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Comprehensive Materials Management Strategy

2016 Connecticut Solid Waste Management Plan



Connecticut Department of
**ENERGY &
ENVIRONMENTAL
PROTECTION**

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Introduction

This Comprehensive Materials Management Strategy (“CMMS” or “this Strategy”), an update to the State Solid Waste Management Plan (“the Plan”), provides the vision and roadmap to transform Connecticut’s aging materials management infrastructure into a more sustainable system that boosts diversion and recovers more value from waste. Climate change mitigation, including the realization of the greenhouse gas benefits of reduction and diversion, as well as consideration of the impacts of new and existing processing technologies, are central to this Strategy.

This Strategy is focused on meeting Governor Dannel P. Malloy’s goal to achieve 60 percent diversion of solid waste from disposal by 2024, a target that received the unanimous support of the Connecticut General Assembly in 2014 with the passage of *An Act Concerning Connecticut’s Recycling and Materials Management Strategy* (P.A. 14-94).

In furtherance of the goal of 60 percent diversion, this Strategy provides specific, actionable steps to meet three objectives:

- I. Connecticut must improve the performance of municipal recycling systems and increase compliance with mandatory recycling provisions.
- II. Connecticut must develop and improve recycling and waste conversion technologies.
- III. Corporations that design, produce, and market products must share responsibility for stewarding those materials in an environmentally sustainable manner.

Statutory Foundation of this *Comprehensive Materials Management Strategy*

The Connecticut Department of Energy and Environmental Protection (“the Department” or “DEEP”) presents this *Comprehensive Materials Management Strategy*, which serves as the updated *State Solid Waste Management Plan* called for by Section 22a-241a of the Connecticut General Statutes (CGS). As required by statute, this Strategy focuses on diverting, through source reduction, reuse and recycling, 60 percent of the solid waste generated in the state by and after January 1, 2024 and addresses the modernization of solid waste management infrastructure throughout the state. As called for by statute, this Strategy addresses the management of organic materials in the waste stream, the recycling of construction and demolition materials, the development of intermediate processing centers (e.g. recycling facilities or materials recovery facilities), recommendations for the development and implementation of municipal or regional recycling programs, and options for local compliance of municipalities with recycling requirements.

In accordance with CGS Section 22a-229, any action taken by a person, municipality, or regional authority that is governed by CGS Chapter 446d shall be consistent with this Strategy.

Purposes of this Strategy

This Comprehensive Materials Management Strategy serves four purposes:

- I. The CMMS serves as the State's Solid Waste Management Plan, and consistency with the Plan is enforceable in accordance with CGS Section 22a-229.
- II. The CMMS is a strategic planning document to express the state's policy and direction on materials management through 2024.
- III. The CMMS provides a basis for DEEP and other state agencies to focus resources and implement programs to meet the state's diversion goal.
- IV. The CMMS provides a basis for evidence-based planning and program evaluation at the state and local level.

In order to fulfil these purposes, this Strategy must be a living document that is amended as often as needed to anticipate and respond to changes in the waste stream, economy, and technological capabilities.

Plan Adoption, Amendments, and Variances

The process for Plan adoption, amendment, and the granting of variances is guided by the Regulations of Connecticut State Agencies Section 22a-228-1. Because this Strategy is a comprehensive revision to the 2006 State Solid Waste Management Plan, the process for plan adoption was followed. Subsequent revisions, if they are not comprehensive in nature, should follow the process for Plan amendment described by the Regulation.

The adoption process includes public notice, a public hearing, and a 45-day comment period. In addition, Public Act 14-94 required that a draft of this Strategy be presented to the Environment Committee of the Connecticut General Assembly. The Committee, at its discretion, may hold a hearing on this Strategy. After considering all comments received, and making whatever changes appropriate, the Commissioner of the Department of Energy and Environmental Protection (the Commissioner) shall sign the final plan.

Section 22a-228-1(b) of the Regulations anticipates amendments to be integrated into the Plan every two years, and that amendments may be developed by the Commissioner or at the request of municipalities. The Regulations provide the process by which amendments to the plan are made, including public notice and comment and the option for a public hearing. Consistent with the Regulations, DEEP will review the CMMS every two years and make amendments as needed.

Under Section 22a-228-1(c), municipalities may apply to the Commissioner for temporary variances from provisions of the Plan. Accordingly, municipalities may apply to the Commissioner for temporary variances if they are unable to implement any provision of this Strategy.

I. Connecticut's Vision: Moving Up the Hierarchy

The order of priority for managing solid waste is referred to as the “solid waste hierarchy” or just the “Hierarchy” and is established through CGS Section 22a-228(b). The Hierarchy favors source reduction and reuse, recycling, and composting, with remaining materials managed for energy recovery, and disposal in landfill as a last resort.



Figure 1
EPA Waste Management Hierarchy
(Consistent with CT's adopted Hierarchy)

This Strategy envisions moving up the Hierarchy, maintaining greatest preference for source reduction, reuse, recycling, and composting, while concurrently focusing on state-of-the art and emerging waste conversion technologies, including, but not limited to anaerobic digestion, gasification, plasma arc gasification, pyrolysis, and hydrolysis/fermentation (waste-to-ethanol).

With this dual focus, this Strategy seeks both to promote best practices in reduction, reuse, recycling, and composting, and to promote the development of a diverse portfolio of new materials management options to accelerate a transition from Connecticut's heavy reliance on combustion-based resource recovery.

Moving up the Hierarchy will conserve natural resources, reduce toxins in the environment, generate clean energy, boost industries associated with material management, and mitigate the greenhouse gases (GHGs) associated with the management of waste, virgin material extraction, and product manufacture.

Achieving this vision will be possible with the shared and sustained commitment of all system participants:

- State and local governments and regional planning organizations must work together to plan, implement, and evaluate recycling programs.
- State and local governments and regional planning organizations must partner with the private sector to develop and improve recycling and waste conversion infrastructure.
- Every resident and business must comply with mandatory recycling provisions and strive to utilize best practices for sustainable materials management.

- Every collector and processing facility must optimize their processes to increase both the quantity and quality of materials recovered for higher uses and comply with statutory provisions and permit requirements.
- Businesses responsible for materials design, production, and sale must share responsibility for lifecycle management.

II. Defining the Goal of 60 Percent Diversion

Diversion includes both the reduction in overall generation of waste from a set baseline (this Strategy uses FY2013, the most recent available data), and the amount of materials recovered for value by reuse, recycling, composting, and waste conversion.

Connecticut's current diversion rate is best represented by the FY2013 recycling rate for Municipal Solid Waste (MSW), which is 35 percent. This rate accounts for traditionally tracked composting, recycling and disposal through solid waste facilities, bottle deposit redemptions, and residential scrap metal recycled by scrap metal processors.

To achieve 60 percent diversion by the year 2024, Connecticut must divert at 2.16 million tons of MSW from disposal (using FY2013 3.6 million tons in MSW generation as baseline). This goal can be achieved under the following conditions:

- I. A reduction in overall MSW generation (i.e. all discarded materials, whether diverted or disposed) by at least 10 percentage points below FY2013 levels. This results in a reduction of at least 360,000 tons.
- II. An MSW recycling rate of at least 45 percent, resulting in the recovery of at least 1.46 million tons of materials.
- III. The use of new waste conversion processes, including anaerobic digestion, to manage at least 10 percent of total generated MSW. This results in at least 324,000 tons diverted through waste conversion.

To fully achieve the state's diversion goal, which applies to solid waste and not MSW alone, the state must also increase the diversion of Construction and Demolition (C&D) waste commensurate with increases in MSW diversion rates.

III. Building on Past Success

The state's 2006 Solid Waste Management Plan set out an ambitious long-range vision to transform the materials management system into one that considers every phase of the product lifecycle and to reduce generation and toxicity of trash. While much progress is still needed, Connecticut has utilized the vision and strategies set forth in 2006 to meet significant milestones.

Over the last decade, the state has shown leadership in creating the policies and infrastructure to manage materials sustainably. Of particular note, Connecticut set the stage for expanding our processing capacity for food scraps and potential for reducing waste burned at the resources

recovery facilities with a first-in-the-nation mandate for commercial organics recycling. This landmark legislation has already encouraged developers to apply for permits for food residual recycling facilities by guaranteeing feedstock. In addition, P.A. 14-94 set forth a process for the state to pursue creative and environmentally progressive diversion solutions to reshape infrastructure.

Consistent with the 2006 Plan, Connecticut strengthened recycling market signals by adding materials to the list of designated recyclables and to the beverage container deposit law. To fulfill the call for increased recycling education and outreach statewide, the State in 2015 launched the RecycleCT Foundation, a state-chartered organization combining public and private resources to promote recycling, reuse, composting, and other sustainable materials management practices. Additionally, for the first time in over a decade, the State offered grants to municipalities and schools for waste reduction, reuse, and recycling, a much needed resource for strained municipal budgets.

In carrying out the vision set forth in the 2006 Plan, Connecticut has become a national leader in creating collective responsibility for the management of key products by passing producer responsibility legislation and implementing programs for electronics, paint and mattresses over the last eight years, significantly changing the way those materials are managed. Producer responsibility programs relieve some cost and management burdens from municipal programs and create a sustainable funding infrastructure for materials management.

In many respects, this Strategy builds upon the successful implementation of the 2006 Solid Waste Management Plan. While the significant strides in diversion envisioned in 2006 have not yet been fully realized, the state has made significant overall improvements to the materials management system and developed momentum for the bold action needed to meet the state's new diversion goal.

IV. Evidence-Based Planning and Program Evaluation

To provide the foundation for action, this Strategy relies on comprehensive analysis of Connecticut's changing materials management system. In particular, this Strategy relies on studies of the composition of waste and recycling streams, forecasts for changes in generation and composition over the course of the planning horizon, an analysis of gaps and opportunities as seen through the eyes of diverse stakeholders, and recommendations from national experts. To establish measures to evaluate progress in plan implementation, DEEP reviewed practices in data collection and analysis and established a set of key indicators that will be used to gauge system performance and program delivery at the state and local levels.

a. Waste Characterizations and Forecasts

DEEP commissioned two in-depth waste characterization studies in 2015, one that focused on disposed MSW and residential curbside single-stream recyclables (mix of glass, metal, paper, and plastic containers, and other paper) delivered to Connecticut recycling facilities, and one that

focused on Construction and Demolition (C&D) Waste, and to a limited extent, oversized (or “bulky waste”) MSW.

The MSW study, conducted by MidAtlantic Solid Waste Associates, with its subcontractors DSM Environmental and Cascadia Consulting Group, provides a reliable statewide composition profile for disposed MSW based on extensive waste sorts conducted in spring and fall 2015 at five disposal facilities (RRF-WTE) and one transfer station throughout the state. By replicating the methodology of a 2010 MSW composition study, the 2015 composition study provides a valid comparison that can be used to identify significant changes in the MSW stream over the past five years, including a decrease in the presence of designated recyclables in disposed MSW, and an increase in disposed organic waste, particularly food scraps. In addition, the study provides waste profiles by key commercial sectors and population densities, and a profile of curbside recycling focused on identifying the most common contaminants, with an eye toward a forthcoming education campaign aimed at cleaning up the curbside recycling stream.

The C&D study, conducted by Green Seal Environmental, provides a reliable statewide profile for loads of mixed C&D debris and oversized MSW delivered and sampled at four volume reduction facilities in 2015. In addition, the study provides detailed analysis of the flow and final destinations for disposed C&D materials, and areas of opportunity for increased diversion.

The data from these studies were then analyzed and used to generate forecasts, provided by Skumatz Economic Research Associates (SERA) with its subcontractors, Boisson Consulting and Cascadia Consulting Group.

b. Stakeholder Input and Expert Recommendations

This Strategy draws from research and recommendations provided by Skumatz Economic Research Associates (SERA) with its subcontractors, Boisson Consulting and Cascadia Consulting Group. In developing recommendations for the state, SERA gathered feedback from diverse stakeholders, with an emphasis on the views of market participants, including representatives of waste and recycling facilities and collectors. In addition to interviews, surveys, and roundtables coordinated by SERA, DEEP staff participated in meetings throughout the state with key stakeholders, including municipal officials, environmental advocates, industry representatives, regional waste groups, and others. DEEP also considered research and recommendations from the Product Stewardship Institute in developing approaches to stewardship that are outlined in this Strategy. Together, the feedback gained from this broad cross section of stakeholders provided meaningful direction for this Strategy.

Finally, this Strategy integrates many of the findings of the 2010 Legislative Program Review and Investigations Committee study *Municipal Solid Waste Management Services in Connecticut*, as well as the reports from the 2012 Modernizing Recycling Working Group and the 2013 Resources Recovery Task Force.

c. Data and Analytics

DEEP collects extensive data on the Connecticut waste system on an ongoing basis, and publishes an annual report of key indicators and numerous other reports for both internal and external use. This information can be used to evaluate system performance in disposal, recycling, composting, recycling markets, and municipal recycling program implementation. This Strategy leverages the depth of the available data and calls for certain improvements and greater integration of data and analytics into planning and program evaluation at state and local levels.

Statewide Performance Indicators

The following key indicators are used to measure state-wide performance:

- **Statewide diversion** of MSW and C&D are estimated by the amount of materials, by weight, which is processed and marketed from recycling facilities, source separated organics composting facilities, and C&D volume reduction facilities, or otherwise converted to higher uses, except by combustion in a waste-to-energy plant. The amount of MSW and C&D debris not reused, recycled or composted is estimated by the amount combusted and the amount landfilled (including use as alternative daily cover).

Residual materials that are disposed in a landfill or combustion plant after a recycling or waste conversion process (such as residues or disposed digestates) are not considered diverted – thus, diversion rates measure the proportion of materials that find higher uses.

DEEP is in the process of refining a methodology to account for source-reduction in calculating statewide diversion. For the purposes of this Plan, reduction from FY2013 total MSW generation is counted towards the state's diversion goal.

The FY2013 statewide MSW diversion rate through recycling and source separated composting is estimated to be 35 percent. The state's goal is to increase the statewide diversion rate to at least 60 percent by 2024 through source reduction, reuse, and recycling. To track progress toward this goal, DEEP will publish revised estimates of the statewide diversion rates annually along with an explanation of the methodology used and an analysis of factors in any change. To clearly illustrate the performance of distinct parts of the waste system, DEEP will provide separate estimates for MSW and C&D diversion.

- **Waste disposal** is ideally measured by the average Connecticut per-capita tonnage of residential MSW landfilled or incinerated (with or without energy production); tonnage of non-residential MSW landfilled or incinerated (with or without energy production); and tonnage of C&D waste landfilled or incinerated (with or without energy production). These indicators will be tracked and reported separately from statewide diversion rates because they offer particular insight into the performance of initiatives aimed at waste
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reduction (including unit-based pricing) and reuse, which is difficult to accurately account for using other measures. This metric is most suited to comparing across states, as it does not involve varying definitions that confound and undermine recycling rate comparisons.

- **Waste composition** will be measured through sampling conducted every three to five years. These studies provide meaningful data on the actual characteristics and composition of waste that was not source reduced, reused, or recycled. Of particular relevance to planning and program evaluation is the nature and amount of recyclable materials found in waste landfilled, incinerated, converted, etc. This data, in combination with other metrics, can be used to assess the effectiveness of curbside recycling programs, food scrap diversion programs, C&D recycling, reuse, and other key priorities of this Strategy. DEEP will conduct these studies at regular intervals, and will consider the merits of targeted studies at individual facilities, municipalities, or points of generation.
- **Statewide recycling performance** is measured by the tons and types of material marketed (recycled), and as a separate indicator of facility performance, the amount of residue generated by facilities processing source separated recyclables.

DEEP is considering tracking additional key indicators to measure other environmental and economic outcomes of the material management system, including:

- **Greenhouse gas emissions and other air quality and environmental impacts**, including upstream impacts due to use of virgin material vs. recycled material in product manufacture (e.g. natural resource use, pollutants emitted) of waste transport, processing, and disposal.
- The **quality of materials** marketed by Connecticut recycling processing facilities, as determined by marketability.
- **Costs per ton** (to municipal budgets and customers) for recycling, composting, and disposal.

Local Performance Indicators

The following key indicators are used to evaluate local system performance:

- **Recycling** is measured by estimating the amount of recyclables collected, based on municipal collection and transfer station data, as applicable, as well as hauler reports. Municipalities may take credit for any materials collected through their municipal programs, and composted.
 - **Disposal** is measured by average per-capita residential disposal rate for MSW and the tonnage of non-residential MSW disposed.
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- In addition to recycling and disposal measures, DEEP will rely on **qualitative indicators for system performance**, which vary depending on system delivery (i.e. municipal curbside collection vs. drop-off). DEEP will utilize some of these indicators in partnership with municipalities as explained in Section X.

Enhancements to DEEP's Data and Analytics Program

In order to more reliably measure and utilize the key indicators outlined above, DEEP will make the following enhancements to its data collection and analysis practices:

- By 2018, DEEP will provide a streamlined “eGov” **registration and reporting tool for collectors**. By statute, collectors must register with all municipalities in which they operate, and report certain information annually, on forms prescribed by DEEP. Unfortunately, implementation of this requirement has been mixed, resulting in data gaps that impair the ability to determine accurate estimates for statewide and municipal recycling and disposal. This Strategy emphasizes the need for municipalities and collectors to comply with these requirements, and DEEP will support this directive by developing a streamlined eGov tool for hauler registration and reporting.
 - DEEP will **implement a data system** to further streamline reporting for municipalities and facilities. At present, various entities report data to DEEP on a combination of paper and electronic forms, necessitating considerable effort on the part of reporters as well as manual data input and management by DEEP staff.
 - DEEP will collect **data on residential MSW disposal** as a subset of overall disposal. This will require greater accuracy in reporting by both collectors and receiving facilities.
 - DEEP will provide an **annual materials management scorecard** providing key indicators on the status of the materials management system, accompanied by an update on the implementation of the Comprehensive Material Management Strategy.
 - DEEP will optimize the **integration of data in planning and program evaluation** to ensure that programs and actions of the agency achieve measurable results and promote meaningful progress toward statewide goals.
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V. Current State of Materials Management in Connecticut

a. MSW Diversion, Disposal, Recycling, and Composition

The following MSW figures are based on FY2013 data reported to DEEP by Connecticut municipalities and by Connecticut permitted solid waste facilities.

MSW *includes* regular trash and recyclable material generated by residential, commercial, and industrial sources, whether recycled or burned at RRFs (WTE) or buried in landfills. MSW calculations *exclude* solid waste consisting of: significant quantities of hazardous wastes, land-clearing debris, building and road construction and demolition structural debris, biomedical waste, and sewage sludge.

Since the 2006 Solid Waste Management Plan, DEEP has adjusted its methodology for calculating MSW statistics. Most significantly, the 2013 MSW statistics include an estimate of Connecticut bottle bill material recycled. Also starting in 2013, calculations include more complete estimates of scrap metal recycled by Connecticut scrap metal processors (the scrap metal estimate excludes C&D scrap metal, and automobile scrap metal). Where trends are discussed in the following sections, DEEP has applied the earlier methodology to ensure valid comparisons with past estimates.

Trends in MSW Generation

Statewide trends in generation can be understood by looking at per-capita generation over time. The per-capita generation rate (adjusted to standardize methodology as discussed above) has

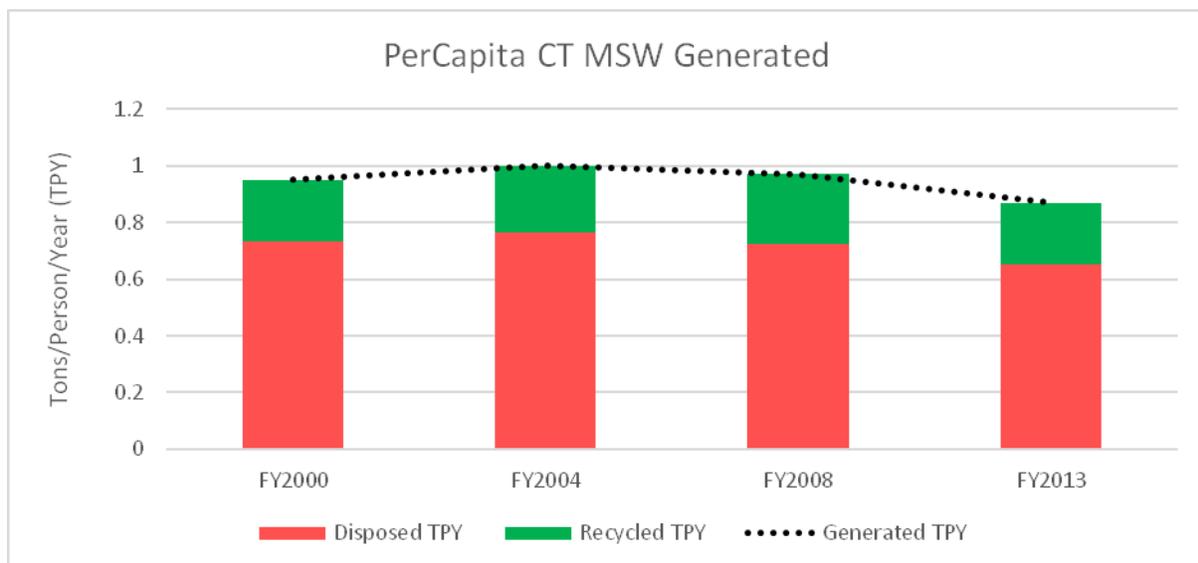


Figure 2
 Per Capita CT MSW Generated
 Source: DEEP annual waste data

declined slightly since a high of 1 ton per person per year in 2004 as seen in Figure 2.

Statewide MSW Diversion

Statewide MSW diversion achieved through recycling or composting at CT permitted, registered, or authorized solid waste facilities remains a reliable indicator of overall waste system performance. Diversion of other types of waste (e.g. construction and demolition debris, some types of special waste, etc.) is not as easily tracked since data is not as complete or accurate as the MSW data.

For this Plan, an attempt was made to track and include more complete statewide MSW recycling data than in the past. The FY2013 MSW diversion data was calculated as follows:

FY2013 Percent Statewide MSW Diversion =

FY2013 Tons MSW Materials Diverted or Recovered / FY2013 Tons MSW Generated

FY2013 Tons MSW Diverted or Recovered (through recycling and composting) includes the following:

- MSW recyclables marketed by CT permitted, registered, or authorized CT recycling or composting facilities;
- CT-generated scrap metal marketed by CT scrap metal processors. Automobile and C&D scrap was excluded from this estimate.
- CT bottles and cans recycled through the CT bottle deposit system (based on a one-time study of CT bottle bill material flow for FY2013);
- Scrap metal recovered from RRF ash (although this data has been available historically, it was never included in the MSW recycling stats), most RRFs and the one ash-landfill in CT have made substantial investment in technology to recover both ferrous and non-ferrous metals;
- Additional material reported recycled by CT municipalities (e.g. organics, textiles, e-waste)

FY2013 Tons of MSW Materials Generated includes the following:

- MSW diverted or recovered through recycling and composting (i.e. all of the items above);
- MSW disposed of in landfills;
- MSW incinerated with or without any energy production;
- MSW converted to a fuel.

Statewide diversion (FY2013) is estimated to be 35 percent.

It is important to note that this estimate includes materials that were underreported or not included in previous estimates, including CT bottles and cans recycled through the bottle bill, metals recovered from resource recovery ash, and previously underreported scrap metal.

Statewide MSW Disposed

Statewide MSW disposal is measured by disposal method (e.g. landfill, WTE), tonnage disposed, and by per-capita disposal rate (pounds/person/year).

Approximately 87 percent of MSW disposed in FY2013 (2.3 million tons) was disposed in-state (just under 2.1 million tons). The vast majority of this in-state disposed MSW, just under 2.1 million tons, was managed in the state’s then six (now five) active MSW resources recovery facilities, generating electricity as a by-product.

In FY2013, a remaining 282,992 tons was reported as being sent out-of-state.

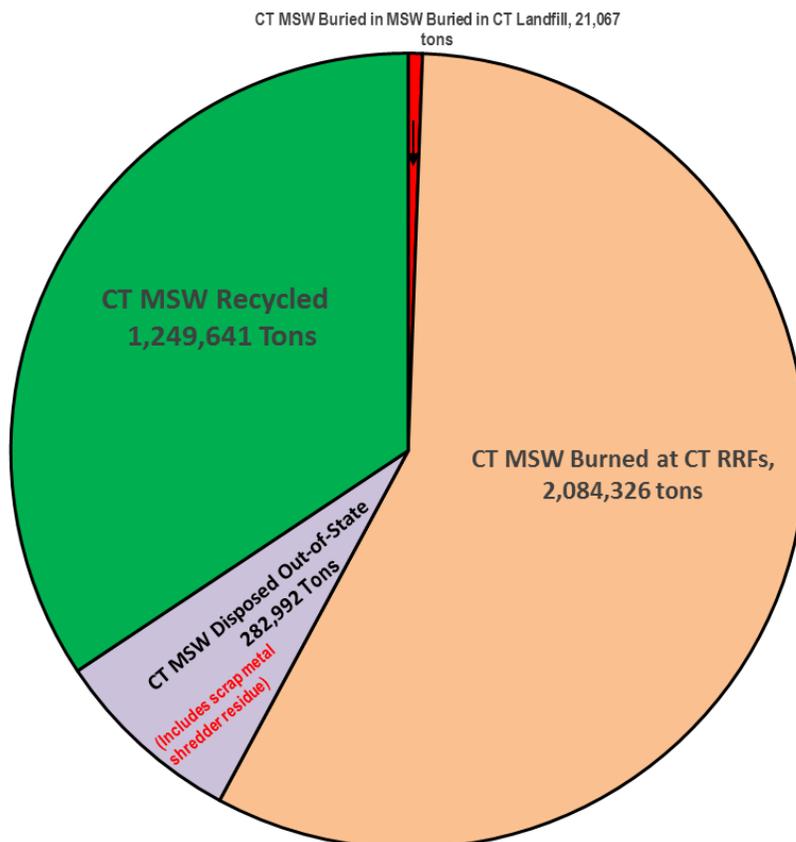


Figure 3
Tons Disposed & Recycled (FY2013)
Source: DEEP annual waste data

According to DEEP data, using historic methodology to calculate per capita MSW disposal rates, those rates have decreased from 1,532 pounds/person/year in 2004 to 1,300 pounds/person/year in FY2013. Figure 4 provides a sense of the historical trends since 1992, although data is not available for every year.

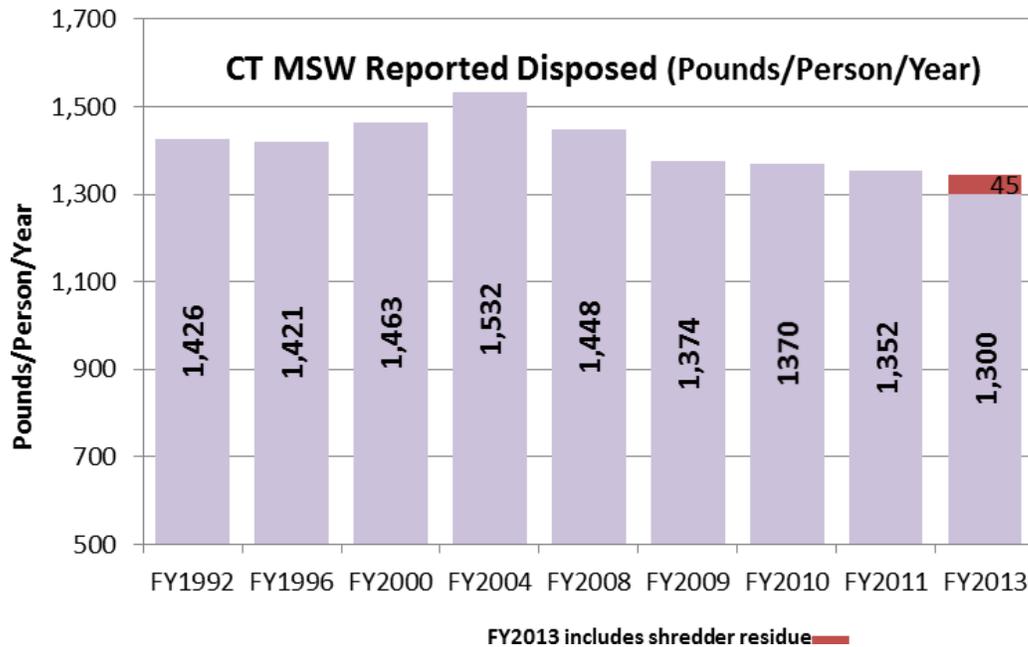


Figure 4

Per Capita MSW Disposed in Various Years Since 1992
Source: DEEP annual waste data

MSW Recycling and Composting

Approximately 1.25 million tons were estimated recycled and composted (not including an estimated 29,000 tons of material home composted and grasscycled) in FY2013, with paper and containers (traditional curbside materials plus bottle bill) representing about 40 percent of the total material estimated recycled or composted. Figure 5 shows the materials reported recycled in Connecticut.

Legally designated (mandated) recyclables are:

- glass and metal food containers
- plastics #1 and #2
- scrap metal
- high grade white and colored office paper
- newspapers
- magazines
- boxboard
- corrugated cardboard
- organics from large sources, phased in as capacity becomes available
- waste oil
- leaves
- lead acid storage (motor vehicle) and Ni-Cd rechargeable batteries

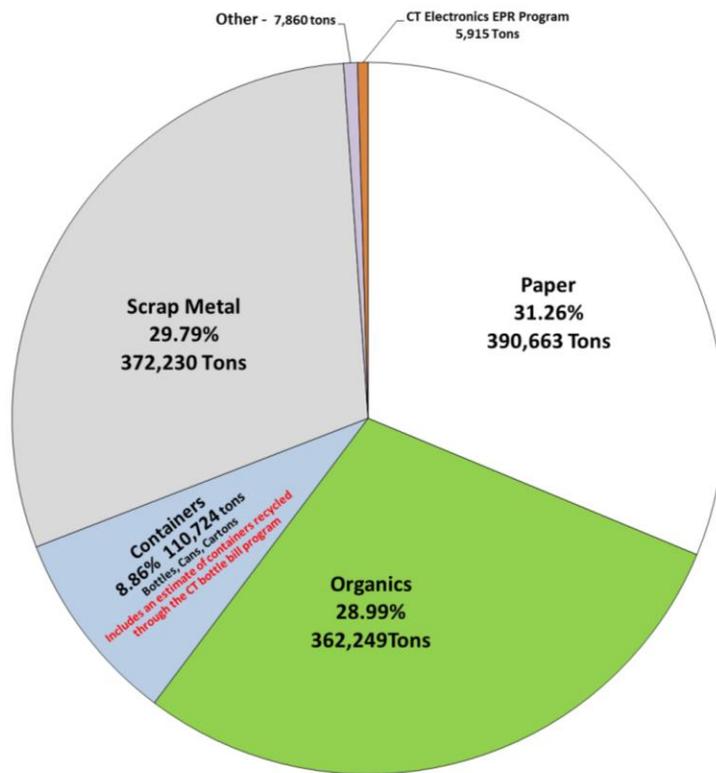


Figure 5
Tons Reported Recycled (FY2013)
Source: DEEP annual recycling data

New Since 2006: The Rise of Single-Stream Recycling

The vast majority of residential (and some non-residential) bottles, cans, paper, and beverage cartons are now recovered in Connecticut through “single stream” collection systems. These systems, sometimes called “zero sort” systems, allows certain empty food and beverage containers made of glass, metal, paper, or plastic and paper products such as newspaper, magazines, cardboard, and boxboard to be collected together in one container for sorting at a recycling processing facility such as a Materials Recovery Facility (MRF). This represents a significant shift since 2006, when the preceding State Solid Waste Management Plan was published, and it is a shift that demands significant attention to both its benefits and its challenges. The transition to single stream collection statewide was swift and driven largely by collection cost savings and increased amounts of recyclables collected (due in large part to the larger containers and expanded list of recyclables that usually accompany a transition to single stream collection and concurrent education campaigns). Unintended consequences of the transition, such as increased contamination and decreased quality of some of the material collected for recycling, and increased costs to some manufacturers and paper mills which use the recycled material as a feedstock to make a new product, has resulted in the need to now optimize the system for better performance. Optimization can include the implementation of the municipal performance standards set forth in this Strategy, and taking steps to address the prevalence of contamination, which is the greatest challenge of single stream collection.

Contamination in Single-Stream Recycling

As is the case in most single-stream collection systems, the quality and market value of recycled materials collected in Connecticut are negatively impacted by contamination.

Although it is a designated recyclable material, glass, which constitutes over 17.4 percent of residential single-stream recyclables (by weight) entering facilities, is problematic when collected as part of the single-stream mix. According to the 2015 Waste Composition Study, 46 percent of all glass entering a MRF is broken in the process of collection and transportation. Broken glass wears on sorting equipment and can diminish the quality and end-market value of other recovered materials. The glass itself is highly contaminated by other materials in the collection and sorting process, and less than 40 percent of glass collected in single-stream is ultimately recycled. Most MRFs in Connecticut pay to have glass hauled away for disposal, in some cases paying more than \$20/ton.

Other materials considered to be contaminants include plastic bags and film plastic, shredded paper, C&D materials, wood, electronics, bulky items, textiles, diapers, sanitary products, and other organic wastes.

The 2015 Waste Composition Study also determined that the presence of bagged materials made up almost 3 percent of the materials entering recycling facilities from single-stream collection. Bagged materials contained roughly half waste and half recyclables, on average.

While levels of contamination are generally found to be higher in single-stream recycling collection systems than in dual stream (collecting paper separately from bottles and cans) or multi-stream source-separated collection systems (collecting one type of material separately e.g. cardboard), it is important to recognize that despite this challenge, single-stream collection systems generally yield greater overall quantities of recyclable materials, and can significantly decrease collection costs. Thus, this Strategy seeks to optimize single-stream recycling collection through increased education, standardization of collected materials, and promoting more effective single stream MRF technology, while promoting increased source-separation where doing so yields best results, such as expanding opportunities for the separate collection of glass.

MSW Resource Recovery

Connecticut's primary MSW disposal management approach is energy recovery through five active MSW resources recovery facilities (RRFs, often referred to as waste-to-energy facilities). This system is challenged by market conditions that recently led to the closure of CT's smallest RRF (Covanta Wallingford) and may continue to threaten system capacity in the years to come. At the time of the development of this Strategy, it is estimated that Connecticut already faces a shortfall in in-state disposal capacity.

Figure 6 - Connecticut Resource Recovery Facilities

	Bridgeport RRF	Wallingford RRF (Inactive)	Southeast RRF	Mid-CT RRF	Bristol RRF	Lisbon RRF
Maximum Permitted Design Capacity (tons/year)	821,250	153,300 (inactive)	251,485	888,888	237,250	195,640
Average Amount (tons)of MSW Burned/Year	722,692	n/a	250,484	715,011	196,113	181,987
Generation Capacity (Megawatts)	67	11	18	68.5	16.3	15

In FY2013, the state's (then six) resources recovery facilities burned 2.2 million tons of MSW (2.1 tons from CT). Together, the five currently active facilities have a combined maximum permitted design capacity of approximately 2.4 million tons per year, however, because RRFs typically operate at about 85 percent of design capacity, the operational capacity is likely just over 2 million tons per year. In FY2013, approximately 87 percent of all post-recycled CT MSW disposed was burned in these facilities. This remains the highest reliance on in-state resources recovery capacity of any state.

The expiration of both long-term solid waste contracts and favorable power purchase agreements challenges Connecticut's reliance on existing resource recovery infrastructure.

In 2012, Governor Dannel P. Malloy's Modernizing Recycling Working Group called for a state policy that would "promote an environmentally beneficial infrastructure that balances the need for both stability and responsiveness under market conditions and includes a diversity of systems and facilities to collect, process, and recover material and energy value, and to support the development of stronger markets for recovered commodities."

In 2013, the state's Resources Recovery Task Force found that the infrastructure necessary to move the state towards its materials management goals was early in its development, and called for regulatory changes that could accelerate the transition from combustion-based waste-to-energy to newer technologies. The Task Force further noted that the closure of the state's largest waste-to-energy facilities, whether because of maintenance costs or other economic factors, "has the potential to create a surplus of waste that could not be accommodated by the remaining plants, which are operating near capacity. This is would lead to an increase in the disposal of waste in out-of-state landfills, and could create a non-competitive environment with increased costs for municipalities."

In 2014, the Covanta Wallingford RRF transitioned away from combusting waste, eliminating approximately 150,000 tons/year in disposal capacity. Covanta cited market conditions for its decision to discontinue combusting waste at the facility.

In 2015, an extended unscheduled shutdown of the Connecticut Waste System (MidConnecticut) RRF at the same time as scheduled maintenance of other RRFs resulting in tens of thousands of tons of MSW being transferred out-of-state for disposal. Market conditions and the added cost to transport waste out-of-state prompted Covanta to increase commercial tipping fees at its

Wallingford transfer station by nearly 30 percent, imposing unexpected and unwelcome cost increases on collectors and customers. The shutdown also increased queue times at tipping areas, causing delays to the normal operation of collectors and increasing overtime and other costs.

The owner of the Connecticut Waste System RRF, the Materials Innovation and Recycling Authority (MIRA), has warned that similar events are increasingly likely as aging equipment fails and must be replaced. MIRA officials have raised concerns about the practicality of maintaining and/or upgrading the facility.

Through a Request for Proposals (RFP) issued November 6, 2015, the state began a process to explore options for the redevelopment of the Connecticut Waste System RRF. However, any future redevelopment will take at least 3-5 years to complete, and may not replace the entire 888,888 TPY capacity of the current facility. This has the strong likelihood of further disrupting current market patterns, raising costs for municipalities and other customers and leading to a vast increase in the amount of waste sent out of state to landfill. As discussed throughout this Strategy, this looming capacity shortfall can only be effectively addressed by swift action leading to the development of new facilities elsewhere in the state.

MSW Landfilling

Connecticut is the U.S state closest to eliminating the landfilling of MSW within its borders. This distinction should not obscure the fact that the state sends significant (though still comparatively small) quantities of MSW, as well as the vast majority of its disposed C&D waste, to out-of-state landfills.

In FY2013, only 21,000 tons of the total amount of Connecticut-generated MSW was landfilled in the state, all of it at the Windsor-Bloomfield Sanitary Landfill, the state's sole active MSW landfill. This is a significant decrease from 2006 levels, when the now-closed Hartford landfill accepted an additional 100,000 tons/year of MSW. The Hartford Landfill ceased ash landfilling and residue landfilling operations in 2008 and officially completed closure in 2015.

While in Connecticut, the prospect of future development of new landfill capacity for MSW disposal was once considered unlikely, the potential for escalating costs associated with disposal could change the calculus for cities and towns. State law and Connecticut's long-standing vision to move up the materials management hierarchy discourages that course of action, calling instead for increased source reduction, reuse, recycling, and investment in recycling and modern waste conversion infrastructure. Given that better alternatives exist, this Strategy rejects the development of new in-state landfill capacity for MSW disposal.

MSW Composition

In 2010 and 2015, DEEP conducted statewide waste composition studies to characterize the composition of MSW. To ensure the studies could be used for comparative purposes and to study trends, the field data collection methodology was identical in both years, though the 2015 Waste Composition Study was more comprehensive, including a composition analysis of recyclables collected in single stream recycling.

Between 2010 and 2015, significant changes in composition were noted. Most significant was a decrease in the prevalence of designated recyclables in the disposed MSW stream, a hopeful indicator that suggests the success of Public Act 10-87 which increased the list of designated recyclables and increased collection points through an equitable collection mandate. More troubling was an apparent uptick in the prevalence of food waste, material that has been the focus of concerted state policy to stimulate the development of organic recycling infrastructure that has yet to be fully realized. Figure 7 provides an overview of the 2015 composition of MSW.

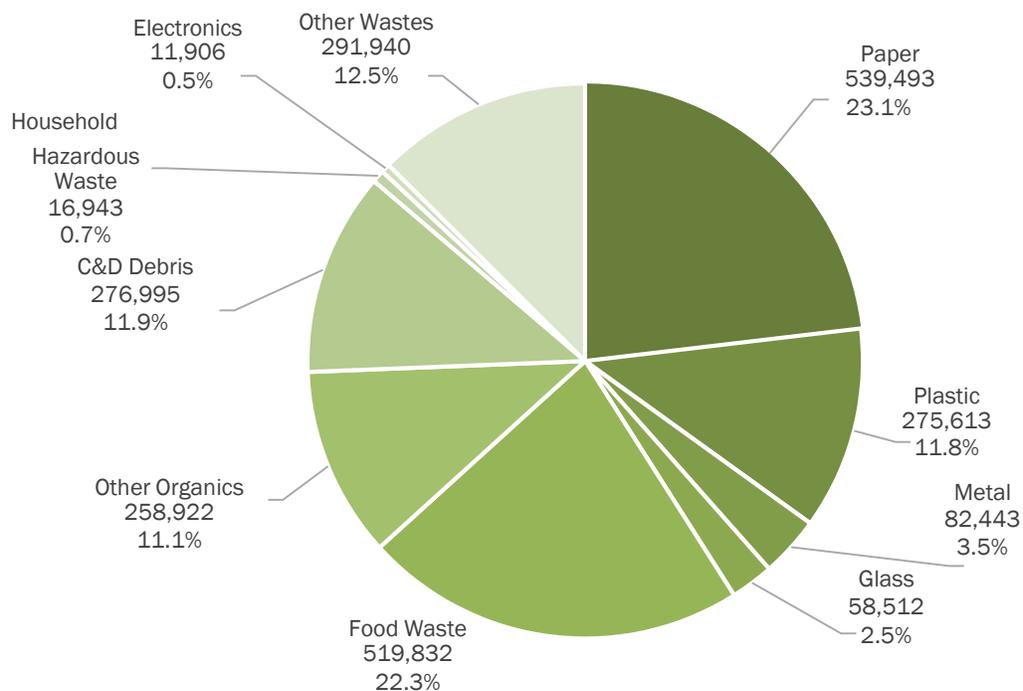


Figure 7
2015 MSW Composition
Source: 2015 Waste
Characterization Study

Composition Comparison, 2010-2015

The most noteworthy change in the waste stream since 2010 is the heightened fraction of food waste remaining in disposed wastes, along with relatively lower incidence of most other materials. The percentage of plastics sampled in the waste stream also decreased from 14.7 percent in 2010 to 11.8 percent in 2015. However, plastics and packaging, particularly non-deposit plastic containers and films (bag, non-bag, flexible plastic packaging, and other films), cumulatively increased over 1 percent. Other organics (including yard trimmings) and metals did have a lower incidence in the waste stream. Lastly, electronic waste, items targeted by extended producer responsibility (EPR) programs implemented by the state in 2011, were observed at lower percentages in 2015 (0.5 percent) than in 2010 (2.1 percent).

Figure 8 compares the composition in 2015 with the same results from the 2010 Study.

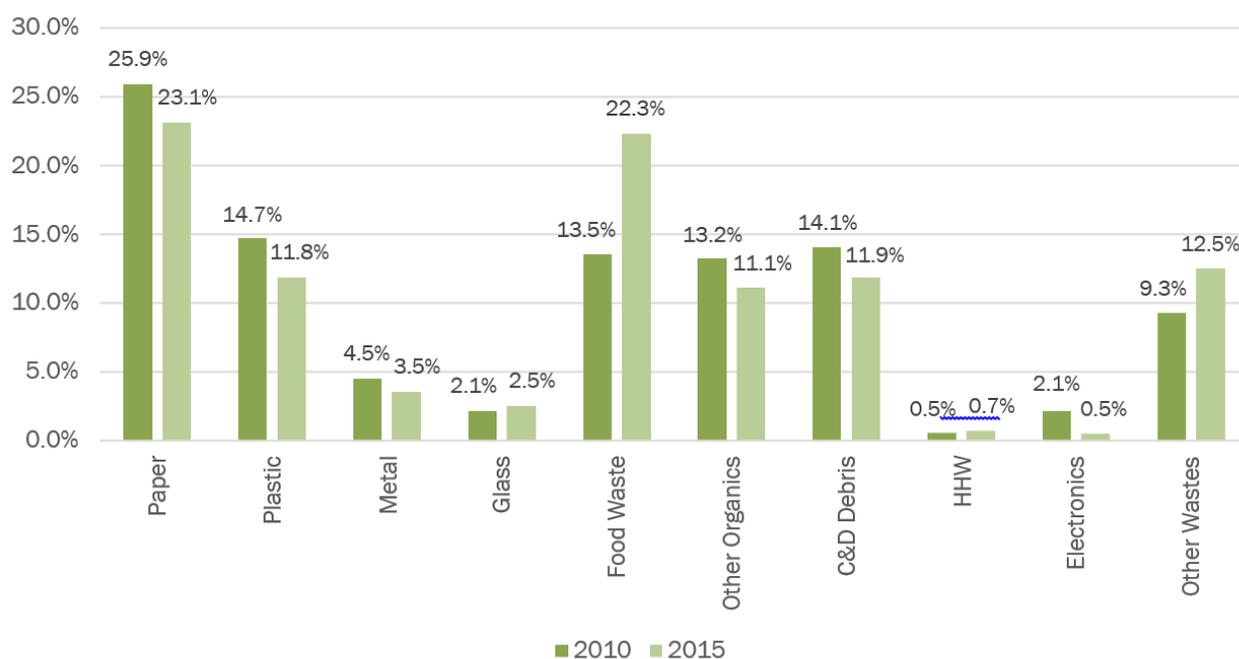


Figure 8

2010-2015 MSW Comparison
Source: 2015 Waste Characterization Study

Recoverable Materials in Disposed MSW

Even with a significantly increased capture of potentially recoverable recyclables (e.g., recyclable fibers, containers, plastics, and compostable organics) in the waste stream at facilities, 44.5 percent of materials are not currently recoverable through the curbside or on-site recycling system. This underscores the need for a holistic approach to diversion, including the promotion of source-reduction and reuse, optimization of recycling collection systems, the development of new markets for materials diversion, and an embrace of new processes for converting non-recyclable waste into energy or materials of value.

Figure 9 shows the breakdown of recoverable materials within the disposed MSW stream. It indicates that the fraction of targeted curbside recyclables – dry fiber and plastic, metal and glass containers – remaining in the waste stream is a significant but comparatively smaller than the fraction of compostable organics – which include food wastes, yard wastes, and some compostable papers. It is important to note although some materials are not collected in single-stream, they may in fact be recyclable and are sometimes collected separately.

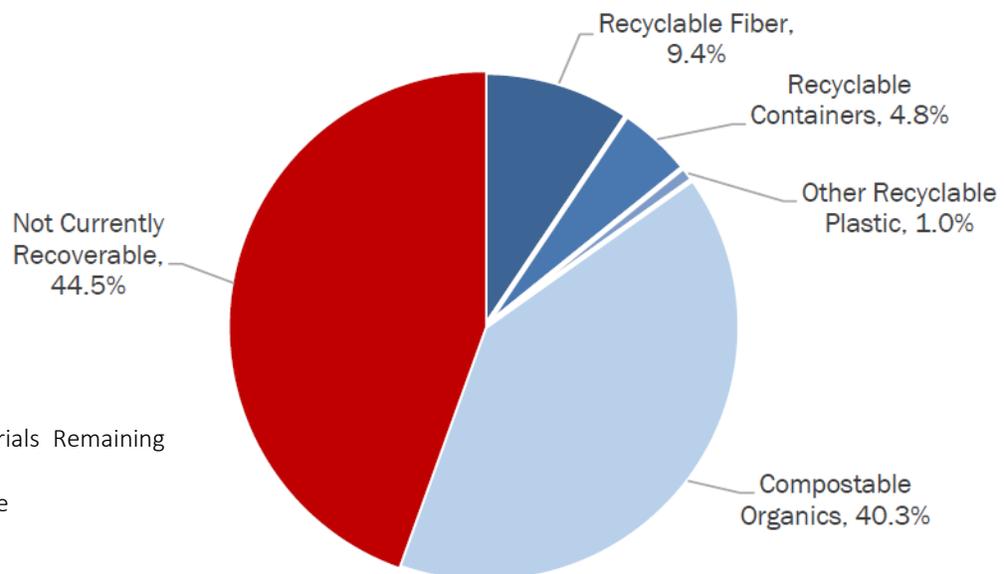


Figure 9
Recoverable Materials Remaining
in Disposed MSW
Source: 2015 Waste

Comparison of Residential and ICI Profiles

Perhaps not surprisingly, the prevalence of potentially recyclable materials was found to be significantly higher in commercially (ICI) generated MSW than in residentially generated MSW. This may be attributed to differences in the materials generated in industrial/commercial processes, and, to some extent, to comparatively poor compliance across this sector with mandatory recycling provisions. Figure 10 illustrates the differences between the commercial and residential waste profiles.

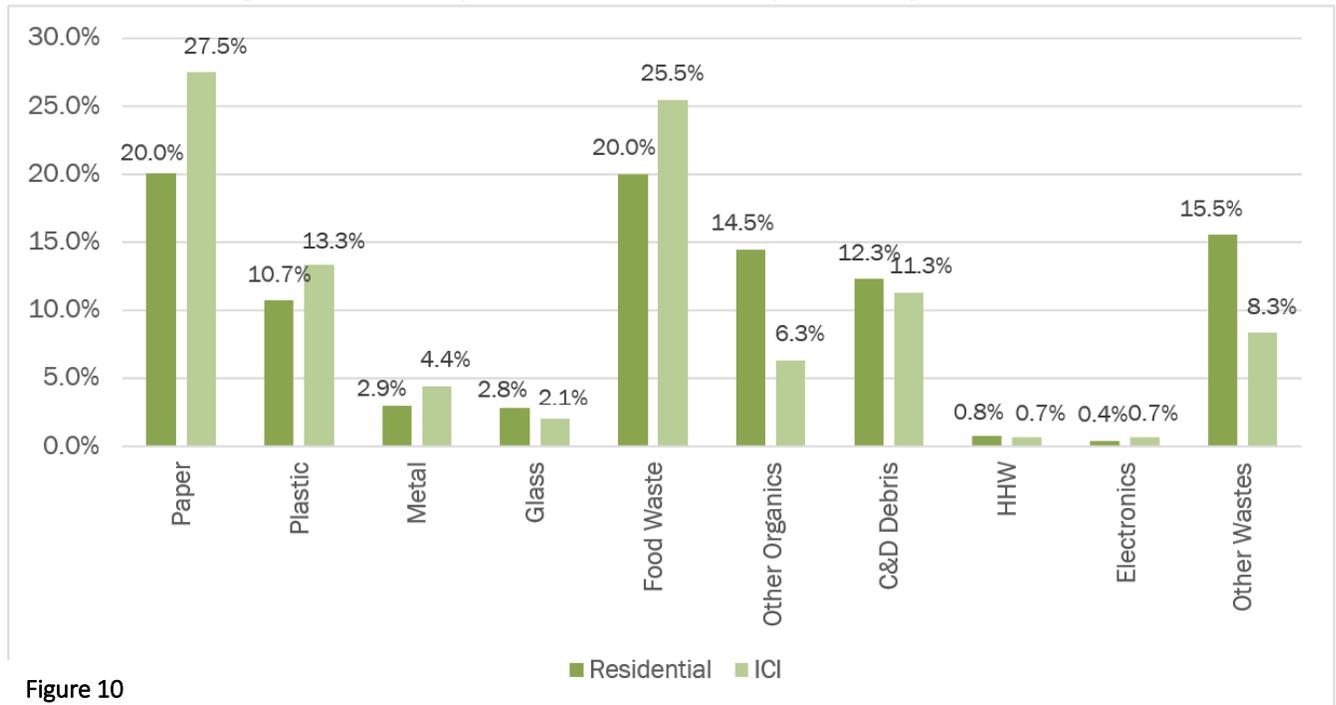


Figure 10
 MSW Comparison by Sector
 Source: 2015 Waste
 Characterization Study

b. C&D Waste / Oversized MSW

Connecticut statutes define bulky waste as demolition waste (other than clean fill) and land clearing debris. However, in practice, oversized MSW wastes such as mattresses, furniture, and carpet are commonly handled along with construction and demolition wastes, and consequently in this Strategy are termed “C&D waste/oversized MSW.”

Generation

Based on 2013 data reported to DEEP by VRFs and Recycling Facilities, Connecticut generated approximately 1,041,643 tons of C&D waste. This figure include a significant amount of oversized MSW which is managed along with C&D waste. Almost all of the C&D waste originated from within the state, with only approximately 48,000 tons of C&D materials being identified as imported from other states. The 1,041,643 tons generated translates into approximately 0.29 tons per capita per year.

Composition/Characterization

Green Seal performed a series of quantitative estimations of the different components of “typical” materials entering VRFs in Connecticut. Inbound loads were observed for a total of eight days at four different VRFs to obtain data on the typical percentages of the major inbound material makeup. Additionally, Green Seal performed a literature review to compare with the quantitative estimations. The goal of the quantitative estimations and literature review was to

determine the average composition of C&D materials for determining the types and quantities of each category of material available for recycling and/or disposal in Connecticut.

A summary of the average composition data generated from the analysis is provided in the Figure 11 below.

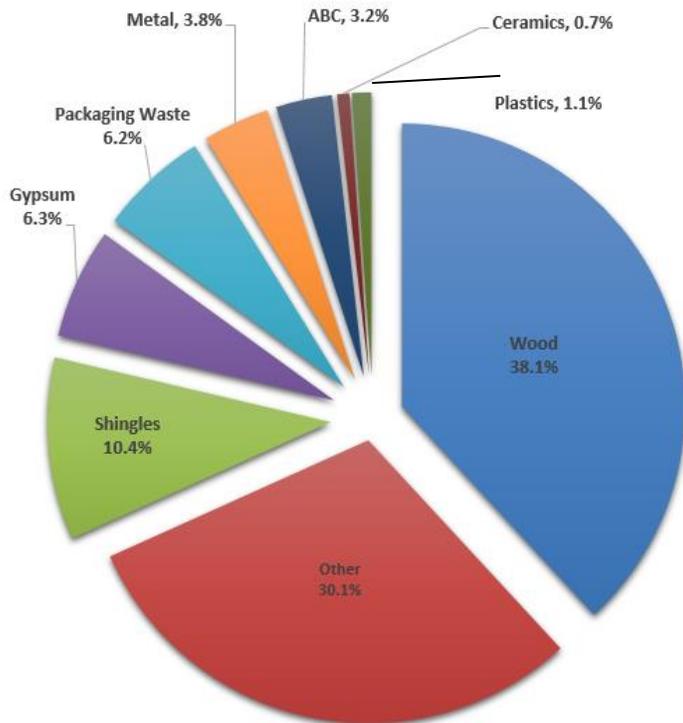


Figure 11
C&D Composition, 2015
Source: 2015 C&D
Characterization Study

Figure 12 below applies the percentages obtained from the quantitative estimations to the baseline C&D Generation estimate of 1,041,643 tons in 2013.

Figure 12 – 2015 Quantitative Estimations Applied to 2013 Connecticut C&D Generation
Source: 2015 C&D Characterization Study

Material Category	Percentage	Tonnage
Wood	38.1%	397,204
Other (primarily oversized MSW)	30.1%	313,110
Shingles	10.4%	108,131
Gypsum	6.3%	65,951
Packaging Waste	6.2%	64,831
Metal	3.8%	40,085
Asphalt Brick and Concrete (ABC)	3.2%	33,398
Ceramics	0.7%	7,752
Plastics	1.1%	11,180
	100.0%	1,041,643

Disposal of C&D

Connecticut relies heavily on out-of-state disposal for C&D waste. Approximately 82 percent of C&D materials are disposed out-of-state. Of C&D material disposed within Connecticut, 60 percent were disposed at RRFs. The Manchester Sanitary Landfill received the majority of the remainder of the tonnage with approximately 50,631 tons or 31.9 percent, with the remaining tonnage going to several small outlets, including for usage as landfill cover.

Based on 2013 CT facility data reports, interviews with VRFs, and when possible, verification with adjacent states' solid waste agencies, Figure 13 provides a summary of the disposal of C&D materials generated within CT.

Figure 13 – 2013 Connecticut VRF Outbound Disposal to Receiving States
Source: 2015 C&D Characterization Study

Location by State	Total (Tons)	Percentage
Connecticut	158,593	17.9%
Ohio	494,633	55.9%
New York	122,357	13.8%
Massachusetts	52,985	6.0%
Pennsylvania	44,115	5.0%
Rhode Island	6,036	0.7%
Virginia	2,595	0.3%
Maine	2,824	0.3%
"Unidentified Location"	19	0.0%
Total	884,157	100.0%

Diversion of C&D

Based on 2013 facility data reports and interviews with VRFs and Recycling Facilities, Figure 14 below provides a summary of recycling of C&D materials in Connecticut. Given the estimated generation of 1,041,643 tons of C&D materials in 2013, with 71,181 tons reported recycled, Connecticut VRFs achieved a C&D recycling rate of approximately 7 percent. It should be noted that this recycling rate does not include an unknown quantity of materials (asphalt brick and concrete, metals, and in some cases clean wood, gypsum, cardboard, and plastics) that are diverted at the source of generation and sent to non-reporting destinations. Because of this limitation, further study is needed to determine the overall diversion of C&D and oversized MSW.

Figure 14 – 2013 C&D Recycling in Connecticut
Source: 2015 C&D Characterization Study

C&D Material	Quantity Recycled (Tons - 2013)	Percentage of Total Recycled
Wood	23,831	33.5%
Metals	22,093	31.0%
Asphalt Shingles	13,377	18.8%
Asphalt Brick and Concrete (ABC)	6,267	8.8%
Old Corrugated Cardboard (OCC)	4,176	5.9%
Mixed Plastics	893	1.3%
Gypsum	544	0.8%
Total	71,181	

c. Management of Other Types of Special Wastes

While this Strategy focuses primarily on MSW and C&D wastes, Connecticut administers programs for special wastes and other hard to manage wastes. A summary of such programs follows:

Tires

Connecticut residents generate an estimated 3.3 million scrap tires annually. Until 2013, virtually all of those tires and many from neighboring states were incinerated for energy value in a plant in Sterling, Connecticut. That plant closed in the fall of 2013. After the plant closed, many of the tires generated in Connecticut were sent to pulp mills in Maine to be burned for fuel. However, the closure of pulp mills and an oversupply of tires has raised concern about the viability of this disposal option.

DEEP will continue to explore other management options for tires, including the development of an Extended Producer Responsibility (EPR) program for tires, as well as markets for recycled tires.

Household Hazardous Waste (HHW)

HHW is generally defined as a household waste that is toxic, flammable, reactive or corrosive. Common HHW includes oil-based paints, thinners, pool chemicals, pesticides, mercury thermometers and devices, and gasoline. Since the first collection in 1984 in Ridgefield, Connecticut, HHW programs have grown dramatically. Collections are available for nearly every resident, and on average, over 30,000 state residents participate in HHW collections each year. Currently there are 5 permanent HHW facilities and many regionally organized collection day programs.

Dredge Materials

Dredged materials refer to material removed from both inland and marine waters. The potential volume of marine dredged materials is much more significant than the volume of inland waters dredged materials. Marine dredged materials result from dredging operations to deepen harbors and navigation channels and anchorages. Approximately 1.1 million tons of dredge material is generated in Connecticut each year from dredging operations in Long Island Sound. Currently, there is not a treatment facility in Connecticut designed to treat dredged materials with the goal of reusing the material.

The U.S. Army Corps of Engineers (USACE) is the lead agency for development of the Long Island Sound Dredged Material Management Plan (LIS DMMP).

Street Sweepings & Catch Basing Cleanings

In 2007, the DEEP updated a guidance document on the management, reuse, and disposal of street sweepings and catch basin clean-outs.¹ Street sweepings disposal options include disposal in a MSW solid waste disposal facility, typically a landfill. Street sweepings and catch basin cleanings may be so polluted that they cannot be safely reused. All municipalities are encouraged to develop a management plan for collecting street sweepings and catch basin cleanings, for safely storing such materials, for reusing such materials locally in a manner that does not pose a risk to public health or a risk to wetland and water quality and, if necessary, for disposing of the material.

Catch basin cleanings are usually wetter, have a higher organic content, and generally have higher levels of pollutants than street sweepings. Catch basin cleanings are also more likely to have been affected by spills and polluted runoff than street sweepings. The catch basin cleanings (solids) may be dried and disposed in a sanitary landfill or used as landfill cover. As in the case of

¹ See http://www.ct.gov/deep/lib/deep/waste_management_and_disposal/solid_waste/street_sweepings.pdf

street sweepings, there is very limited in-state opportunity for their use as landfill cover. Shifts by the Department of Transportation (DOT) and many municipalities away from sand/salt mixtures to other formulations without sand for road anti-icing and deicing has significantly reduced the amount of street sweeps and catch basin cleaning grit in recent years.

Sewage Sludge

Sewage sludge is generated by the 111 wastewater treatment plants located in Connecticut. Most sewage sludge is de-watered on-site resulting in a generation of approximately 118,000 dry tons de-watered cake per year. Sewage sludge is handled by incineration, composted on-site, or is shipped out-of-state for disposal. At this time, state regulations do not allow for beneficial reuse of ash residue that results from sludge incineration. Limited amounts of sewer sludge is being processed and pelletized into soil amendments that may meet agricultural and public health standards.

Contaminated Soils

Contaminated soils are typically generated as a result of fuel and chemical spills, leaking oil tanks, and by both remediation and construction activities at properties with historical contamination. Contaminants may include any substance that has the potential to pollute air or water. Owners of property containing contaminated soils generally retain a private contractor to clean up the site. Soil contamination varies in degree and is typically handled through one or more of the following options available to responsible parties in Connecticut for managing contaminated soils: deliver it to an out-of-state facility; reuse it as cover material at landfills undergoing closure; dispose of it at a limited number of in-state landfills [most commonly the Manchester CT Landfill]; deliver it to an in-state treatment facility; or reuse it in accordance with the state's Remediation Standard Regulations.

DEEP will continue to explore and develop plans for the management of contaminated soils.

Animal Mortalities

Animal mortalities are typically managed by the Connecticut Department of Transportation (DOT) or municipal road crews and are generally managed by dragging the animal off the road for natural decay and/or burying it. In some states, animal mortalities are routinely composted with other organics. This is not a common practice in Connecticut other than at poultry farms. Routine poultry mortalities can be managed through RRFs utilizing special waste authorizations, however, large-scale animal or poultry mortalities from illness (such as avian influenza) may not be managed solely through RRFs and may necessitate large scale composting. The Department of Agriculture, in coordination with other state agencies and the U.S. Department of Agriculture, is currently updating the 2010 "Avian Influenza Response Plan." The 2016 "Avian Influenza Monitoring & Response Plan" will further detail disposal of mortalities through RRFs and/or composting.

Land Clearing Debris

Currently, in Connecticut, land clearing debris is managed as follows: (1) chipped or ground and then used for mulch or as a component in compost by municipalities and private recycling facilities; (2) milled for lumber or processed into firewood, though generally land clearing debris is unsuitable for either product; (3) left on site to decay; (4) burned legally on-site pursuant to CGS Section 22a-174(f); (5) dumped illegally on remote sites; (6) chipped and sent out-of-state for use in boiler-fuel applications; (7) buried in in-state bulky waste landfills; and (8) burned at in-state RRFs.

Radiopharmaceutical Contaminated MSW

Physicians and veterinarians prescribe the use radioactive chemicals such as iodine-131 and technecium-99m for diagnosis and treatment of medical conditions in patients and animals. These substances use short-lived radioactive isotopes which means that they will naturally decay away (and no longer emit radiation) within a few hours or days depending on the substances used. This can result in some MSW (diapers, kitty litter, colostomy bags, etc.) that may temporarily emit low levels of radiation when disposed of by residences.

Water filtration and radon mitigation systems can also concentrate some naturally occurring material that will also emit low levels of radiation until the material naturally decays away. This material will not be radioactive when stored for 30 days after which it can be disposed of as MSW.

Some consumer products such as self-luminous devices and “positive-ion” energy bands contain radioactive material that requires them to be disposed of as radioactive waste and not as MSW.

RRFs, scrap metal facilities, and some transfer facilities use incoming radiation detectors to detect this material and remove it from the processing stream until evaluated. These detectors are not required by statute, regulation or permit, but function to prevent contamination of the facilities. The DEEP Radiation Division responded to 190 such incidents in 2015.

DEEP will continue to explore other management options for efficient adjudication of radiation alarms from MSW including stakeholder outreach and training, regulation and the use of an Extended Producer Responsibility (EPR) program.

VI. Processing Capacity Needs 2015-2024

The Goal of Capacity to Match Generation

The state should have sufficient in-state capacity for recycling, processing and disposal to manage waste generated within the state. Self-sufficiency in managing solid waste represents good public policy for Connecticut for many reasons, including the ability to better control costs and other risks associated related to solid waste disposal.

Self-sufficiency does not deny the fact that in a global economy, waste and recovered materials will sometimes cross state lines and national borders for processing and end uses. Nor does it mean that Connecticut recyclers, conversion facilities, and RRFs cannot source materials from out of state.

Self-sufficiency merely calls for Connecticut to develop and maintain sufficient capacity to manage its share of the environmental impact of the materials generated within the state, in line with the state's well-developed environmental standards and goals. Failure to maintain sufficient capacity effectively transfers the burden for management of Connecticut's waste materials to our neighbors.

Sufficient Capacity Stabilizes Prices

Sufficient supply of in-state processing capacity to meet demand stabilizes prices in favor of customers. While there are compelling environmental arguments for maintaining a self-sufficient waste system (reliance on out-of-state capacity — particularly landfills — increases the carbon footprint of waste), the state must also consider the strong economic and budgetary implications of a shortfall in in-state capacity. If the 2015 disruptions to the markets caused by extended RRF shutdowns (where spot market tipping fees increased from \$80 to \$100) are an indication, municipalities and other customers should plan for much higher costs in years to come as the result of a breakdown in the in-state disposal market associated with insufficient capacity. Conversely, reasonable excess capacity, though it may result in the import of feedstocks from neighboring states, leads to a healthy market with prices more favorable to customers.

MSW Generation Forecast

Long-term forecasts of MSW generation are not always reliable because economic drivers of waste generation are difficult to predict. For example, the 2006 Solid Waste Management Plan predicted sustained increases in MSW generation (from 3.7 million in FY2003 to 5.23 million tons by 2024), based on an assumption of sustained economic growth. However, the 2007-2009 economic recession contributed to a decrease in waste generation. In addition, significant changes to packaging design ("light weighting"), decreased generation of printed paper, and other trends in the waste stream may not have been fully accounted for. Therefore, this Strategy relies on new projections made with the benefit of the context that the intervening decade has provided.

In providing long term projections for MSW Generation, DEEP's consultant SERA relied on two approaches that yield divergent results. One, based on the long-term trend in Connecticut generation from 1992-2012, suggests generation of all MSW materials in Connecticut will increase gradually from 2013 total of 3.6 million tons to 3.91 million tons in 2024. Another, based on EPA predictions of national trends in source reduction suggests that MSW generation will decrease gradually to 3.48 million tons by 2024. Figure 15 illustrates these diverging scenarios.

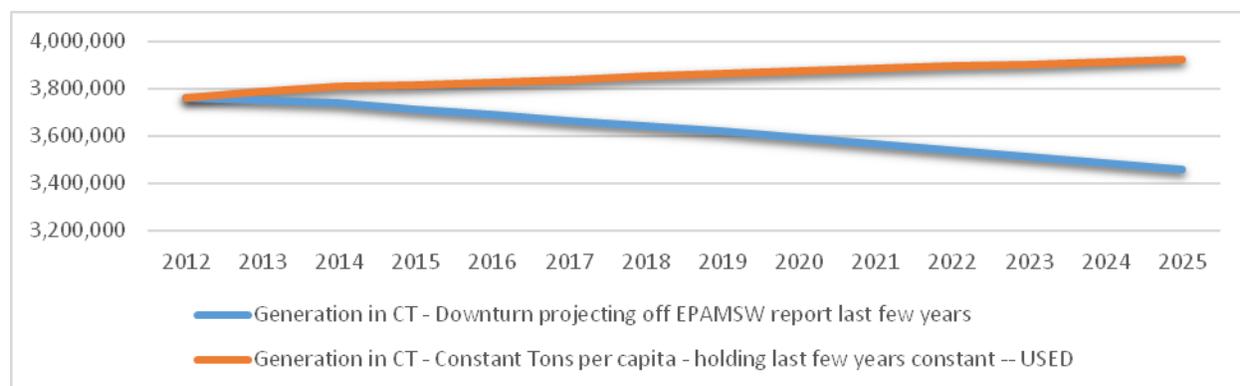


Figure 15 – Two Scenarios for MSW Generation

Source: SERA Consulting

Processing Capacity Needs

The following assumptions are used to determine capacity needs for the state:

- No in-state landfill capacity for MSW by 2024.
- Actual “practical” RRF capacity is 85 percent of permitted design capacity (based on historical throughputs).
- Total disposal capacity at all five currently active RRFs: 2,035,556 TPY (2,394,513 TPY permitted maximum).
- Total disposal capacity without CWS Hartford RRF: 1,279,781 TPY (1,505,625 permitted maximum).
- If Connecticut is successful in achieving the goal of 60 percent diversion from disposal, the associated 10 percent reduction from FY2013 levels (3.6 million tons) will mean that 3.24 million tons of MSW materials will need to be managed.
- A recycling rate of 45 percent, as projected will be necessary to achieve the goal, leaves 1.78 million tons of post-recycled MSW to be managed.
- According to this Strategy (Section II), 10 percent of overall MSW materials should be managed by new waste conversion technologies, which would be a total of 324,000 TPY.
- If Connecticut is not successful in achieving its goal of 60 percent diversion from disposal, 3.91 million tons of MSW materials will need to be managed (according to the “constant tons per capita” model illustrated by Figure 15), with 1.36 million tons diverted (at the current 35% diversion rate) and 2.54 million tons requiring disposal.

MSW Capacity Scenarios (Year 2024)

- I. If Connecticut is successful in achieving the 60 percent diversion goal and maintains the capacity of the five currently active RRFs, at least 324,000 TPY in new waste conversion capacity is called for to meet the diversion goal (see Section II of this Strategy), and no additional disposal or recovery capacity will be needed.

- II. If Connecticut is successful in achieving the 60 percent diversion goal but loses net disposal capacity equivalent CWS Hartford RRF, approximately 176,000 TPY of additional disposal or recovery capacity will be necessary (assuming that 324,000 TPY in additional waste conversion capacity is also developed).
- III. If Connecticut is not successful in meeting the diversion goal but instead maintains 35 percent diversion and maintains the capacity of the five currently active RRFs, an additional 505,000 TPY of disposal or recovery capacity will be necessary.
- IV. If Connecticut is not successful in meeting the diversion goal but instead maintains 35 percent diversion and loses net disposal capacity equivalent CWS Hartford RRF, an additional 1.2 million TPY of disposal or recovery capacity will be necessary.

Discussion

Only if Connecticut is successful in achieving its diversion goal will it avoid a significant disposal capacity shortfall. In these scenarios (I and II), it is assumed that the state will develop at least 324,000 TPY of new in-state waste conversion capacity. The four AD facilities currently in development in 2015 may provide an estimated 200,000 TPY toward this target.

If Connecticut falls short of the diversion goal, and/or loses existing capacity, the state will face a dire capacity gap that could result in nearly one third of the state's MSW being sent out of state.

Defining RRF Capacity for the Determination of Need Process

The Determination of Need process set forth by CGS 22a-208d was noted in 2010 findings by the Legislative Program and Review Committee to stifle the state's ability to develop new RRF capacity in a time of transition. Because facilities take 3-5 years to develop, the state must be able to allow the development of some "excess" capacity in anticipation of future plant closures. For this and other reasons, this Strategy recommends that the Determination of Need process be substantially streamlined.

Pending clarification or streamlining of the Determination of Need process, this Strategy seeks to clarify, in accordance with CGS Sections 22a-208d and 22a-208d(i), how DEEP may consider the question should it receive an application. While the official determination must be made in response to an application, the guidance contained in this Strategy should indicate the state's receptivity to the development of new RRF capacity in this period of a shortfall in disposal capacity. As stated elsewhere throughout this Strategy, it is preferred that such capacity take the form of waste conversion technologies as opposed to combustion-based waste-to-energy.

The formula used to determine allowable capacity (until otherwise determined by the Commissioner) is the total amount of CT-generated MSW disposed in the most recent fiscal year for which data is kept, minus active RRF capacity at time of application (at 85% usage), plus the capacity of the smallest active RRF at time of application (to hedge against future facility closures).

For example, in 2016, this formula would be applied as follows:

CT MSW disposed:	2,413,833 Tons-
Total current (2016) active RRF capacity (85%):	<u>2,035,556 Tons</u>
	378,277 Tons

378,277 tons + 166,294 (85% Lisbon RRF permitted capacity) = 544,571 TPY in new RRF capacity would not be considered excessive.

MRFs and Intermediate Processing Needs

The state enjoys a relatively high concentration of Material Recovery Facilities (MRFs, otherwise called Intermediate Processing Centers) that is sufficient to meet demand for MSW-derived recyclable materials, even with expected increases in the collection of recyclable materials under this Strategy. However, the state could benefit from advanced sorting lines and other improvements at existing and new facilities. This Strategy calls for the establishment of reasonable performance standards for MRFs to drive continuous improvements to processes and technology.

The state lacks sufficient secondary processors to receive and further refine the materials coming from MRFs. Among the actions of this Strategy to spur investment, focus should be put on the development of these processing facilities and market drivers to increase demand, including through State procurements.

C&D Processing

The state currently lacks sufficient infrastructure (facilities, equipment, and sorting lines) needed to recover recyclable C&D materials and oversized MSW. The highest-performing volume reduction facilities for recycling (those with sorting lines) recycle less than 20% of incoming material. Substantial investment in new infrastructure is required if the state is to achieve 60 percent diversion of these materials and to develop the market drivers to increase demand.

In addition, the vast majority of these materials are disposed out-of-state in landfills. This Strategy specifically calls for further study to be conducted of all C&D management options, with an emphasis on promoting greater source separation of recyclable materials at construction job sites.

VII. Integrating Greenhouse Gas Evaluation and Air Quality Impacts into Materials Management Policy and Planning

Connecticut's goal is to reduce Greenhouse Gas (GHG) emissions to 80% below 2001 levels by 2050. In the state's 2012 Greenhouse Gas Inventory, waste accounts for 0.6% or 2.2 million metric tons of GHGs; achieving the 80% reduction below 2001 levels by 2050 as required by the Global Warming Solutions Act means reducing those emissions to no more than 0.2

million metric tons. Materials management planning that fully accounts for the GHG and air quality impacts of various management options will have an integral role in meeting this target. Accounting for GHG impacts will also have the co-benefit of reducing air pollutant impacts.

According to the 2009 EPA report *Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management Practices*, approximately 42 percent of U.S. greenhouse gas emissions are associated with the energy used to produce, process, transport, and dispose of food and goods. Waste minimization through source reduction is clearly a preferred approach when considering GHG and air emissions. Reuse and recycling, by reducing the extraction of raw materials, is the next favored option. Reducing materials waste also reduces energy waste, both upstream and downstream in the life cycle of material goods. Additionally, to manage materials that are not recycled, GHG and air emissions should be a primary factor in deciding how to demonstrate environmental preferences among waste conversion technologies. As Connecticut seeks to transform its technologies for materials management consistent with this Strategy, DEEP will ensure that consideration of GHG and air quality impacts of various options are central to the formation of the state's technology preferences and performance standards for existing and new facilities. To accomplish this, DEEP will use the MSW and C&D profiles established by the characterization studies of 2015 to develop estimates of the overall emissions profile for various processing options under consideration. Among other uses, these estimates may help inform the future inclusion of specific waste conversion technologies in the state's Renewable Portfolio Standards.

VIII. Challenges to the Materials Management System

Through stakeholder surveys, listening sessions, and meetings with system participants throughout Connecticut, broad consensus emerged about some of the biggest challenges that threaten the state's current materials management system and progress towards the state's goal of 60 percent diversion by 2024. These include the following:

Gaps in Enforcement of Mandatory Recycling Statutes

Stakeholders identify gaps in enforcement at the state and local levels as a leading challenge. It is commonly acknowledged that the root cause of the lack of enforcement is a lack of resources committed to enforcement programs. Local governments vary widely in enforcing recycling requirements for residents and businesses, and a stronger program of state-led enforcement is needed.

Volatility in Markets for Recovered Materials

Recent declines in the market values of PET, fiber, metal and other materials recovered through recycling was cited as a challenge faced by collectors and MRF owners. Volatility is commonplace in commodity prices but markets have been particularly impacted, beginning in 2012, by China's so-called "green fence" standards for the import of recovered materials.

Lack of Access to Recycling Collection in Public Places, Workplaces, and Multi-Unit Residential Buildings

Residents who are committed to recycling reported frustration with the lack of readily accessible collection points, including in places open to the public (e.g. shopping malls, convenience stores, and even state parks and government buildings). In addition, some tenants in multi-unit residential buildings report a lack of recycling collection for their buildings.

Lacking Public Awareness / Lagging Adoption of Reduction, Reuse, and Recycling Practices

While a lack of access to recycling collection remains a barrier for some residents, others who could easily recycle have not integrated the practice into their daily lives. Furthermore, our consumption-based economy tends to encourage a “throw-away society” that can be inconsistent with sustainable consumer choices, waste reduction, and reuse. Stakeholders recommended a sustained campaign of education and outreach to attempt to influence consumer behavior. Increased standardization of recycling collection and the provision of clear information on what can be recycled in single-stream are key elements of this outreach campaign.

The Cost of Recycling Collection

Municipal officials and others raise concerns about the cost of mandatory recycling. Despite avoided costs of disposal, the cost of collection programs can burden municipal governments. In addition, municipalities that market recovered materials from transfer stations have been impacted by declining commodity values in recent years.

Uncertain Future for Existing Resource Recovery Facilities

MIRA, the state’s quasi-public agency for resource recovery and recycling, as well as private-sector owners of RRFs have warned that the expiration of long-term contracts for waste disposal, decreased revenue from energy sales, and maintenance costs threaten their economic sustainability.

The Regulatory Climate

Stakeholders have identified state statutory and regulatory provisions and practices that can act as barriers to innovation in material management technology and infrastructure. Another frequently mentioned concern is the time and resources needed to obtain environmental permits, including beneficial use determinations (“BUDs”) and recycling demonstration projects.

IX. Opportunities to Increase Diversion

- a. **Develop New Product Stewardship Programs, Including a Focus on Packaging and Printed Paper**
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Product stewardship is the act of minimizing the health, safety, environmental, and social impacts of a product and its packaging, while maximizing the economic benefits, throughout all lifecycle stages. The producer of the product has the greatest ability to minimize adverse impacts, but other stakeholders, such as suppliers, retailers, and consumers, also play a role. Stewardship can be either voluntary or required by law.

Extended Producer Responsibility, or EPR, is a mandatory type of product stewardship that includes, at a minimum, the requirement that the producer's responsibility for its product extends to post-consumer management of that product and its packaging. There are two related features of EPR policy: (1) shifting financial and management responsibility, with government oversight, upstream to the producer and away from the public sector; and (2) providing incentives to producers to incorporate environmental considerations into the design of their products and packaging.

By shifting the costs of materials management from taxpayer-funded government programs to manufacturers and consumers, EPR laws provide for equitable alternative funding sources, which are needed to expand and sustain product end-of-life management programs without depleting scarce government resources. However, EPR does not simply shift costs from the public sector to the private sector; it seeks to minimize costs through economies of scale, product design, and other market forces.

EPR systems provide a direct financial incentive for producers to reduce material use and increase recyclability of their products and packaging through design change. When manufacturers are financially responsible for the collection, transportation, and proper recycling of these products, companies have a natural incentive to design their products and packaging to minimize the costs of end-of-life management and maximize the value of the material once collected. As manufacturers take these factors into account, another goal of EPR is for companies to reduce the use of toxic materials.²

Successful Programs in Connecticut

- **Electronics:** In 2007, Connecticut became one of the first states to pass a law requiring manufacturers of computers, monitors and televisions to finance the transportation and recycling of their products. The program began in February 2011 and now Connecticut municipalities can recycle residential electronics appropriately and at no cost to the taxpayer. In addition, as of January 1, 2011, covered electronic devices (CEDs) are banned from the trash. To date, municipalities have saved over \$2 million in avoided e-waste tip fees for the 50 million pounds collected.
- **Paint:** Through 2011 legislation, paint manufacturers assumed the costs of managing unwanted latex and residential oil-based paints. In the summer of 2011, the Department

² This overview of EPR is adapted from a briefing document provided to the 2012 Governor's Modernizing Recycling Working Group prepared by the Product Stewardship Institute.

established a stakeholder group to work with the industry to develop the program plan. As a result of this process, PaintCare, the non-profit organization established to implement this program, submitted a plan to the Department on March 1, 2013, and the program was launched July 1, 2013. As a result of the program, 99 percent of Connecticut residents now have access to a free paint drop-off location within 15 miles of their residence.

- **Mattresses:** In 2013, Connecticut became the first state to pass comprehensive mattress recycling legislation. Public Act 13-42 required mattress manufacturers to establish a program to manage unwanted mattresses generated in Connecticut. The Connecticut Mattress Stewardship Program officially began on May 1, 2015. Many municipalities are diverting their mattresses free of charge into this EPR program, which has contracted with recycling facilities in Bridgeport and East Hartford.
- **Mercury Thermostats:** While mercury thermostats have not been legal to sell in Connecticut since 2004, many still remain in service. The thermostat manufacturers established a program to recover mercury thermostats removed from service in 1998. The organization they formed, the Thermostat Recycling Corporation, primarily serves heating, ventilation and air conditioning contractors by providing collection points at electrical wholesalers that sell thermostats. A law passed in 2012 made this program mandatory. The program has expanded to include household hazardous waste facilities and municipal transfer stations. The law also established a prohibition on disposal for all household thermostats beginning in 2014.

Areas for Action

- DEEP will work with stakeholders to study and produce an actionable strategy for the implementation of an EPR system to cover packaging and printed paper, likely with a focus on the residential stream. In doing so, DEEP will consider (1) how such a system could meet the state's goal of 60 percent diversion, (2) how such a system would impact municipal budgets, (3) how such a system would impact the state's economy, including CT-based businesses, and (4) how such a system would impact product/packaging design, including the promotion of recyclability and the reduction of toxicity.
- DEEP will continue to engage with stakeholders to pursue EPR for tires, batteries, and carpet.
- DEEP will review the Priority List for Product Stewardship, to determine which, if any product categories should be pursued.³

³ The Priority List created by DEEP in 2012 included mattresses, carpet, batteries, pesticides, fertilizers, packaging, tires, lamps, gas cylinders, smoke detectors, pharmaceuticals, furniture, plastic bags, textiles, phone books, and C&D debris.

b. Reduce the Generation and Toxicity of Waste

While macroeconomic factors are the primary drivers of changes in waste generation, Connecticut can achieve meaningful reduction in waste generation, as well as increased recycling, through the widespread implementation of unit-based pricing structures that reward consumers for reducing their disposal of waste. Despite having been recognized for its high potential impact since the 1980s, only a handful of towns in Connecticut have implemented effective pricing structures. DEEP will continue to promote this proven approach, including as a factor in new municipal performance standards included in this Plan.

In addition to reducing waste quantity, source reduction also seeks to reduce climate impacts and toxicity of waste through redesign of products and packaging and changes in purchasing and other practices.

Areas for Action

- Connecticut will build on the success of early measures to eliminate other toxic and problematic materials from the waste stream through approaches that may include compliance assurance, technical assistance, surcharges, regulations, disposal bans and/or extended producer responsibility (EPR) programs.
- Connecticut will increase the number of municipalities that enact effective unit-based pricing approaches, and will make adoption of unit-based pricing a key indicator of municipal recycling system performance (and compliance with statutory recycling performance goals). DEEP will support municipalities in this transition by providing an implementation toolkit.

c. Promote Reuse

Reuse involves extending the life of a product, packaging, or resources. Reuse-related activities are a growing part of Connecticut's economy and deserve emphasis and programmatic support as part of a comprehensive approach to diversion. The broad spectrum of reuse-related activities includes everything from the creative reuse of materials by artists and artisans, to retreading of tires, to building deconstruction practices that preserve reusable building materials, to repairing durable goods such as electronics, appliances, bicycles and automobiles. Reuse is a force in the wider economy, with businesses such as ZipCar, Air BnB, Savers and various consignment markets, and nonprofits such as Goodwill Industries, Salvation Army, and Habitat for Humanity facilitating reuse on a mass scale. The exchange of reused goods is facilitated by websites like Craigslist and Freecycle.

At the present time, there are few programs at the state level that directly promote reuse. At the local level, reuse initiatives supported by municipalities often take the form of "swap areas" at transfer stations, and in some cases, tool libraries or other sharing initiatives.

Areas for Action

- DEEP will develop better metrics to measure reuse activities so that the full impact and potential for reuse as a driver for waste reduction can be better understood.
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- DEEP, in partnership with the RecycleCT Foundation, will identify opportunities to leverage the successes of local and private-sector programs by providing recognition, grants, and other support for reuse initiatives.
- DEEP will continue to partner with existing organizations to promote textile collection programs.
- DEEP will promote greater reuse of bulky items collected by home cleanout contactors.
- DEEP will promote the proper handling of reusable C&D materials, including deconstruction as a strategy to preserve the reusability of building materials.

d. Improve Collection and Processing Systems for Traditional Recyclables

There continues to be significant opportunity to increase recovery of traditional recyclables. According to the 2015 waste composition study, over 410,000 tons of recyclable material remains in the Connecticut disposal stream, or 17.5 percent of all disposed MSW (excluding the remainder/composite portion of each category along with other hard-to-recycle portions). This includes: over 267,000 tons of recyclable paper; 60,000 tons of recyclable plastic packaging (excluding expanded polystyrene and film); 44,000 tons of recyclable metals (excluding compressed fuel tanks); and 39,000 tons of recyclable glass containers.

Stakeholders report there is generally sufficient capacity at Connecticut materials recovery facilities (MRFs), including seven facilities with a combined capacity of over 4,000 TPD.⁴ There is, however, a growing need for MRFs to invest in automated sortation and other technologies to address the evolving material stream, shifts in end-market demand and material quality requirements, and contamination in single stream collection and to maximize collection of traditional and new materials. Assisting MRFs in addressing these challenges can boost diversion in coming years.

Glass markets are regional and are problematic due to low value, high contamination and high shipping and handling costs. Even so, there continues to be strong demand for high-quality, color sorted glass at regional glass container facilities with at least 48,900 tons of glass from Connecticut's bottle bill program flowing to such markets, comprising 73 percent of all glass collected in that program.⁵ Some Connecticut glass from both curbside and bottle bill sources flows to alternative uses such as construction fill. Establishing in-state beneficiation capacity to clean and process mixed glass to meet manufacturer specifications is critical to building market demand for recycled glass.

⁴ "Municipal Solid Waste Management Services in Connecticut." Legislative Program Review and Investigations Committee, Connecticut General Assembly, 2010.

⁵ "Material Flow Analysis for Containers Subject to the CT Beverage Container Deposit and Redemption Law." Prepared by Danny Macri, Masters in Environmental Management Candidate Yale University, January 2015.

While there are well-founded concerns regarding global demand, pricing and quality requirements for recyclables, demand is expected to remain sufficient to absorb Connecticut's supply of most grades of paper, metals and plastics for the foreseeable future. Since Connecticut is not positioned to influence global markets for these materials, boosting end-use demand is a lower priority than strengthening collection and processing systems.

Areas for Action

- Although there is widespread access to recycling programs covering a broad range of materials, participation and capture rates vary with some communities lagging behind top performers in the state. Recognizing this, Connecticut will take steps to ensure the continuous improvement in municipal systems, as well as promote greater and more effective participation by residents through increased outreach and enforcement.
- Connecticut will increase enforcement of mandatory recycling provisions, with state-led enforcement targeting commercial generators and multi-unit residential dwellings.
- Connecticut will support the implementation of programs that provide technical assistance and compliance assurance and share best management practices for waste reduction, reuse and composting/recycling programs for different business sectors.
- Connecticut will increase outreach and education, including via the RecycleCT Foundation, to promote effective public participation in recycling. Main areas of focus are increasing participation and decreasing the contamination of single-stream recycling collection.
- Connecticut will pursue approaches to reduce the amount of glass collected in single stream and provide other more effective options for recycling glass containers.

e. Increase Source Separation and Composting/Conversion of Food Scraps and Organics

Organics provide the largest opportunity to increase Connecticut waste diversion. According to the 2015 waste composition study, over 926,000 tons of readily compostable organics were disposed, or nearly 40 percent of total MSW disposal. This includes over: 519,000 tons of food waste; 56,000 tons of yard waste (i.e., branches and stumps, prunings and trimmings); 100,000 tons of leaves and grass; and 249,000 tons of compostable paper.

Food waste is generated at every stage of the supply chain. When food is wasted, we are also wasting the fresh water, chemicals, energy, and land used to produce food. Opportunities exist to reduce food wasted at by businesses and households as well as work with businesses and farms to recover more food for human and animal.

The top growth priorities for organics are to strengthen and expand both the collection system (from both residential and commercial generators) and to expand processing capacity at new and existing compost facilities, and at new anaerobic digestion (AD) facilities. The Connecticut collection system for organics is much less developed than for recyclables, at both the residential and commercial levels. While grass, leaves and other yard waste are widely collected, significant quantities remain in the disposal stream.

Collecting food waste efficiently requires identifying commercial routes rich in source separated organics, and this is complicated by Connecticut's demographics and hauler industry structure. Collectors report that some commercial entities find it very challenging and expensive to source separate food waste for separate pick-up. Collecting food waste from residences, especially in winter, is complicated by the very small quantities generated by each household.

There are 118 active leaf composting facilities in Connecticut, with a combined throughput of over 775,000 cubic yards per year of incoming feedstock.⁶ These include 86 municipal facilities, seventeen private facilities, and seven farm-based facilities. Ten of the facilities are identified as accepting grass. Municipal operations tend only to accept leaves generated by that town, and may also provide small quantities of finished compost to residents for free or at a nominal charge. There are also several private leaf composting facilities which have been established in response to the demand for purchasing finished compost and for places to recycle leaves.

In 2016, DEEP was working with the developers of four proposed AD facilities that, once operational, would have a combined capacity of 1,600 TPD. The state also hosts two "volume reduction composting facilities" with combined capacity of 195,365 tons per year and one small-scale composting facility with a capacity of 5,000 cubic yards per year. Securing feedstock is a challenge to financing new processing facilities, as is contamination of feedstock, siting, permitting, and overall economics and financing.

The availability of attractive renewable power contracts could be essential for new AD facilities to be viable, especially given their relatively high capital costs. Subsidization of other Class I renewable energy generation sources such as solar has increased the disparity in capital costs between AD and solar. Clean energy procurements currently underway as part of implementation of P.A. 15-107 include AD facilities as eligible Class I energy resources. Connecticut will need to ensure that potential barriers to development, such as permitting timeframes and pre-development costs, are not preventing participation in incentives.

Areas for Action

- Connecticut will promote the recovery and donation of edible food for human and/or animal consumption.

⁶ See http://www.ct.gov/deep/cwp/view.asp?a=2718&q=325374&depNav_GID=1645

- Connecticut will focus on the effective implementation of the state's laws mandating source separation and recycling for large generators. This includes a focus on assessing the financing and contracting needs for infrastructure development, as well as a program of outreach to affected generators, technical assistance for compliance, and enforcement.
- DEEP will continually evaluate and make improvements to permitting standards and practices to ensure a regulatory climate that welcomes innovation. This includes the establishment of clear guidelines for the management and use of residual digestate of anaerobic processes, and prioritization of applications for facilities that will fill an infrastructure gap.
- DEEP, in partnership with the RecycleCT Foundation, will offer grants for educational programs that encourage food waste reduction, engage in food recovery, provide home composting education, and support community composting initiatives.

f. Increase Recycling and Reuse of Construction & Demolition Materials and Oversize MSW

The 2015 MSW characterization estimates indicate that over 276,000 tons of C&D materials were disposed in the MSW stream, or nearly 12 percent of all disposed MSW. This includes over 132,000 tons of treated wood, 39,000 tons of untreated wood, 29,000 tons of carpet, 13,000 tons of gypsum/wall board and 6,000 tons of asphalt roofing. Over 40,000 tons was counted as "remainder/composite C&D" materials. The 2015 C&D composition study analyzed flows of C&D materials (not defined as MSW) to Connecticut volume reduction facilities estimated disposal of an additional 1.04 million tons, with over: 38 percent being wood, 10 percent asphalt shingles; six percent gypsum/wallboard and 30 percent "other" (including a variety of bulky waste).

The top priority diversion opportunities vary somewhat for each C&D material type, but they span all stages including collection, processing and end-use/consumer demand. A large portion of C&D materials flow to 32 volume reduction plants (VRPs), with a combined permitted capacity of over 130,000 tons per day. These sites handle construction and demolition materials including wood (clean, mixed and treated), cardboard, asphalt roofing shingles, gypsum wallboard, asphalt shingles, asphalt, brick and concrete (ABC), metals, plastic and a variety of bulky items from household demolition or remodel projects. While VRPs may accept asphalt, brick and concrete, most of this material is processed by aggregate facilities, which do not require a permit, so data is not available. In addition, VRPs were traditionally not designed to recover materials for recycling.

Areas for Action

- Connecticut will implement policies to increase source separation at construction/job sites. These policies may include the statutory designation of certain materials for
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mandatory source-separation, and/or the establishment of a building/demolition permit deposit system (to be adopted on a voluntary basis by municipalities) which provides a financial incentive to recycle materials generated at the building or demolition site.

- DEEP will work with collectors and volume reduction facility owners to optimize processes to recover recyclable materials such as cardboard, metals, wood, plastics, and asphalt shingles for end markets.
- DEEP will reassess permit conditions requiring the phase-in to 40 percent recycling of non-designated recyclables at volume reduction facilities, with the goal of establishing ambitious but achievable improvements in the recycling of both designated and non-designated items.
- The state (DEEP and/or MIRA) will study the flow, recycling, and disposal of “oversized MSW” which accounts for as much as 30 percent of the incoming stream at volume reduction facilities. The goal of this study will be to determine opportunities and incentives to increase reuse and recycling, as well as the potential to develop new options for in-state disposal.
- DEEP, in partnership with the RecycleCT Foundation, will offer grants for educational programs that encourage waste reduction, reuse and recycling at construction job sites, or develop innovative programs or pilot projects to divert oversized MSW or “bulky waste” for reuse or recycling.

g. Embrace Technological Approaches to Diversion

As discussed in Section VI, the state faces a likelihood of significant shortfalls in in-state disposal capacity in the coming years with the retirement of existing resource recovery facilities. The state’s 60 percent diversion goal, while calling first for source reduction and increased recycling, also prompts the state to consider a role for waste conversion technologies in diverting materials from landfill and traditional combustion plants. Examples of waste conversion technologies include, but are not limited to anaerobic digestion, gasification, plasma arc gasification, pyrolysis, and hydrolysis/fermentation (waste-to-ethanol).

In addition to waste conversion technologies, eco-industrial parks can be part of a comprehensive approach to diversion. Eco-industrial parks can co-locate multiple recycling / conversion processes with end users of recovered materials, such as mixed waste processing facilities to recover materials from post-recycled MSW, and glass beneficiation facilities.

The Role of Quasi-Public Agencies in Infrastructure Modernization

Development of new materials management infrastructure will require a coordinated state program combining investment, incentives, and siting assistance.

Just as the Connecticut Resources Recovery Authority (CRRRA) developed the state's fleet of recycling facilities and energy recovery plants in place of landfill disposal capacity, the Materials Innovation and Recycling Authority (MIRA, CRRRA's successor in statute), has the potential to facilitate a statewide transition to the next generation of materials management infrastructure. However, there are several challenges that must be overcome before MIRA will be situated to fully lead this transition, some of which are outside of MIRA's direct control. To effectuate a renewed role, DEEP will act as a partner for the MIRA Board of Directors and staff, strengthening existing ties between the two agencies and communicating frequently about matters of shared concern. DEEP will also consider how to encourage municipalities to demonstrate their commitment to regional action in order to provide the necessary certainty in planning and implementing regional or statewide infrastructure investments. In turn, MIRA will provide its vision for infrastructure development and detail the measures required to support the role envisioned by P.A. 14-94.

Because this transition — if successful — will take time, the state must also utilize other approaches to align public financing and investment with materials management goals, including closer coordination between DEEP, the Connecticut Green Bank, and the Department of Economic and Community Development.

Areas for Action

- Connecticut will consider the benefits of waste conversion technologies as part of a diversified portfolio of material management options in the state, and will: a) consider GHG and air pollution emissions in determining technology preferences and develop related performance standards and permit language, b) remove unnecessary regulatory barriers to the issuance of permits to implement these technologies, c) inventory potential sites for such technologies, and d) leverage private investment with public funds when possible to support the development of such facilities in the state.
 - Connecticut will establish a coordinated state program combining investment, incentives, and siting assistance and clarify the roles of various state agencies and the Materials Innovation and Recycling Authority in relation to material management infrastructure development.
 - Connecticut (DEEP and DECD) will conduct a concept study to determine the potential to develop new eco-industrial parks.
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X. CMMS Action Plan

The following Action Plan is founded on the three objectives of this Strategy and presents the actions required to achieve each. Together, these three objectives are central to meeting the state's goal to divert 60 percent of materials from disposal by 2024.

It is important to note that although the objectives and associated actions are presented from a state-level perspective, meaningful progress will depend on the commitment of stakeholders across the system, including state and local governmental agencies, collectors and facilities, producers of materials, and residents.

Objectives

- I. Connecticut must improve the performance of municipal recycling systems and increase compliance with mandatory recycling provisions.
- II. Connecticut must develop and improve recycling and waste conversion technologies.
- III. Corporations that design, produce, and market products must share responsibility for stewarding those materials in an environmentally sustainable manner.

Objective I: Connecticut must improve the performance of municipal recycling systems and increase compliance with mandatory recycling provisions. To achieve 60 percent diversion, Connecticut must boost statewide recycling rates from the current 35 percent to 45 percent over eight years. This will require significant steps by the state and municipalities to improve recycling collection systems, enforcement, and outreach, as well as new measures to promote the source separation of food scraps and certain C&D materials.

Action I(a): Using the authority of the Commissioner to issue orders pursuant to CGS 22a-220, 22a-225, 22a-230, and 22a-241e, DEEP will enforce minimum performance standards for local systems. Under existing statutory authority, DEEP will evaluate the sufficiency of municipal systems and their progress in meeting statewide diversion goals. By statute, all Connecticut municipalities were required to make sufficient progress towards a goal of 25 percent recycling by 2000. Today, municipalities are responsible to make progress towards the state's 60 percent diversion goal, which this Plan estimates to require an average recycling rate of 45 percent (with other gains coming from source reduction and technology-driven waste conversion).

Accordingly, this action focuses on bringing all municipal systems into consistency with the 2000 target of 25 percent recycling by 2018 and 45 percent recycling by 2024.

CGS 22a-220(j) provides the process for a determination of sufficiency and the series of remedial steps that may follow. To paraphrase this section:

1. If DEEP determines that a municipality is making insufficient progress in implementing a recycling program that meets the state's goal, it may issue a notice of deficiency.
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2. Within 30 days, the municipality may provide information to DEEP about impediments to its progress in meeting the goal.
3. After considering this information, DEEP may determine whether deficiencies still exist. If such a determination is made, the municipality will be sent notice and will have 90 days to take remedial actions.
4. If DEEP determines that the municipal recycling system remains deficient after the 90 day period, it may hold a hearing and issue an order to require additional remedial steps to be taken.

Between 2016 and 2018, the following factors will be considered by DEEP as evidence of “sufficient progress in implementing a recycling program.”

- (a) The municipality demonstrates to DEEP’s satisfaction that it has achieved a recycling rate greater than 25 percent, as evidenced by data reported to DEEP in accordance with 22a-220(h) or additional information provided by the municipality.

Or, all of the following standards are met:

- (b) The municipality has implemented, or is in the process of implementing, unit-based pricing consistent with best practices for curbside MSW collection and transfer stations, as applicable. A guidance document with model ordinances and standards for pricing differentials will be provided by DEEP on or before October 1, 2016.
- (c) The municipality has made provision that any resident receiving curbside collection service for trash (whether by municipal or private collector) shall also receive recycling collection using a bin or cart equal or greater in size at a frequency not less than once every two weeks.
- (d) The municipality has ensured that any collector providing service in the municipality complies with registration and reporting requirements in accordance with 22a-220a and contracting provisions.

From 2019-2024, sufficient progress is evidenced by substantial, continuous progress towards 45 percent recycling. It is recommended that DEEP update performance standards consistent with this goal and issue a guidance document on or before December 31, 2018.

For municipal programs determined to be deficient, remedies will be determined based on the nature of the deficiency. These remedies may include, but are not limited to, the following:

- Implementation of standards (b) through (d) above.
 - Establishment and enforcement of performance standards for collectors providing services in the municipality (through a contract).
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- Implementation of public outreach and enforcement initiatives to increase residential and commercial compliance with mandatory recycling provisions.
- Contracting with private collector(s) to improve recycling collection, if applicable.
- Opting in or otherwise participating in recycling collection services offered through “product stewardship” or “extended producer responsibility (EPR)” programs, to the extent that such programs are created in the State of Connecticut.

Implementation Plan			
Action Required	Timeframe	Responsible Parties	Measures of Success
Guidance document on unit-based pricing issued	October 1, 2016	DEEP in consultation with municipal stakeholders	Issuance of guidance document by target date
DEEP reviews sufficiency of municipal programs based on 25 percent recycling and issues notices in accordance with CGS 22a-220 (j)	July 31, 2016-December 31, 2018	DEEP in consultation with municipal stakeholders	-Determinations of sufficiency made, notices sent -Remedial actions implemented as applicable -Programs meet sufficiency standards
DEEP issues guidance document updating performance standards as necessary in accordance with goal of 45 percent recycling	October 1, 2018	DEEP in consultation with municipal stakeholders	Issuance of guidance document by target date, if deemed necessary
DEEP reviews sufficiency of municipal programs based on 45 percent recycling and issues notices in accordance with CGS 22a-220 (j)	January 1, 2019-December 31, 2024	DEEP in consultation with municipal stakeholders	-Determinations of sufficiency made, notices sent -Remedial actions implemented as applicable -Programs meet sufficiency standards

Action I(b): The State will strengthen enforcement of mandatory recycling provisions, including focusing additional resources on areas of high potential impact such as franchised businesses and multi-unit apartment dwellings. DEEP will develop a program of active enforcement of all recycling-related statutes, with a focus on ensuring the collection of designated recyclables, separately from trash, at businesses, job sites, and multi-unit residential dwellings. DEEP will seek to implement enforcement efforts directed at collectors with a robust program focused on generators. Whenever possible, DEEP will conduct these activities in coordination with municipalities.

Implementation Plan			
Action Required	Timeframe	Responsible Parties	Measures of Success
The cross-training of DEEP inspectors to identify recycling compliance issues when visiting businesses of all kinds)	July 31, 2016	DEEP	-Information gathered is used for follow up investigation, outreach, and/or enforcement
The establishment of a web	December 31, 2016	DEEP	-Website live and made known

form for citizens to make reports of noncompliance.			to the public via press release or other announcement -Number of citizen reports received
DEEP investigations and enforcement actions, prompted by citizen reports, of large commercial generators such as franchised businesses.	July 31, 2016 - December 31, 2024	DEEP	-Issuance of notices of violation or other enforcement actions -Remedial steps taken by violators
The development of a more comprehensive civil penalty framework	December 31, 2018	DEEP in consultation with municipal stakeholders.	Civil penalty regulations approved and implemented

Action I(c): The State will promote source separation and recycling of food scraps and compostable organics.

Implementation Plan			
Action Required	Timeframe	Responsible Parties	Measures of Success
Program of outreach to large generators	July 31, 2016	DEEP	-Outreaches made to all large generators -Enforcement for noncompliance initiated
Guidelines for management of residual materials developed	December 31, 2017	DEEP	-Guidance document issued -Language integrated into new permits as necessary
Grant program developed for eligible composting / recycling of food scraps	December 31, 2017	DEEP and RecycleCT	-Grants made -Follow-up report on grant outcomes
Promote food donation	December 31, 2018	DEEP, Foodshare, Food justice groups, grocers, etc.	Strategy to promote food donation established as result of collaborative process

Action I(d): The State will promote source separation and best management practices of recyclable C&D and Oversize MSW materials. Both voluntary and mandatory programs for the source separation and management of materials will be developed, including the following specific steps:

- Implement an initiative to increase source separation of designated recyclables at job sites.
- Designate new materials for recycling, depending on the status of markets of those materials.
- Promote of deconstruction and reuse.
- Develop a model program for municipal building permits that incentivizes recycling and reuse.

- Study opportunities for diversion of oversized MSW as well as increasing in-state disposal options for these materials.

Implementation Plan			
Action Required	Timeframe	Responsible Parties	Measures of Success
Distribute outreach materials that clarify requirements for the source separation of designated recyclables at jobsites, as well as best practices for deconstruction and reuse	December 31, 2016	DEEP in coordination with industry stakeholders and RecycleCT	Materials are distributed to contractors statewide
An evaluation of source-separation practices at job sites is completed, using either inspections, surveys, or discussions with stakeholders	December 31, 2017	DEEP	A report of source separation practices is compiled
A study of reuse, recycling, and disposal options for oversized MSW is completed	December 31, 2018	DEEP and/or MIRA	A report on options is compiled
Designation of certain C&D materials for separate collection at the source of generation, contingent on marketability	December 31, 2018	DEEP, industry stakeholders	New items designated for recycling
Development of pilot program for municipal building permits to incentivize recycling / reuse	December 31, 2018	DEEP, regional recycling authorities, COGs, industry and municipal stakeholders	At least one pilot program adopted in a Connecticut municipality

Action I(e): The State will work with collectors, facilities, and municipalities to implement systems for the accurate reporting of the amount and destination of MSW and C&D waste and recycled materials, including the following specific steps:

- Beginning in 2016, facilities receiving MSW will report whether its origin is residential or commercial.
- Collectors are required to comply with the provisions of CGS 22a-220a, including through utilizing a new online municipal registration reporting system that will be provided by the state by 2018 to streamline and improve collector reporting.
- DEEP will make data available through an annual Materials Management Scorecard, enabling all stakeholders to evaluate progress towards the state's diversion goal.

Implementation Plan			
Action Required	Timeframe	Responsible Parties	Measures of Success
Facility and municipal reporting forms changed to require residential / commercial generation totals	July 31, 2016	DEEP	-Data collected for residential vs. commercial generation
State launches new Material	December 31, 2016	DEEP	-Scorecard published annually

Management Scorecard to track progress to 60 percent diversion			online
Statewide online collector reporting system implemented and provided for use by municipalities and collectors	July 31, 2018	DEEP, BEST, municipal stakeholders, collectors	-Municipalities adopt new system -Universal compliance with registration and reporting

Action I(f): The State will provide outreach/education coordinated by the RecycleCT Foundation. A coordinated program of statewide outreach to promote reuse and recycling will be established, including the development of materials that can be used by municipalities.

Implementation Plan			
Action Required	Timeframe	Responsible Parties	Measures of Success
A statewide marketing campaign focused on optimizing recycling of designated recycling, with focus on uniform messaging for single-stream recycling collection, is launched by RecycleCT in coordination with DEEP	July 31, 2016 - December 31, 2024	RecycleCT, DEEP	-Campaign is launched -Number of impressions -Followup surveys of public awareness -Measurable impacts on recycling behaviors

Objective II: Connecticut must develop and improve recycling and waste conversion technologies. Achieving 60 percent diversion will require at least 10 percent of materials to be diverted using technological processes that are not yet fully developed in the state, and the state must also maintain sufficient disposal capacity for materials that are not diverted.

Action II(a): The State will evaluate and work to remedy regulatory factors that serve to burden or discourage the development of new facilities. While maintaining a focus to the protection of the environment as the first priority, the state will seek to eliminate barriers to the development of new recycling, waste conversion, and disposal facilities that are needed to maintain sufficient in-state capacity and increase the diversion of materials by recycling and waste conversion. This action includes the following specific steps:

- The state will define a new category of waste conversion technologies, distinct from resources recovery and recycling. These technologies will not be subject to the Determination of Need process.
- The state will revise the Determination of Need process to allow for the development of excess disposal capacity in the state.
- The state will refine existing and develop new preferences, performance standards, and permitting language specific to conversion technologies, including anaerobic digestion, gasification, and technologies that convert waste to fuel or other chemical byproducts.
- DEEP will continue to refine its internal processes to ensure timely decisions for new and modified permits while maintaining environmental standards.

- Using an open and transparent process, DEEP will refine and develop new performance standards for recycling and volume reduction facilities and integrate those standards into permit language.

Implementation Action Plan			
Action Required	Timeframe	Responsible Parties	Measures of Success
Define a new category of waste conversion technologies	December 31, 2016	DEEP	
Explore options to revise the Determination of Need process	December 31, 2016	DEEP	
Refine existing and develop new preferences, performance standards, and permitting language specific to waste conversion technologies	December 31, 2018	DEEP and/or MIRA	A report on options is compiled
Continue to refine internal processes to ensure timely decisions for new and modified permits	December 31, 2018	DEEP, industry stakeholders	
Refine and develop new performance standards for recycling and volume reduction facilities	December 31, 2018	DEEP, regional recycling authorities, COGs, industry and municipal stakeholders	

Action II(b): The state will proactively seek the development of new facilities in partnership with MIRA and host municipalities. The state will conduct and maintain a statewide inventory of potential sites for waste facilities and develop concept studies for potential facility developments, including eco-industrial parks. The state will then seek to match municipal partners with project developers.

Implementation Action Plan			
Action Required	Timeframe	Responsible Parties	Measures of Success
Conduct statewide inventory of sites; develop market assessments for needed infrastructure	December 31, 2016	TBD	Statewide inventory created
Develop concept study for eco-industrial parks	December 31, 2017	DEEP, MIRA, DECD	A report detailing the concept is produced
MIRA will provide DEEP and OPM with an evaluation of any steps needed for it to fulfill its statutory role as envisioned by P.A. 14-94	December 31, 2017	MIRA, DEEP	A report is submitted to DEEP

Action II(c): DEEP, MIRA, and Green Bank will identify sources of financing and other investment in the development of new facilities.

Implementation Action Plan			
Action Required	Timeframe	Responsible Parties	Measures of Success
New state program of investment in materials management facility development launched	December 31, 2017	DEEP, MIRA,CT Green Bank	Program launched

Action II(d): The state will leverage intersections between renewable energy, climate, and materials management goals.

Implementation Action Plan			
Action Required	Timeframe	Responsible Parties	Measures of Success
DEEP will explore opportunities to prioritize permitting for Class I resources to enable improved access to time-limited financial incentives (i.e., Virtual Net Metering,)	Ongoing	DEEP	
DEEP will engage municipalities in achieving sustainability goals as part of statewide coordination of sustainability actions to assist municipalities articulate greenhouse gas emissions metrics attributed to solid waste diversion from disposal	Ongoing	Municipal stakeholders	
DEEP will work with CT Green Bank to explore opportunities for pre-development financing customized for anaerobic digestion facilities and other waste conversion technologies	Ongoing	DEEP, CT Green Bank	

Objective III: Corporations that design, produce, and market products must share responsibility for stewarding those materials in an environmentally sustainable manner.

Action III(a): DEEP will work with stakeholders to study and produce an actionable strategy for the implementation of an EPR system to cover most or all materials traditionally handled in the curbside single stream collection system. In doing so, DEEP will consider (1) how such a system could meet the state's goal of 60 percent diversion, (2) how such a system would impact municipal budgets, (3) how such a system would impact the state's economy, and (4) how such a system would impact product/packaging design, including the promotion of recyclability and the reduction of toxicity. It is the goal that this system, should it receive support, would be implemented after 2018.

Implementation Action Plan			
Action Required	Timeframe	Responsible Parties	Measures of Success

DEEP will conduct a process of public input and discussion of various EPR approaches for curbside recycling.	Ongoing	DEEP	Stakeholder/public input gathered and considered
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Action III(b): DEEP will continue to lead efforts to implement EPR programs for targeted materials (e.g. tires, batteries, carpet, etc.)

Implementation Action Plan			
Action Required	Timeframe	Responsible Parties	Measures of Success
DEEP will convene stakeholder dialogues and other opportunities for comment on targeted materials	2016-2024	DEEP	
DEEP will work with stewardship organization(s) to implement EPR programs	2016-2024	DEEP, stewardship organization(s), other stakeholders	-Number of covered materials -Outcomes of individual programs

Action III(c): The state will pursue other approaches to eliminating toxic or problematic materials from the waste stream, including mandatory recycling, disposal bans, bottle bill expansion, and eco-fees.

Implementation Action Plan			
Action Required	Timeframe	Responsible Parties	Measures of Success
Explore approaches to increasing the recycling of glass	July 31, 2016	DEEP	
Determine approaches to problematic materials not covered by existing or planned EPR programs	2016-2024	DEEP	List of priority materials with scientific justification for environmental concern

-END OF MAIN DOCUMENT-