# Increased Recycling Initiative

**Summary:**
Support the increased recycling of municipal solid waste (MSW) sufficient to achieve an additional, cumulative reduction (i.e. 2013 through 2020) in greenhouse gas (GHG) emissions of 5.0 million metric tons of carbon dioxide equivalent (MMt$CO_2$e) by improving the efficiency of existing programs and maximizing collections within mandated communities including expansion of single-stream recycling, focusing on increasing collection of those materials with the greatest GHG emission reductions per ton recycled and then consideration of expanding mandatory recycling requirements to currently non-mandated communities.

**Goal:**
Increase recycling in Pennsylvania to achieve a cumulative 5.0 MMt$CO_2$e reduction, which equates to increased tonnage recycled of approximately 2.1 million tons above projected "Business as Usual" recycling volumes.

Background Discussion:
Act 101, the Municipal Waste, Planning Recycling and Waste Act Reduction of 1988, provides the foundation for recycling that has resulted in comprehensive environmental and economic benefits for Pennsylvania. The Act provides for a $2/ton recycling fee on waste disposed of or processed at municipal waste landfills and resource recovery facilities in the commonwealth. In 2007, the recycling fee generated approximately $47 million to the Recycling Fund administered by PA DEP. Since adoption of the $4/ton Growing Greening Fee established by Act 90 of 2002, the amount of out-of-state waste disposed of or processed in Pennsylvania has declined, resulting in significantly lower annual revenue for the Recycling Fund. In 2011, the recycling fee generated approximately $37.7 million to the Recycling Fund.

The Recycling Fund provides support to local governments for implementation of recycling programs. The recycling fee also supports the stimulation of markets for recyclable materials. DEP is focusing Act 101 funds on programs geared toward financial sustainability, including those programs that are targeting new materials for recycling that have historically been disposed. Increasing the amount of materials recycled will provide direct reductions in GHG emissions.

In 2000, 2005 and 2010, Pennsylvania's recycling efforts provided GHG reductions equal to about 9.2, 9.7 and 10.8 MMt$CO_2$e, respectively. During these years the approximate tonnage of MSW recycled was 3.4, 3.6 and 4.3 million tons. According to EPA, the energy conserved from manufacturing products from the 4.3 million tons of recycled feedstock, rather than using virgin raw materials or non-renewable resources, is equivalent to 1.2 billion gallons of gasoline or enough electricity to power 1.6 million homes.

When considering the impact of population growth, the per capita rate of recycling has been 27.6 percent in 2000, 28.8 percent in 2005 and 33.6 percent in 2010. While there has been an annual rate of increase in recycling, it is not valid to assume that annual increases in the mass of materials recycled can or will continue for several reasons, including consumer-driven issues such as:

- Reduced product and packaging weights (light-weighting), which can decrease gross tonnages of materials recycled despite constant/increasing recycling rates (for example, decreases in the mass of plastic used in water bottles).
- Greater use of e-commerce and electronic media, which is reducing production/distribution of certain types of printed media, including newspapers, magazines, novels and phone books.

And municipal governmental issues such as:

- The fiscal ability of municipalities to offer single-stream recycling
- The continued fiscal ability of municipalities currently offering recycling services that are not currently required to do so under Act 101.

In some cases, when secondary effects are considered, an overall reduction in GHG emissions will occur even though the reductions cannot be attributed directly to recycling activities. For example, light-weighting will result in GHG emission reductions from reduced production of packaging, as well as GHG emission reductions related to decreased fuel costs from transporting products that have lower weights due to decreased packaging.

Since 2005, a significant increase in recycling in the commonwealth has come from the growth of single-stream recycling. Single-stream recycling, providing convenience, cost effectiveness and immediate increases in the amount of recycled materials, accounted for over 43% of recycled residential materials in 2009, up from only 6% in 2005. Pennsylvania now hosts six (6) privately owned and funded, single-stream recycling facilities, and at least two more are scheduled to come on-line in the near future. When single-stream recycling service is provided to a curbside collection community, the amount of material recycled increases by approximately 45%.

Clearly, the single biggest boon to recycling rates is making curbside, single-stream recycling widely available. As published on the Department's website, while at least 94 percent of the state's population has access to recycling, only 79 percent have convenient access to recycling through curb-side pickup programs (although not discussed on the website, a significant portion of that 79 percent does not have access to single-stream recycling). The City of Philadelphia's recent initiative to increase its recycling rate was very successfully; with single-stream recycling at the core of the initiative, the recycling rate quadrupled.

The typical single-stream facility can handle more material in one day than most of the other 89 recycling facilities located in the commonwealth can handle in a year, and this increase in recycling capacity provides the critical foundation necessary for success of this work plan's GHG emission reduction goals.

**<u>Calculations and Methodology:</u>**

The U.S. Environmental Protection Agency's (EPA) Waste Reduction Model (WARM) was used to calculate the estimated reductions in GHG emissions. WARM provides lifecycle-based emission reductions for each of numerous types of materials being recycled or composted. Table 1 provides the WARM values with tonnage of materials recycled in PA in 2000, 2005 and 2010 and the associated GHG emissions reduced, expressed in metric tons of carbon dioxide equivalent ($MTCO_2e$).

The EPA-WARM data presented in Table 1 represents recyclables generated from the municipal waste stream (46 materials) in PA. County recycling data reported to the DEP included material numbers from both the municipal and residual waste streams (62 materials). For this reason much higher recycling figures and GHG reductions for 2011 are found on the DEP's website.

**<u>Table 1. WARM GHG Values and PA Recycling Tonnages</u>**

| Material | GHG Emissions per Ton of Material Recycled ($MTCO_2E$) | GHG Emissions per Ton of Material Composted ($MTCO_2E$) | 2000 Recycled (Tons) | 2000 GHG Reduced (MTCO2e) | 2005 Recycled (Tons) | 2005 GHG Reduced (MTCO2e) | 2010 Recycled (Tons) | 2010 GHG Reduced (MTCO2e) |
|---|---|---|---|---|---|---|---|---|
| Aluminum Cans | (8.89) | NA | 17,590 | 156,384 | 47,603 | 423,218 | 39,037 | 347,058 |
| Aluminum Ingot | (6.97) | NA | | 0 | | | | |
| Steel Cans | (1.80) | NA | 13,936 | 25,114 | 19,074 | 34,373 | 912,956 | 1,645,269 |
| Copper Wire | (4.89) | NA | | 0 | | | 10,658 | 52,136 |
| Glass | (0.28) | NA | 28,571 | 7,947 | 57,447 | 15,978 | 58,888 | 16,379 |
| HDPE | (0.86) | NA | 12,341 | 10,578 | 6,629 | 5,682 | 4,901 | 4,201 |
| LDPE | NA | NA | 37,267 | 0 | | | 4,894 | 0 |
| PET | (1.11) | NA | 6,755 | 7,487 | 6,644 | 7,364 | 5,446 | 6,036 |
| LLDPE | NA | NA | | | | | | |
| PP | NA | NA | | | | | 1,542 | 0 |
| PS | NA | NA | 1,850 | 0 | | | 327 | 0 |
| PVC | NA | NA | | | | | 578 | 0 |
| PLA | NA | (0.20) | | | | | 5,789 | 0 |
| Corrugated Containers | (3.11) | NA | 713,552 | 2,219,177 | 660,244 | 2,053,386 | 751,248 | 2,336,412 |
| Magazines/third-class mail | (3.07) | NA | 24,683 | 75,784 | | | 30,182 | 92,668 |
| Newspaper | (2.78) | NA | 244,252 | 679,393 | 234,406 | 652,006 | 96,353 | 268,007 |
| Office Paper | (2.85) | NA | 76,304 | 217,815 | 73,939 | 211,063 | 110,572 | 315,636 |
| Phonebooks | (2.65) | NA | | | | | 784 | 2,078 |
| Textbooks | (3.11) | NA | | | | | | |
| Dimensional Lumber | (2.46) | NA | 213,285 | 524,070 | 191,032 | 469,392 | 220,224 | 541,119 |
| Medium-density Fiberboard | (2.47) | NA | | | | | | |
| Food Scraps | NA | (0.20) | 66,482 | 13,141 | 63,573 | 12,566 | 73,603 | 14,549 |
| Leaves/Grass/Yard Trimmings | NA | (0.20) | 585,682 | 115,769 | 557,691 | 110,236 | 484,920 | 95,852 |
| Branches | NA | (0.20) | | | | | | |
| Mixed Paper (general) | (3.52) | NA | 239,283 | 841,762 | 249,233 | 876,762 | 192,736 | 678,017 |
| Mixed Paper (primarily residential) | (3.52) | NA | | | | | | |
| Mixed Paper (primarily from offices) | (3.59) | NA | | | | | | |
| Mixed Metals | (3.97) | NA | 1,074,263 | 4,268,428 | 1,084,607 | 4,309,527 | 963,236 | 3,827,276 |
| Mixed Plastics | (0.98) | NA | | | 43,352 | 42,556 | 24,290 | 23,844 |
| Mixed Recyclables | (2.80) | NA | | | 178,576 | 499,724 | 172,558 | 482,884 |
| Mixed Organics | NA | (0.20) | 25,183 | 0 | 24,029 | | 15,355 | 0 |
| Mixed MSW | NA | NA | | | | | 18,606 | 0 |
| Carpet | (2.37) | NA | | | | | | |
| Personal Computers | (2.35) | NA | 2,962 | 6,950 | 2,835 | 6,652 | 7,717 | 18,110 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Tires | (0.39) | NA | | | 49,730 | 19,430 | 63,975 | 24,996 |

This work plan establishes a goal of reducing an additional cumulative 5.0 million metric tons of carbon dioxide equivalent (MMT$CO_2$e) beyond the GHG emission reductions of 9.2 MMTCO2e that occurred in Year 2000. This is consistent with the outcome from the original work plan from the 2009 Pennsylvania Climate Change Action Plan. The total GHG reductions therefore, would be 14.6 MMTCO2e in 2020 corresponding to approximately 5.5 million tons of recycled materials. Because GHG reductions per ton of recycled materials vary, it is expected that the final gross tonnage recycled necessary to achieve this goal will also vary. Average annual rates of GHG reduction per ton of gross recycled material were used in helping to project future recycled tonnages to meet the goal. For purposes of this work plan, future changes in recycling rates are assumed to be uniform across all types of materials.

In performing the analysis three sets of calculations were made to examine a possible business-as-usual (BAU) scenario, the policy implementation scenario and an examination of the incremental growth between these two scenarios. The BAU scenario assumes an annual increase of roughly 0.44% in total tons of materials recycled each year in 2014 and 2015 (as compared to the previous year), and an annual increase of roughly 1.44% in total tons of materials recycled each year in subsequent years. As noted previously, whether recycling rate growth can or will continue is uncertain. Using this estimated BAU recycling rate growth and the increase of 5.0 MMTCO2e above baseline levels from Year 2000, the incremental GHG reduction in 2020 will be 2.19 MMTCO2e , indicating that additional measures and efforts (such as set forth in this workplan) are required to achieve the 5.0 MMTCO2e GHG emission reduction goal. These values are displayed in Table 2.

Economic data for this analysis was taken from *Increased Recycling Economic Information Study Update: Delaware, Maine, Massachusetts, New York and Pennsylvania Final Report 2009.* This report provides for residential and commercial costs of collection and revenues as well as, tonnages of material recycled. This data reflects collected survey data from numerous establishments in Pennsylvania representing urban and rural communities with widely divergent populations, and should not therefore be used to estimate costs for any specific location or facility. This data served as the basis for the costs and cost-effectiveness data displayed in Table 2. Annual rate of discounting of 5 percent was applied to the net costs. The net present value for the policy scenario is a savings of approximately \$119 per ton of $CO_2$e reduced, and the difference between BAU and the policy scenario is a net present value of \$82. The cost-effectiveness of this initiative is a savings of \$6.22 per ton of $CO_2$e.

This analysis does not include an assessment of the indirect and induced economic benefits realized by recycling, but these are significant. A 2009 study, "Recycling Economic Information Study Update," prepared for the Northeast Recycling Council, Incorporated indicates that as of 2007, PA had 3,800 establishments involved in some aspect of recycling, employing a work force of more than 52,000 with an annual payroll of approximately \$2.2 billion and revenues of nearly \$21billion. In Pennsylvania, private sector employment in the recycling industry is significant and growing. Much of this growth is being driven by the expansion of single-stream recycling capacity, as well as expansion of recycling pick-up services by private industry.

**<u>Table 2. Costs and Cost-effectiveness</u>**

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|
| BAU Tons Recycled | 4,328,724 | 4,347,840 | 4,366,957 | 4,428,026 | 4,489,095 | 4,550,164 | 4,611,233 | 4,672,302 |
| Policy Tons Recycled | 4,576,489 | 4,678,194 | 4,779,899 | 4,923,557 | 5,067,214 | 5,210,872 | 5,354,529 | 5,498,187 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Incremental Tons Recycled | 247,765 | 330,354 | 412,942 | 495,531 | 578,119 | 660,708 | 743,296 | 825,885 |
| BAU GHG Reduced (MMtCO2e) | 11.28 | 11.44 | 11.60 | 11.77 | 11.93 | 12.09 | 12.25 | 12.42 |
| Policy GHG Reduced (MMtCO2e) | 11.94 | 12.32 | 12.70 | 13.08 | 13.46 | 13.85 | 14.23 | 14.61 |
| Incremental GHG Reduction (MMtCO2e) | 0.66 | 0.88 | 1.10 | 1.32 | 1.54 | 1.76 | 1.98 | 2.19 |
| BAU Collection Cost ($ million) | 219.83 | 220.81 | 221.78 | 224.88 | 227.98 | 231.08 | 234.18 | 237.28 |
| Policy Collection Cost ($ million) | 232.42 | 237.58 | 242.75 | 250.04 | 257.34 | 264.63 | 271.93 | 279.23 |
| Incremental Collection Cost ($ million) | 12.58 | 16.78 | 20.97 | 25.17 | 29.36 | 33.55 | 37.75 | 41.94 |
| BAU Recycling Revenue($ million) | 339.42 | 340.91 | 342.41 | 347.20 | 351.99 | 356.78 | 361.57 | 366.36 |
| Policy Recycling Revenue ($ million) | 358.84 | 366.82 | 374.79 | 386.06 | 397.32 | 408.58 | 419.85 | 431.11 |
| Incremental Recycling Revenue ($ million) | 19.43 | 25.90 | 32.38 | 38.85 | 45.33 | 51.81 | 58.28 | 64.76 |
| BAU Net Cost ($ million) | (119.58) | (120.11) | (120.64) | (122.32) | (124.01) | (125.70) | (127.39) | (129.07) |
| Policy Net Cost ($ million) | (126.43) | (129.24) | (132.04) | (136.01) | (139.98) | (143.95) | (147.92) | (151.89) |
| Incremental Net Cost ($ million) | (6.84) | (9.13) | (11.41) | (13.69) | (15.97) | (18.25) | (20.53) | (22.82) |
| BAU Discounted Net Cost ($ million) | (102.53) | (97.83) | (93.35) | (89.92) | (86.60) | (83.39) | (80.28) | (77.28) |
| Policy Discounted Net Cost ($ million) | (108.39) | (105.26) | (102.17) | (99.98) | (97.75) | (95.50) | (93.23) | (90.94) |
| Incremental Discounted Net Cost ($ million) | (5.87) | (7.43) | (8.83) | (10.06) | (11.15) | (12.11) | (12.94) | (13.66) |

**Implementation Steps:**

To achieve the goal of this initiative, a two-pronged approach is suggested. The single most effective strategy for improving recycling rates and thereby reducing GHG emissions, is to increase the availability of curbside, single-stream recycling. Similarly, efforts targeting those specific materials that provide the maximum GHG reductions, as set forth in the "GHG Emissions per Ton of Material Recycled (MTCO2E)" column in Table 1, are also highly recommended.

Additional specific recommendations include:

1. *Commonwealth Management Directive.* Ensure that the state government is taking a leadership role and maximizing recycling efforts. These efforts will include ensuring compliance with the comprehensive management directive that all commonwealth agencies, boards and commissions implement recycling and waste reduction programs, as well as purchase environmentally preferable products. PA DEP will promptly review the annual reports from GSA regarding the status of compliance with the directive, and will take appropriate measures to ensure future compliance.

2. *Recycling Reporting Improvements.* Encourage county governments to report recycling activities within their jurisdiction, as required by Act 101. To facilitate more timely and improved reporting, PA DEP has procured a new reporting system to capture much of the recycling data that currently goes unreported. PA DEP should conduct regular and comprehensive audits of the data to ensure accuracy and consistency, and then promptly make the information available for review on the Department's website. It is important that the website-posted data distinguish between recycled material quantities from residential and non-residential sources, as well as the amounts of materials managed by single-stream processing.

3. *Municipal Government Recycling Programs*—

a. Assist in working to amend Act 101 to either require recycling programs for municipalities with a lesser population density or smaller populations than currently stated in the Act, and/or (current population threshold is 5,000 in the Act).
b. In addition to considering proposing the new density/population limits, the Department should consider adding "high concentration" facilities to the mandatory recycling requirements under Act 101. High concentration facilities could include gathering places located in non-mandated communities such as larger airports; shopping malls; rest stops; and arenas, stadiums concert halls, etc. seating 3,000 or more people that offering food or drink service.
c. Seek ways to encourage all municipal recycling programs to include all plastic and paper types in a list that should be developed by PA DEP. This would logically include all types of plastic and paper that have a market potential and/or sorting convenience to home owners—e.g., generally co-mingled materials that do not required confusing requirements for acceptable versus unacceptable materials.
d. PA DEP should evaluate existing recycling programs and assist municipalities to identify steps to improve recycling services, such as endorsement of more encompassing or efficient collection processes and consolidation or elimination of redundant, out-dated or non-sustainable recycling facilities.

4. *Public Recycling Availability*—PA DEP should consider establishing rules on density and availability of recycling containers for all public areas in which waste disposal receptacles are placed, including high concentration facilities, such as airports and shopping malls, and arenas, stadiums and concert halls seating 3,000 or more people and offering food or drink service. This should be in the form of guidelines for municipal recycling programs and state governmental agencies. Appropriate language can be incorporated into the Act 101 amendments.

5. *Funding through Act 101*— In light of the reduction in fees generated for the Recycling Fund, the DEP should become more discerning in how those funds are utilized. The department should encourage more encompassing and efficient collection processes, provide greater incentive to those programs and processes that demonstrate improved recycling performance, provide expansion of recycling to high concentration events and facilities, and consolidation or elimination of redundant, outdated, or non-sustainable recycling operations.

6. *Review Legislation to Remove Impediments.* Conduct a comprehensive review of all the current legislation to identify areas where legislation creates obstacles or impediments to the management and beneficial use of waste material.

7. *Assist in Expanding Recycling Programs.* Develop a strategy to focus on expanding recycling programs to:
   a. Support and grow recycling industries.
   b. Eliminate barriers that impede the use of waste for energy production.
   c. Support the growth of private-sector recycling programs by leveling the playing field between government-supported and private-sector programs.
   d. Ensure financial support to protect past investments in recycling programs.
   e. Promote new private-sector investments and protect past private-sector investments in LFGTE projects and similar programs.
   f. Ensure adequate funding to facilitate a sophisticated and robust statewide recycling program for all commonwealth citizens.

8. *Comprehensive Legislative Package.* Assist in developing a single legislative package for consideration that folds all previously enacted legislation under one comprehensive package. The

resulting package should include assisting in recycling at the source of generation, encouraging market development, and limiting disposal of recyclable materials at the end.

**Potential Overlap:**

- Waste-to-Energy MSW Work plan. An overlap may exist between the Waste-to-Energy MSW Work plan and this Statewide Recycling Initiative work plan, but it is not quantifiable based on the data available at this time. The overlap would only exist to the extent that the same waste would be subject to both work plans.

**Subcommittee Comments:**