels for some time and waste is linked to economic activity. Waste reduction strategies in product design, packaging, and consumer choice, may take hold, particularly in this time of economic change, and those strategies may result in permanent reductions in certain components of the MSW stream leading to overall reductions in tonnages.

Thus, the projected 4% growth rate may be too aggressive. It should be qualified by connecting it with overall state economic growth and with progress in waste reduction and other green efforts to slow or reverse the growth of waste. The 4% rate should be seen as the high case Maine’s economic growth rate to provide the plan with the background in which to base the forward looking reduction and recycling strategies.

The plan is built from the annual waste generation data contained in the state *Waste Generation and Disposal Capacity Report*. The annual report is aptly more fluid than the plan and reflects actual solid waste conditions in Maine. The plan takes a longer view of waste data in order to assess the effectiveness of statewide policies. It relies on the trends provided over time by the annual data.

Tied to the 4% growth rate question is the issue of the importation of waste. There are questions as to whether or not out-of-state waste will really decline and be supplanted by the growth of in-state waste for the W-T-Es. If delivery numbers from Maine communities continue to decline, due to their economic conditions or recycling and waste reduction efforts, the fuel gap will grow, maintaining the flow of out-of-state wastes.

The Run Up to 50%

A strategy for achieving Maine's 50% recycling goal.

Meeting a 50% recycling goal would extend the life of the state's existing state and municipal land disposal facilities. It would require an increase in recycling by 300,000 more tons a year at today's generation totals and up to 2.3 million tons a year by 2027. It could be accomplished through the expansion of public and private sector recycling efforts. Most local programs could on average achieve a 60% participation rate.

All strategies and goals assume some level of state assistance within available resources, to encourage these efforts through grants, education, outreach, and technical assistance.

Objective: Improve collection and participation in public recycling programs.

- Single sort recycling and other efficiency based collection and processing systems would be implemented by all those programs in which the technology demonstrates a clear advantage over their previous method(s). This would include the majority if not all of the most heavily populated areas of the state. It would be combined in many situations with the adoption of curbside collection and PAYT (pay as you throw) programs and an expanded list of items to be recovered.

- Maine materials would still move to market in times of over supply due to improved quality controls installed at the processors and by public education and inspection at the municipal level.

- The relationship of volume to price will stay within acceptable limits (excluding current market conditions) because any potential reduction in revenue will be more than offset by the increase in recycling volume and the decrease in disposal costs.

- The state would provide targeted infrastructure, planning, and equipment grants to regions to improve collection and participation rates..

Objective: Mandate recycling of old corrugated cardboard (OCC).[36]

- OCC is easily identified, easily separated, of good value, and comprises 14% of the MSW stream (excluding CDD). If the majority of recycling programs in Maine had banned corrugated cardboard from disposal, the amount of OCC recycled in 2007 (117,000 tons) would have doubled and thus could have provided 20% of the tonnage needed to reach the 50% recycling goal. It is already mandatory for businesses with 15 or more employees to recycle OCC. This strategy would extend that program to all businesses and residences.

Objective: Encourage communities to ban the disposal of leaf and yard waste.

- Municipalities would be encouraged to establish their own leaf and yard waste compost programs to divert up to 13% of their waste stream from disposal and provide quality compost for municipal projects and community use. The goal is to build up the

[36] There has been an ongoing debate on mandatory recycling since the inception of the state recycling goal. There are real questions as to how such programs would gain public acceptance and be monitored and enforced.

composting infrastructure in numbers of locations and the capacity of those locations around the state.

Objective: Encourage recycling the components of the CDD waste stream that can be recycled.

- CDD recycling can have dramatic effects on recycling rates. While they require oversight, space, access, regulatory requirements for operating surface and separation between materials, CDD recycling operations are not complicated and there are many municipal programs in the state with high diversion rates that can serve as model programs and be replicated in other locations. As with the compost facilities, communities would be encouraged to set up and run new programs or expand existing facilities.

Objective: Expand recycling opportunities for commercial sources.

- Businesses would embrace recycling similar to other green energy, efficiency, and green building initiatives. The state would engage business in a public/private grassroots effort to realize the financial and social benefits of recycling, through a grants and technical assistance program through the regional councils as part of their current outreach to business programs. The state will encourage expansion of municipal programs to include recycling from commercial sources.

Objective: Maine state government, the state's largest employer in terms of employees and building square footage, leads by example.

- The state would routinely achieve a 65% recycling rate for its own operations and facilities, including the university and community college systems.

Objective: Continue efforts to remove toxic wastes from Maine's MSW stream.

- Expand the number of permanent HHW facilities from 2 to 16 (every county). Include mobile collection infrastructure with these HHW service centers in order to improve the level of access and convenience for all Maine residents.

Moving Beyond 50%

Once we achieve the 50% goal, what could we do to move beyond it? What if we change our perspective on who's responsible for the products that we make and buy and then no longer want? What if we were to keep the defining line between what we call a waste and what we call a resource always fluid, always moving towards resource?

Beyond 50% will call for building on the steps outlined to get to there and then proceeding on two pathways. One would fully exploit our traditional means of resource recovery. The other would pursue shared responsibility or stewardship for certain individual products or classes of products.

The traditional approach will call for on-going commitments from both the state and municipalities. Not only investments in collection and processing, management and equipment, but recognizing recycling as the centerpiece for managing business' and residents' discards. Waste as unwanted "garbage" must be seen as secondary and only constitutes what has not, as

yet, been recycled. Waste systems will be converted to recycling systems and recycling becomes a resource recovery management system.

The second track will entail the development and implementation of a new set of policies based on stewardship of individual products using extended producer responsibility. The goal, to paraphrase the California Product Stewardship Council's mission statement, is to shift Maine's system of managing certain discarded products from one focused on government waste diversion efforts to one that relies on producer responsibility in order to reduce public and environmental costs and drive improvements in product design that promote environmental sustainability.

The following are some of the steps to build all or part of this dual scenario.

A. The State

By direct participation in the management of municipal solid waste, the state will:

Objective: Encourage personal responsibility by building public trust in recycling.

- In order for Mainers to agree to a recycling system, they must trust that: the system is effective; their participation makes a difference; and, is a shared community value that most of the people respect most of the time. This message would be delivered through a continual state public education and awareness campaign in unison with local program elements.

Objective: Enact a statewide ban on the disposal of all commodities for which there is a proven accessible market.

- Cardboard, newspaper, mixed paper, #1, and 2 plastics, steel containers, metals, glass, etc. would be banned from disposal, subject to an emergency provision. The state would provide targeted infrastructure, planning, and equipment recycling and composting grants to regions.

Objective: Encourage the separation and collection of organics, leaf and yard waste and food wastes.

- The full utilization of existing facilities and the development of a system of public and private composting facilities within all major service center areas would support full-scale organics composting.
- Leaf and yard materials would be banned from disposal by 2020.
- Communities that contract for collection service would include organics collection provisions to homes and commercial establishments in their contracts.

Objective: The state would encourage management efficiencies and provide clear state-level direction by:

- Encouraging collection and transportation efficiencies to reduce to the extent practical the energy required to collect and transport Maine's MSW.
- Establishing recycling standards for all materials delivered to disposal facilities and CDD processing facilities based on the waste hierarchy and the state recycling and reduction goals as applied to their annual tonnage.

B. Local Government

Objective: Municipalities join into regional programs in order to take more effective control over their waste streams including the following municipal initiatives:

- Public recycling services would be encouraged through targeted grants to extend to all commercial entities within their jurisdictions;
- Ongoing reuse and recycling clean-up programs would be provided;
- Recycling and trash collection contracting practices in public/private partnerships would be changed so that all parties have the maximum incentive to increase recycling collections tonnage and to process materials to achieve best available market prices as private sector's revenue share (percentage) would increase as recycling tonnage increases. Under the proper structure, the public and private would become genuine partners, both having incentive to maximize recycling and minimize disposal and contamination;
- Recognizing that recycling and composting have to compete with trash for market share, programs would encourage curbside collection, container sizing (larger bins for recycling, smaller bins for garbage), and single sort mechanisms;
- A CDD recycling component would be attached to all building permits, through local ordinance;
- Participation in recycling programs would be incentivized;
- Collection and transportation efficiencies would be increased in order to reduce to the greatest extent practical, the energy required to collect and transport Maine's MSW; and
- 'Flow control' initiatives based on the key points of the Supreme Court ruling would be used.

The state would assist municipalities with enhanced technical and educational recycling assistance for outreach to:

- the commercial sector,
- to multi family units, and
- in public areas and at public events.

C. Product Stewardship

Maine can pursue a product stewardship system by considering each item or class of items and developing legislation, regulations, and programs to address that specific class. This approach has been a success with computer and TV monitors and thermostats —a common process with clear goals but flexible approaches.

As a place to start, the state could use the key elements of our existing electronics waste (E-waste) law as templates for future deliberation. In brief, the basic premise is that the management of products that are disposable and exhibit hazardous characteristic(s) by design and manufacture

is not a core function of local government, but should be shared by the producers and consumers and government, with the preponderance of responsibility borne by the producers.

In broad terms, products would be chosen using criteria that looks at their volume, complexity, and characteristics. Complexity refers to the relative ease or difficulty by which the product may be managed through the traditional recycling/resource recovery system.

There would be clear policy goals, guiding principles, definitions, clear roles and responsibilities, governance, products and product categories covered, program effectiveness and measurement. These are the key elements that reflect Maine's E-waste law.

Whichever system we design for the future, the goal is to respond quickly to new products or changes to current products that affect their impact on the environment; identifying them on their way into the market, before they enter the waste stream.

The steps to go beyond 50% could result in the following:

1. Although waste prevention will remain a challenge, as so little of what Mainers consume is produced here, the state will join with other jurisdictions in the region and across the nation to put in place extended producer responsibility programs, using sales bans and mandatory producer recycling efforts and encouraging sustainable purchasing by the retail markets. The reduction and elimination of toxic and complex products will remain the number one priority.

2. There will be on-going public relations and education campaigns across media and in all markets utilizing as many channels as practical with several specific annual elements (for example, Maine Recycles Week, and the yearly best of all media high school and college contests), coordinated through a campus media project and paid for though private sponsorship. The sustained high level of public awareness campaigns may lead to Maine produced ads and advertising agencies finding their way into the national marketplace.

3. There would be a significant increase in recycling volume and participation after the statewide ban on the disposal of all materials for which there was an established, proven market demand; eventually including all fiber products, 1-7 plastics, metals, and glass. Despite some predictable market fluctuations, additional gains would be realized when it becomes the accepted practice for municipalities to extend public recycling services to all commercial entities. With quality assurance practices in place, collection and processing systems such as single stream would be widespread.

4. Market demand and prices for recycled commodities in the long term will remain stable. The overseas markets will mature, as they produce more of their own recycled commodities, but rising standards of living across the globe and the high cost of energy and the relatively low cost and energy efficient nature of recycled resources over virgin extraction will keep them attractive to the market.

5. Local governments' role in MSW management will remain essential as they are encouraged to join into regional entities, a process may lead to the development of several regional waste-to-resources master plans.

6. Although the state will not find it necessary to impose a full ban on the disposal of all organics, local programs will be given incentives and encouraged through grants and aid to pursue the separation and collection of organics, including the full utilization of existing facilities and the development of a system of public and private composting facilities within all major service center areas. Thus, communities that contract for collection service will be rewarded if they included organics collection provisions to homes and commercial establishments in their contracts.

7. There would certainly be effects on and to the state's recycling and disposal capacity. As local recycling programs grow in volume, they will need to choose between expansion of local collection and processing capacity through their own capital investment, and combining with or into larger regional efforts. Among the outcomes would be to extend the life of the state's existing land disposal capacity.

D. Waste and Greenhouse Gases

Addressing waste generation and its impact on disposal capacity and toxicity of waste is only part of an effort to move beyond 50%. To truly move from a waste to resource, we must also look at larger environmental issues such as climate change related to greenhouse gas emissions.

To move beyond 50%, the state of Maine could establish an emissions goal for all waste management facilities:

- through an expanded hierarchy;
- directed by a state solid waste greenhouse gas initiative;
- to take into account energy and emissions using the improved life cycle analysis WARM (model) or the best available technology;

Performance standards for all recycling and waste facilities would be developed so that those facilities may be issued a greenhouse gas initiative rating. The performance measure will encourage collection and transportation efficiencies to reduce to the greatest extent practical the energy required to collect and transport Maine's MSW and the emissions from our facilities.

Common Threads

Maine's solid waste program managers will make their own plans for the future. They may choose to use all or parts of the scenarios outlined in the plan or something else entirely. But there are some common threads that ought to be included as essential parts in any effort from the smallest local program to statewide initiatives.

1. **Waste prevention remains the top priority**. It is the goal of the state to take advantage of every available means to change practices at the source of production through state, local, and regional projects, using all levels of technical and financial assistance, voluntary agreements, and legislative action to reduce the amount of solid waste we produce.

2. **It is the goal of the state to maintain and promote recycling as Maine's preferred solid waste management method.** Recycling is cost-effective and we should actively seek ways to increase recycling tonnage. It will extend the life of existing land disposal facilities and lower health and environmental risks.

3. **It is the goal of the state to continue to make every effort to remove toxics from our MSW stream**. As its has with mercury products, CRTs, and now cell phones, we must continue to find and extract those toxic products from the waste stream and assign appropriate responsibility for their sound and sustainable management. We must find and continue support for household hazardous waste collection and look to find ways to include remedies for very small quantity commercial generators of similar waste types and amounts.

4. **It is the goal of the state to include greenhouse gas emissions reduction, energy self-reliance, and energy conservation** in our present operations and future waste management plans. We should develop measurement and reporting tools so that all parts of our system are aware of the effects and consequences of their operations. This could mean using the EPA WARM system, available life cycle analysis, or any improvement upon those systems.

5. **It is the goal of the state to promote personal responsibility**. If we produce waste, our responsibility does not end at the curb. We are responsible for it as long as it remains waste. In effect, it stays in our custody.

Conclusion: We Have a Choice

Maine is at a crossroads. After 20 years, we have achieved laudable results. We have dramatically reduced the environmental risks posed by our disposal facilities. We have a waste management system that effectively handles the waste we generate. Guided by ambitious goals, with minimal incentives, municipalities and businesses voluntarily recycle a third of Maine's waste stream. We can continue with minimal investment to maintain an effective and respectable system. Or we can go beyond that. We can change the way we view waste. We can enact more aggressive waste management policies. We can make new investments. We can adopt more rigorous standards and regulations. It's a matter for policy makers to choose.

Appendix A: Statutory References for the Plan

These chapters are edited for relevancy to the purposes of this section.

Title 38: Chapter 13: Subchapter 1-A: Article 3: §1310-N. Solid waste facility licenses

1. Licenses. The department shall issue a license for a waste facility whenever it finds that:

C. In the case of a disposal facility or a solid waste processing facility that generates residue requiring disposal, the volume of the waste and the risks related to its handling and disposal have been reduced to the maximum practical extent by recycling and source reduction prior to disposal.

3. Public benefit determination.

5. Recycling and source reduction determination.

5-A. Recycling and source reduction determination. The requirements of this subsection apply to solid waste disposal facilities and to solid waste processing facilities that generate residue requiring disposal.

A. An applicant for a new or expanded solid waste disposal facility shall demonstrate that:

(1) The proposed solid waste disposal facility will accept solid waste that is subject to recycling and source reduction programs, voluntary or otherwise, at least as effective as those imposed by this chapter and other provisions of state law. The department shall attach this requirement as a standard condition to the license of a solid waste disposal facility governing the future acceptance of solid waste at the proposed facility; and

(2) The applicant has shown consistency with the recycling provisions of the state plan.

B. The provisions of this paragraph apply to solid waste processing facilities that generate residue requiring disposal.

(2) A solid waste processing facility that generates residue requiring disposal shall recycle or process into fuel for combustion all waste accepted at the facility to the maximum extent practicable, but in no case at a rate less than 50%. For purposes of this subsection, "recycle" includes, but is not limited to, reuse of waste as shaping, grading or alternative daily cover materials at landfills; aggregate material in construction; and boiler fuel substitutes.

(3) A solid waste processing facility subject to this paragraph shall demonstrate consistency with the recycling provisions of the state plan.

Title 38: Chapter 13: Subchapter 1-A: Article 3: §1310-AA. Public benefit determination

1-A. Public benefit determination for acceptance by publicly owned solid waste landfills of waste generated out of state. Prior to accepting waste that is not generated within the State, a solid waste facility that is subject to this subsection shall apply to the commissioner for a determination of whether the acceptance of the waste provides a substantial public benefit.

2. Process. … In making the determination of whether the facility under subsection 1 or the acceptance of waste that is not generated within the State under subsection 1-A provides a substantial public benefit, the commissioner shall consider the state plan,……..

3. Standards for determination. The commissioner shall find that the proposed facility under subsection 1 or the acceptance of waste that is not generated within the State under subsection 1-A provides a substantial public benefit if the applicant demonstrates to the commissioner that the proposed facility or the acceptance of waste that is not generated within the State:

A. Meets immediate, short-term or long-term capacity needs of the State;

B. Except for expansion of a commercial solid waste disposal facility that accepts only special waste for landfilling, is consistent with the state waste management and recycling plan;
C. Is not inconsistent with local, regional or state waste collection, storage, transportation, processing or disposal;

The following statutes also have bearing on the purposes of this section:

Title 38: Chapter 24: Subchapter 1: §2101. Solid waste management hierarchy
1. Priorities. It is the policy of the State to plan for and implement an integrated approach to solid waste management for solid waste generated in this State and solid waste imported into this State, which must be based on the following order of priority:
A. Reduction of waste generated at the source, including both amount and toxicity of the waste;
B. Reuse of waste;
C. Recycling of waste;
D. Composting of biodegradable waste;
E. Waste processing that reduces the volume of waste needing land disposal, including incineration; and
F. Land disposal of waste.
It is the policy of the State to use the order of priority in this subsection as a guiding principle in making decisions related to solid waste management.

2. Waste reduction and diversion. It is the policy of the State to actively promote and encourage waste reduction measures from all sources and maximize waste diversion efforts by encouraging new and expanded uses of solid waste generated in this State as a resource.

Title 38: Chapter 24: Subchapter 3: §2132. State goals
1. State recycling goal. It is the goal of the State to recycle or compost, by January 1, 2009, 50% of the municipal solid waste tonnage generated each year within the State.

1-A. State waste reduction goal. It is the goal of the State to reduce the biennial generation of municipal solid waste tonnage by 5% by January 1, 2009 and by an additional 5% every subsequent 2 years. This reduction in solid waste tonnage, after January 1, 2009, is a biennial goal. The baseline for calculating this reduction is the 2003 solid waste generation data gathered by the office.

Title 38 MRSA §2122. State waste management and recycling plan
The office shall prepare an analysis of, and a plan for, the management, reduction and recycling of solid waste for the State. The plan must be based on the priorities and recycling goals established in sections 2101 and 2132. The plan must provide guidance and direction to municipalities in planning and implementing waste management and recycling programs at the state, regional and local levels.

1. Consultation. In developing the state plan, the office shall consult with the department. The office shall solicit public input and may hold hearings in different regions of the State.

2. Revisions. The office shall revise the analysis by January 1, 1998 and every 5 years after that time to incorporate changes in waste generation trends, changes in waste recycling and disposal technologies, development of new waste generating activities and other factors affecting solid waste management as the office finds appropriate.

§2123-A. State plan contents

The state plan includes the following elements.

1. Waste characterization. The state plan must be based on a comprehensive analysis of solid waste generated, recycled and disposed of in the State. Data collected must include, but not be limited to, the source, type and amount of waste currently generated; and the costs and types of waste management employed including recycling, composting, landspreading, incineration or landfilling.

2. Waste reduction and recycling assessment. The state plan must include an assessment of the extent to which waste generation could be reduced at the source and the extent to which recycling can be increased.

3. Determination of existing and potential disposal capacity. The state plan must identify existing solid waste disposal and management capacity within the State and the potential for expansion of that capacity.

4. Projected demand for capacity. The state plan must identify the need in the State for current and future solid waste disposal capacity by type of solid waste, including identification of need over the next 5-year, 10-year and 20-year periods.

§2124. Reports

The office shall submit the plan and subsequent revisions to the Governor, the department and the joint standing committee of the Legislature having jurisdiction over natural resource matters.

Appendix B: Municipal Cost of Solid Waste Management: Contrasting Profiles

The communities of Hartford, ME (pop. 963) and Portland (pop. 64,249) offer two very different perspectives on the costs of managing solid waste.[37]

Town of Hartford

- Contracts for curbside MSW and recyclable collection
- Operates small bulky waste transfer station
- MSW Disposal at Crossroads Landfill at $70.50/ton
- Expenses paid from tax revenue

The Town of Hartford, with a population of 963 and 364 year-round housing units, contracts with Archie's, a local trash collection firm, for curbside municipal solid waste collection that is disposed of at Waste Management's Crossroads Landfill. Recyclables are also collected curbside by Archies. Hartford pays a disposal tip fee of $70.50/ton. Hartford has 206 seasonal housing units, and a large summer population. Hartford operates a small transfer station for construction/demolition debris, large bulky items, and metal appliances. In 2005, Hartford disposed of 380.63 tons of municipal solid waste, which is equivalent to 790.6 pounds per person, and recycled 115.71 tons of municipal solid waste, which was equivalent to 240.4 pounds per person.

As shown in the chart below, Hartford spent a total of $58,050, or $60.28 per person:

Personnel	$1,200
Curbside MSW Collection	$25,920
MSW Disposal Fee	$26,155
Recycling	$1,000
Bulky	$3,775
Total:	$58,050

City of Portland

- Provides full service recycling, MSW and bulky waste disposal
- Municipal employees collect residential MSW and recyclables curbside
- Residents "pay-by-the-bag" (PAYT) for solid waste removal
- City operates Riverside bulky waste processing facility
- MSW Disposal at Ecomaine $88/ton + additional financial assessments
- Expenses paid by tax revenue and from the PAYT fees and bulky waste fees

[37] Information presented in these profiles is based upon the annual solid waste management reports submitted to the State Planning Office

The City of Portland, with a population of 64,249 and 29,714 year round housing units, has its public works employees provide curbside pick-up of MSW and recyclables. Portland has a 'pay by the bag' trash collection program, where residents are charged $.95 for a 30-gallon bag of trash and $.47 for a 15-gallon bag of trash. Portland has a crew of 20 in solid waste and recycling collection and operates six recycling trucks, four solid waste trucks, and one roll-off truck. Portland services single-dwelling homes and apartment buildings with up to nine units. Portland is a member of *ecomaine*, formerly Regional Waste Systems, where its MSW is incinerated and recyclables processed.

Portland residents have the option of curbside recycling pick-up, or drop-off at 14 recycling roll-off containers placed around the city.

Portland contracts with Commercial Paving and Recycling Company to operate the Riverside Bulky Processing Facility. This facility is open to Portland residents and businesses, as well as surrounding municipalities. Residents and businesses in Portland account for about one-half of the material received at Riverside. The Riverside facility is staffed by four Portland employees and 8-10 Commercial Paving and Recycling Company employees. Portland residents receive an annual punch-pass for their use of the facility. Businesses and commercial waste operators are charged a fee for using Riverside

In 2005, the single-family dwellings and qualified apartment building residents generated 12,249 tons of municipal solid waste, or about 381.2 pounds per person. The city collected 5,018 tons of recyclables, and *ecomaine* recycled 151 tons of metal for a total of 5,169 tons, or 161 pounds per person. About two-fifths of Portland's solid waste and recycling program is paid through fees collected, and three-fifths from tax revenue.

As shown in the chart below, Portland spent $5,351,834, or $83.30 per person, though not all residents qualified to receive the solid waste services provided by the city:

Personnel	$779,954
Equipment Purchase	$160,000
Equipment maintenance	$101,320
Spring Clean-Up	$100,000
MSW Disposal	$1,110,560
ecomaine Assessment	$1,100,000
Riverside Facility	$2,000,000
Total:	$5,351,834

These two examples highlight the complexity in cost and other points of comparisons between the over three hundred municipal programs and operating systems.