

Waste Reduction and Resource Recovery Plan Goals and Metrics Recommendations April 2019

Executive Summary

Purpose

This document lays out recommendations to fulfill the goals and metrics portion of the Governor's 2017 Executive Order, entitled *Waste Reduction and Resource Recovery Plan for Maryland* (the EO). Specifically, the EO calls for the Maryland Department of the Environment (the Department) to consult with stakeholders and recommend to the Governor:

- An improved method of quantifying and tracking statewide waste diversion;
- Voluntary statewide goals to encourage continuous improvement in sustainable materials management; and
- A method of obtaining business waste diversion data.

In making these recommendations, the Department seeks to incorporate principles of the State's sustainable materials management (SMM) policy, also laid out in the EO. Goals and metrics that take a SMM approach should consider the impacts of materials management throughout the entire lifecycle of products (not just at end-of-life), including through waste prevention. They should be linked to the extent possible with environmental outcomes that the State seeks to achieve. Finally, they should take into account the differences in impacts from different types of materials, and seek to incorporate the most comprehensive data available.

Currently, the Department tracks county and statewide recycling (recycling includes composting) rates and waste diversion rates. The waste diversion rate consists of the recycling rate plus a "source reduction credit" of up to 5 percentage points, based on waste reduction activities conducted by the counties. While these metrics are useful, they have some limitations. In particular, they focus only on end-of-life management of materials, do not necessarily correspond with optimal environmental outcomes, and treat all materials the same in terms of their contribution toward the recycling rate. In addition to these limitations, the Department and counties experience some data limitations, particularly in the collection of commercial sector recycling data, which is provided voluntarily by businesses in most Maryland counties.

Recommendations

Voluntary Statewide Metrics and Goals. Table ES-1 lists the recommended metrics to be tracked, along with voluntary statewide goals corresponding with each metric. All goals stated

are to be achieved by the State as a whole (including the commercial, government, and institutional sectors) by 2035.

Table ES-1 – Voluntary Statewide Metrics and Goals – Recommendations

Metric	Goal
Waste generation per capita	Reduction in the amount of waste generated by 10% to 5.5 lbs/person/day
Greenhouse gas (GHG) emissions reductions from materials management	Annual reduction of 1.2 million MTCO ₂ e in 2035, compared to a baseline year of 2016.
Reduction in energy usage associated with materials management	Annual reduction of 4.3 trillion BTUs in 2035, compared to 2016.
Material-specific recycling rates	Voluntary recycling rate goals for each county of: <ul style="list-style-type: none"> • Food scraps – 60%; • Yard trimmings – 85%. • Glass – 55%; • Metal – 75%; • Paper products – 65%; and • Plastic – 25%.
Overall statewide recycling and waste diversion rate goals	Maintain the goals of 55% recycling and 60% waste diversion currently in the statute, but extend the timeframe to 2035.

Business Waste Diversion Data. The following recommendations are made to improve the collection of waste diversion data from businesses.

- The Department should develop an online reporting site where businesses can go to report their waste diversion data. The reporting site will allow one-stop reporting for businesses no matter which county they are located, and will be simplified as much as possible, with clear instructions. Businesses located in counties with mandatory reporting will be redirected to the appropriate counties’ web pages.
- The Department should promote the new reporting site on its website, through contacts with businesses (such as through the Maryland Green Registry), and with relevant business groups. The Department should notify recycling processors of the website.
- For counties without mandated business reporting, individual counties should refer other businesses within their jurisdictions to the site to report their waste diversion data. Recycling processor businesses should still be referred to the State reporting site to ensure recyclables collected outside the host county are captured and reported by the originating county.
- The online reporting site should collect email contact information of the businesses reporting, so that businesses can be reminded in a low-cost manner to submit reports annually.

- Waste diversion data collected by the Department through the reporting site should be distributed to counties, in spreadsheet format, so the counties can total waste diversion totals for businesses within their county. The counties will be responsible for conducting any verification or quality control on the data prior to reporting it via the annual Maryland Recycling Act Tonnage Reporting Survey.

Additionally, the following recommendation is made in order to improve information-sharing across businesses to facilitate waste diversion.

- The Department should work with the Department of Commerce, similar agencies in other states, and private sector stakeholders to promote a virtual materials exchange, physical resource recovery park, or research and technology center to serve Maryland or the Mid-Atlantic region.

Source Reduction (SR) Credit System. The following recommendations are made with respect to the existing SR credit system.

- The Department should maintain the current SR credit system with modifications.
- Food scraps reduction activities should be prioritized in the checklist. They should be given the same status as yard trimmings reduction activities in terms of providing credit.
- The checklist should be revised to allow counties to propose new and innovative SR activities for credit on a case-by-case basis that are not specifically listed on the checklist.

For the 2018 reporting year, the SR recommendations above have already been incorporated into the checklist system. Food scraps activities have been elevated to the same level as yard trimmings. New SR activities have been added based upon feedback from the counties. Counties can submit now their source reduction information electronically.

Current Metrics and Goals

Currently, the primary metrics tracked in Maryland are those established under the Maryland Recycling Act (MRA). These include county and statewide recycling rates and waste diversion rates. The waste diversion rate consists of the recycling rate plus a “source reduction credit” of up to 5 percentage points. The credit is derived from activities that the counties report having conducted to reduce the generation of waste (e.g., conducting waste prevention outreach). Under the MRA, counties are required to plan for and meet minimum recycling rates of 20 or 35 percent, depending on their populations. In 2012, the State established a voluntary statewide goal of 55 percent recycling and 60 percent waste diversion by 2020.

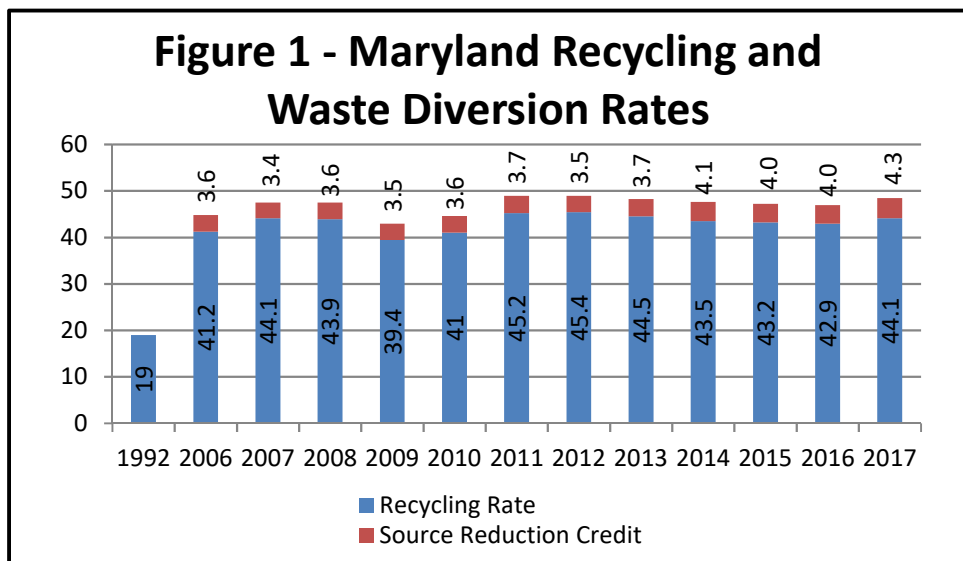
Maryland’s SMM Policy

It is the policy of the State that solid waste and recycling planning should, to the extent practicable, seek to:

- (1) Minimize the environmental impacts of materials management over their entire life cycles, including from product design to production, consumption, and end-of-life management;
- (2) Conserve and extend existing in-State disposal capacity through source reduction, reuse, and recycling;
- (3) Capture and make optimal use of recovered resources, including raw materials, water, energy, and nutrients; and
- (4) Work toward a system of materials management that is both environmentally and economically sustainable in the long term.

Figure 1 below shows historical statewide recycling and waste diversion rates. Maryland’s waste diversion rate has increased steadily from a 19% recycling rate in 1992 to the 48.4% waste diversion (*i.e.*, 44.1% recycling rate + 4.3% source reduction credit) rate in 2017. While this waste diversion rate is good news (above the national average as reported by the EPA), the rate has stabilized over the last 12 years. This recent trend is in line with the national trend toward the stabilization of recycling rates. There are a number of possible reasons for this.

- As recycling rates increase, it becomes more difficult to sustain the same rate of progress since the most easily recyclable and higher-value materials have already been captured, leaving materials that are technologically, logistically, or economically challenging to recycle. (The same principle applies to generators that are relatively difficult to reach, such as those in rural areas where efficient collection is difficult.)
- The composition of the waste stream changes over time. With technological advances, many products have been redesigned to be lighter, particularly packaging. Some light-weighting is achieved by replacing heavy but recyclable materials with lighter but not as recyclable materials. To the extent that highly recyclable materials compose a smaller share of the waste stream relative to less frequently recycled materials, it becomes more difficult to improve a weight-based recycling rate.
- Markets for recyclables are variable and can impact the recycling rate. A recent example is the impacts to recycling markets resulting from tightening import policies in China and other significant importers of U.S. recyclables. (Note, however, that any impact from these policies would be too recent to be captured in available Maryland data.)



Through the public comment process, stakeholders noted some additional challenges to improving recycling generally, such as the need to constantly educate and motivate residents and businesses to do more, the challenges of training staff on recycling in businesses and multi-family properties where there is turnover, and practical limitations (*e.g.*, space, etc.) in certain commercial locations.

There are some advantages to tracking recycling and waste diversion rates. They are relatively simple to calculate and understand, and they are useful to track progress over long periods of

time because of the availability of historical recycling rate data. They also provide an indication of what is occurring with materials at end-of-life, which is why they are an important aspect of the MRA. However, to move toward a broader SMM policy, it will be useful to track additional metrics that provide a more complete picture, taking into account all lifecycle phases of materials, environmental impacts, and material-specific data.

New Metrics and Goals

This section lays out a set of metrics, with corresponding voluntary statewide goals to be met by 2035. During public review of the draft recommendations, some commenters noted that not all of the metrics proposed can be entirely influenced by counties. For example, waste generation per capita, discussed below, is heavily dependent on the way materials are purchased and used by businesses and individuals. While counties typically operate residential recycling programs and often promote recycling and waste reduction through outreach to residents, they do not directly influence these individual purchasing and consumption decisions, especially in the commercial sector. The Department acknowledges this. The mandatory goals laid out in the MRA are specifically imposed on counties, but the voluntary goals established below are intended to be statewide, both geographically and in terms of sectors. State and local governments, businesses, institutions, and individuals all play important roles in working toward the goals listed below.

Additionally, during the public review process on these recommendations, the Department received some suggestions of ways to meet the proposed goals. While this document focuses on the goals and metrics themselves, the Department appreciates and welcomes continued discussion on new initiatives to advance the goals established here.

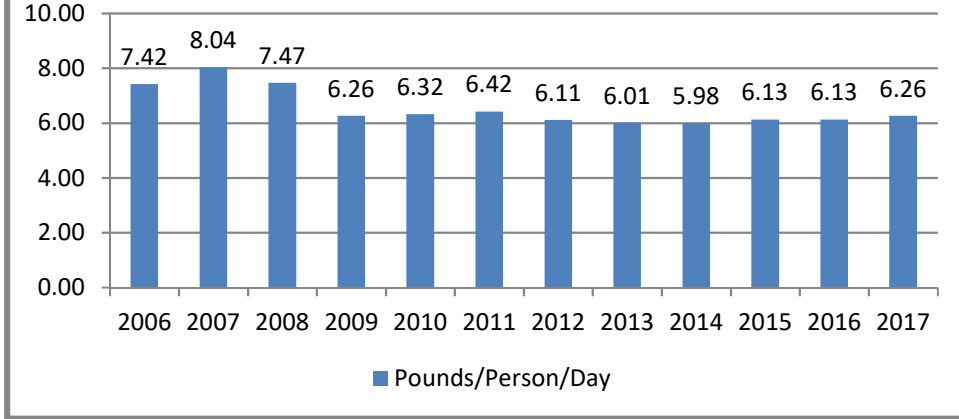
Waste Generation Per Capita

Background. Waste generation per capita provides an indication of the total amount of waste that is produced for disposal or recycling, while controlling for changes in population over time. This metric allows for tracking upstream changes that avoid waste before it occurs, including in the materials extraction, manufacturing, distribution, sale, and consumption lifecycle phases. The following are examples of progress that would be captured in per capita waste generation but not in a recycling rate:

- A business redesigns a product so that it has a longer life span, is more easily repaired, or requires less packaging;
- A university transitions to reusable food service-ware;
- A business converts a major process to an electronic system, reducing paper usage; and
- A resident manages yard trimmings and food scraps in a backyard compost bin rather than setting them out at the curb.

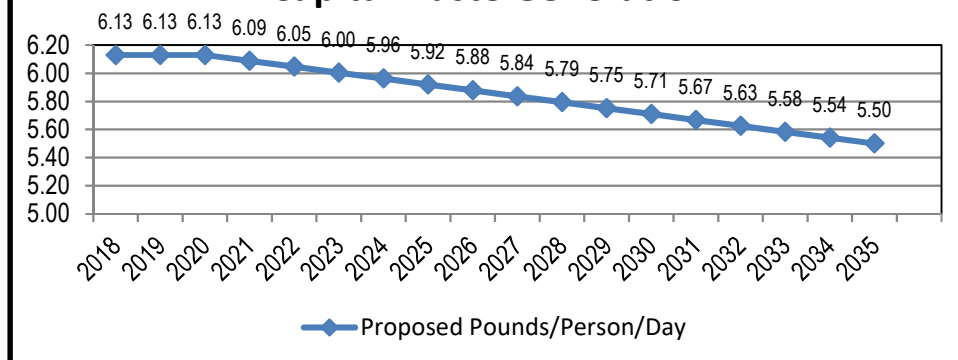
Maryland generated a high of 8.04 lbs./person/day of MRA waste in 2007. Generation was consistently above 7 lbs./person/day prior to the great recession in 2009. Since 2009, Maryland MRA waste generation dropped to a low of 5.98 lbs./person/day ($\approx 34\%$ drop compared to 2007) in 2014 and has consistently stayed around the 6 lbs./person/day level. In 2017, the last year for which data is available, Maryland generated 6.26 lbs./person/day of MRA waste. Figure 2 shows the historical waste generation per capita.

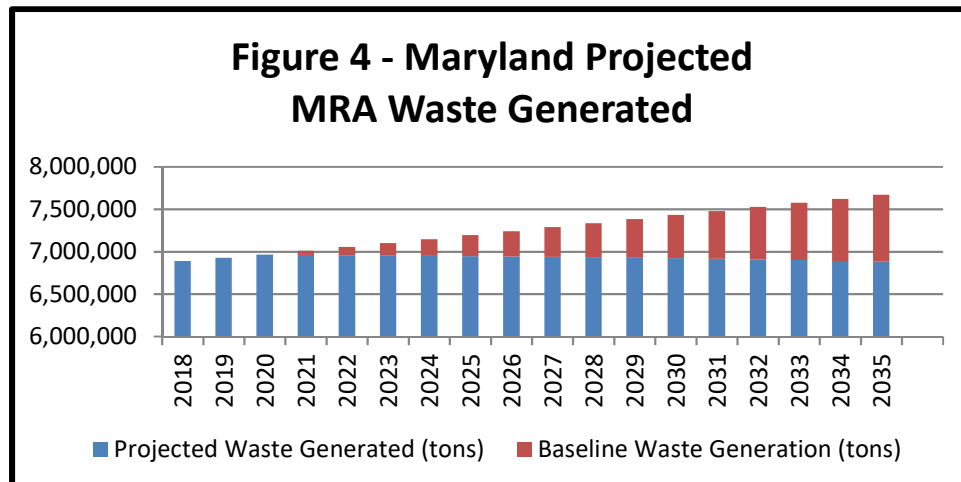
**Figure 2 - Maryland MRA
Waste Generation**



Recommendations. The Department recommends a goal to reduce the amount of MRA waste generated by 10%, from the 2016 baseline, to 5.5 lbs/person/day by 2035. The proposed 10% reduction was deemed reasonable based upon the 16% reduction in one year that occurred from 2008 to 2009. National data has begun to show a decoupling of waste generation and gross domestic product, suggesting that reductions in per capita generation are possible even outside economic downturns. Figure 3 shows the proposed MRA waste generation rates through 2035. Figure 4 shows the total tons of MRA waste generation with the proposed goal, compared with the baseline tons of generation (assuming no reduction in per capita waste generation).

**Figure 3 - Maryland Proposed MRA Per
Capita Waste Generation**





A stakeholder commented that this metric should be expanded to include not just MRA waste, but all waste generated in Maryland. The Department considered this suggestion, but ultimately decided that MRA waste was the better metric on which to base this goal. Non-MRA waste predominantly includes materials such as asphalt, concrete, scrap metal, and other construction and demolition debris. The main objective of this metric is to capture source reduction. While source reduction of these non-MRA wastes is possible, it is likely that more impact could be made on reducing the generation of MRA materials, thus providing the better metric to establish a goal. However, the Department does already track and publish total waste generation annually and will continue to do so.

GHG Emissions Reductions from Waste Diversion

Background. One of the most important environmental outcomes associated with waste diversion is a reduction in GHG emissions. Maryland has a goal to reduce overall GHG emissions by 25% by 2020 and 40% by 2030, relative to 2006 levels. The EPA Waste Reduction Model (WARM) calculates GHG (MTCO₂E) emissions and energy (BTU) usage of associated with different materials management scenarios. The WARM model is a lifecycle accounting tool, meaning that it factors in emissions from the entire lifecycle: raw materials extraction, manufacturing or processing, transportation, use, and end-of-life management. As a SMM metric, tracking GHG emissions reductions has the following advantages:

- Includes the impacts of source reduction, recycling, composting, landfilling, and combustion over the lifecycle of materials;
- Accounts for the differing impacts of different types of materials; and
- Is directly linked to an environmental outcome that the State seeks to achieve.

The following WARM table (Table 1) compares GHG savings of managing materials in different ways. The data has been adjusted to assign landfilling a neutral value (0) to make comparing items to landfilling easier. A negative value means a GHG emissions reduction vs. landfilling. The greater the negative value the greater the savings. For most materials, the benefit of source reduction exceeds that of recycling, and the magnitude of impacts varies significantly by material, underscoring the importance of a metric that captures these nuances.

Table 1 - Greenhouse Gas Values for 1 Ton of Material

Material	GHG Emissions per Ton of Material Source Reduced (MTCO ₂ E)	GHG Emissions per Ton of Material Recycled (MTCO ₂ E)	GHG Emissions per Ton of Material Landfilled (MTCO ₂ E)	GHG Emissions per Ton of Material Combusted (MTCO ₂ E)	GHG Emissions per Ton of Material Composted (MTCO ₂ E)	GHG Emission per Ton of Material Anaerobically Digested
Aluminum Cans	(4.93)	(9.13)	0.00	0.02	NA	NA
Aluminum Ingot	(7.49)	(7.21)	0.00	0.02	NA	NA
Asphalt Concrete	(0.13)	(0.10)	0.00	NA	NA	NA
Asphalt Shingles	(0.21)	(0.11)	0.00	(0.37)	NA	NA
Beef	(30.59)	NA	0.00	(0.68)	(0.72)	(1.26)
Branches	NA	NA	0.00	0.33	0.36	NA
Bread	(1.21)	NA	0.00	(0.68)	(0.72)	(1.26)
Carpet	(3.84)	(2.38)	0.00	1.06	NA	NA
Clay Bricks	(0.29)	NA	0.00	NA	NA	NA
Concrete	NA	(0.03)	0.00	NA	NA	NA
Copper Wire	(7.03)	(4.73)	0.00	0.01	NA	NA
Corrugated Containers	(5.83)	(3.35)	0.00	(0.74)	NA	NA
Dairy Products	(2.28)	NA	0.00	(0.68)	(0.72)	(1.26)
Dimensional Lumber	(1.02)	(1.45)	0.00	0.40	NA	NA
Drywall	(0.15)	0.09	0.00	NA	NA	NA
Fiberglass Insulation	(0.40)	NA	0.00	NA	NA	NA
Fly Ash	NA	(0.89)	0.00	NA	NA	NA
Food Waste	(4.20)	NA	0.00	(0.68)	(0.72)	(0.60)
Food Waste (meat only)	(15.64)	NA	0.00	(0.68)	(0.72)	(1.26)
Food Waste (non-meat)	(1.30)	NA	0.00	(0.68)	(0.72)	(1.26)
Fruits and Vegetables	(0.98)	NA	0.00	(0.68)	(0.72)	(1.26)
Glass	(0.55)	(0.30)	0.00	0.01	NA	NA
Grains	(1.16)	NA	0.00	(0.68)	(0.72)	(1.26)
Grass	NA	NA	0.00	(0.31)	(0.28)	NA
HDPE	(1.49)	(0.89)	0.00	1.21	NA	NA
LDPE	(1.82)	NA	0.00	1.22	NA	NA
Leaves	NA	NA	0.00	0.34	0.37	NA
LLDPE	(1.60)	NA	0.00	1.21	NA	NA
Magazines/third-class mail	(8.21)	(3.46)	0.00	0.02	NA	NA
Medium-density Fiberboard	(1.35)	(1.59)	0.00	0.27	NA	NA
Mixed Metals	(3.72)	(4.36)	0.00	(1.04)	NA	NA
Mixed MSW	NA	NA	0.00	(0.42)	NA	NA
Mixed Organics	NA	NA	0.00	(0.36)	(0.36)	NA
Mixed Paper (general)	(6.24)	(3.66)	0.00	(0.64)	NA	NA

Material	GHG Emissions per Ton of Material Source Reduced (MTCO ₂ E)	GHG Emissions per Ton of Material Recycled (MTCO ₂ E)	GHG Emissions per Ton of Material Landfilled (MTCO ₂ E)	GHG Emissions per Ton of Material Combusted (MTCO ₂ E)	GHG Emissions per Ton of Material Composted (MTCO ₂ E)	GHG Emission per Ton of Material Anaerobically Digested
Mixed Paper (primarily from offices)	(7.58)	(3.76)	0.00	(0.64)	NA	NA
Mixed Paper (primarily residential)	(6.11)	(3.60)	0.00	(0.58)	NA	NA
Mixed Plastics	(1.94)	(1.04)	0.00	1.20	NA	NA
Mixed Recyclables	NA	(2.86)	0.00	(0.48)	NA	NA
Newspaper	(3.95)	(1.93)	0.00	0.24	NA	NA
Office Paper	(9.19)	(4.08)	0.00	(1.71)	NA	NA
Personal Computers	(50.51)	(2.52)	0.00	(0.21)	NA	NA
PET	(2.22)	(1.14)	0.00	1.19	NA	NA
Phonebooks	(5.40)	(1.82)	0.00	0.24	NA	NA
PLA	(0.45)	NA	0.00	0.99	1.49	NA
Poultry	(3.01)	NA	0.00	(0.68)	(0.72)	(1.26)
PP	(1.57)	NA	0.00	1.21	NA	NA
PS	(2.52)	NA	0.00	1.58	NA	NA
PVC	(1.97)	NA	0.00	0.62	NA	NA
Steel Cans	(3.08)	(1.83)	0.00	(1.59)	NA	NA
Textbooks	(10.29)	(4.33)	0.00	(1.71)	NA	NA
Tires	(4.30)	(0.40)	0.00	0.49	NA	NA
Vinyl Flooring	(0.63)	NA	0.00	(0.35)	NA	NA
Wood Flooring	(3.19)	NA	0.00	0.09	NA	NA
Yard Trimmings	NA	NA	0.00	0.00	0.03	NA

Recommendation. The Department recommends a goal to reduce the annual GHG emissions from materials management by 1.2 million MTCO₂e by 2035, compared to a baseline year of 2016.¹ For comparison, this is the equivalent of removing 245,280 passenger vehicles from the road. This goal could be met with a 10% reduction in waste generated per capita (described above),² as well as an increase in recycling to meet the material-specific goals described below. It is important to note that meeting this goal will require not only reducing GHG emissions from materials management from their 2006 levels, but also avoiding the increase in GHG emissions that would otherwise occur by 2035 in a business-as-usual scenario in which waste generation is expected to increase as population increases.

A stakeholder noted that recycling or composting of certain materials actually results in a net increase in GHG emissions under the WARM Model. This was already taken into account in setting the above goal. It is true that if the State based its goals *only* on GHG emissions reductions, it may discourage activities such as yard waste composting that result in a slight

¹ Reduction goals are based upon the EPA's v14 WARM. An update of the target GHG reduction shall occur when the model used for the projection is updated or changed. Future GHG totals will be based upon the same model as used for the GHG target.

² This assumes that the 10 percent reduction in per capita waste generation occurs evenly across each material.

increase in GHG emissions relative to landfilling. This document proposes multiple metrics and goals, which allows tracking of activities that may show a benefit under one metric but not another.

Energy Savings from Waste Diversion

Background. Similar to GHG emissions reductions the Department can estimate the energy savings associated with different scenarios of materials management. The following WARM table (Table 2) compares energy savings of managing materials in different ways. The data has been adjusted to assign landfilling a neutral value (0) to make comparing items to landfilling easier. A negative value means a reduction in energy use vs. landfilling. The greater the negative value the greater the savings.

Table 2 - Energy Values for 1 Ton of Material

Material	Energy Savings per Ton of Material Source Reduced (million BTU)	Energy Savings per Ton of Material Recycled (million BTU)	Energy Savings per Ton of Material Landfilled (million BTU)	Energy Savings per Ton of Material Combusted (million BTU)	Energy Savings per Ton of Material Composted (million BTU)	Energy Savings per Ton of Material Anaerobically Digested (million BTU)
Aluminum Cans	(89.96)	(153.03)	0.00	0.33	NA	NA
Aluminum Ingot	(127.22)	(114.12)	0.00	0.33	NA	NA
Asphalt Concrete	(1.95)	(1.49)	0.00	NA	NA	NA
Asphalt Shingles	(3.40)	(2.70)	0.00	(8.80)	NA	NA
Beef	(63.86)	NA	0.00	(2.04)	0.60	(1.38)
Branches	0.00	NA	0.00	(2.48)	0.58	NA
Bread	(6.50)	NA	0.00	(2.04)	0.60	(1.38)
Carpet	(91.33)	(21.74)	0.00	(7.46)	NA	NA
Clay Bricks	(5.40)	NA	0.00	NA	NA	NA
Concrete	NA	(0.38)	0.00	NA	NA	NA
Copper Wire	(122.63)	(82.86)	0.00	(0.81)	NA	NA
Corrugated Containers	(22.07)	(9.72)	0.00	(6.39)	NA	NA
Dairy Products	(14.25)	NA	0.00	(2.04)	0.60	(1.38)
Dimensional Lumber	(3.90)	0.36	0.00	(8.11)	NA	NA
Drywall	(3.83)	(2.89)	0.00	NA	NA	NA
Fiberglass Insulation	(5.00)	NA	0.00	NA	NA	NA
Fly Ash	NA	(5.04)	0.00	NA	NA	NA
Food Waste	(14.54)	NA	0.00	(2.04)	0.60	(1.38)
Food Waste (meat only)	(43.58)	NA	0.00	(2.04)	0.60	(1.38)
Food Waste (non-meat)	(7.15)	NA	0.00	(2.04)	0.60	(1.38)
Fruits and Vegetables	(5.05)	NA	0.00	(2.04)	0.60	(1.38)
Glass	(7.17)	(2.40)	0.00	(0.77)	NA	NA
Grains	(5.62)	NA	0.00	(2.04)	0.60	(1.38)

Material	Energy Savings per Ton of Material Source Reduced (million BTU)	Energy Savings per Ton of Material Recycled (million BTU)	Energy Savings per Ton of Material Landfilled (million BTU)	Energy Savings per Ton of Material Combusted (million BTU)	Energy Savings per Ton of Material Composted (million BTU)	Energy Savings per Ton of Material Anaerobically Digested (million BTU)
Grass	(0.19)	NA	0.00	(2.67)	0.39	NA
HDPE	(61.48)	(50.47)	0.00	(19.61)	NA	NA
LDPE	(71.29)	NA	0.00	(19.51)	NA	NA
Leaves	(0.16)	NA	0.00	(2.64)	0.42	NA
LLDPE	(66.64)	NA	0.00	(19.57)	NA	NA
Magazines/third-class mail	(33.27)	(0.73)	0.00	(4.93)	NA	NA
Medium-density Fiberboard	(12.18)	0.60	0.00	(8.14)	NA	NA
Mixed Metals	(50.88)	(66.26)	0.00	(11.26)	NA	NA
Mixed MSW	NA	NA	0.00	(4.57)	NA	NA
Mixed Organics	NA	NA	0.00	(2.32)	0.52	NA
Mixed Paper (general)	(29.23)	(0.29)	0.00	(6.46)	NA	NA
Mixed Paper (primarily from offices)	(34.46)	(56.22)	0.00	(5.93)	NA	NA
Mixed Paper (primarily residential)	(28.47)	(27.66)	0.00	(6.45)	NA	NA
Mixed Plastics	(54.69)	(39.11)	0.00	(13.90)	NA	NA
Mixed Recyclables	NA	(11.99)	0.00	(6.51)	NA	NA
Newspaper	(36.51)	(16.54)	0.00	(7.58)	NA	NA
Office Paper	(36.07)	(9.55)	0.00	(5.87)	NA	NA
Personal Computers	(957.01)	(30.30)	0.00	(6.54)	NA	NA
PET	(50.53)	(32.14)	0.00	(10.40)	NA	NA
Phonebooks	(40.25)	(11.98)	0.00	(7.58)	NA	NA
PLA	(30.96)	NA	0.00	(8.21)	(0.85)	NA
Poultry	(26.46)	NA	0.00	(2.04)	0.60	(1.38)
PP	(66.86)	NA	0.00	(19.58)	NA	NA
PS	(75.26)	NA	0.00	(17.67)	NA	NA
PVC	(48.62)	NA	0.00	(7.73)	NA	NA
Steel Cans	(30.15)	(20.24)	0.00	(17.41)	NA	NA
Textbooks	(35.07)	(0.50)	0.00	(5.87)	NA	NA
Tires	(71.98)	(3.83)	0.00	(28.79)	NA	NA
Vinyl Flooring	(11.00)	NA	0.00	(7.73)	NA	NA
Wood Flooring	(14.72)	NA	0.00	(10.66)	NA	NA
Yard Trimmings	(0.14)	NA	0.00	(2.62)	0.44	NA

Recommendation. The Department recommends a goal of a Statewide reduction of the annual energy usage associated with materials management by 4.3 trillion BTUs³ by 2035, compared to 2016. For comparison, this is the equivalency of conserving 735,885 barrels of oil. As with the GHG emissions goal discussed above, this goal could be met with the 10 percent reduction in per capita waste generation and an increase in recycling to meet the material specific rates discussed below.

Voluntary Material-Specific Recycling Rates for Each County

Background. A more detailed look at the MRA materials recycled reveals varying degrees of recycling success among the different materials. Using data compiled from Maryland permitted solid waste acceptance facilities, counties (via the annual *MRA Tonnage Reporting Survey*), and the Department's 2017 Maryland Statewide Waste Characterization Study, the Department is able to estimate the amount of specific materials disposed in Maryland.⁴ This, along with data on the tons of each material recycled in Maryland (reported by the counties via the annual *MRA Tonnage Reporting Survey*) allows for calculation of an estimated recycling rate for specific MRA materials. The data shows that Maryland recycled:

- Food scraps – 20.4%;
- Yard trimmings – 84.5%;
- Glass – 57.2%;
- Metal – 76.0%;
- Paper products – 47.9%; and
- Plastic (all types combined) – 13.9%.

Tracking material-specific recovery rates by county can ensure that all counties operate effective recycling programs and that Statewide goals are the result of participation by all counties. Also, taking a material-specific recovery approach at least partly resolves the light-weighting concern expressed by counties when calculating an overall recycling rate. Finally, a material-specific approach will allow counties and the State to target specific materials lagging in recovery and to more effectively expend limited outreach and other resources.

Recommendation. The Department recommends the following county voluntary, material-specific recycling rate goals by 2035.

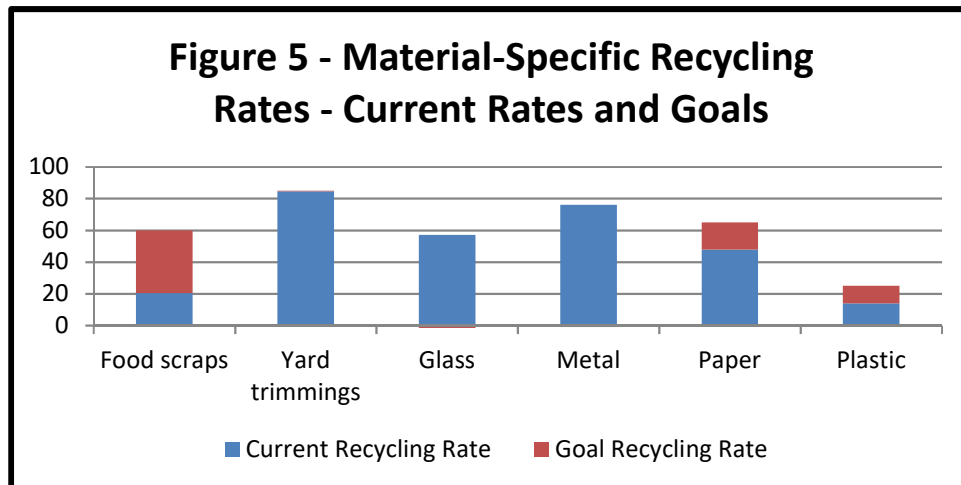
- Food scraps – 60%;

³ Saving goals based upon the EPA's v14 WARM. An update of the target BTU savings shall occur when the model used for the projection is updated or changed. Future BTU totals will be based upon the same model as used for the BTU target.

⁴ For example, the recycling rate for food scraps is calculated as follows. The percentage of waste disposed that is composed of food scraps is 17.9%, according to the 2016 Statewide Waste Characterization Study. Multiplying this by the total tons of MRA waste disposed in 2017 yields an estimated 715,386.58 tons of food scraps disposed (3,996,573.09 MRA tons disposed x 17.9% = 715,386.58). The total tons of food scraps reported by the counties as recycled in 2017 was 183,852.55 (includes food waste, bakery waste, corn silage, and grain/yeast). The total tons of food scraps generated is estimated as the tons disposed (715,386.58) plus the tons recycled (183,852.55), equaling 899,239.13 tons. Finally, the food scraps recycling rate is calculated as the food scraps recycled (183,852.55) divided by the total food scraps generated (899,239.13), or 20.45%.

- Yard trimmings – 85%;
- Glass – 55%;
- Metal 75%;
- Paper products – 65%; and
- Plastic (all types combined) – 25%.

Assuming the above rates are reached by 2035, the overall Statewide recycling rate would equal approximately 55%. The Department therefore recommends maintaining the 55% recycling rate and 60% waste diversion rate goal in the statute at §9-1706.1 of the Environment Article, Annotated Code of Maryland, but striving to achieve the rate by 2035. Figure 5 shows the current material-specific recycling rates versus the proposed goals.



The goals were selected with a variety of considerations, including the current recycling rate, the feasibility of increasing recycling in the future, and the environmental benefit derived from additional recycling of each material. A brief summary of these considerations is as follows:

- **Food scraps** have the largest proposed increase in the recycling rate. While food scraps recycling is not the largest contributor to GHG emissions reductions on a per-ton basis (see Table 1), food scraps make up a large portion of the waste stream, and at a relatively low current recycling rate of 20.4 percent, there is significant potential to recover additional material. Maryland has seen a slow but steady growth in food recycling infrastructure, and this is expected to continue in the future.
- **Yard trimmings** recycling is already very high at over 84.5 percent, thus the Department is recommending that this rate be maintained as it may be more feasible for additional efforts to focus on source reduction (e.g., on site management) of the remaining material that is not easily captured.
- **Glass** recycling and source reduction benefits relate more to energy savings rather than GHG reductions (though there are GHG benefits, also). Glass can also be recycled with no loss in quality (unlike paper). Additionally, for every ton of

glass recycled, 1,300 pounds of sand, 410 pounds of soda ash, 380 pounds of limestone, and 160 pounds of feldspar are saved.⁵

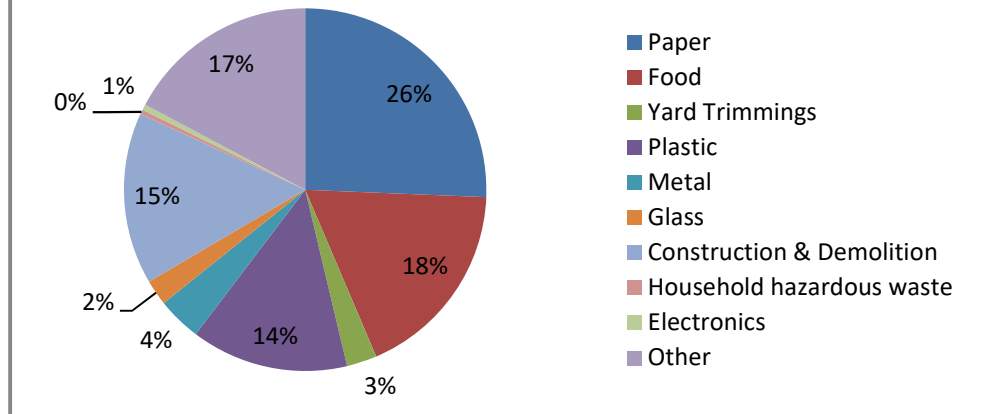
- **Metal** recycling is similarly very high already at 76 percent; therefore the Department recommends a goal to increase the rate slightly.
- **Paper:** The goal to increase paper recycling to 65 percent is ambitious, but paper is deemed to be a target material because it makes up a large portion of the waste stream and on a per-ton basis, contributes some of the greatest GHG emissions reductions from recycling of any material category. Additional progress on paper is likely feasible, as some materials such as cardboard are widely recyclable but are still found in significant portions in Maryland's disposed waste stream.
- **Plastic** (all types) has the lowest current recycling rate, so there is some opportunity for improvement. However, the Department also acknowledges that plastic is a diverse material stream, portions of which are currently difficult to recycle effectively. Plastic makes up a relatively small portion by weight of the waste stream by weight and contributes less toward GHG emissions reductions, per ton, than paper.

Some commenters noted that given current market conditions, there is uncertainty whether a particular material-specific recycling rate can be met. Additionally, given the market values and the available outlets for certain materials (e.g. glass), some commenters suggested that a cost versus benefit analysis of additional recycling should be taken into account. The Department acknowledges that recycling markets tend to fluctuate, and that at times they can be highly variable. Still, the Department believes it is useful to have voluntary goals that can be tracked in the long term, even if market conditions may result in temporary fluctuations in the recycling rate. Additional investigation into potential higher-value outlets for certain materials such as glass may also be beneficial.

Figure 6 shows the portion of Maryland's disposed waste stream currently made up of each material category. This provides an indication of the material remaining to be captured.

⁵ "Unmatched Environmental Benefits," Glass Packaging Institute (www.gpi.org), accessed July 11, 2018.

Figure 6 - Components of the Disposed Waste Stream



Business (i.e., all non-residential) Waste Diversion Data

Background. Recycling tonnage data is currently reported to the Department annually by the counties, as required under the MRA. Counties have accurate data on the materials they manage directly, which are primarily residential materials. State law does not require businesses that generate waste and recyclables to report recycling to the Department or the counties. Because most recycling facilities do not require solid waste permits and therefore do not have reporting requirements, the Department does not necessarily obtain recycling data from the facilities that accept commercial sector recyclables either. In the absence of mandatory business reporting, counties have taken varying approaches to trying to obtain commercial sector recycling data, including passing mandatory business reporting and recycling laws and conducting outreach and incentive programs. Anecdotally, the Department learns about innovative business recycling activities through voluntary programs like the Maryland Green Registry. However, it is likely that a significant quantity of business recycling is not being captured in current metrics.

In past stakeholder consultation initiatives and in a January 2018 meeting with the counties during the development of these recommendations, there was significant discussion regarding whether commercial sector reporting should be made mandatory and, if so, who should report (businesses, processors, haulers, or all of these).

Individual business reporting would be the most accurate and county-specific, and would provide for the least chance of double-counting. However, this would require an additional responsibility on businesses, as businesses may not know the specifics of their waste generated. Volume-based estimates have limited accuracy because, for example, an estimate based on number and size of dumpsters would assume that each dumpster is always full upon pickup. For the businesses to obtain the information from haulers, the haulers would need to track and report waste pick-up business-by-business and record the totals as pick-up occurs. Additional hauler hardware resources for more accurate quantification would be necessary for haulers to track and report the

data by weight. Additionally, the large number of businesses in the State would make tracking the individual reports and ensuring compliance of all businesses very difficult and would likely exceed available county and Department resources.

As it stands now, hauler and processor data is more accurate than data provided by businesses because it is scale-house data rather than estimates by businesses. However, both have their disadvantages. Haulers cross county lines when collecting waste. As a result, in most cases, county origination totals are estimated. Processor reporting would exclude material that goes directly to an out-of-state processor as out-of-state facilities would not be subject to Maryland reporting requirements. Additionally, extra care would need to be taken to not double-count materials that are captured by multiple processors. Most recyclers and haulers are not currently regulated at the state level and any reporting requirement would involve new regulation of these entities.

For the reasons above, there has not been consensus among stakeholders on mandatory reporting. The Department therefore seeks to encourage more voluntary reporting by reducing reporting burdens. There is a general consensus that the Department's current options (*i.e.*, Microsoft Word and Excel surveys) for reporting waste diversion data are adequate. However, a system where counties and businesses are able to report on-line would be beneficial in simplifying the reporting and encouraging greater participation from the commercial sector.

A separate, though somewhat related issue regarding commercial and industrial sector recycling information is how businesses can better communicate with one another on the availability of and need for materials. With better and more timely information, surplus materials or byproducts generated by one business can more efficiently be put to use by another business. A materials exchange is one way to achieve this goal. The concept is to provide a simple, real-time platform for advertising the availability of materials and facilitating or even completing transactions electronically. While examples of this exist in several states or regions, there is currently no organized materials exchange serving Maryland. Other concepts that may serve a similar goal of better connecting available materials with potential users of those materials include resource recovery parks or research centers where uses for available materials can be studied and piloted.

Recommendations.

- The Department should develop an online reporting site where businesses can go to report their waste diversion data. The reporting site will allow one-stop reporting for businesses no matter which county they are located, and will be simplified as much as possible with clear instructions. Businesses located in counties with mandatory reporting will be redirected to the appropriate counties' web pages.
- The Department should promote the new reporting site on its website, through contacts with businesses (such as through the Maryland Green Registry), and with relevant business groups. The Department should notify recycling processors of the website.
- For counties without mandated business reporting, individual counties should refer other businesses within their jurisdictions to the site to report their waste diversion data. Recycling processor businesses should still be referred to the State reporting site to ensure recyclables collected outside the host county are captured and reported by the originating county.

- The online reporting site should collect email contact information of the businesses reporting, so that businesses can be reminded in a low-cost manner to submit reports annually.
- Waste diversion data collected by the Department through the reporting site should be distributed to counties, in spreadsheet format, so the counties can total waste diversion totals for businesses within their county. The counties will be responsible for conducting any verification or quality control on the data prior to reporting it via the annual Maryland Recycling Act Tonnage Reporting Survey.
- The Department should work with the Department of Commerce, similar agencies in other states, and private sector stakeholders to promote a materials exchange system in Maryland or the Mid-Atlantic region. The materials exchange should include an online system that makes it easier for businesses to communicate with each other on surplus materials that are available or needed. The Department should explore opportunities to build on the MdRecycles.org recycling market directory and materials exchange systems in operation elsewhere in the U.S. Any data generated through the materials exchange system could be used to further improve the Department's commercial sector waste diversion data. The Department should also work with stakeholders to investigate opportunities for resource recovery parks or research centers.

Source Reduction (SR) Credit System

Background. Maryland counties can earn credits for activities designed to reduce the amount of waste entering the waste stream. The State's SR credit system is successful. In 2017, 15 of Maryland's jurisdictions were able to add from 1 point to 5 points to their waste diversion rates by conducting SR activities as a waste reduction strategy. The result was a Statewide SR credit of 4.3%. However, like the State's recycling rate, the SR credit has stabilized over time (See Figure 1 above).

Some counties have recommended elevating the status of food scraps activities in the SR checklist to accurately reflect the current conditions of food recovery in Maryland. Adding additional activities to the checklist should better document and increase SR activities occurring in Maryland and consequently, Maryland's SR credit. While the SR credit is not a measure of actual, measured tons of source reduction, it reflects and provides recognition for important activities that counties conduct to encourage waste prevention in their communities.

Recommendations. It is recommended that the current SR credit system remain with modifications. The changes include elevating food scrap reduction activities to the same status as yard trimmings in terms of providing credit, and adding the opportunity for counties to propose new and innovative SR activities for credit on a case-by-case basis that are not specifically listed on the checklist.

For the 2018 reporting year many of the SR recommendations have already been incorporated into the system. Food scraps have been elevated to the same level as yard trimmings. New SR activities have been added based upon feedback from the counties. Counties can submit their information electronically.

Other Stakeholder Suggestions

Some stakeholder suggestions were included or discussed in the recommendations above. There were several other suggestions that were not incorporated, either because they were not directly related to establishing goals and metrics, or because they require further exploration.

One comment was that non-MRA materials should be incorporated into recycling, energy, and GHG emissions reduction goals. The Department does track and report annually the recycling of non-MRA materials. However, the available recycling data on non-MRA materials is likely less complete than data for MRA materials, because counties have more ability and incentive to collect data for materials subject to the mandatory MRA recycling rates. Additionally, the WARM Model that the Department uses for calculating energy and GHG emissions reductions is primarily intended for municipal solid waste and may not have the capability of modeling all non-MRA materials that are generated or recycled.

Another comment suggested including a material-specific recycling rate goal for textiles. While the Department supports increases in textile recycling, much of the diversion of textiles is through reuse, which would not be captured in the recycling rate. While reuse is itself a worthy goal, the Department does not currently receive information on quantities of materials reused, so this would not be a good candidate for a material-specific goal at this time.

A variety of other suggestions we made as to how to support or work toward the recommended goals. While not the subject of this document, the Department appreciates these suggestions and supports many of them, including additional outreach to promote source reduction, business recycling reporting, and the diversion of specific target materials.