

Act 101 Program Review

Executive Summary

Statewide recycling in Pennsylvania began in 1988 with a state law — the Municipal Waste Planning, Recycling and Waste Reduction Act, or Act 101 — that required larger municipalities and encouraged smaller municipalities to recycle. Act 101 authorized each county to develop a plan to manage its wastes. Each year, the counties report recycling data to the Pennsylvania Department of Environmental Protection (Department or DEP), which consolidates the reports to develop a statewide profile. To fund these programs, the act imposed a \$2-per-ton recycling fee on waste disposed at Pennsylvania municipal waste landfills and waste-to-energy facilities. To date, the fee has not changed. The Recycling Fund has generated approximately \$39 million annually since its inception and Pennsylvania counties have reported recycling more than 132 million tons of materials.

However, in the last two decades there has been approximately \$188 million diverted to other programs including Waste Tire Remediation, Growing Greener, Forest Lands Beautification and General Fund augmentations. The most recent diversion of \$50 million to the General Fund has greatly impeded DEP's ability to implement new plans and new ideas. Stated simply, most of the recommendations in this report cannot be accomplished since adequate resources no longer exist.

Despite this reappropriation, at least 89% of Pennsylvania's population (11.25 million out of a total population of more than 12.7 million) has access to recycling through the Commonwealth's 1,114 municipal curbside collection programs and 775 county and municipal drop-off programs. About 57% of Pennsylvania municipalities have curbside pick-up and/or access to drop-off programs. From 2015 through 2019, DEP awarded approximately 3,700 grants totaling over \$164 million to counties and municipalities to develop and expand local recycling, planning and other waste management programs, for an aggregate of over 24,000 grants totaling over \$887 million since 1988. Public education and market development have also received significant funding over the years. Over the last five years, DEP has invested approximately \$4.2 million in the Commonwealth's Recycling Markets Center.

Over calendar years 2015 - 2019, Pennsylvania's municipal waste landfills and waste-to-energy facilities reportedly received approximately 113 million tons of waste; of this total, approximately 74 million tons of waste were generated in Pennsylvania and approximately 39 million tons were imported. It is estimated that approximately 1.5 million tons were exported to bordering states. This illustrates that there is still work to be done in waste reduction and recycling.

Recycling has tremendous positive impact on the environment and the financial health of Pennsylvania. Because of recycling, nearly 10 million metric tons of carbon dioxide emissions are avoided per year. This is equivalent to removing 2.15 million (or just over 25%) of Pennsylvania's vehicles from the road annually.

Pennsylvania counties reported recycling over 27 million tons from 2015-2018. The 5.5 million tons of material Pennsylvanians recycled in 2018 is enough to fill 212 capitol domes!

There is a cost for collection, transportation and processing for both recycling and disposal. This has been a point of confusion, as many Pennsylvanians are under the false assumption that recycling is free. The significant difference occurs at the end of the cycle when waste is disposed,

whereas recyclables are reintroduced into the economy. At this point, there is no more economic benefit from waste, just the cost of long-term monitoring of disposal facilities. The economic cycle restarts when recyclables are reintroduced as commodities, thus providing exponential economic opportunity and benefits.

There are tremendous economic impacts from recycling in the Commonwealth. As the Recycling Economic Impact study of 2017 illustrated, in 2015, the recycling marketplace directly employed over 66,000 people, while stimulating almost 110,000 indirect and induced jobs. The recycling marketplace contributed \$22.6 billion to Pennsylvania's gross state product. Every dollar of direct activity was matched by another dollar of combined indirect and induced value added. Within state government, in Fiscal Year (FY) 2019, the Department of General Services (DGS) Recycling Program collected nearly 4.5 million pounds of wastepaper in the Harrisburg-area alone, generating over \$45,000 in revenue.

Household hazardous waste (HHW) collection is not mandatory, but many municipalities and third-party sponsors hold numerous collection events each year, following approval by DEP. During FY 2018-19, a total of 236 events were held, at which 6,874 tons of HHW was collected. From 2015-2019, DEP awarded 377 Act 190 grants, totaling \$5.58M, to reimburse HHW program sponsors. These events collected 27,687 tons of materials; enough to fill 75 Boeing 747 airliners.

Electronic waste (e-Waste) can contain metals such as lead, cadmium, and mercury that, if not properly managed, can become hazardous waste. The Covered Device Recycling Act (CDRA) of 2010 established several requirements for manufacturers, retailers, and other entities to facilitate the recycling of electronic devices covered under the CDRA. In 2019, 63 registered manufacturers recycled 56.4 million pounds of e-Waste. Over the last five years, approximately 296 million pounds of e-Waste have been recycled, removing a heavy burden and potentially hazardous materials from the Commonwealth's waste stream. However, many residents still lack the opportunity to recycle televisions in a free and convenient fashion.

As a result of its firm commitment to utilize recycled products whenever possible, the Commonwealth of Pennsylvania purchased more than \$56 million worth of recycled products in FY 2018 and \$201 million worth of recycled products from FY2015-16 to FY 2018-19.

A number of Commonwealth agencies work on special recycling projects statewide. For instance, the Pennsylvania Department of Transportation (PennDOT) uses a wide variety of recycled materials in transportation projects, including plastic, aluminum, glass cullet, scrap tires, reclaimed concrete/asphalt/aggregate, fly ash, steel and blast furnace slag, spent foundry sand, compost, shingle tabs, cellulose fiber and biosolids. Also, in 2019, the Pennsylvania Department of Agriculture (PDA) collected and granulated over 116,000 pounds of plastic pesticide containers for recycling; PDA has multiple collection locations in 51 counties.

The environmental and economic benefits of Act 101 and recycling are real. There exists potential to make positive changes and realize even more benefits in the next few years. However, the continued draining of the Recycling Fund for non-recycling purposes limit DEP's ability to maintain a functioning recycling program, much less implement meaningful and productive change. Without adequate resources, the Department cannot implement many of the proposed improvements highlighted in this report.

The following recommendations will improve and expand DEP's recycling efforts to reduce waste:

- Diversion of organic waste from landfills by funding composting and anaerobic digestion projects.
- Keep recycling funds in the Recycling Fund.
- Support smaller, dual-stream and commingled waste recycling facilities.
- Create Research and Development grants to invest in emerging technologies.
- Fund regional public Material Recovery Facilities (MRFs) to create competition and increase stability in the cost of processing recyclables.
- Reinstigate a Waste Planning Section to evaluate new technologies, product evaluations and the consumption of recyclable materials in Pennsylvania.
- Oversee the development of a comprehensive education program to improve the quality of materials collected.
- Expand access to recycling through convenience centers. Ensure all Pennsylvanians have convenient access to all recycling options.

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Introduction to Act 101

Since the enactment of the Municipal Waste Planning, Recycling and Waste Reduction Act (Act 101) over 30 years ago, there has been a recent, renewed interest in modernizing Pennsylvania's municipal waste management laws. As such, DEP, the waste and recycling industry, local governments, and members of the General Assembly have started to take a closer look at potential amendments to Act 101 due to technology advancements, recycling market conditions, and the necessity to plan for Pennsylvania's next chapter in municipal waste management and recycling. However, the repeated diversion of Act 101 Funds from its intended use for recycling programs has thwarted intentions for change and jeopardizes the continued operation of the Commonwealth's recycling programs.

Evaluations of Act 101 and identification of opportunities for improvement were conducted by DEP and its Solid Waste Advisory Committee (SWAC) and Recycling Fund Advisory Committee (RFAC). These evaluations are integrated throughout this report.

Background

Act 101 was signed into law on July 28, 1988, as the culmination of a greater focus on the management of solid waste both in Pennsylvania and on a national level. This focus was triggered by the widespread attention brought to the illegal disposal of hazardous waste and the resulting groundwater contamination caused by Love Canal in the 1970s. The federal Superfund statute resulted, and the concern with groundwater contamination shifted attention to management of other solid wastes, including municipal waste.

Pennsylvania's focus on municipal waste management and development of stricter regulations dates to 1977. Regulations at the time didn't include liner requirements for landfills and were generally outdated. At the same time, the heightened attention on mismanagement of solid waste and its impacts resulted in the cleanup of smaller scale "town dumps." This led to a landfill capacity crisis that also needed to be addressed. As a result, the 1980s focused on developing comprehensive legislation that integrated municipal waste planning, disposal, and recycling into one of the nation's most successful programs. Consequently, Pennsylvania's updated municipal waste regulations were also promulgated in 1988.

Act 101 listed four major goals (Chapter 1, Section 102, Paragraph (c)):

- 1) At least 25% of all municipal waste and source-separated recyclable materials generated in Pennsylvania on and after January 1, 1997, should be recycled;
- 2) The weight or volume of municipal waste generated per capita in Pennsylvania on January 1, 1997, should, to the greatest extent practicable, be less than the weight or volume of municipal waste generated per capita on the effective date of this act;
- 3) Each person living or working in Pennsylvania shall be taught the economic, environmental and energy value of recycling and waste reduction and shall be encouraged through a variety of means to participate in such activities; and,
- 4) The Commonwealth should, to the greatest extent practicable, procure and use products and materials with recycled content and procure and use materials that are recyclable.

In addition, the minimum goals were to freeze municipal waste generation rates at 1988 levels, recycle 25 (later 35) percent of waste materials, and ensure 10 years of disposal capacity.

Prior to Act 101, Pennsylvania relied on landfills to manage most of its municipal waste. Resources that are now recognized as recyclable commodities were typically hauled away from the alley or curb as trash, illegally dumped, or burned in backyard burn barrels. Pennsylvania counties identified 167,000 tons of materials recycled in 1988. Thirty years later, recycling and composting in Pennsylvania are diverting about 6 million tons from disposal annually.

The last 30 years have seen several amendments to both Act 101 and the municipal waste regulations. In recent years, technology advancements, market conditions, and the necessity to plan for Pennsylvania's next chapter in municipal waste management and recycling have caused DEP to begin to take a closer look at potential amendments to the act.

This evaluation began to take shape in meetings of DEP's Solid Waste Advisory Committee (SWAC) and Recycling Fund Advisory Committee (RFAC) in 2016. Initial priorities discussed in these meetings included universal access to waste collection and recycling; increased and consistent education about recycling; flexibility in developing recycling programs; and the critical need to eliminate the sunset date of the Recycling Fee, as it is the sole funding source for the grant programs established by Act 101. In anticipation of the General Assembly introducing a bill to address the Recycling Fee, DEP staff in the Bureau of Waste Management's (BWM) Division of Waste Minimization and Planning developed a broader list of ideas to be addressed if Act 101 was to be amended. This list was provided to Secretary Patrick McDonnell on August 30, 2016.

In 2017, the renewed interest in Act 101 expanded. The waste industry developed its own list of priorities for amendments and brought these ideas to DEP in meetings held in February, March, and April of 2017. In May, DEP established a planning team to form a workgroup to facilitate discussions amongst the stakeholder groups about amendments to the act. The Act 101 Workgroup was established and was charged with recommending potential amendments to the act that all stakeholder groups could agree were needed ("consensus amendments"). DEP decided to utilize the RFAC as the primary membership of the Workgroup, as it is comprised of representatives of the main stakeholder groups party to Act 101 (i.e., waste and recycling industry, local government, and the legislature). As such, meetings of the Workgroup were held in conjunction with the regular meetings of DEP's SWAC beginning June 29, 2017; and concluding on December 12, 2018. The Workgroup also held two Special Meetings on January 30 and November 5, 2018, for a total of eight meetings. The consensus amendments of the Workgroup were considered in the writing of this document and included to the maximum extent practicable.

Successes

Of the four major goals included in Act 101, Pennsylvania has had the most success related to recycling. The Commonwealth has met and exceeded the first goal of Act 101. In 2018, 5.5 million tons of resources were recycled by Pennsylvanians. Presently, about 90% of the Commonwealth's population has access to some type of recycling. However, given the increased participation in recycling among Pennsylvanians, the goal of recycling 25% of all municipal waste and source-separated recyclable materials generated is no longer an appropriate measure of the success for Pennsylvania's recycling program. The content of the municipal waste stream is

continuously evolving to include more light weight containers which skews weight-based metrics and represents the impacts of the recycling program as stagnant or insignificant.

The Commonwealth has realized measurable economic and environmental benefits from recycling since the enactment of Act 101. The analysis of recycling programs should always include the economic and environmental benefits of recycling versus waste disposal. There is a cost of collection, transportation and processing for both recycling and disposal. This has been a point of confusion, as many Pennsylvanians are under the false assumption that recycling is free. The significant difference occurs at the end of the cycle when waste is disposed, while recyclables are reintroduced into the economy. At this point, there is no more economic benefit from waste, just the cost of long-term monitoring of disposal facilities. The economic cycle restarts when recyclables are reintroduced as commodities, thus providing exponential economic opportunity for an undefined period. These benefits are described in detail under “Benefits of Recycling.”

New Challenges from Recycling Contamination

With the inception of recycling, in many municipalities, residents had to sort their own recycled goods for curbside pickup. This required residents to make sure their glass recyclables were separate from aluminum cans, for example, and be cognizant of the quality of the materials they were recycling. However, advances in technology and a desire to reduce collection costs throughout the 1990s and early 2000s created a “single stream” recycling system that has become the standard in waste recycling among the United States. Single stream recycling allows people to place plastic, paper, glass, aluminum, and other recyclable materials in the same recycling bin which is then taken to a Materials Recovery Facility (MRF) where recycled materials are sorted out and sold.

However, single stream collection and processing of recyclables, as well as a lack of education on what can be recycled and how to recycle across the United States, has led to high levels of contamination of recyclables. Glass is a primary example. Because glass typically breaks at some point in the recycling process; either when it’s dumped into the waste truck, is compacted, or is dumped onto conveyor belts to be processed by a MRF. In the single stream system, this broken glass then ends up contaminating other recycled content like paper or cardboard. Ultimately, MRFs cannot separate recyclables as well as what is done at the home and curbside.

In 2017, China began taking steps to eliminate the importation of waste and ceased purchasing the United States’ recycled content in 2018. Since then, many stakeholders have raised concerns about recycling and markets. Single stream collection and processing of recyclables, as described above, was and continues to be a contributing factor to the loss of China as a viable market.

Single stream technology is still lowering the quality of valuable commodities in the recycling stream and will require significant capital investment if it continues to be the primary collection and processing technology. There are some single stream facilities in Pennsylvania and across the U.S. that generate higher quality materials and focus on domestic markets. These facilities have remained competitive and were less impacted by changes from China. The challenges from single stream technology have resulted in some Pennsylvania communities reverting to commingled, source separated, or dual stream collection; being forced to eliminate glass

collection; and implementing other changes to improve the marketability of the materials they collect.

In response to China's policy change, many Chinese entities are exploring opening MRFs in North America, with the intent to capture North American recyclables without bringing waste and residue back to China. This directly correlates to China's need for large volumes of higher-quality recyclables. Domestic markets are still consuming large amounts of recyclables and are being forced to expand. Those materials that were formerly exported to China are now difficult to recycle, as the quality of those materials is unacceptable for domestic markets. Even after quality improvement occurs, this material competes with that of companies already having long-term relationships with recyclers focused on domestic markets. Markets are also growing and evolving in response to changes in packaging and new consumer products.

It is important to note that the overall recycling marketplace is global; no one country can host or sustain markets for all the recyclables they generate. There will always be fluctuations in the prices for recyclables that mirror the economy. Consistent supply and minimizing contaminants are the best course of action against market fluctuations.

Benefits of Recycling

Economic Impacts

The Commonwealth has realized measurable economic and environmental benefits from recycling since the enactment of Act 101. The business of recycling provides sales revenues, jobs, and tax benefits to the local and state economy. The analysis of recycling programs should always include the economic and environmental benefits of recycling versus waste disposal. There is a cost of collection, transportation and processing for both recycling and disposal. This has been a point of confusion, as many Pennsylvanians are under the false assumption that recycling is free. The significant difference occurs at the end of the cycle when waste is disposed, while recyclables are reintroduced into the economy. At this point, there is no more economic benefit from waste, just the cost of long-term monitoring of disposal facilities. The economic cycle restarts when recyclables are reintroduced as commodities, thus providing exponential economic opportunity for an undefined period.

Employment

- In 2015, the Recycling Marketplace in Pennsylvania directly employed over 66,000 people, while stimulating almost 110,000 indirect and induced jobs.
- Activity related to the Core Recycling Sectors supported over 32,000 direct, indirect and induced jobs. This was matched by over 122,000 Downstream Manufacturing jobs and almost 21,000 Reuse/Remanufacturing jobs.
- For every direct job within the Recycling Marketplace, an additional 1.7 jobs are supported in Pennsylvania.
- For every job associated with the Core Recycling Sectors, an additional 4.4 jobs are supported in Pennsylvania.

Output

- Every \$1,000 in direct output (sales activity) leads to an additional \$700 in indirect and induced sales activity.
- Every \$1,000 of output in the Core Recycling Sectors leads to more than \$5,000 of output across the Downstream Manufacturing and Reuse/Remanufacturing Sectors.
- Every \$1 million in direct output supports six workers throughout the direct, indirect, and induced categories.
- Every \$1 million of output related to the Core Recycling Sectors supports 21 workers in the Recycling Marketplace.

Value-Added Contribution to Gross State Product (GSP)

- In 2015, the Recycling Marketplace contributed \$22.6 billion to Pennsylvania's GSP. Every dollar of direct activity was matched by another dollar of combined indirect and induced value added.
- Activity related to the Core Recycling Sectors lead to \$3.8 billion of value added contribution to GSP in 2015. The corresponding figures for the Downstream Manufacturing and Reuse/Remanufacturing Sectors were \$17.3 and \$1.5 billion, respectively.

Labor Income

- The average labor income per direct job within the Recycling Marketplace was almost \$73,000 in 2015.
- The average labor income across the direct, indirect, and induced categories was \$64,500, approximately 23% above the state average.

Government Revenues

- IHS Markit estimates the Recycling Marketplace generated \$1.7 billion in state and local taxes and \$2.7 billion in federal taxes in 2015.
- Direct economic activity within Pennsylvania totaled \$635 million in state and local taxes and about \$1.3 billion in federal taxes during 2015.
- Activity in the Downstream Manufacturing Sectors lead to \$1.3 billion and \$2.0 billion in federal taxes or about three-quarters of both tax categories.

Environmental Benefits

Costs and benefits of recycling are usually measured in dollars and tons – dollars spent on collection or gained in sales; tons diverted from disposal and marketed as feedstock. Too often, the environmental benefits of recycling — what the planet gains in pollution reduction or resources saved — are not factored into the equation. Public and private sector officials need to be aware that not only is recycling a business, it's also an environmental protection program meant to enhance the quality of life for Pennsylvania's residents and the world.

The United States Environmental Protection Agency's (EPA) Waste Reduction Model (WARM) of May 2019 was created to help solid waste planners and organizations track and voluntarily report greenhouse gas emission reductions, energy savings, and economic impacts from several different waste management practices. Using WARM, the Commonwealth's recycling effort can be converted into environmental benefit equivalencies realized as a result of recycling nearly 27.5 million tons of material between 2015 and 2018.

Recycling reduces greenhouse gas emissions:

- Over 39,682,785 metric tons of CO₂ emissions were avoided.
- This is equivalent to removing 8.57 million vehicles from the road.

Recycling saves energy:

- 6.7 million homes' worth of electricity was saved.
- This is also equivalent to conserving the annual energy use of 4.57 million US households.
- This is also equivalent to saving over 4.4 billion gallons of gasoline!
- This is also equivalent to 1.6 billion BBQ grill propane cylinders!

Recycling saves natural resources:

- Over 268 thousand acres of forest were saved from conversion to cropland.
- This is also equivalent to conserving 51.5 million acres of forest storing carbon.

Recycling in Pennsylvania

2015-2018 Materials Diverted: 27.45 million tons

Introduction

Pennsylvania's recycling program, which requires larger municipalities to recycle and encourages smaller communities to do so, has enjoyed enormous success. When the program started in 1988, less than two percent of the municipal waste generated was recycled. Pennsylvania was fortunate to have glass, metals and paper industries that were already accepting materials for recycling, but in 1988, its total recycling infrastructure was minimal. Despite this, there was great enthusiasm to make recycling work.

The recycling infrastructure developed alongside local collection programs, which provided a consistently growing supply of materials. The \$2-per-ton fee on all waste disposed at municipal waste landfills and incinerators established by Act 101 helped pay for local collection programs, public education, materials processing and composting facilities, equipment, and technical training. DEP and local recycling programs gave top priority to educating the public on recycling materials and buying recycled products. Pacesetter businesses voluntarily established recycling and waste reduction programs; most realized cost savings — some of them enormous — and told other businesses how they did it.

Companies, colleges, individuals, and government agencies took up the challenge to develop new uses for recycled materials, new processes, and new equipment. A number of manufacturers developed uses for waste by-products and thereby increased their profits. In at least one case, a small farm community retrofitted old farm equipment to assist their voluntary recycling program. State and local governments revised procurement procedures to give preference to recycled products and stimulate recycling markets. Retail merchants showcased recycled products. Government and private enterprises constructed “green” buildings using recycled materials and products. The development of computers and the Internet coincided with the expansion of recycling, and stakeholders promptly made use of the wonderful new tools to build more efficient programs. Pennsylvanians were on a creative roll in an environmental cause.

In 2017 and 2018, nearly 1,500 of the Commonwealth’s 2,628 municipalities — representing approximately 89 percent of the population — collected 6.4 and 5.5 million tons of recyclables respectively and delivered them to 179 processing facilities and other markets. All told, Pennsylvania’s 6,373 recycling and reuse establishments employ 175,586 people and do \$50.9 billion worth of business annually. This report celebrates those accomplishments and the Pennsylvanians who make recycling work.

Municipal Recycling Programs

Pennsylvania counties reported recycling over 27 million tons from 2015-2018, the most recent data available.

Mandated Communities

Act 101 mandates recycling in municipalities with populations over 10,000 and those with populations between 5,000 and 10,000 that have population densities greater than 300 persons per square mile. At present, 472 of Pennsylvania’s 2,628 municipalities are mandated to recycle and provide curbside collection programs. These municipalities collect yard and leaf waste and at least three materials from a menu of eight (8) materials — steel/tin and aluminum cans, plastics, clear and colored glass, office paper, newspaper, and corrugated cardboard — from residents. They also provide recycling education and enforce their recycling ordinances.

Non-Mandated Communities

Of the communities not required to recycle, 649 have a voluntary curbside program, of which, 298 are mandated by a local ordinance.

Total Number of Programs

Pennsylvania has a total of 1,930 recycling programs within 1,498 communities across the Commonwealth. These programs serve an estimated 89 percent of the state's population. These programs include 809 municipalities with drop-off programs.

Type of Program	Number of Municipalities
Act 101 Mandated Curbside Collection	472
Mandated by Local Ordinance Curbside Collection (Voluntary)	298
Voluntary Curbside Collection	351
Drop-off Collection	809
Total Number of Programs	1,930

Recyclable Materials

Pennsylvania distinguishes between "standard" and "nonstandard" recyclable materials. "Standard" materials refer to those covered by the U.S. standard recycling calculation, developed by EPA and the Council of State Governments to enable comparisons of recycling results between states. These include all the materials specified in Act 101, plus food wastes, textiles, tires, and white goods (table below). Pennsylvania's recycling programs also collect "non-standard" materials — notably construction and demolition wastes, used oil and aluminum scrap.

Total Tons Recycled by Category, 2015-2018

Material	Total
Single Stream	
[SS1] SINGLE STREAM - All recyclables, including fiber, collected together	3,796,758.05
Commingled	
[XXX] COMMINGLED - 2 or more recyclables collected together, fiber separate	480,633.57
Glass	
[GL1] Clear Glass – bottles, jars	36,504.69
[GL2] Mixed Glass – bottles, jars	86,392.58
[GL3] Green Glass – bottles, jars	8,879.57
[GL4] Brown Glass – bottles, jars	17,227.35
[GL5] Plate Glass	50,177.12
[GL6] Other Glass	30,089.52
Glass Total	229,270.83
Paper	
[C01] Cardboard - corrugated	4,296,857.75
[C02] Brown bags and sacks	13,310.56

[C03] Gabled/Aseptic Cartons - milk, juice, etc.	6,729.43
[PA1] Magazines and Catalogs	54,035.89
[PA2] Newsprint / Newspaper	231,332.01
[PA3] Mixed/Other Paper Grades - junk mail, paper board, computer paper, chipboard	1,110,179.70
[PA4] Office Paper - all high grades	371,812.44
[PA6] Phone Books	5,331.22
[DR3] Drum Fiber	8,158.47
Paper Total	6,097,747.47
Plastics	
[PL1] #1 Plastic (PET) - Polyethylene Terephthalate	19,072.57
[PL2] #2 Plastic (HDPE) - High Density Polyethylene	26,676.98
[PL3] #3 Plastic (PVC) - Unplasticized and Plasticized Polyvinyl Chloride	11,485.52
[PL4] #4 Plastic (LDPE) - Low Density Polyethylene	19,295.58
[PL5] #5 Plastic (PP) - Polypropylene	7,674.85
[PL6] #6 Plastic (PS) - Polystyrene and Expanded Polystyrene	1,959.94
[PL7] Mixed/Other Plastic	103,013.43
[PL8] Film Plastic	36,031.24
[DR1] Drum Plastic (HMW HDPE)	5,904.51
[DR4] Drum Plastic (Mixed Bulky Rigid)	6,759.23
Plastics Total	237,873.85
Metals	
[AA1] Aluminum Cans	37,490.22
[F02] Steel and Bimetallic (Tin) Cans	88,950.23
[MX2] Mixed Cans	13,387.03
[AA2] Aluminum Scrap	150,191.83
[F01] Ferrous metal	2,418,957.29
[N01] Non-ferrous metal	219,709.89
[N02] Copper	43,996.72
[N03] Brass	36,240.29
[N04] Lead	40,990.19
[N05] Stainless Steel	947,336.79
[N10] Nickel	1,512.20
[W01] Wire/Cable	27,471.71
[MM1] Mixed Metals - includes Drum Steel	1,092,498.26
[F03] White Goods	486,539.33
Metals Total	5,605,271.98
Household Hazardous Waste	
[O02] Antifreeze	268.69
[B01] Batteries: Lead-Acid	5,581.50
[B02] Batteries: Other Household	1,432.03
[CR1] E-Waste - includes televisions	78,743.64
[FL1] Fluorescent Tubes and CFLs	557.94
[OL2] Used Oil	4,354.51
[OL3] Oil Filters	113.44
[HHW] Other (paints, varnishes, pesticides, etc.)	4,173.79

Household Hazardous Waste Total	95,225.54
Commercial Hazardous Waste	
[O02] Antifreeze	9,344.29
[B01] Batteries: Lead-Acid	684,571.23
[B02] Batteries: Other Household	5,055.13
[CR1] E-Waste - includes televisions	74,489.53
[FL1] Fluorescent Tubes and CFLs	3,118.89
[OL2] Used Oil	530,579.98
[OL3] Oil Filters	20,110.05
[CHW] Other (paints, varnishes, pesticides, etc.)	8,206.13
Commercial Hazardous Waste Total	1,335,475.23
Other	
[ASP] Asphalt	1,373,841.12
[M01] Rubber Tires	215,808.23
[M02] Construction and Demolition	3,251,383.96
[M03] Clothing/Textiles	61,563.02
[M04] Furniture and Furnishings	46,918.35
[MT1] Mattresses	1,586.69
[MIS] Miscellaneous/Other Consumer Items	122,616.91
Other Total	5,073,718.28
Organics	
[SSF] Source Separated Foods	1,009,146.19
[WW1] Wood Waste	1,126,991.76
[Y01] Yard and Leaf Waste	2,356,164.71
Organics Total	4,492,302.66
Grand Total	27,444,277.46

Act 101 Tonnages Recycled 2015-2018
13,237,187.46

Non-Act 101 Tonnages Recycled 2015-2018
14,207,090

Tons Recycled by DEP Region, 2015-2018

NORTHWEST REGION Meadville Office (814) 332-6945
Tons Recycled....1.535 million

NORTHCENTRAL REGION Williamsport Office (570) 327-3636
Tons Recycled....1.347 million

NORTHEAST REGION Wilkes-Barre Office (570) 826-2511
Tons Recycled....7.871 million

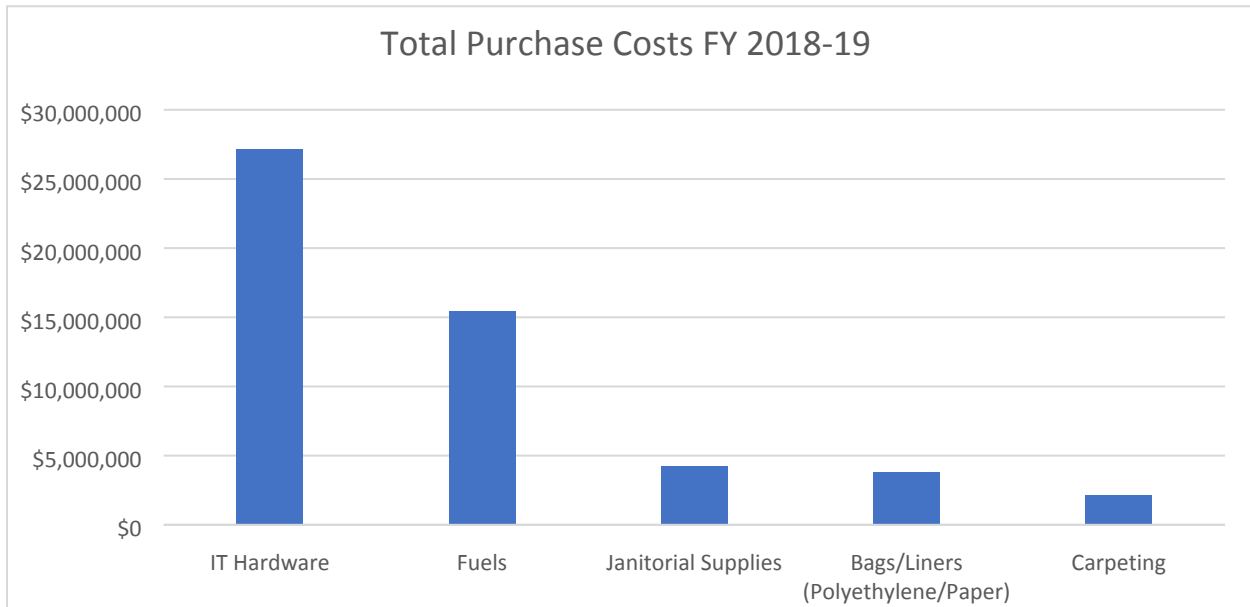
SOUTHWEST REGION Pittsburgh Office (412) 442-4000
Tons Recycled....4.408 million

SOUTHCENTRAL REGION Harrisburg Office (717) 705-4700
Tons Recycled....4.486 million

SOUTHEAST REGION Norristown Office (484) 250-5900
Tons Recycled....7.794 million

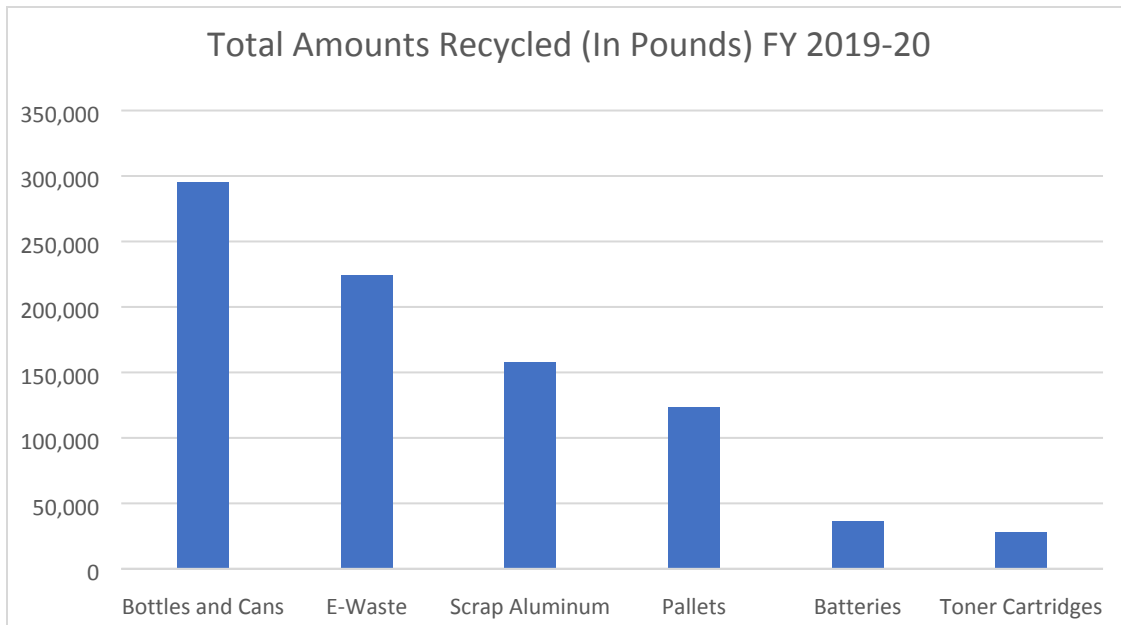
Commonwealth Agency Recycling

As a result of its firm commitment to utilize recycled products whenever possible, the Commonwealth purchased more than \$201 million worth of recycled products from FY 2015-16 to FY 2018-19. In FY 2018-19, the most recent FY with complete data available, the Commonwealth purchased over \$56 million in recycled products. The graph below contains a partial list of recycled products purchased and the amounts spent for FY 2018-19. For more information on state government procurement, visit <https://www.dgs.pa.gov/Materials-Services-Procurement/Pages/default.aspx>.

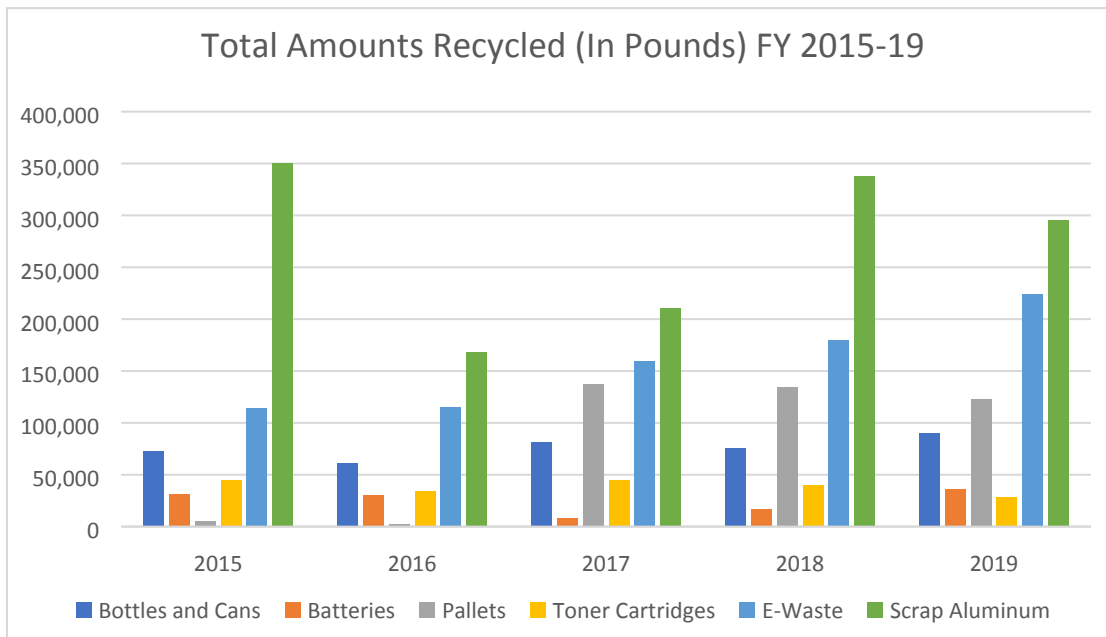


Collected products for recycling is another key component of the Commonwealth's overall plan. In FY 2019-20, DGS's Commonwealth Agency Recycling Program collected over 4.8 million pounds of waste fiber -- 4.4 million pounds of which was collected in Harrisburg -- which generated \$45,432 in total revenue.

The program also recycles numerous other items including bottles and cans, shrink wrap, plastic drums, toner cartridges, batteries, waste oil, electronic waste, pallets, and more. The graph below shows a partial list of the amounts of recycled products collected in FY 2019-20.



The graph below shows a partial list of the amounts of recycled products (in pounds) collected over the last five years.



The total amount of products recycled from these six categories alone – over 1,627 tons -- is seven times the weight of the Statue of Liberty! With that perspective in mind, it's easy to see why DGS's Commonwealth Recycling Program is such an essential part of the everyday operations in Pennsylvania.

Organics Management

DEP supports diverting food and leaf waste from disposal through Act 101 grants and recycling technical assistance for the collection and management of leaf and food waste. Nearly 500 public and private composting and processing facilities exist in Pennsylvania today. This success is due in part to Act 101's prohibition of truckloads primarily comprised of leaf waste from disposal at landfills and waste-to-energy incinerators; and leaf waste collection requirements for Act 101 mandated recycling municipalities. DEP has recently created the Food Recovery Infrastructure Grant program to divert consumable food from disposal by providing approximately \$9.6 million for food banks and associated food distribution entities. These funds allowed these entities to transport, accept, and prepare increased amounts of food that would have previously been disposed.

DEP, via the Energy Programs Office and the Bureau of Waste Management, has initiated a study to identify the renewable energy generation potential from the diversion of institutional, commercial, and industrial (ICI) sources of food waste from the solid waste stream. The scope of this study will focus on food waste that should be recycled following the implementation of prevention and recovery activities as outlined in EPA's Food Waste Hierarchy (<https://www.epa.gov/sustainable-management-food/food-recovery-hierarchy>). The project will result in a statewide assessment - using existing sources of data such as the EPA Excess Food Opportunities Map (<https://www.epa.gov/sustainable-management-food/excess-food-opportunities-map>) as well as other public and propriety datasets - to identify major producers (those generating more than 52 tons per year) of ICI food waste across Pennsylvania. In addition, it will inventory and determine the capacity of current digesting and composting infrastructure to process food waste from ICI sources and calculate the renewable energy generation potential and greenhouse gas emissions reductions from diverting this waste.

This assessment will provide DEP with:

1. The estimated volume and location of major producers of recyclable ICI food waste across the Commonwealth.
2. The capacity and location of facilities to process ICI food waste to the highest and best use through digestion or composting activities. In addition, the assessment will identify facilities that do not currently have the ability to process ICI food waste but could be modified to accept waste with limited capital and programmatic support.
3. Renewable energy generation potential as well as the greenhouse gas emissions reductions from diverting the food waste identified in the assessment.
4. Pursuable short and long-term strategies to increase the rate of diversion of food waste from the solid waste stream, increase renewable energy generation, and reduce greenhouse gas emissions.

The analysis will ultimately provide DEP with the foundation to participate in larger, cross-functional, food waste reduction strategies with other Commonwealth agencies, non-profits, and the private sector. Funding for this project is anticipated to be provided wholly or in part from the United States Department of Energy (DOE) State Energy Program (SEP).

Early data from DEP's Waste Composition Study is revealing that organics continue to comprise more than one third of municipal waste. This portion of the waste stream presents an opportunity to reduce the landfilling of organics and ultimately a reduction in greenhouse gas emissions.

The reduction in the disposal of organic materials is a high priority for DEP. There are several sustainable options to manage organic materials available to residents and businesses of Pennsylvania. DEP will further develop an organics infrastructure that will provide convenient access to food recovery, composting and/or anerobic digestion, prior to a decision to disposal at a municipal waste landfill or processing at a resource recovery facility.

Electronics Recycling

Overview

The Covered Device Recycling Act (CDRA or act), the act of November 23, 2010, P.L. 1083, No. 108, 35 P.S. §§ 6031.101 et seq., established requirements for manufacturers, retailers, and other entities to facilitate the recycling of electronic devices covered under the CDRA.

The CDRA established a producer responsibility program with the objective of offering readily available recycling opportunities to Pennsylvania residents. Under the act, manufacturers shall collect and recycle an amount equal-to or greater-than their two-year prior sales (in pounds) of covered devices. The CDRA also bans the disposal of covered devices in landfills. All costs associated with the collection, transportation, and recycling of covered devices under a CDRA recycling plan are to be paid by the manufacturer, making this one of the few remaining programs where residents do not incur a direct cost for recycling.

What is a Covered Device?

The act defines “covered device” as a computer device or television device marketed and intended for use by a consumer. This includes televisions, desktop computers, laptop computers, computer monitors, tablets, eReaders and computer peripherals.

The table below offers a list of common household electronic devices and their distinction as a covered device under the CDRA.

Type of Device	Covered?
Computer Peripherals (Keyboards, Mice)	YES
Desktop & Laptop Computers	YES
Printers, Scanners & Copiers	YES
Tablets & eReaders	YES
Televisions & Computer Monitors	YES
Air Conditioners, Dehumidifiers, Refrigerators/Freezers	NO
Batteries (Alkaline, Lithium-Ion, Nickel Cadmium)	NO
Camcorders & Digital Cameras	NO
Cellphones, Cordless Telephones, Smartphones	NO
Gaming Consoles (Nintendo, PlayStation, Xbox)	NO
GPS Devices	NO

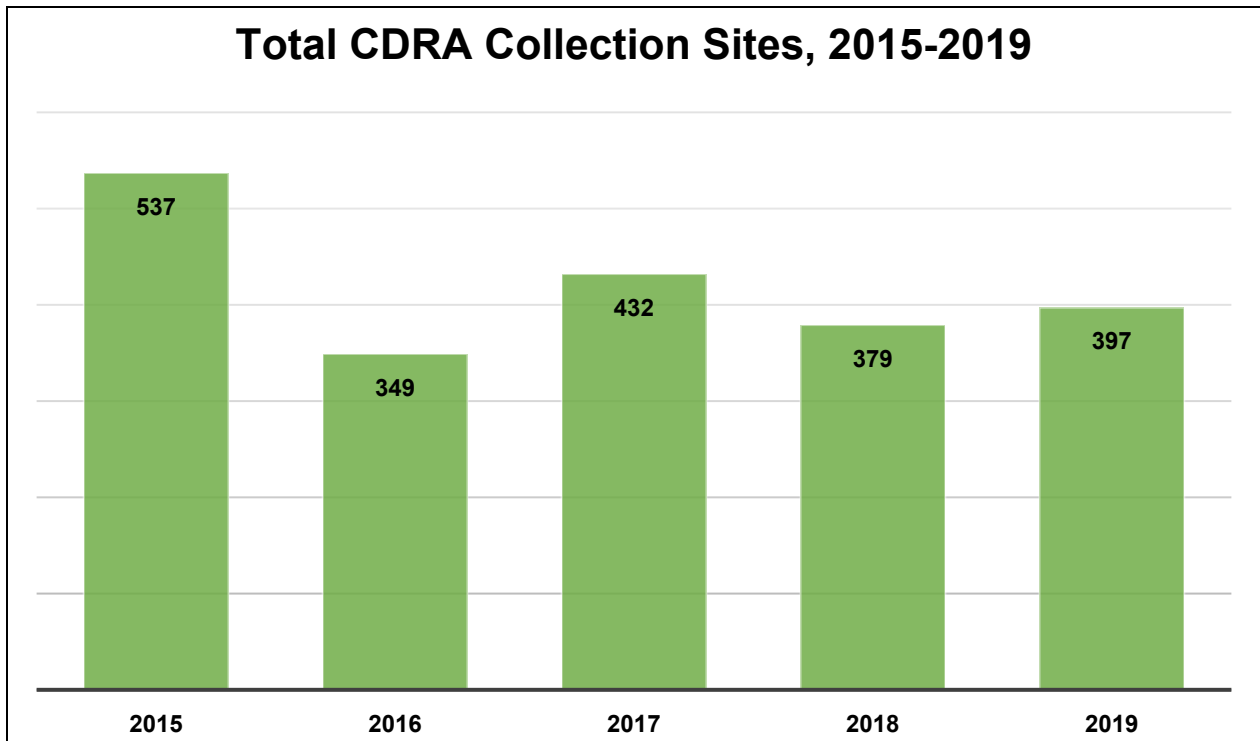
Home Audio Equipment (Radios, Stereo Systems, Speakers/Sound Bars)	NO
Kitchen Appliances (Blenders, Coffee Makers, Microwave Ovens, Toasters)	NO
Major Appliances (Washers, Dryers, Dishwashers, Ranges/Stoves)	NO
Personal Audio Equipment (MP3 Players, Bluetooth Speakers, Headphones)	NO

How does the CDRA affect Pennsylvania residents?

Since the implementation of the act, residents may no longer dispose of covered devices in their municipal solid waste. Instead, the CDRA includes language that requires manufacturers to offer electronics recycling options to Pennsylvania residents. CDRA collections may not collect a fee from residents utilizing this service unless the resident is offered a financial incentive of equal or greater value, such as a coupon or rebate. The financial incentive may come from a retailer offering sale of new covered devices, or a manufacturer of new covered devices. It is important to note that not every electronics collection in Pennsylvania is a CDRA collection program, and those collections acting independent of the act may charge a collection fee to the resident.

The language in the CDRA, as it relates to collection sites, is somewhat indeterminate. While the act requires manufacturers to offer collections to residents, it does not require that all collection sites accept all types of covered devices, nor does it require that all collection sites serve residents of all townships, municipalities, boroughs, cities or counties. In general, CDRA collection sites accept computers and peripherals, while most do not collect televisions and/or computer monitors without restriction. The act requires the DEP to maintain a list of CDRA collection sites. However, it is important to remind residents that not every collection site included on the list will accept televisions, which happen to be the item most likely to be recycled.

The graph below illustrates the annual total number of CDRA collection points for each program year, 2015 through 2019.



There are three annual requirements of covered device manufacturers under the act:

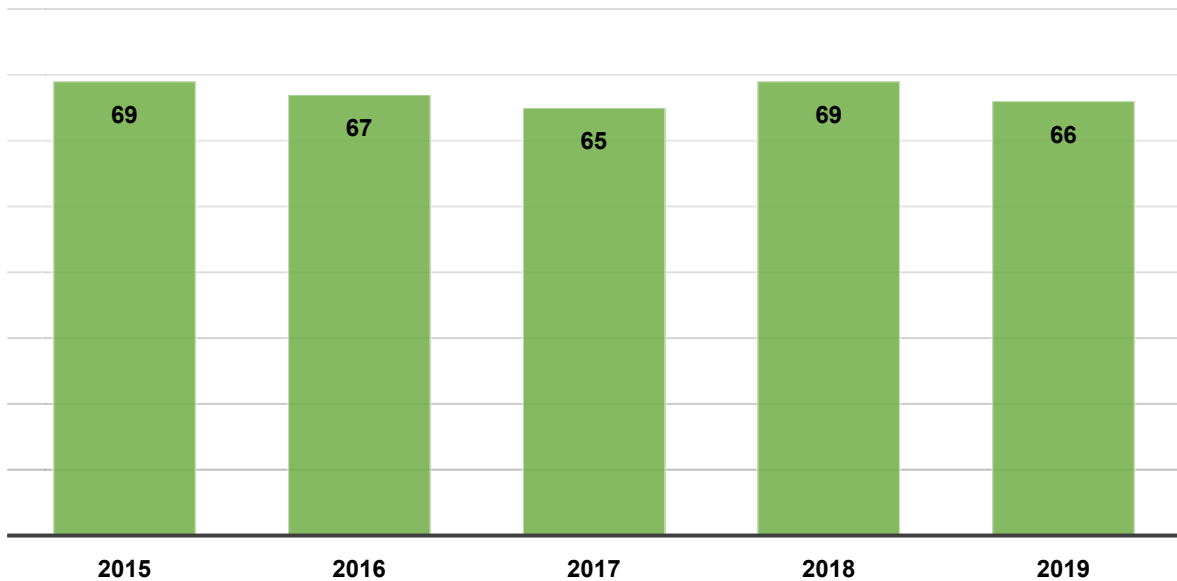
1. Registration

Prior to offering sale of a covered electronic device to Pennsylvania residents, whether through brick and mortar retailers or via online sales, manufacturers are required to complete a CDRA registration form and submit an annual registration fee in the amount of \$5,000. Registration forms and payments are due by August 31st, prior to the beginning of the respective program year. The registration fee is intended to fund the administration of the CDRA program, while the form is completed to satisfy the following data collection requirements under the act:

- Manufacturer contact information;
- Brands manufactured by and/or licensed to each manufacturer;
- Type of device(s) manufactured by and/or licensed to each manufacturer;
- Total weight of covered devices, in pounds, sold nationally during the calendar year two years prior; and
- Total weight of covered devices, in pounds, sold in Pennsylvania during the calendar year two years prior, as calculated using the Pennsylvania population multiplier (historically around 4 percent)

The graph below illustrates the annual total number of manufacturers registered during each program year, 2015 through 2019.

Total Registered Manufacturers, 2015-2019



2. Covered Device Recycling Plan

Once a manufacturer has been selling covered devices in Pennsylvania for two years, they will be required to submit and adhere to an approved Covered Device Recycling Plan (Plan) to collect and recycle an amount of material equal to, or greater than, their Pennsylvania sales weight during the calendar year two years prior, as stated on their CDRA registration form. This is referred to as an “annual recycling obligation”. Plan forms are also due by August 31st, prior to the beginning of their respective program year.

For material to be counted towards a manufacturer’s annual recycling obligation, the material must meet all four of the following criteria:

- Collected from Pennsylvania residents or small businesses (<50 employees);
- Collected at no charge to the resident or small business;
- Collected during the appropriate program year; and
- Recycled by a certified R2 or e-Stewards recycler.

Manufacturers may, and generally do, contract with recyclers and/or collectors to collect, transport and recycle material on their behalf. They may also contract with a group plan manager to satisfy any/all compliance efforts on their behalf.

An approved Covered Device Recycling Plan includes the following:

- A list of all certified recyclers contracted to recycle and process material on behalf of the manufacturer;
- A list of all collection sites to be utilized by Pennsylvania residents, and the types of devices accepted at these sites;
- Instructions associated with the manufacturer’s mail back program, if applicable;
- The total weight of material (in pounds) intended to be collected and recycled; and

- Signatures of intent from the manufacturer and all contracted recyclers, certifying that all material will be collected, transported, recycled, and processed in accordance with the CDRA.

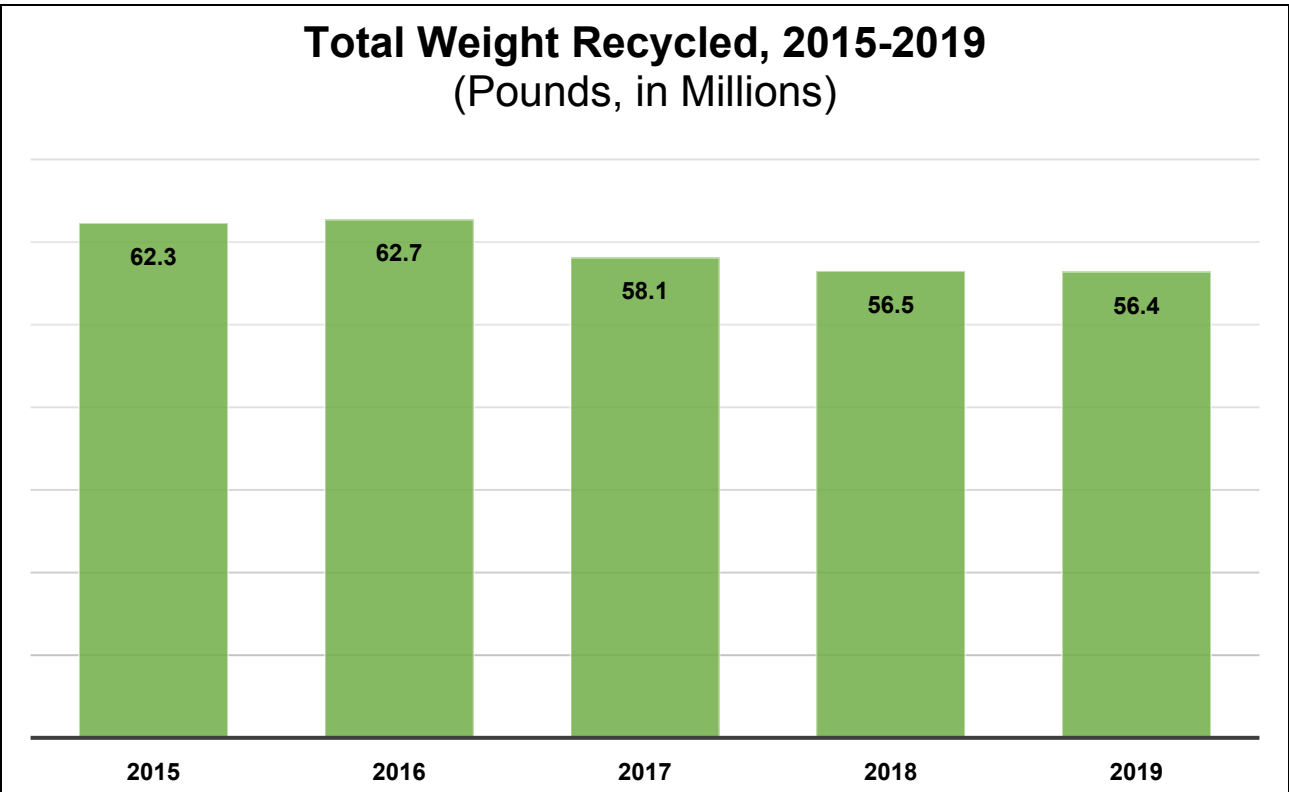
3. Annual Reporting

The annual report form is an end-of-year assessment of the manufacturer's adherence to their approved recycling plan. This form is due by January 31st, following the end of the program year. The data included in the annual report form is used to confirm that the manufacturer has satisfied all recycling requirements under the act. This data is also collected to determine the total weight of covered devices recycled through the CDRA program.

Data collected through the annual report includes:

- A breakdown of the weight of material recycled by each recycler included in the Covered Device Recycling Plan;
- The total weight of material recycled through the Plan;
- Any additional recycling facilities utilized by the manufacturer that may not have been included in the Plan;
- Any additional collection sites utilized by the manufacturer that may not have been included in the Plan;
- A detailed description of how cathode-ray tubes (CRT) were handled and processed by the recyclers included in the Plan; and
- Signatures from the manufacturer and all contracted recyclers, certifying that all material was collected, transported, recycled, and processed in accordance with the CDRA.

The graph below illustrates the total amount of material recycled through the CDRA program during each program year, 2015 through 2019. Through the past five years, a total of over **296 million** pounds of covered devices have been recycled through the CDRA program.



Problems with the CDRA

Since the inception of the program, the most critical issue plaguing the CDRA has been weight-based recycling obligations. Under the act, recycling obligations are based on sales of new covered devices (in pounds), rather than the amount of material residents wish to recycle. As manufacturers continue to produce smaller, lighter devices, residents are almost always purchasing a device that is lighter than the device they are replacing. This has created a situation where buying a new device and recycling the old device is no longer a one-for-one exchange, creating an impasse of material that falls outside the responsibility of the manufacturer to recycle under the CDRA.

Issues continue with the collection and processing infrastructure necessary to implement the CDRA. DEP continues to work with the operators and managers of recycling collection programs to evaluate the existing collection and processing infrastructure. The same concerns DEP has heard previously are more prevalent due to the absence of reliable funding, low market values for materials, and the uncertainty of having the collected material covered by a manufacturer’s plan.

The CDRA has not stimulated a dependable statewide infrastructure to ensure local governments, collectors, and recyclers are able to operate and provide recycling services on a continuing basis. Collection infrastructure continues to be inadequate because recyclers are hesitant to contract with counties as some collected electronics are not covered by manufacturers’ goals.

Televisions and computer monitors that contain cathode ray tubes (CRT) continue to be problematic for recycling due to the leaded glass in the CRTs; absence of low-cost recycling technology; and limited number of CRT processors. The high cost of transporting CRTs to

processors and the actual processing cost is greater than the value of the material recovered, which creates a negative value commodity. In response, some entities have reduced, limited, or eliminated CRTs from collection programs. Nevertheless, the demand for opportunities to recycle old televisions continues to be high. Reports indicate that, by weight, approximately two-thirds of the materials recycled from households are CRT-containing electronics, such as televisions.

Efforts to explore new technologies for processing CRT glass are ongoing; however, none of these efforts have yet to be successfully deployed. In late 2018, a major CRT glass end-market stopped taking shipments, citing regulatory challenges.

The CDRA requires manufacturer programs to provide recycling access to 85 percent of the population; however, the landfill ban prohibiting the landfilling of covered devices applies to 100 percent of the population. These provisions in the CDRA continue to result in a confounding situation for residents that may have limited or no opportunities for recycling but are faced with a landfill ban on the material they wish to discard. A 2019 Pennsylvania Recycling Markets Center analysis reported that collection infrastructure diminished to the point of eight collection sites in Pennsylvania that take covered devices without restriction. This reduction leaves only 23.7 percent of the population with unrestricted access to recycling opportunities under the CDRA. Restrictions on recycling sites invariably involve television recycling. Consequently, the ongoing inadequacy of viable television recycling options has exacerbated the proliferation of illegal television dumping as reported by county recycling coordinators.

Non-CDRA Electronics Collections

Electronics recycling does occur outside the scope of the CDRA in Pennsylvania. Electronics collectors and recyclers are not required to contract with a manufacturer in order to collect or recycle electronics in Pennsylvania and may choose to operate independent of the CDRA and collect items in addition to the covered devices defined in the CDRA. Any electronics collections events held in Pennsylvania must register and meet the approval of DEP prior to accepting material. Recyclers processing this material in Pennsylvania must possess a current R2 or e-Stewards certification, as well as a valid General Permit Number WMGR081 from DEP's Waste Management Program.

Unlike CDRA collections, these collections are not subsidized by electronics manufacturers and may accept payment from the entity hosting the event and/or the resident at the point of collection.

Household Hazardous Waste (HHW)

HHW collection events play a pivotal role in minimizing and managing waste within Pennsylvania. Some examples of HHW are paint, pesticides, pool chemicals, drain cleaners, batteries, and motor oil. Although HHW collection is not mandatory, many municipalities and third-party sponsors hold numerous collection events each year, following approval by the DEP. Below is a chart with relevant data from the last five fiscal years:

Fiscal Year	Total # of Events	# of Participants	Materials Collected (pounds, millions)
2018-19	236	151,795	13.74
2017-18	230	164,871	13.85
2016-17	189	148,237	12.13
2015-16	92	97,187	7.44
2014-15	63	131,835	8.18
Total	810	693,925	55.34

Over 55 million pounds of HHW has been collected across the Commonwealth at one-day and on-going collection events since the start of the 2014 fiscal year. For perspective, that's the equivalent of over 11,000 mid-size automobiles or 75 Boeing 747 airliners! By weight, batteries, used oil and electronics are the most popular items to recycle.

Sponsors of HHW collection programs with DEP approval are eligible to apply for reimbursement of part of the incurred costs. Under the Small Business and Household Pollution Prevention Act (Act 190), DEP can reimburse up to 50 percent of eligible HHW program costs, not exceeding \$100,000 per county per fiscal year. Funding priority is given to existing programs and those operated by counties, multi-county groups, and first- and second-class cities, as required by Act 101. Below is a table listing the total amount of reimbursement for the last five years:

Year	Total HHW Grant Reimbursement
2019	\$1,025,814.47
2018	\$1,186,984.70
2017	\$1,297,243.94
2016	\$973,821.59
2015	\$1,122,821.64
Total	\$5,606,686.34

Total HHW Materials Collected in tons, 2015-2018

<i>Household Hazardous Waste</i>	
Antifreeze	268.69
Batteries: Lead-Acid	5,581.50
Batteries: Other Household	1,432.03
E-Waste - includes televisions	78,743.64
Fluorescent Tubes and CFLs	557.94
Used Oil	4,354.51
Oil Filters	113.44
Other (paints, varnishes, pesticides, etc.)	4,173.79

Household Hazardous Waste Total	95,225.54
Commercial Hazardous Waste	
Antifreeze	9,344.29
Batteries: Lead-Acid	684,571.23
Batteries: Other Household	5,055.13
E-Waste - includes televisions	74,489.53
Fluorescent Tubes and CFLs	3,118.89
Used Oil	530,579.98
Oil Filters	20,110.05
Other (paints, varnishes, pesticides, etc.)	8,206.13
Commercial Hazardous Waste Total	1,335,475.23

Recycling Market Development

Recycling Market Development is a critical component to successful recycling, both to ensure a demand for recycling feedstock on the front end of the manufacturing process, and on the back end as products are produced and ultimately purchased which contain post-consumer Act 101 recycled materials.

Much of the recyclable material collected in Pennsylvania is transported, processed, and converted into commodities within Pennsylvania, contributing to the Commonwealth's economy. Pennsylvania's glass, steel and most paper industries depend on recycled feedstock for their manufacturing processes. The use of recycled plastic containers in the manufacture of laundry product bottles, automotive parts, nursery containers, parking stop bumpers and various forms of plastic lumber continues as a growth industry in Pennsylvania.

Fence posts and split-rail fencing made from recycled plastics in Saylorsburg, Monroe County, can be seen in National Parks and Forests across the country. Recycling receptacles made from recycled aluminum, steel and plastic lumber in Kempton, Berks County, are also distributed widely in the U.S.

Pennsylvania Recycling Markets Center (RMC)

With DEP funding, the Pennsylvania Recycling Markets Center Corporation (501c(3)) (RMC) began operations as a Pennsylvania non-profit corporation in July 2005. Formed and funded by the Department, the RMC was designed to encourage the continued growth and economic health of the Commonwealth's recycling and reuse industries. The existence of the RMC and its functions directly support the market development requirements of the recycling program plan that was legislated in 2002 through Act 175, which amended Act 101.

The RMC has the mission to reduce or eliminate barriers that lead to new expanded use of Pennsylvania's recycled materials. The RMC team brings market development assistance to a near endless list of stakeholders including entrepreneurs, manufacturers, recycled material processors, collection programs, haulers, and governmental agencies. Through market development assistance, the services of the RMC begin at the demand side of the recycled materials market, not with traditional supply at the household or business. The RMC has an

affiliation with the Pennsylvania State University (Penn State) and is headquartered at Penn State Harrisburg with an office in Pittsburgh. Core areas of RMC outreach include feedstock supply connectivity, applied research and commercialization assistance; technology acceleration; and concierge service as a curator of technical and business growth information. Building and supporting Pennsylvania's \$22.6B recycling marketplace with over 120 years of combined professional recycling industry experience, the RMC bridges relationships between economic development and use of Pennsylvania's recycled materials supply.

The RMC is governed by its Board of Directors and supported by a President/CEO and professional staff. With inclusion of ex-officio Board Directorates, there are 26 states represented through the RMC Board, offering broad industry feedback from RMC to the Commonwealth.

Featured Successes

AeroAggregates of North America, LLC

With introductions by an RMC Board Director which followed with RMC technical assistance to AeroAggregates, LLC, the ultra-lightweight foam glass producer is well on its way to success. The team at AeroAggregates demonstrated their vertical climb to success, earning both the RMC 2017 William M. Heenan Markets Development Award and a 2018 Governor's Award for Environmental Excellence.

With capacity this year to produce upwards of 32,000 tons of ultra-lightweight foam glass while using curbside post-consumer, mixed color glass, the engineered lightweight aggregate is used for many applications including structural support along both I-95 in Philadelphia and at the Langley Avenue project in the Philadelphia Naval Yard. Additional applications include sound barriers; growing media; green roof systems; floating blankets; and much more.

Given the ultra-lightweight aggregate is made from recycled glass and a foaming agent, the RMC worked with AeroAggregates to verify that upon laboratory analysis it did not present the silicosis hazard that can accompany use of other aggregates.

Post-consumer recycled glass solutions have expanded greatly while directly benefitting Pennsylvania communities. At a time when processing residues are being questioned, AeroAggregates makes use of post-consumer glass that often ends up in Material Recovery Facilities' residue. AeroAggregates is clearly a circular economy leader, providing value to the local economy and developing high-value, high-volume product from what may have previously been unfeasible to recover.

(L) Ultra-Lightweight Aggregate required in design of new Langley Avenue in Philadelphia Navy Yard expansion. Bottle and container glass sourced from Philadelphia recycling program. Ultra-Lightweight structural, supportive aggregate needed due to fill soils impacted by high water table.

(R) Ultra-Lightweight Aggregate used in Interstate-95 new ramp construction, north Philadelphia near Cottman Avenue. Ultra-Lightweight Aggregate required as a result of unstable soil embankment near project with adjacent, legacy utility lines. Fear of using conventional stabilization media includes damage or crushing of utility services.

PittMoss®

What began as a kitchen experiment in 1994 grew into a part-time venture, a Shark Tank sensation, and ultimately, a successful business that manufactures a sustainable alternative to sphagnum peat moss. PittMoss®, LLC, is a premium provider of horticulture growing media that is not harvested from peat bogs. As environmental issues related to peat mining and carbon emissions become more understood, PittMoss® offers a cost-effective, recycled-content alternative that is better for both plants and the planet.

The RMC assisted PittMoss® by extending their existing product testing, advising on the manufacturing process, and evaluating and securing feedstock. PittMoss® was also a recipient of the William M. Heenan, Jr. Recycling Markets Development Award for its commitment to recycling and innovation. Now, PittMoss is selling about a quarter-million pounds per year of recycled content potting mixes.

The PittMoss® product – a plant-customized, proprietary blend of organic and nutrient additives combined with recycled paper and cardboard – was created to replace the Canadian sphagnum peat moss imported each year by greenhouses, nurseries, and home gardeners. Over the last five years PittMoss is not only proven to grow bigger healthier plants with less water and fertilizer - but also has a profound impact on the environment.

Since its inception, PittMoss has helped reduce carbon emissions by 3,000 metric tons by replacing carbon emitting peat moss. This is the equivalent of burning 3.3 million pounds of coal or driving 7.4 million miles, an astounding feat for such a small, growing company. What most people don't know is that the average bag of peat-based potting soil has a carbon emission equivalent to burning 22 pounds of coal, so for each bag of potting soil replaced by PittMoss, that is how much CO2 emissions can be reduced.

In addition, as manufacturing feedstock, PittMoss has used more than enough paper and cardboard to fill approximately 50,000 average flowerpots. Less quantified is the massive amount of water saved by using this hydrophilic soil replacement as well as an incredible amount of fertilizer runoff reduced since the soil retains nutrients so much better than existing soils.

Weis Markets

Weis Markets, headquartered in Sunbury, Pennsylvania, is a full-service family-owned grocery chain. The company employs more than 19,000 associates in 205 stores and support facilities in Pennsylvania, Maryland, New York, New Jersey, Delaware, Virginia, and West Virginia. Committed to developing a corporate strategy that defines themselves as socially responsible, Weis Markets has implemented a sustainability program to minimize their impact on the environment, including providing recycling opportunities that are convenient and effective.

The RMC has provided technical assistance to Weis Markets by conducting material reduction and recovery evaluations at select stores and ancillary operations. Waste generation and recycling opportunities were evaluated at each location where more than a dozen separate categories of material were sorted, weighed, and volumetrically estimated. Summaries of each included item specific data as well as recommendations for program improvements.

These material evaluations provided Weis Markets with baseline data to better understand the composition of the resources generated at a given store or operation. Moreover, potential opportunities were identified to assist with their journey toward zero waste that involves new waste reduction, reuse, and recycling initiatives. Through the partnership with RMC, Weis Markets has also been able to review the performance of existing material reduction and recycling efforts, particularly food waste diversion programs.

As a result of this RMC assistance, in 2016, Weis Markets has now achieved outstanding “boots on the ground” results. Weis Markets had an increase in recycling of 8.3% when compared to 2015 values, recycling 26,500 tons of cardboard, 607 tons of mixed paper, 786 tons of plastic bags, and 170 tons of recycled prescription pill bottles. This is approximately the equivalent weight of the Capitol Dome at the State Capitol in Harrisburg.

Pennsylvania-Manufactured Recycled-Content Products by Material Type

Wood

- Mulch
- Livestock bedding
- Pallet Refurbishing
- Heritage wood reuse
- Compost

Paper & Cardboard

- Paper cores and tubes
- Peat moss substitute growing media
- 100% and blends of recycled-content office paper
- 100% and blends of recycled-content cardboard
- Absorbent socks
- Notebooks
- Molded fiber packaging
- Livestock bedding
- Cellulose insulation
- Ceiling tile
- Gypsum board
- Paperboard, backing for board games
- Custom molded fiber products and packaging

Tires (Rubber)

- Drain covers
- Pitcher's mats
- Practice mats
- Animal feeders
- Water basins
- Flooring
- Mulch
- Vibration Dampeners
- Turf Shock Padding
- All weather running tracks
- Acoustic noise control
- Modified Asphalt Binders
- Retread and Reused Tires

Plastic

Stormwater drainage systems
Molded plastic packaging
Water-repellent fleece garments
Plastic strapping
Plastic edge protectors
Carpet, acoustic, and thermal fabric for the automotive industry
Parking stops
Waste and recycling roll-out carts
All weather fencing
Nursely pots
Plastic lumber, decking lumber
Bathroom partitions
Watering cans
Plastic drainage pipe
100% and blends recycled-content plastic bottles, #1 & #2
All weather chairs and furniture
Vehicle carpet

Glass

Septic water distribution media
Ultra-Lightweight Foamed Glass Aggregates
Expendable blasting abrasives
100% and blends recycled-content glass bottles and containers
Carpet backing fill
Wastewater solids management, reedbed anchor media
Water filtration media for community pools and spas
Structural PennDOT fill for drainage piping and other infrastructure applications
Cookware and Drinkware

Asphalt Shingles

Asphalt pavement
Crack sealant

Expanded Polystyrene

Picture frames

Gypsum

Lawn & Garden Soil Conditioner
Dairy Bedding and Absorbent
Poultry Litter Amendment
Horse Bedding Amendment
Industrial Fillers
Bulk Waste Solidifier
Non-Potable Water Clarifier

Steel

Piping
Structural Members
Construction Products
Cans and Pails
Reused Auto Parts

Aluminum

Steel Manufacturing Reducing Agents
 Beverage Cans
 Reused Auto Parts

Apparel

Fashion Accessories
 Leather Goods

Electronics

Primary Metals
 Reused Components

Other Commonwealth AgenciesPennsylvania Department of Agriculture:

The Plastic Pesticide Container Recycling (PPCR) Program continues to excel in the quantity of containers recycled. The collection system depends on a network of pesticide distributors and/or commercial pesticide application businesses to accept clean, empty plastic pesticide containers from all types of pesticide applicators, regardless of point-of-purchase. The PPCR program has recycled over 2.4 million pounds of plastic pesticide containers since the program began in 1994 and has served as a model for establishing other programs across the nation.

Plastic Pesticide Container Recycling Program Totals	
Year	Pounds Collected
2015	119,825
2016	N/A
2017	123,365
2018	116,100
2019	116,040

Pennsylvania Department of Transportation (PennDOT):

In cooperation with the DEP since 2000, PennDOT’s Strategic Recycling Program (SRP) has conducted research; implemented and reported on demonstration projects throughout the Commonwealth; and conducted outreach to the engineering community to promote and encourage the use of recycled materials in PennDOT’s operations. Since its inception, the SRP has researched and completed evaluations of scrap tires, crumb rubber, glass cullet, waste plastics, recycled asphalt pavement (RAP), recycled concrete aggregate (RCA), fly ash, various types of slag, asphalt shingles, compost, and more.

Collaborating with district design staff, the SRP has assisted in the implementation and development of Hot In-Place (HIP) recycling of pavements, as well as furthering the use of waste mixed plastics. HIP recycling is an in-situ process which attempts to restore the pavement in preparation for a surface wearing coat placement. In the FY2016/2017 period, three projects encompassing approximately 10.7 miles of roadway in Allegheny, Armstrong and Indiana Counties were a part of the HIP study.

The SRP has also completed research and pilot testing designed to identify opportunities to recycle the Maintenance Department's out of service polyethylene brine tanks into new brine tanks or other products used by the Commonwealth. While unsuccessful in finding an economic solution, this research led to further examination into incorporating hard-to-recycle plastics into asphalt pavements.

PennDOT's SRP team also considered 'waste' recycling of materials generated by PennDOT's operation and routine materials used in maintenance. Specifically, PennDOT recycled and replaced old dilapidated wooden benches and tables with recycled plastic varieties and identified handicap ramps constructed of recycled plastic.

With strong encouragement from DEP, PennDOT's SRP team is assessing the use of various post-consumer plastics in asphalt pavements. Several opportunities that use hard-to-recycle HDPE and LLDPE plastics as an asphalt binder extender are being assessed; these products identify good opportunities for both their potential technical (performance and lifecycle) and cost benefits to PennDOT and the Commonwealth. The SRP team is collecting global performance data and specifications to identify necessary data inputs to PennDOT's design model. The SRP team will collaborate with the RMC to identify a Pennsylvania recycler that can meet the plastics QA/QC and quantity requirements for one or more test sections. It is noted that even at a two or three percent (by weight) substitution within the bitumen equates to thousands of pounds of plastics per lane mile in a 2-inch thick asphalt overlay. PennDOT is optimistic that one or more pilot projects will be planned, implemented, and monitored.

The SRP has also provided support on an engineering project to re-use historically significant Pennsylvania structures. The project entails engineering studies to assess the feasibility and needs to relocate two iron truss bridges located in Chester and Crawford Counties for a trail project located in Tioga County.

Recycling Education

A key goal of Act 101 is to educate residents in Pennsylvania about the benefits of waste reduction and recycling. Education is a critical component of ensuring each generation understands how to recycle and why it is important to do so. DEP has a history of using media campaigns, classroom training, and its recycling website to support local educational programs and statewide initiatives.

However, a change in direction during a previous administration defunded and re-prioritized those efforts. Therefore, many Pennsylvania residents do not understand how to correctly recycle, and the variation of what materials can be recycled on a municipal basis. This leads to further confusion about recycling. To ensure that all Pennsylvanians understand how to recycle and the associated environmental and economic benefits of recycling, the Commonwealth must reprioritize its recycling educational efforts.

Recycling Website

The Commonwealth's online recycling content is among the most frequently visited areas on DEP's website. Generally broken down into two categories – residents and businesses – online visitors can access a wealth of information spanning topics such as household hazardous waste,

composting, electronics recycling, grant opportunities, prescription drug disposal, and much more. Updates regarding the availability of HHW curbside collection programs in Pennsylvania communities, one-day electronic waste and tire collection events, and contact information for county recycling coordinators are posted on a regular basis to ensure residents have access to the most up-to-date information. Frequently asked question sections are a new feature installed on several web pages to simplify the process of safe disposal of potentially harmful materials.

To access these features, as well as the rest of the recycling content available online, please visit the main Recycling and Waste Reduction page at <https://www.dep.pa.gov/Citizens/RecyclingDisposal/Pages/default.aspx>.

Recycling Technical Assistance

For over 20 years, DEP has been providing recycling technical assistance to local governments for improving recycling efficiency. During 2015, the program was conducted in partnership with the Pennsylvania State Association of Township Supervisors; starting in 2016, the program has been conducted by SCS Engineers. The technical assistance is provided at no cost to the local government. Project reports are posted on DEP's website at <https://www.dep.pa.gov/Business/Land/Waste/Recycling/Municipal-Resources/TechnicalAssistance/Pages/default.aspx>.

Below is the list of 59 projects approved from 2015 through 2019:

Municipality	Project Type
Douglass Township	Pay-as-you-throw
Borough of West Chester	Food Waste
York County SWA	C&D Waste
Centre Region COG	Brush Collection
Borough of Ambridge	Review of Program
City of Washington	Review of Program
Towamensing Township	Drop-off Recycling
South Lebanon Township	Compost Site review
Cambria County SWA	Drop-off Recycling
Crawford County SWA	Recycling Study
West Mead Township	Composting
City of Pittsburgh	Curbside Recycling
Clearfield County SWA	Convenience Center
Borough of West Chester	Collection Evaluation
Plainfield Township	Collection Evaluation
City of Reading	Yard Waste Processing
East Greenville Borough	Recycling Program Efficiency
City of Harrisburg	School Recycling
City of Philadelphia	Recycling at Airport
Montgomery County	HHW Collection Site
Morton Borough	Recycling Ordinance
Carlisle Borough	Organics/Leaf Waste
Stroud Township	Pay-as-you-throw
Jefferson County SWA	Drop-off Recycling
Delaware Water Gap Borough	Leaf Collection
Bristol Township	Recycling Education
Dallas Area Municipal Authority	Recycling Evaluation
Uwchlan Township	Glass/Single Stream
City of Scranton	Pay-as-you-throw
Allen Township	Curbside leaf collection service
Greenville Borough	Commercial recycling

Willistown Township	Curbside Recycling
Bridgeport Borough	Curbside Recycling
Clinton County Solid Waste Authority	Recycling Education
Borough of Geistown	Composting
Milford Borough	Curbside Recycling
Greenville Borough	Residential recycling
West Brandywine Township	Recycling Ordinance
West Caln Township	Recycling Ordinance
Media Borough	Food Waste
Zelienople Borough	Curbside Recycling
Hatboro Borough	Curbside Recycling
Wernersville Borough	Organics/Leaf Waste
Tredyffrin Township	Recycling Ordinance
Caln Township	Recycling Program Improvements
Upper Dublin Township	Composting - food scraps
Harborcreek Township	Composting
Lower Frederick Township	Curbside Recycling
City of New Kensington	Recycling Program Improvements
Fayette County	Recycling Program Review
City of Reading	SW Education & Enforcement Program (SWEEP)
City of Altoona	Material Recovery Facility Opportunities
Spring Township	Composting Opportunities
West Grove Borough	Recycling Collection Efficiency
Pike County	Residential Recycling Guide
Franklin Park Borough	Recycling Contamination Issues
Cumberland County	Yard Waste Equipment Sharing Program
Butler Township	Commercial Recycling/ Solid Waste Ordinance
Upper Chichester Township	Collection Evaluation

Pennsylvania Recycling Hotline

The Commonwealth's toll-free Recycling Hotline (1-800-346-4242) has operated since 1984 to assist Pennsylvanians who need to know where to recycle. Over the years, DEP has expanded the hotline's services to take requests for literature on recycling, recycled products, used oil recycling and household hazardous waste. The hotline provides feedback on the reach of DEP's print and media advertising efforts, as well as weekly reports on calling trends, including the origin and nature of calls. In 2019, the hotline accepted just over 1,700 calls, for an average of 33 calls per week. For that year, the majority of calls received concerned covered devices (TVs, computer equipment). In fact, there was not a week where covered devices were not the leading item of concern; they averaged 46% of the calls, with some weeks accounting for up to 70% of the calls

Used Oil Recycling

Some programs collect and recycle wastes that cause problems when improperly disposed. Fifty counties have sites that accept waste oil (motor oil, used oil, cooking oil/grease, oil gasoline mixture) from the public.

Act 89 of 1982, the Used Oil Recycling Act, established a voluntary, statewide program to collect and recycle used motor oil generated by people who change their own oil. The program depends on the voluntary participation of service stations, garages, and other sites able to accept used oil from the public. Currently, 564 sites in 50 counties accept used oil.

Do-it-yourself oil changers can obtain used oil recycling information on DEP’s website using www.dep.pa.gov/Citizens/RecyclingDisposal/MotorOil/Pages/default.aspx or by calling the Pennsylvania Recycling Hotline. Collection sites are listed by county and include addresses, telephone numbers and hours of operation.

Municipal Waste Management Planning Generation & Disposal

Pennsylvania’s ample disposal capacity at municipal waste landfills and resource recovery facilities, and its proximity to other populous states, results in a net importation of municipal waste. Over the last five years, 39 million tons, or 35 percent, of the waste disposed in Pennsylvania municipal waste landfills and resource recovery facilities originated in 25 other states, the District of Columbia and Puerto Rico. Pennsylvania relies on other states for disposal of minor amounts of municipal waste and for disposal of all hazardous waste generated in the state. It is estimated that during those five years, the Commonwealth exported approximately 1.5 million tons of municipal waste to bordering states. This data coupled with the recycling data provides the monitoring, analysis, and planning for the integrated management of municipal waste. The ability to manage and analyze this data is essential to plan successful programs and prioritize regulatory and statutory changes.

The re-creation of the Waste Planning Section would provide DEP the insight, data and analysis needed to modify programs, policies, and regulations in accordance with the evolution of current waste management and recycling technologies and practices. Planning is a foundational element of Act 101 and is of the utmost importance to any attempt to modernize Act 101.

Municipal Solid Waste Disposed 2015-2019: Tons by Origin

Total Waste	<u>Total Waste Disposed</u>	<u>In-State</u>	<u>Out-of-State</u>
CY 2015	21,420,797.30	14,307,779.90	7,113,017.40
CY 2016	21,441,348.80	13,899,022.90	7,542,325.90
CY 2017	22,709,554.20	14,853,736.90	7,855,817.30
CY 2018	23,740,088.30	15,445,953.90	8,294,134.40
CY 2019	24,076,523.80	15,544,387.70	8,532,136.10
5 Year Total	113,388,312.40	74,050,881.30	39,337,431.10
*The information for this table is available on the department’s website			

Program Funding

Act 101 programs are financed by a \$2-per-ton recycling fee on all waste disposed in landfills or processed by resource recovery facilities in Pennsylvania. Since the inception of the Recycling

Fund in 1988, the fee has generated \$1.2 billion in revenue and through legislative transfers has provided approximately \$187 million to other environmental programs and the General Fund.

Counties and municipalities receive most of the funding to help pay for their solid waste management programs. This is generally done through the administration of grants. From 2014 through 2019, DEP awarded approximately 3,700 grants totaling over \$164 million to counties and municipalities to develop and expand local recycling, planning and other waste management programs, for an aggregate of over 24,000 grants totaling over \$887 million since 1988. The tables below outline the distribution of these grants over the last five years.

Act 101 Grants

County Planning Grants (§901)	Reimburse 80 percent of the approved costs of preparing county municipal waste management plans and related studies. The grant also reimburses county expenses for HHW education.
Recycling Program Grants (§902)	Reimburse 90 percent of the approved costs of county and municipal recycling programs.
Recycling Coordinator Grants (§903)	Reimburse 50 percent of a county recycling coordinator's salary and approved expenses.
Recycling Performance Grants (§904)	Reward counties and municipalities for recycling results. The grants are based on population and type/weight of materials marketed.
Host Municipality Inspector Grants (§1102)	Reimburse host municipalities 50 percent of the approved costs to employ a certified landfill or resource recovery facility inspector.
Independent Permit Evaluation Grants (§1110)	Pay host municipalities up to \$10,000 for an independent engineering review of a landfill or resource recovery facility permit application.

901 Grant Dollars Awarded by Year, 2015-2019:

Year	2019	2018	2017	2016	2015
Planning grants awarded	5	9	4	4	5
In dollars:	\$355,660	\$404,544	\$222,014	\$215,093	\$289,822
HHW grants awarded	7	9	6	14	n/a
In dollars:	\$222,118	\$275,222	\$180,630	\$556,458	n/a

902 Grant Dollars Awarded by Year, 2015-2019:

Year	2019	2018	2017	2016	2015
Grants Awarded	86	195	n/a	120	102
Dollars awarded, in millions	\$13.3	\$37.2	n/a	\$17.1	\$16.8

903 Grant Dollars Awarded by Year, 2015-2019:

Year	2019	2018	2017	2016	2015
Grants awarded	58	59	58	57	58
Dollars awarded, in millions	\$1.82	\$1.78	\$1.74	\$1.61	\$1.68

904 Grant Dollars Awarded by Year 2015-2018:

Year	2018	2017	2016	2015
Grants awarded	712	688	718	737
Dollars awarded, in millions	\$20.3	\$16.1	\$16.0	\$16.5

1102 Host Inspector Grant Awards

Year	No. Apps Rec'd	Amt. Awarded
2015	31	\$349,440.38
2016	28	\$288,271.17
2017	24	\$240,779.22
2018	24	\$235,322.21
2019	22	\$201,761.64
2020	19	\$146,478.30
TOTAL	148	\$1,462,052.92

Looking to the Future – The Start of a New Decade

As this report was being prepared in mid-2020, there were some exciting projects initiated that will guide and modernize DEP's recycling and waste reduction programs into the future. This report has provided a foundation for these programs, along with concepts for further exploration and specific recommendations to modify Act 101. They are:

Waste**Waste Composition Study and Recyclables Composition Study Update**

In 2020, DEP initiated a \$500,000 waste composition study and recyclables composition study to characterize the municipal waste generated in Pennsylvania. This is an update of a similar study completed in 2003. Understanding the waste stream and its recyclable components is crucial to targeting resources, spending funds wisely and developing an effective recycling program. To obtain a comprehensive profile, waste from residential and commercial generators in urban, suburban, and rural areas will be sorted and weighed in all six DEP regions during each of the four seasons. The waste composition study will provide more accurate data on types of waste generated by Commonwealth residents. The recyclables composition study will characterize various recovered material streams and reject/residue streams at MRFs across Pennsylvania. Both studies will help with future recycling collection and market development efforts.

Universal Waste Collection

It is not possible that a homeowner, no matter the area or amount of land owned, can properly dispose of their waste on their own property. It is usually (in whole or in part) burned or buried on their property or illegally dumped in another area, violating Pennsylvania law, and causing environmental degradation. Some residents will utilize the waste receptacles of their neighbors or nearby businesses to dispose of their trash, either with consent or surreptitiously; this practice is a theft of services since the generator pays nothing for collection/disposal.

In order to be eligible for several existing Act 101 recycling grants, the applicant must have a mandatory waste collection program. There is a correlation between participating in a waste program and engaging a maximum effort to recycle. If one can burn, bury, or otherwise toss away unwanted materials, one is less likely to take the time and effort to recycle.

Act 101 should be modified to require all residents (directly or through a county ordinance) to utilize a waste collection service (county convenience centers and rural transfer facilities, discussed below, would both qualify). This would aid greatly in eliminating open burning and illegal dumping and disposal.

Disposal Bans

Metals and corrugated cardboard are a valuable resource that can and should be used rather than mining or cutting down trees for virgin materials. The market value of these materials remains high even with fluctuations in the overall recycling market. This makes it feasible to ban disposal of these materials for maximum benefit to the environment without being overly burdensome to local municipalities and the waste and recycling industries. The infrastructure for recycling these materials can be strengthened by:

- Modifying the municipal waste regulations to require additional processing at landfills and resource recovery facilities
- Modifying Act 101 to require municipal drop-offs specifically for aluminum, metal, and corrugated cardboard; and the municipal waste regulations to create a permit-by-rule (PBR) for Rural Transfer Facilities to help manage these materials
- Annually evaluating the feasibility of banning disposal of additional materials

In addition to taking steps to conduct an updated waste composition study as described above (see #3), the Bureau has begun development of regulatory changes to create a municipal waste PBR for rural transfer facilities to help inform the feasibility of banning disposal of these and additional materials. In addition to informing disposal bans, DEP will gain knowledge on the content of Pennsylvania's waste and recycling stream to better understand how these materials can be managed most effectively and efficiently by all stakeholders. A new PBR will provide a streamlined way to authorize additional management opportunities for these materials to be recycled in areas of the Commonwealth where curbside collection isn't immediately available, thereby capturing more of these materials for recycling.

Burn Ban

According to the Pennsylvania Department of Conservation and Natural Resources, one of the major causes of forest fires in Pennsylvania is debris burning. A careless person burning trash or yard waste can be responsible for causing wildfires that burn thousands of acres of valuable Pennsylvania forests. These fires most frequently start in someone's backyard and travel through dead grass and leaves into bordering woodlands. In fact, ninety-eight percent of the wildfires in

Pennsylvania are a direct result of people's actions, and place emergency responders directly in harm's way. They also tie up emergency responders and apparatus that serve the community in the event of traffic accidents, house fires, and other emergencies.

In the first quarter of 2020, fifty-one (51) wildfires occurred in southeastern Pennsylvania alone, resulting in one death. Most of these fires were the result of someone burning trash, brush, or vegetation. (Reading Eagle, March 1, 2020)

An EPA report published in November 1997 shows that a single household burn barrel may emit as much toxic chemicals as a well-controlled municipal incinerator.

Residential burning of waste is a dangerous and environmentally hazardous activity. While temporary burn bans have been instituted on a local, county and even state level when extremely dry conditions have been observed, it is time to end the practice of outdoor burning once and for all.

The Solid Waste Management Act (Act 97) requires anyone who burns waste to have a permit from DEP. Clearly DEP doesn't issue permits to individual homeowners to burn waste and recyclables; this provision regulates commercial incinerators and resource recovery facilities.

Act 101 requires certain municipalities to recycle at least three items they choose from a list of eight materials, plus leaf waste, as listed in and defined by Act 101. Burning of materials that are required to be recycled by a municipality is unlawful. However, air quality regulations allow single family dwellings to burn domestic refuse. The contradiction between these laws and regulations is confusing; allows for destruction of valuable commodities; and contributes to the pollution of the air and waters of Pennsylvania.

Act 101 should be modified to:

- Eliminate all open burning of waste.
- Clarify the definition of leaf waste to remove the confusion regarding what materials it includes.
- Eliminate the single-family dwelling domestic refuse burning exemption in the air quality regulations.

County Convenience Centers

A ten-year study (partially funded by DEP) was conducted by Keep Pennsylvania Beautiful in which more than 6,200 illegal dumps were identified across the Commonwealth. The study also conveyed several important findings: 1) remediation of dumping sites does not stop illegal dumping in the area; 2) there is less illegal dumping in areas where there is universal access to waste and recycling collection, and; 3) more than 87% of Pennsylvanians indicated that they would be willing to take their household waste, recyclables, or other items not collected at the curb to a convenient outlet and pay for the service.

The cost per ton to remediate an illegal dump can be 10- to 20-times higher than the cost to properly dispose of the material in the first place. While illegal dumping occurs in every county in the Commonwealth, it is most prevalent in the more rural counties where waste and recycling services are limited or non-existent.

The most prevalent items found in illegal dumps are household trash, construction & demolition waste, and tires. It is also in rural areas where electronic waste is difficult to recycle as few manufacturers' covered device recycling plans cover these areas.

In order to promote convenient local opportunities for responsible waste collection, as well as outlets for the collection of recyclables including electronics and tires, DEP is proposing a program that will support the establishment of rural "convenience centers." The program will provide seed money to establish the centers. For counties Class 6 – 8 (and possibly higher), allowing the development and implementation of county convenience centers would allow for a permanent facility to properly handle waste and recyclables.

These facilities are envisioned to be operated by the county but serviced by private sector businesses. Residents and small businesses would be able to bring waste, recyclables, and other items (e.g. HHW, bulky items) to the facility where these items would be stored until transported for disposal (waste) or processing (recyclables). These facilities will need operate under the rural transfer facilities PBR is already being developed if they plan to accept municipal waste. It is hoped that this program will be available by the end of 2022.

Product Stewardship

Product stewardship is an environmental management strategy that mandates whoever designs, produces, sells, or uses a product takes responsibility for minimizing the product's environmental impact throughout all stages of the product's life cycle, including end of life management. Extended Producer Responsibility, as defined by the Product Stewardship Institute, requires the shifting of financial and management responsibility, with government oversight, upstream to the manufacturer and away from the public sector.

Even prior to the advent of the novel coronavirus COVID-19 and the subsequent shut down of retail stores, consumer preference was moving toward online purchases for at-home deliveries. This preference is resulting in an increase in cardboard, foam, and film plastic materials generated to meet the demand for increased home deliveries. Other than cardboard, these materials are not easily recycled through Pennsylvania's curbside recycling collection programs, leading to an increase in disposal of these items.

DEP believes there is tremendous potential to minimize packaging waste and increase recycling and reuse through the use of product stewardship and extended producer responsibility. Requiring manufacturers and shipping companies to take financial and management responsibility of their products would effectively minimize waste and increase recycling and reuse of these particular materials. Therefore, DEP recommends modifying Act 101 to ensure that companies that manufacture or use packing materials such as foam and film plastic are required to assume the financial and management responsibility of the materials.

In addition to packaging, the disposal of spent solar panels appears to be a growing concern. Between January and March 2019, Pennsylvania saw 1,185 solar installation projects completed (Philadelphia Inquirer, 7/17/2019). The number of solar energy projects continues to grow as panels become more affordable and incentive programs (including those sponsored by the Commonwealth) are offered. However, solar panels do have a useful life, and some of the earliest projects are approaching that time. How these panels can be safely disposed of and where, or can they be recycled, are questions that will need to be answered soon. The manufacturers of these products should play a part in the solution to this issue.

DEP currently implements a producer responsibility program in the Covered Device Recycling Act (CDRA) of 2010, which requires specified electronic devices to be collected, transported, and

recycled by the manufacturers of the electronic devices. While there are inherent problems with the CDRA that minimizes DEP's ability to ensure proper recycling throughout the Commonwealth, using the concept of this producer responsibility law in more effective legislation would strengthen the Commonwealth's producer responsibility efforts when it comes to recycling electronic covered devices.

Reinstitute the Waste Planning Section and Include an Organic Management "CZAR"

The Waste Planning Section was eliminated from the Division of Waste Minimization and Planning in November 2009 (due to staffing cuts). The Section was focused on planning for the future of waste management and recycling; developing educational programs and materials; and documenting program successes and the underlying statistics. The Section should be reinstated with the following priorities:

- Development of informational packages documenting the economic and environmental benefits of recycling.
- Creation of a position to coordinate the management of organic materials in Pennsylvania and ensure counties develop and implement Organics Management Plans (see #7).
- Identification and implementation of industry-specific waste reduction programs and initiatives.

Recycling

2020 Census

With the results of the census (expected in the first half of 2021), the DEP anticipates several municipalities will meet, for the first time, the population thresholds in Act 101 for implementing mandatory curbside recycling programs. These municipalities will be given two years from the official release of the census data to come into compliance. To assist these municipalities, DEP will prioritize their requests for grant funding to cover collection equipment, ordinance development, and education costs.

Uniform County Curbside Programs

Philadelphia is the only Class 1 county in Pennsylvania. Comprised entirely of the City of Philadelphia, its population is mandated to recycle under Act 101. Philadelphia directs and coordinates the recycling practices and message for 1.526 million Pennsylvanians.

Many counties in classes below Philadelphia contain numerous mandated municipalities, encompassing a high percentage of their total county population (e.g., Allegheny, 89%; Bucks, 89.9%, Delaware, 91.3%; Montgomery, 91.5%). Those in Class 2 and 2A (population between 500,000 – 1,499,999), and possibly even Classes 3 – 5 (population between 90,000 – 499,999), could find advantages in being able to implement uniform, county-wide mandated curbside programs. Educational efforts, along with standard practices, would ease confusion and stimulate greater recycling efforts, making the overall program more efficient and effective. Mandating certain counties implement universal recycling, based on their population, is the logical next step from mandating local governments. Mandated counties would implement this requirement via the established planning process.

Education

Professional Recyclers of Pennsylvania (PROP) Partnership

In June of 2020, DEP entered into a partnership with PROP to conduct an extensive outreach to schools (K-12, colleges, and universities, public and private) regarding recycling. This outreach, which is envisioned to proceed well into the decade, will have two main areas of focus: recycling collection programs at schools; and, recycling education. The end results will be a comprehensive understanding of recycling activities within each school (with an emphasis to inspire new and expansive programs) and a vast array of educational materials to encourage students to recycle both at school and at home.

General Recycling and Waste Reduction Education Efforts

Education regarding waste reduction and recycling is a top priority of all the stakeholders party to Act 101, and one of the few items on which the Act 101 Workgroup achieved consensus. Recycling education in particular has been a priority of DEP for even longer; to support this effort, DEP worked with the RMC to conduct a study on the economic and environmental impacts of recycling in the Commonwealth, which has already been discussed. Previous experience with recycling educational programs has indicated they should:

- Normalize programs so recycling can be done the same way at home, work, or play.
- Support a consistent educational message across multiple audiences.
- Include development of a suite of educational materials for use by stakeholders at all levels.

This can be facilitated by reinvigorating DEP's educational campaign, programming and materials pertaining to waste reduction and recycling. The campaign will remind stakeholders of the hierarchy of waste management ("Reduce, Reuse, Recycle") and expand upon the "Recycle" component of the hierarchy. To aid in implementation, DEP will continue to capitalize on its partnership with the RMC to gather and report needed information on recycling and maximize distribution of consistently messaged information to stakeholders.

In addition, DEP can modify existing grant/incentive and permitting programs to require an educational component be considered and/or included in the development of a program or operation.

Organics Recovery & Composting

Food Recovery Infrastructure Grant (FRIG) Program

The recycling and/or reduction of food waste has been a goal of the DEP's for many years. Beginning in late 2018, the Division of Waste Minimization and Planning began to formulate a grant program whereby still-usable food nearing its expiration could be diverted from disposal at farms and retailers and transferred to non-profit food banks and kitchens. The grant would be offered to eligible non-profits to expand their capacity to collect, transport, store, and prepare the diverted food stock to those in need. The timing of the first grant solicitation was set for spring 2020.

With the advent of novel coronavirus COVID-19 and the subsequent increased need to feed and supply a large number of Pennsylvania residents affected by the pandemic, DEP implemented a

comprehensive overhaul of the newly created Food Recovery Infrastructure Grant (FRIG) Program in late April/early May to allow the rapid acceptance and review of applications. The efforts resulted in Governor Wolf's May 21, 2020 announcement of 145 grants to non-profit organizations totaling \$9.7 million. This program significantly increased the amount of fresh produce and dairy products food banks can stock and provide to those in need, eliminated unnecessary food waste, and prevented losses for the Commonwealth's farmers. The FRIG Program improved food security to residents.

Food Recovery Infrastructure Grants Awarded:

Year	2020
Grants Awarded	145
Dollars awarded, in millions	\$9.7

The intent of the FRIG program is to reduce, to the greatest extent practical, the amount of fresh and processed foodstuffs currently entering Pennsylvania's waste stream and feeding those in need. This grant program currently provides the necessary equipment for registered Pennsylvania non-profits to transport, store and prepare recovered fresh foods to feed those in need. The program also assists farmers from having to waste food and dairy products from being disposed. FRIG addresses ongoing food security issues by diverting food waste that would otherwise be disposed in landfills.

Going forward, DEP recommends reinstatement of pre-application conferences with Regional recycling staff. This will eliminate the submission of applications for ineligible projects or by ineligible entities. Pre-application conferences provide invaluable guidance to eligible applicants about what equipment is fundable under FRIG and increase DEP's ability to fund all eligible projects and eliminate or reduce the rejection of ineligible applicants and equipment. The conferences also assist with guidance and instruction on completion of a grant application through the Department of Community and Economic Development's Electronic Single Application (ESA) website. The program estimates more than 20 potential applicants never submitted in the last grant round due to their inability to navigate ESA and follow the detailed instructions.

The FRIG program needs to focus on the importance of nonprofit entities feeding more Pennsylvanians by diverting food that would otherwise be disposed in the Commonwealth. The organization must have an existing food recovery, utilization, and distribution program. The nonprofit will need to demonstrate that they are open and available year-round to feed all those in need and must provide their existing operation schedule. The nonprofit will also need to provide supporting documentation on the amounts of fresh and processed foods being recovered; where they are being recovered (retailers, wholesalers, agriculture organizations, farms, and cooperatives); and the number of residents being fed.

County Food Waste Composting/Digester Grant Program

DEP seeks to develop a grant program specifically to address the amount of food waste being disposed in Pennsylvania. This grant would focus on supporting the construction of food waste composting sites and the purchasing and placement of digester units by counties, municipalities, and other similar entities. The grant would target and divert the growing percentage of food waste currently generated from entering the waste stream.

In order for this grant program to be successful, municipal waste regulations regarding permitting will need to be addressed and modified. One recommendation is to create a PBR for acceptance and processing food waste, coupled with modification of the bonding and other restricting

requirements of existing municipal waste general permit WMGM025. The program proposes the exploration of a county and municipal food waste composting PBR similar to the current yard waste PBR. This PBR will allow immediate implementation of the proposed grant program. These modifications will address the current issues that counties and municipalities have in meeting the requirements in obtaining WMGM025. The permitting process needs to be streamlined in order for the expedited development of food waste composting sites and the purchase and placement of digesters across the Commonwealth.

The grant application would only be available to counties, municipalities, and similar entities. Applicants would need to commit to collect food waste from grocery stores, restaurants, and cafeterias to be eligible. The next phase of the food waste project would be the development of pilot projects for collecting food waste from residents. Applicants would need to demonstrate their proposed food waste recycling program and how the grant would develop and implement the collection, transportation, and processing of food waste. Items eligible for funding under this proposed grant program would include, but not be limited to site preparation of a food waste composting facility, including land development, paving, and fencing; and processing equipment including front-end loaders, windrow turners, trucks, containers and digesters. The ultimate goal of this grant program is for counties and municipalities to possess the ability to divert and properly manage food waste across the Commonwealth.

Work with the Energy Office to Develop a New Statutory Definition of Food Waste Recycling

In order to plan solid waste strategies, it is necessary to understand the waste stream generated by specific populations. To that end, DEP is undertaking a waste characterization study and recycling audit as discussed above. The purpose of the waste characterization study and recycling audit is to identify the amount and types of waste generated by rural, suburban, and urban areas within the Commonwealth, as well as the types and quantities of potentially available recyclable and compostable materials in the waste stream.

DEP and nationwide Waste Composition Studies, along with early results from the current waste composition study, identify food waste as a major portion of the municipal waste stream and there exists a need to identify, locate and evaluate existing facilities' ability and capacity to manage this component of the waste stream. Gathering of data regarding the management of food waste is a foundational element in DEP's strategy to handle various components of the municipal waste stream. DEP has directed the waste characterization study contractor to provide additional consulting services in support of the development of a *Commonwealth of Pennsylvania Food Waste-to-Energy Assessment* for the purpose of identifying the renewable energy generation potential from the diversion of institutional, commercial, and industrial (ICI) sources of food waste from the solid waste stream. This information will be used to evaluate the Commonwealth's current food capacity, areas in need of increased capacity and to prioritize future infrastructure investment.

County Yard Waste Composting Sites and Organics Management Plans

The modification of Act 101 should mandate that all counties are responsible for developing a county-wide yard waste composting program and the development of a county-wide Organics Management Plan. Counties will be required to support their residents and businesses through establishment of at least one facility for yard waste composting as part of their plan. These new requirements will ensure that all county residents and businesses have an accessible and convenient outlet for collected yard waste materials.

There would be different options available to counties to meet the yard waste composting operation mandate. The following are the options counties could select to meet those requirements:

- Counties must continually maintain and update a list of yard waste composting operations within the county. This list must meet the following criteria:
 - 1) Outline details of every municipality located within the county and their specific yard waste collection and processing practices.
 - 2) Identify all DEP-approved yard waste composting facilities, satellite drop-off locations and farms approved for land application of materials that are available to its residents and businesses (public, private and farming operations), including the name, address and hours of operation for all facilities.
 - 3) Identify all current mandated municipal yard waste curbside collection programs and those mandated programs complemented with drop-off locations, including the details of each specific mandatory operation program.
 - 4) The list must be maintained and updated quarterly and made available to DEP and the public.
 - 5) The yard waste operation program list must demonstrate adequate outlets exist for all residents and businesses.

AND

- Counties must operate their own yard waste composting facility and allow all residents to utilize their facility. This program would need to be complemented with satellite drop-off locations at the municipal level for accessibility to all residents and businesses. The county may also work cooperatively with municipal, private, and farming operations to provide accessible outlets for yard waste materials.

OR

- Counties must work in conjunction with municipal and private compost facilities, drop-off locations and farmland application locations to ensure that all county residents and businesses have the ability and access to recycle their yard waste material. Counties may be required to provide additional drop-off locations to meet the mandate.

The mandate to require counties to develop a county-wide Organics Management Plan addresses the ongoing need to capture and divert organic materials from being disposed in landfills or waste incinerators. The county will need to address this concern and reduce organic material from being disposed. The county plan must address the development and implementation for collection, transportation, and processing of organic materials through a yard waste composting educational and promotional program. Such a program is essential for success and ensures consistency of management of materials at all levels and stages. It will be the counties' responsibility for promoting their plan and ensuring all residents and businesses have an accessible outlet for yard waste material. The plan must also address the opportunities for cost savings and economic development.

These proposed modifications to Act 101 will require counties to be responsible for managing a successful county-wide organic program. Organic materials continue to be the greatest component in the municipal waste stream. These proposed changes will require that organic materials are managed as a valuable resource and will provide many benefits to the community. It will reduce the amount of organic materials currently being burned and illegally dumped.

Additionally, it will reduce litter, conserve natural resources, and remove organics from the waste stream. The implemented county-wide organic management plan will enhance and expand the organics management system by having short- and long-term goals.

Financial Incentives for Organics Collections at Grocery Stores, Restaurants and Cafeterias

The two obvious incentives that can be offered to businesses and institutions regarding food waste recycling are avoided collection/disposal costs and a “greener” image. Collection costs tend to be high for these entities because food waste requires a higher collection frequency—whether or not the container is full. If food waste is handled separately from other wastes generated at these facilities, a cost savings could be realized.

DEP recycling staff worked with a school facility in Berks County to assess its waste generation/collection with an eye toward cost reduction. It was found that collection of non-food waste could take place once per week, while a local composting facility (approximately 5 miles away) was willing to accept the food waste—thus lowering overall collection costs.

Approximately 10 years ago, DEP worked with the City of Philadelphia to establish a pilot program for restaurants to manage their food waste. A digester was centrally located within a group of establishments that separated their food waste and brought it for composting. That program continues to be operated successfully. DEP can utilize the success of this project to develop parameters and resources for locating and establishing additional projects.

Another way to facilitate cost avoidance would be through the implementation of a curbside organics collection program. This would be achieved by partnering with the county or the local municipality for the curbside collection of the organic materials. Doing so would require the creation of a grant for counties, municipalities, or similar entities for funding exclusively to collect and transport organic food waste material. Such a program has the potential of playing a huge role in diverting food waste from being disposed in the Commonwealth. The proposed grant would cover costs exclusively for food waste collection equipment. Items eligible for funding under this grant program would include box trucks with lifts, containers, dollies/pallet jacks, and education and training programs.

The need to educate grocery stores, restaurants and cafeterias will be a crucial component for the organics collection program to be successful. The organics collection education program would consist of providing specific details to these businesses and institutions on the preparation of how the organic materials need to be collected. Part of the education would also include how businesses can promote their participation in the food collection/composting program. The environmentally educated public is more apt to patronize a business that is concerned and active regarding waste issues over one that is not. The positive image a business gains from managing its food waste via composting can equate to more customers; more customers equals more revenue.

DEP-Initiated General Permits to Promote Food Waste Recycling

The following general permits need to be evaluated to determine the feasibility for modification and/or combination to facilitate ease of implementation and recognize the specific issues that arise in urban and suburban settings (i.e., proximity to homes, schools and public places; and nuisances that can arise such as odors, vectors, etc.). DEP should also initiate and develop permits that are globally useful to multiple entities and that take into consideration these issues. This task would be best coordinated by the reinstated Planning Section and the Organics Management “Czar.”

WMGM015 - Processing and beneficial use of wood and timber waste (i.e., tree stumps, limbs, clean wood, untreated and unpainted wood and pallets) and the leaf and yard waste as mulch and compost to compliment the mulch production.

WMGM016 - Processing and beneficial use of trees, tree stumps, limbs, clean pallets, untreated and unpainted scrap lumber, packing crates and brush.

WMGM017 - Processing and beneficial use of compost of manure, yard waste, source separated food scraps from food markets, grocery stores, food banks, food distribution centers, school cafeterias and institutions, source-separated newspaper, and source-separated corrugated paper (cardboard) as soil substitute, soil conditioner, fertilizer, mulch or soil amendment

WMGM025 - Composting and beneficial use of the following source-separated wastes: agricultural waste other than mortalities, butcher waste other than whole carcass, food processing waste, pre-consumer and post-consumer food residuals, yard waste, land clearing and grubbing material, untreated wood waste, gypsum wallboard, paper, cardboard, waxed cardboard, virgin paper mill sludge and spent mushroom substrate. The beneficial uses of the finished compost approved in this permit are for use, marketing or distribution as a soil conditioner, soil amendment, fertilizer, mulch or for erosion control. The finished compost is not considered a waste when it has satisfied the conditions of this permit and is ready for use, marketing or distribution as a soil conditioner, soil amendment, fertilizer, mulch or for erosion control.

WMGM027 - Processing of wood waste (clean and uncontaminated land clearing, grubbing and excavation waste, yard waste, and residual and municipal wood scrap) to produce mulch for landscaping purposes; leaf and yard waste, food processing residuals, and spent mushroom substrate (SMS) to produce compost; organic, non-organic residuals with a BTU value of at least 5,000 BTU/lb. for use as alternative fuels; compost, drinking water treatment plant sludge, waste gypsum, foundry sand and SMS with non-waste soils to produce topsoil for landscaping purposes; and clean, uncontaminated rock, stone, gravel, brick, block, concrete and used asphalt for use as a construction material at the processing facility only.

WMGM030 - Composting yard waste facilities between five acres and 15 acres.

WMGM042 - Processing by anaerobic digestion of animal manure generated on a farm to be blended with grease trap waste and pre-and-post consumer food waste from commercial and institutional establishments for beneficial use activity as follows:

- 1.) The methane gas produced by the anaerobic digestion as fuel, including in the production of electricity;
- 2.) The waste solids removed from the digester as animal bedding material at the farm; and
- 3.) The liquid waste and solids removed from the digester as a soil additive for agricultural purposes.

WMGM045 - Processing and beneficial use activities performed by facilities that, at any one time, do not exceed 5 acres and 6,000 cubic yards per acre of wastes as follows:

1.) Processing by mixing or blending, screening, and composting of:

- (a) source separated food processing waste;
- (b) source separated pre-and-post consumer food wastes;
- (c) yard waste;
- (d) unpainted and untreated wood waste;
- (e) source segregated paper and cardboard;
- (f) land clearing and grubbing waste; and
- (g) agricultural waste on an active or abandoned mine site approved by DEP as part of a mine reclamation permit or project.

2.) Beneficial use of the cured compost as a:

- (a) soil additive;
- (b) a mulch for landscaping purposes;
- (c) a fertilizer in normal farming operations or mine reclamation activities; or
- (d) in the production of a manufactured topsoil.

WMGM052 – general permit allows for the use of up to five manufactured Bio-Bins or approved equivalent for the storage of source separated food scraps, fruit, vegetables, breads, meats, fish, and other organic materials until transported to a permitted composting facility.

WMGM053 – general permit allows for the provision of unpackaged bakery, produce and dairy products that are diverted from disposal for beneficial use as a replacement for dry feed for livestock.

Best Management Practices and PBR (permit-by-rule) for Agricultural Operations

DEP has a limited ability to regulate farmers. The aversion of the agriculture community to DEP oversight has resulted in several missed opportunities. Most notably, the composting and digestion of yard waste, manures and food waste is not being implemented anywhere near the level it could be accomplished in the Commonwealth. A cooperative effort between DEP and the Department of Agriculture could create new economic opportunities for the agricultural and waste industries and reduce certain air emissions. Farmers also generate large volumes of plastics with limited options for recycling and costly disposal options.

Act 101 should be modified to require:

- DEP and Department of Agriculture to develop a PBR for on-farm organics management.
- Creation of best management practices for farmers to operate under the PBR.
- Create free organics management education programs for farmers.
- DEP tracking of locations, data, and capacity of these agricultural operations.
- Create co-ops for farmers to recycle the multitude of plastics generated by the agricultural industry.

Emerging Issues & Technologies

Cost for Municipalities

One of the gravest issues facing municipal recycling today is the rising cost of processing single-stream materials. As industry promoted single-stream as a cost-savings option via more efficient collection, and retooled sortation facilities (e.g. MRFs) to accept this combined stream, most municipal curbside programs converted to this system. As such, there are no private MRFs in Pennsylvania dedicated to commingled (dual stream) recycling and only a few small public facilities.

Due to contamination inherent in any program but especially attributable to single-stream, and depressed markets (COVID-19-related and more stringent Asian market standards), single-stream facilities have increased the fees they are charging to process materials by approximately 50%. In many cases, the cost to process recyclables is now greater than the cost to simply dispose of them. This puts pressure on decision-makers to find alternative program methodologies or to shut down programs altogether.

To revise programs to avoid these escalating costs usually entails increased educational efforts and additional/adapted equipment requirements. This also bears a cost which municipalities have historically relied upon DEP to offset (in whole or in part) through recycling grants.

Presently, the Recycling Fund is in a position where it cannot sustain the support necessary to alleviate these forces. Establishing a commingled/dual-stream processing facility for a county or a region would require millions of dollars. Even providing additional collection containers for households to further separate materials could cost tens of thousands of dollars per community—and there are over 1,000 curbside programs in Pennsylvania.

In summary, municipalities have few options to reduce the increasing cost of recycling other than suspending programs completely. DEP has no oversight of private processing facilities (the vast majority of processing capacity in the Commonwealth) and no financial ability at this time to leverage better pricing through the development of commingled/dual-stream competition. Private facilities could be regulated as a utility, thereby ensuring fair and transparent pricing; this would require action by the legislature.

Plastics

Recycling plastics poses a particular challenge going forward as an increasing amount of plastics enter the waste stream. Most plastics are designed for single-use and are petroleum-based, meaning they require considerable pre- and post-use energy for what is often seconds of use by the consumer. Furthermore, many plastic bottles are used for water, a commodity whose infrastructure already exists to be brought into homes and offices. The many different types of plastics make recycling difficult from community to community as end-markets are often unpredictable or non-existent. The many different types of plastics also require additional sorting; this can be particularly costly for those materials seen as contamination. As a result, many plastics end up in landfills or as litter, and in waterways either as bottles or microplastics.

New plastic management technologies are evolving that could assist in repurposing and recycling the vast array of plastics that have been introduced to the waste stream since the inception of Act 101. Listed below are the four primary technologies that have shown the most promise.

- *Depolymerization* turns mono plastic (like PET bottles) back into monomers, which can be re-polymerized into new PET-based products.

- *Solvolysis* (dissolution) is used to break down certain plastics like expanded polystyrene (EPS) into monomers with the aid of solvents.
- *Pyrolysis* converts mixed plastics into tar oil which can be cracked down and further refined for new plastics production.
- *Gasification* is able to process unsorted, uncleaned plastic waste and turn it into syngas, which can be used to build bigger building blocks for new polymers.

Solar Technology

There exist tremendous economic possibilities with continuing to grow the solar energy field. According to the Solar Energy Industries Association (SEIA), in 2020, the United States installed a record of 19.2 gigawatts (GW) of solar power capacity which brought to a total installed of 97.7 GW solar power capacity. Solar power in the United States offsets over 70 million metric tons of carbon dioxide every year, which is like planting almost 1.2 billion trees. Pennsylvania has installed a total solar power of 761.60 megawatts (MW) including 265.00 MW capacity installed in 2020 alone and projected growth of 1,350.28 MW over the next 5 years.

Solar panels, also known as photovoltaic panels or PV panels, are used to convert light from the sun to electricity. The National Renewable Energy Laboratory estimates the useful life of PV systems to be approximately 25 to 40 years depending on various factors such as environmental conditions. Therefore, it is expected that a surge of solar panel disposal will occur in the early 2030's when the first generation of installed solar panels reach their end-of-life. The International Renewable Energy Agency reported that global PV panel recycling or repurposing will provide an estimated stock of 78 million tons of raw materials and other valuable components by 2050. These recoverable materials have been valued at 15 billion dollars and could be used to produce 15 billion new PV modules. Ninety to ninety-seven percent of materials from decommissioned solar panels can be recycled or sold. Solar panel recycling will provide great opportunities for Pennsylvania to add skilled manufacturing jobs in a quickly evolving industry while simultaneously reducing its carbon footprint.

According to SEIA, by weight 80 percent of a typical PV panel is glass and aluminum which are common easily recyclable materials. Europe has demonstrated successful solar panel recycling through enacted laws and developed infrastructure. Some governments have begun developing module waste management and recycling mandates or guidance to promote recovery of valuable commodities such as silver, copper, and aluminum. The European Union added a PV category to its Waste Electrical and Electronic Equipment regulation in 2012, followed by requirements for depollution and material extraction. Countries such as the Republic of Korea, Australia, India, and Japan are developing requirements to ensure PV manufacturers have extended producer responsibilities, product stewardship, and mandatory recycling.

Domestically, Washington is the first state to require recycling of solar panels. Manufacturers are required to finance the takeback and recycling system at no cost to the owner of the PV module. California enacted regulations in 2021 that include PV modules in universal waste management. Solar panel wastes may include heavy metals such as silver, copper, lead, arsenic, cadmium, selenium that at certain levels may be classified as hazardous wastes. However, as universal waste, solar panels can be held on site up to a year, allowing them to be transported to recycling facilities in bulk, and reducing requirements for testing, labeling and paperwork. With EPA authorization in 2020, the change to California's hazardous waste program is federally enforceable.

As reported by SEIA, Pennsylvania has 395 solar related companies, 96 manufacturers, 201 installers/developers and 98 others, but it has only one drop-off location for a solar panel recycling company.

Recommendations & Conclusion

DEP has taken a comprehensive look at the current state of recycling and assessed available resources to prioritize initiatives in addressing climate change and economic recovery. An examination of Act 101 annual reporting data, coupled with early results from the DEP's waste composition study, revealed many opportunities on which DEP could capitalize.

The annual reporting data showed that the Department is not capturing all the recycling that is occurring in Pennsylvania and found clear underreporting in the leveling off and reductions of reporting in materials such as cardboard, plastics and certain metals. Capturing this data means more recycling data can be entered into the EPA WARM model and therefore, result in more quantifiable air emission reductions. Thus, a direct correlation to additional reductions in air emissions that could be captured exists and would further support the Commonwealth's climate change efforts.

Early results from the waste composition study show a significant portion of the current waste stream is organic. There exists tremendous opportunity to divert organics from landfills, and realize reductions in emissions, again in support of the Commonwealth's climate change efforts. Improving these efforts would also bolster the Commonwealth's ability to attract new business involved in recycling, thereby creating jobs, and decreasing emissions.

Further, the Department stresses that since the inception of the Recycling Fund, more than \$230 million has been diverted to other environmental programs and the General Fund. Along with failing to adjust the fee for inflation, which is still reflective of 1988 dollars, this diversion has severely limited the investment DEP can make in recycling infrastructure and, unfortunately, many of the recommendations in this report.

Also hindering recycling efforts and efficiency is the recent trend towards large single stream recycling facilities that have put many smaller, dual-stream and commingled facilities out of business. This transition has eliminated competition and, coupled with a downturn in the global marketplace, has created a situation where these fewer, bigger facilities can charge excessive prices resulting in the loss of some municipal recycling programs.

With adequate resources, DEP's recycling priorities would be:

- Fund projects to ensure food is used to feed Pennsylvanians in need rather than disposed.
- Fund projects to increase the diversion of organics to composting and anaerobic digestions.
- Create Research and Development grants to evaluate and invest in emerging technologies.
- Fund regional public Material Recovery Facilities to create competition and increase stability in the cost of processing recyclables.
- Create new General Permits for a variety of organic materials.
- Reestablish a Waste Planning Section to evaluate new technologies, product evaluations and the consumption of recyclable materials in Pennsylvania.

- Oversee the development of a comprehensive education program to improve the quality of materials collected.
- Expand access to recycling through convenience centers. Ensure all Pennsylvanians have convenient access to all recycling options.

Additionally, the following changes would be recommended:

Statutory

- Prohibit certain materials from disposal.
- Require communities to collect all eight mandated materials.
- Require all business to implement recycling programs.
- Require increased recycling and recovery at landfills, resources recovery facilities and transfer stations.
- Increase the recycling fee to be consistent with current economics and provide real limitations on its use.
- Increase frequency of education efforts required by local governments.
- Implement phased-in organic collection requirements for certain municipalities.
- Clearly delineate recycling from resource recovery to address the inconsistencies between Act 101 and recently passed HB1810.

Policy

- Set aside funding for public Material Recovery Facilities.
- Provide enforcement/compliance assistance guidance for communities to gain compliance among commercial entities operating within their jurisdictions.
- Create guidance on commercial and residential waste reduction strategies.
- Increase focus on reuse through existing businesses and provide grants for their expansion.
- Refocus on the hierarchy of Reduce – Reuse – Recycle.
- Work with the Green Government Council to prioritize recycling among all state agencies.

Regulatory

- Clarify County Coordinator requirements.
- Eliminate the unnecessary air pollution and groundwater contamination associated with open burning waste.
- Expand county planning requirements to encompass more coordination of their respective recycling programs.
- Expand public participation in the county planning process.
- Allow counties to plan for the management of items like waste tire, leaf waste, HHW etc.
- Include specific reporting requirements for waste haulers to ensure recycling is properly reported.
- Clarify certification and decertification requirements for Host Municipal inspectors.
- Clarify general HHW requirements for ongoing programs.
- Update county and municipal scope and authority to implement recycling programs.

In closing, recycling is the most recognized environmental program in Pennsylvania and contributes significantly to environmental protection and climate initiatives, while simultaneously strengthening the economy and employment. As such, the Commonwealth's residents and

recycling industries would be well-served by the implementation of the proposed changes outlined in this program review. However, the Department understands that not all the changes would be implemented, but those where consensus could be reached would still provide considerable positive environmental and economic benefits.