

US EPA ARCHIVE DOCUMENT

Elements of Standardization

2

SECTION

In order to produce comparable recycling rates, certain elements of recycling measurement must be consistent from one jurisdiction to another.

These required elements of standardization are as follows:

- Include only the standard scope of MSW.
- Include only standard recycling activities.
- Use the standard equation for calculating a recycling rate.
- Account for imports and exports of materials.
- Obtain data on a calendar year basis.
- Report data in tons.

Even though the standardized recycling measurement system presented in this guide is voluntary, if you choose to implement this system in your state or locality, these components must be included in order for standardization to occur.

Other aspects of recycling measurement are flexible. These include:

- WHY to measure recycling.
- WHEN to collect the necessary data.
- WHO should collect and compile the information.
- WHERE to collect the information.
- HOW to collect, organize, and maintain the data.

This guide suggests preferred strategies for handling these flexible aspects of measurement, but since every jurisdiction is different, techniques that work effectively in one region may require modification in another.

Equation for Calculating the Standard Recycling Rate

$$\text{MSW Recycling Rate (\%)} = \frac{\text{Total MSW Recycled}}{\text{Total MSW Generated}^*} \times 100$$

*Total MSW Generated = Total MSW Recycled + Total MSW Disposed of

Standard Elements

The six elements detailed below comprise the standard methodology for measuring recycling. As such, they are required for states and localities that choose to implement the methodology.

1. Include only the standard scope of MSW.

Only MSW as defined in Table A (page 11) is included when calculating a recycling rate using the standard methodology presented in this guide. MSW is generated from residential, commercial, institutional, and industrial sources. Examples of waste from these sources are provided in Table 1, and a detailed description of the standard scope of MSW is provided in Table A.

While definitions of MSW differ from region to region, EPA has

defined and characterized MSW in a consistent way for over a decade. The scope of MSW employed in the standard methodology is consistent with EPA’s *Characterization of Municipal Solid Waste in the United States*, a study based on data collected since 1960. The definition of MSW contained in this report is based on the historical management of municipal solid waste. Although it is common practice to landfill materials such as municipal sludge, nonhazardous industrial process wastes, and construction and demolition (C&D) debris along with MSW, these materials are not included in the standard scope of MSW or in calculating a standard recycling rate. Such wastes are referred to as Other Solid Waste in this guide. (Refer to the Glossary in Appendix A for complete definitions.)

Defining the scope of MSW in the same way it is defined in EPA’s characterization study ensures that recycling rates are comparable from year to year since they are based on historical continuity. This

study also provides a source of default values that can be utilized in calculating a recycling rate if necessary. Finally, use of the study’s definition of MSW promotes consistency by establishing a common language for recycling discussions.

2. Include only standard recycling activities.

Recycling of MSW is defined as the series of activities by which discarded postconsumer materials are collected, sorted, processed, converted into raw materials, and used in the production of new products. Some examples of recycling activities included are recycling old newspaper into new paper, recycling discarded aluminum cans into new ones, offsite composting of leaves, and mulching old pallets into wood chips. (Refer to the Glossary in Appendix A for a complete definition.)

TABLE 1. SOURCES OF MSW

| SOURCES | TYPICAL EXAMPLES OF MSW |
|--|--|
| Residential (single- and multi-family homes). | Old newspapers, clothing, packaging, cans and bottles, food scraps, and yard trimmings. |
| Commercial (office buildings, retail and wholesale establishments, and restaurants). | Old corrugated containers (OCC), office papers, yard trimmings, food scraps, disposable tableware, paper napkins, and cans and bottles. |
| Institutional (schools, libraries, hospitals, and prisons). | Office papers, books, yard trimmings, and cafeteria wastes (food scraps, disposable tableware, paper napkins, and cans and bottles). |
| Industrial (packaging and administrative, but not process wastes). | OCC, plastic film, wood pallets, office papers, and cafeteria wastes (food scraps, disposable tableware, paper napkins, and cans and bottles). |

Preconsumer recycling, such as recycling trimmings from paper converting operations, is not included in calculating a standard recycling rate. Also omitted is the recycling of all non-MSW materials, such as C&D debris and used oil. Source reduction activities, including reuse practices and backyard composting, also are excluded from the standard recycling rate. Combustion for energy recovery, like other types of MSW disposal, is excluded. The scope of MSW recycling is described in detail in Table B (page 13).

The definition of recycling employed by the standard methodology is consistent with the definition used in EPA's *Characterization of Municipal Solid Waste in the United States*. The use of the same definition over time promotes consistency and comparability among recycling rates.

3. Use the standard equation for calculating a recycling rate.

The standard methodology uses the equation shown on page 5 for calculating a recycling rate.

The MSW recycling rate is calculated by dividing the total amount of MSW recycled (including offsite composting) in the measurement year (the previous calendar year) by the total amount of MSW generated. MSW generation is equal to the total amount of MSW recycled plus the total amount of MSW disposed of, in tons. Both MSW generation and recycling totals are adjusted to account for imports and exports of waste and recyclables. Methods for obtaining recycling and waste disposal data

are described in Section 4. Also, methods for using waste characterization data to estimate MSW generation (when disposal data are not available or reliable) are provided in Section 5.

4. Account for imports and exports of MSW and recyclables.

MSW and recyclables often move across jurisdictional lines for economic and practical reasons. Current recycling measurement systems do not always account for the exporting and importing of materials resulting from the free movement of waste and recyclables between states or localities.

The standard methodology requires that your recycling rate include only materials generated in your state or locality. This allows for a more accurate account of waste generated and materials recycled within your jurisdiction. For this reason, when calculating the amount of MSW recycled, be sure to add to the total any recyclable materials that were exported from your state or locality, and subtract any recyclables that were imported into your state or locality. Likewise, when calculating the amount of MSW disposed of, any MSW that was exported from your jurisdiction should be added to the total, and any MSW imported should be subtracted. Section 4 of this guide provides suggestions for how to track exports and imports.

5. Obtain data on a calendar year basis.

Some existing measurement systems use calendar year data, while

other systems employ fiscal year data. An important aspect of standardization, therefore, is setting a uniform measurement year. Private recyclers and disposal facilities supplying more than one jurisdiction with data will appreciate such uniformity. To be consistent, the standard methodology requires collection of data for the previous calendar year (January to December).

6. Report data in tons.

Another important aspect of standardization is a uniform unit of measurement. Data sources are asked to report quantities in tons and to use conversion factors if the tonnage is not available. Volume-to-weight conversion factors are provided to allow for standard conversions (see Appendix B). Alternatively, respondents can use their own conversion factors provided they are based on actual data and not estimates.

Flexible Elements

Below are the elements of recycling measurement that will differ among jurisdictions. Although the standard methodology does not prescribe a single method for addressing these elements, this guide does provide preferred approaches based on the experience of many state and local governments.

1. When to collect data.

Although the standard methodology requires you to collect data from the previous calendar year, exactly when you choose to collect and compile these data is entirely

Benefits To Using The Survey Forms

1. The survey forms ensure you will get the data needed to calculate an MSW recycling rate.
2. Survey respondents serving more than one state or locality will appreciate receiving a standard form.
3. The survey forms also allow agencies to track recycling and disposal of other solid wastes (e.g., C&D debris).
4. You will have enough data from the survey forms to calculate other performance measures if you choose, such as per capita waste generation and recycling rates, and to track reductions in waste disposal (waste diversion rates).
5. The survey forms are easy to read and include clear, simple instructions.
6. The survey forms have been tested and refined through a peer review process and demonstration projects.

up to you. Section 3 contains a recommended timeline that suggests dates for distributing survey forms and requesting responses. While you can adjust this schedule to meet your needs, keep in mind that companies serving more than one state or locality will appreciate having only one due date to remember.

2. How to obtain the necessary data.

Survey forms are typically used for obtaining the data needed to calculate a recycling rate. Although there are many benefits to all states and localities using the same survey form, this is not always practical. Some state and local governments have developed a form over years of surveying that works well for them, while others have unique information needs that preclude using a standard form. Therefore, the use of a standard form is not a required element of standardization.

Appendix C contains six survey forms (see Table 2 on page 9). You can reproduce these forms directly, modify them to fit your needs, or use your own forms. The first three survey forms seek data from specific points in the recycling chain—collection, processing, and remanufacturing. The remaining three survey forms seek waste disposal information from waste haulers, transfer stations, and disposal facility operators. In each set of three, one or more of the forms can be used depending on where you choose to get your data.

Appendix D contains four recycling rate worksheets (see Table 3 on page 9). The worksheets are designed for state and local governments that have never mea-

sured recycling as well as those already collecting data who want to either switch to the standard methodology or recalculate their recycling rate according to the standard method.

3. Who is responsible for collecting the data.

Any entity within a state or locality can collect recycling and waste disposal information from data sources. Typically, the department in charge of recycling takes on the data collection responsibility. However, state or local recycling organizations, trade associations, or other government agencies (such as permitting divisions that are compiling data from annual permit reports) also can collect the necessary data. Alternatively, some states enlist the help of their city or county governments, who survey data sources and then report back. Who is responsible for directly surveying data sources will not affect your ability to calculate a standard recycling rate for MSW.

4. Where to survey for the needed data.

The recycling and waste disposal data needed to calculate a recycling rate can be obtained from numerous sources, including collectors, processors, recycling plants, and disposal facilities. Section 4 explains the different options for surveying these sources. While there are advantages and disadvantages to surveying each of the sources, where you choose to obtain your data is not a required element of the standard measurement methodology.

TABLE 2. SURVEY FORMS AND RESPONDENTS

| SURVEY FORM | RESPONDENT TYPE |
|--------------------|---------------------------|
| Form 1 | Collectors of Recyclables |
| Form 2 | Processors of Recyclables |
| Form 3 | End Users of Recyclables |
| Form 4 | Collectors of MSW |
| Form 5 | Transfer Stations |
| Form 6 | Waste Disposal Facilities |

TABLE 3. RECYCLING RATE WORKSHEETS

| WORKSHEET | WHO SHOULD USE | PURPOSE |
|---|--|--|
| A Converting to the Standard Recycling Rate. | State and local governments that are already collecting data and have previously calculated a recycling rate. | To recalculate a recycling rate using the standard MSW recycling rate equation. |
| B1 Determining the Amount of MSW Recycled. | State and local governments that have not measured recycling previously. State and local governments already measuring recycling that want to switch to the standard methodology. | To compile recycling data and calculate the numerator of the equation, total MSW recycled. |
| B2 Determining Waste Generation. | | To compile disposal data and calculate the denominator of the equation, total MSW generated. |
| B3 Calculating Your MSW Recycling Rate. | | To calculate the standard recycling rate. |

Using the Scope Tables

Tables A and B should be used in conjunction with each other to help you understand what is included in the standard municipal solid waste (MSW) recycling rate and what is excluded. First, use Table A, Scope of Materials Included in the Standard MSW Recycling Rate, to identify which materials are defined as MSW (Column 2, What Is MSW) and which materials are defined as Other Solid Waste (Column 3, What Is Not MSW). The materials outlined in column 2, What Is MSW, are included in both the recycling and waste generation totals of the standard recycling rate.

After you have determined which materials are included in the standard recycling rate, use Table B, Scope of Activities Included in the Standard MSW Recycling Rate, to further refine the scope based on whether the recycling of the materials defined in Table A meets the standard definition of recycling outlined in Table B. As an example, tires from automobiles are defined as MSW according to Table A, so the disposal of such tires may be included in your waste generation total. If these tires are retreaded, however, they may not be included in your recycling total since retreading is considered reuse rather than recycling according to Table B.

TABLE A. SCOPE OF MATERIALS INCLUDED IN THE STANDARD MSW RECYCLING RATE

| MATERIAL¹ | WHAT IS MSW | WHAT IS NOT MSW² |
|---|--|--|
| Food Scraps | Uneaten food and food preparation wastes from residences and commercial establishments (restaurants, supermarkets, and produce stands), institutional sources (school cafeterias), and industrial sources (employee lunchrooms). | Food processing waste from agricultural and industrial operations. |
| Glass Containers | Containers; packaging; and glass found in appliances, furniture, and consumer electronics. | Glass from transportation equipment (automobiles) and construction and demolition (C&D) debris (windows). |
| Lead-Acid Batteries | Batteries from automobiles, trucks, and motorcycles. | Batteries from aircraft, military vehicles, boats, and heavy-duty trucks and tractors. |
| Tin/Steel Cans and Other Ferrous Metals | Tin-coated steel cans; strapping; and ferrous metals from appliances (refrigerators), consumer electronics, and furniture. | Ferrous metals from C&D debris and transportation equipment. |
| Aluminum Cans and Other Nonferrous Metals | Aluminum cans; nonferrous metals from appliances, furniture, and consumer electronics; and other aluminum items (foil and lids from bimetal cans). | Nonferrous metals from industrial applications and C&D debris (aluminum siding, wiring, and piping). |
| Paper | Old corrugated containers; old magazines; old newspapers; office papers; telephone directories; and other paper products including books, third-class mail, commercial printing, paper towels, and paper plates and cups. | Paper manufacturing waste (mill broke) and converting scrap not recovered for recycling. |
| Plastic | Containers; packaging; bags and wraps; and plastics found in appliances, furniture, and sporting and recreational equipment. | Plastics from transportation equipment. |
| Textiles | Fiber from apparel, furniture, linens (sheets and towels), carpets ³ and rugs, and footwear. | Textile waste generated during manufacturing processes (mill scrap) and C&D projects. |
| Tires | Tires from automobiles and trucks. | Tires from motorcycles ⁴ , buses, and heavy farm and construction equipment. |
| Wood | Pallets; crates; barrels; and wood found in furniture and consumer electronics. | Wood from C&D debris (lumber and tree stumps ⁵) and industrial process waste (shavings and sawdust). |
| Yard Trimmings | Grass, leaves, brush and branches, and tree stumps. ⁵ | Yard trimmings from C&D debris. |
| Other | Household hazardous waste (HHW) ⁶ , oil filters, fluorescent tubes ⁷ , mattresses, and consumer electronics. | Abatement debris, agricultural waste, combustion ash, C&D debris, industrial process waste, medical waste, mining waste, municipal sewage and industrial sludges, natural disaster debris ⁸ , used motor oil, oil and gas waste, and preconsumer waste. |

TABLE A. NOTES

- ¹ Composite materials are categorized according to their main constituent; however, they can be designated as a separate category under Other MSW if they cannot be otherwise categorized.
- ² These wastes are not considered MSW due to one or more of the following reasons: (1) they are not defined as MSW in EPA's *Characterization of Municipal Solid Waste in the United States*, (2) they have not been historically handled and disposed of as MSW, (3) they are regulated as hazardous waste, and/or (4) they were generated by a preconsumer source. These non-MSW wastes are referred to as Other Solid Waste in this guide and on the survey forms and worksheets.
- ³ Carpets are categorized as Textiles when discarded in MSW and are included in the rate calculation. When carpets are discarded in C&D debris, they are not considered MSW and are excluded from the rate calculation.
- ⁴ Tires from motorcycles are not defined as MSW because they historically have not been characterized as MSW in EPA's *Characterization of Municipal Solid Waste in the United States*.
- ⁵ Tree stumps are categorized as Yard Trimmings when discarded in MSW and are included in the rate calculation. When tree stumps are discarded in C&D debris, they are not considered MSW and are excluded from the rate calculation.
- ⁶ HHW includes paints, stains, varnishes, solvents, pesticides, and other materials or products containing volatile chemicals that catch fire, react, explode under certain circumstances, or that are corrosive or toxic. Specific examples include oil-based paint, antifreeze, household cleansers, and bug sprays. Used motor oil is excluded.
- ⁷ Fluorescent tubes are categorized as Other MSW when found in MSW and are included in the rate calculation. When fluorescent tubes are discarded in C&D debris, they are not considered MSW and are excluded from the rate calculation.
- ⁸ Natural disasters include earthquakes, floods, hurricanes, and tornados. Heavy storms are not considered natural disasters.

TABLE B. SCOPE OF ACTIVITIES INCLUDED IN THE STANDARD MSW RECYCLING RATE

| RECYCLABLE MATERIAL | WHAT COUNTS AS RECYCLING | WHAT DOES NOT COUNT AS RECYCLING¹ |
|----------------------------|---|--|
| Food Scraps | Composting of food scraps from grocery stores, restaurants, cafeterias, lunchrooms, and private residences, and the use of food scraps to feed farm animals. | Backyard (onsite) composting of food scraps, and the use of food items for human consumption (food banks). |
| Glass | Recycling of container and packaging glass (beverage and food containers), and recycling of glass found in furniture, appliances, and consumer electronics into new glass products such as containers, packaging, construction materials (aggregate), or fiberglass (insulation). | Recycling of glass found in transportation equipment and construction and demolition (C&D) debris, recycling of preconsumer glass or glass from industrial processes, and reuse of refillable glass bottles. |
| Lead-Acid Batteries | Recycling of lead-acid batteries found in cars, trucks, or motorcycles into new plastic and lead products. | Recycling of lead-acid batteries used in large equipment, aircraft, military vehicles, boats, heavy-duty trucks and tractors, and industrial applications. |
| Metals | Recycling of aluminum and tin/steel cans, and recycling of metals found in appliances and packaging into new metal products. | Reuse of metal containers, packaging, furniture, or consumer electronics, and recycling of metals found in transportation equipment (autobodies) and C&D debris. |
| Paper | Recycling of paper products (old newspapers and office papers) into new paper products (tissue, paperboard, hydromulch, animal bedding, or insulation materials). | Reuse of paper products, recycling of preconsumer or manufacturing waste (trimmings, mill broke, print overruns, and overissue publications), and combustion of paper for energy recovery. |
| Plastic | Recycling of plastic products (containers, bags, and wraps), and recycling of plastic from furniture and consumer electronics into new plastic products (fiber fill and plastic lumber). | Reuse of plastic products (storage containers and sporting equipment), recycling of preconsumer plastic waste or industrial process waste, and combustion of plastics for energy recovery. |
| Textiles | Recycling of textiles into wiper rags, and recycling of apparel and carpet fiber ² into new products such as linen paper or carpet padding. | Reuse of apparel. |
| Tires | Recycling of automobile and truck tires into new products containing rubber (trash cans, storage containers, and rubberized asphalt), and use of whole tires for playground and reef construction. | Recycling of tires from motorcycles, buses, and heavy farm and construction equipment, retreading of tires, and combustion of tire chips for energy recovery. |
| Wood | Recycling of wood products (pallets and crates) into mulch, compost, or similar uses. | Repair and reuse of pallets, combustion of wood for energy recovery, recycling of industrial process waste (wood shavings or sawdust), and recycling of wood from C&D debris. |
| Yard Trimmings | Offsite recycling of grass, leaves, brush or branches ³ , and tree stumps ⁴ into compost, mulch, or similar uses; and landspreading of leaves ⁵ . | Mulching of tree stumps ⁴ from C&D debris, backyard (onsite) composting, grasscycling, landspreading of leaves ⁵ , and combustion of yard trimmings for energy recovery. |
| Other | Household hazardous waste (HHW) ⁶ , oil filters, fluorescent tubes ⁷ , mattresses, circuit boards, and consumer electronics ⁸ . | Recycling of used oil, C&D debris (asphalt, concrete, and natural disaster debris), transportation equipment (autobodies), municipal sewage sludge, and agricultural, industrial, mining, and food processing waste. |

TABLE B. NOTES

- ¹ These activities are not considered recycling due to one or more of the following reasons: (1) they are not defined as recycling in EPA's *Characterization of Municipal Solid Waste in the United States*, (2) they involve the recycling of materials that are not part of MSW, (3) they involve reuse or source reduction, and/or (4) they involve the recycling of preconsumer waste.
- ² Carpeting is categorized as Textiles when discarded in MSW and is included in the rate calculation. When carpets are discarded in C&D debris, they are excluded from the rate calculation.
- ³ Includes woody material such as branches, brush, and whole trees such as Christmas trees.
- ⁴ Tree stumps are categorized as Yard Trimmings when discarded in MSW and are included in the rate calculation. When tree stumps are discarded in C&D debris, they are excluded from the rate calculation.
- ⁵ Landspreading of leaves counts as recycling if the manner of the application allows timely biodegradation of the organic plant material. Landspreading of leaves does not count as recycling if the manner of the application precludes the timely biodegradation of the organic plant material.
- ⁶ HHW includes paints, stains, varnishes, solvents, pesticides, antifreeze products, and other materials or products containing volatile chemicals that catch fire, react, explode under certain circumstances, or that are corrosive or toxic. Specific examples include oil-based paint, antifreeze, household cleansers, and bug sprays. Used motor oil is excluded.
- ⁷ Fluorescent tubes are categorized as Other MSW when discarded in MSW and are included in the rate calculation. When fluorescent tubes are discarded in C&D debris, they are excluded from the rate calculation.
- ⁸ Composite materials are categorized according to their main constituent; however, they can be designated as a separate category under Other if they cannot be otherwise categorized.