

# Measuring Recycling, Diversion, and Recovery in Washington

## Background and Methodology 1986 to 2016

Washington State Department of Ecology

Solid Waste Management

Olympia, Washington

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DEPARTMENT OF  
**ECOLOGY**  
State of Washington

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## Purpose

This document provides background and methodology for Washington Department of Ecology (Ecology) Solid Waste Management recycling, diversion, and recovery metrics from 1986 through 2016.<sup>3</sup> It also clarifies how materials, generator sectors, and processing methods are counted, and provides rationale for counting decisions.

This document has no bearing on regulatory status.

This helps to fulfill strategic recommendations for Ecology's Solid Waste Management (SWM) program's data collection and analysis, to provide more communication on measurement methodologies.

## Audience

All internal and external stakeholders with an interest in Washington's recycling and recovery data, including policy makers at the state and local government level, businesses, and non-governmental organizations are among the audience members for this document.

## Background

### Washington's First Recycling Survey

Washington's original recycling survey and municipal solid waste stream analysis was designed and completed by R.W. Beck & Associates (1986 Washington State Recycling Survey, Ecology Publication #87-23). No other state had done anything similar at that time. A limited material list of 15 recycled materials was *tracked* with the initial survey due to limitations on scope and funding for the study, however, the consultant *identified* 22 materials from the municipal solid waste (MSW)<sup>4</sup> stream that were significant in terms of recycling.

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<sup>3</sup> Calendar year data.

<sup>4</sup> MSW recycling, for purposes of determining historic MSW recycling rates (1986-2016), includes mixed solid waste and other materials collected for recycling or disposal from municipal sources (residential and commercial), excludes source separated construction and demolition debris, agricultural waste, mining waste, and most industrial sources. See also the definition in WAC 173-350. ([Ecology, 2020](#))

**Table 1: Recyclable Materials Identified in Washington’s 1986 Recycling Survey**

Refillable beer bottles	Aluminum cans	Batteries
Refillable soft-drink bottles	Aluminum containers	Tires
Container glass	Tin cans	Oil
Newsprint	Bi-metal cans	PET bottles
Corrugated containers	Ferrous metals	HDPE
Computer paper	Nonferrous metals	LDPE
Office paper	White goods	Other plastic products
Mixed waste paper		

Ecology began tracking these 22 materials in the next iteration of the survey, the 1988 Washington State Recycling Survey (Ecology Publication #89-55).

## Methodology

### Washington’s Early Method for Measuring MSW Recycling

In 1989, the state legislature passed Chapter 70.95 RCW, “The Waste Not Washington Act,” establishing the 50 percent reduction and recycling goal, and Ecology is tasked with continuing to measure waste and recycling. Through the 1990s, Ecology continues to develop its measurement program with input from the Solid Waste Advisory Committee, local governments, non-governmental organizations (NGOs), and a Recycling Assessment Panel with broad-based sector representation.

In recycling surveys from 1989 through 1999, other materials such as yard debris and wood were added as they emerged in the MSW stream and were recovered for recycling and other beneficial uses. These materials were added to the recycling rate.<sup>5</sup> Some recyclable materials were discontinued from measurement due to their decline in the MSW stream, non-viability for recycling, or inclusion in other categories, such as refillable bottles, aluminum containers, and catalytic converters.

The calculation for the MSW recycling rate is:

$$\frac{\text{(MSW collected for recycling)}}{\text{(MSW collected for recycling + MSW disposed in landfills and incinerators)}}$$

### Washington’s Method for Measuring Recycling compared to EPA Guidance

As many states were forming recycling metrics or considering them in the 1990s, the Environmental Protection Agency (EPA) wanted to provide guidance, so they looked to states who had established recycling metrics already for input. As Washington’s MSW recycling metric had been well established by this time, Ecology staff was invited and participated in this effort.

<sup>5</sup> Recycling rate (or MSW recycling rate) refers to the percentage of MSW material that is recycled instead of disposed in landfills or incinerators.

[Measuring Recycling: A Guide for State and Local Governments](#) was published in 1997. The following tables are from this guide, with a comparison of Washington’s methodology for determining MSW recycling from the time this guidance was established through 2016.

**Table 2: EPA’s Scope of Materials Included in the Standard MSW Recycling Rate compared to Washington’s method**

<b>EPA’s SCOPE OF MATERIALS INCLUDED IN THE STANDARD MSW RECYCLING RATE</b>			<b>Washington method for counting MSW Recycling</b>
<b>MATERIAL<sup>1</sup></b>	<b>WHAT IS MSW</b>	<b>WHAT IS NOT MSW<sup>2</sup></b>	
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.	Same method.
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).	Same method
Lead-Acid Batteries	Batteries from automobiles, trucks, and motorcycles.	Batteries from aircraft, military vehicles, boats, and heavy-duty trucks and tractors.	Same method
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.	Ferrous metals, including transportation equipment and other non-industrial automotive wastes are included in MSW, unless reported as mixed C&D. <sup>a</sup>
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).	Nonferrous metals are included in MSW, unless reported as mixed C&D.
Paper	Old corrugated containers; old magazines; old newspapers; office	Paper manufacturing waste (mill broke) and converting scrap not recovered for recycling.	Same method

EPA's SCOPE OF MATERIALS INCLUDED IN THE STANDARD MSW RECYCLING RATE		
MATERIAL <sup>1</sup>	WHAT IS MSW	WHAT IS NOT MSW <sup>2</sup>
	papers; telephone directories; and other paper products including books, third-class mail, commercial printing, paper towels, and paper plates and cups.	
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 <sup>3</sup> 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 <sup>4</sup> , 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 <sup>5</sup> ) and industrial process waste (shavings and sawdust).
Yard Trimmings	Grass, leaves, brush and branches, and tree stumps. <sup>5</sup>	Yard trimmings from C&D debris.
Other	Household hazardous waste (HHW) <sup>6</sup> , oil filters, fluorescent tubes <sup>7</sup> , 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 <sup>8</sup> , used motor oil, oil and gas waste, and preconsumer waste.

Washington method for counting MSW Recycling
Some automotive plastics may be included in MSW, such as foam; post-industrial plastics are not included in MSW.
Same method, however some textile waste from manufacturing processes may be counted as MSW, if reports do not distinguish origin.
Tires are counted based on processing method. Reports do not distinguish type.
Reports generally do not distinguish origin. Recycled wood, and shavings and sawdust with MSW origins such as yard debris, are counted as MSW; wood with mixed C&D debris is excluded.
In MSW unless reported as landclearing debris.
Used motor oil that is recycled is counted as MSW; reuse, such as mattresses and electronics are excluded; MSW includes fats & oils.



**Notes (Table A)**

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.

**Washington Notes as Relates to Table 2**

- a. Reports to Ecology may not distinguish origin or specific destination.

**Table 3: EPA's Scope of Activities included in the Standard MSW Recycling Rate compared to Washington's method**

EPA's SCOPE OF ACTIVITIES INCLUDED IN THE STANDARD MSW RECYCLING RATE			Washington method for counting MSW Recycling
RECYCL-ABLE MATERIAL	WHAT COUNTS AS RECYCLING	WHAT DOES NOT COUNT AS RECYCLING <sup>1</sup>	
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).	Same method
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,	Recycling of glass found in transportation equipment and construction and demolition (C&D) debris, recycling of preconsumer glass or glass from industrial processes, and	Same method. From 1986 to 1999, refillable bottles were counted as MSW recycling.

EPA's SCOPE OF ACTIVITIES INCLUDED IN THE STANDARD MSW RECYCLING RATE			Washington method for counting MSW Recycling
RECYCL-ABLE MATERIAL	WHAT COUNTS AS RECYCLING	WHAT DOES NOT COUNT AS RECYCLING <sup>1</sup>	
	construction materials (aggregate), or fiberglass (insulation).	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.	Same method
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.	Ferrous metals are included in MSW, unless reported as mixed C&D; non-industrial automotive wastes are counted as MSW.
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.	Same method
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.	Same method
Textiles	Recycling of textiles into wiper rags, and recycling of apparel and carpet fiber <sup>2</sup> into new products such as linen paper or carpet padding.	Reuse of apparel.	Reused/resold textiles are counted as MSW. Collectors and processors generally do not distinguish how it is used.
Tires	Recycling of automobile and truck tires into new products containing rubber (trash cans, storage containers, and	Recycling of tires from motorcycles, buses, and heavy farm and construction equipment, retreading of tires, and	Same method; although some motorcycle and bus tires may be counted as MSW as reports

EPA's SCOPE OF ACTIVITIES INCLUDED IN THE STANDARD MSW RECYCLING RATE			Washington method for counting MSW Recycling
RECYCL-ABLE MATERIAL	WHAT COUNTS AS RECYCLING	WHAT DOES NOT COUNT AS RECYCLING <sup>1</sup>	
	rubberized asphalt), and use of whole tires for playground and reef construction.	combustion of tire chips for energy recovery.	do not distinguish types of tires.
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.	Same method, although reports generally do not distinguish how pallets are processed; shavings and sawdust can have MSW origins such as yard debris, and is counted as recycled.
Yard Trimmings	Offsite recycling of grass, leaves, brush or branches <sup>3</sup> , and tree stumps <sup>4</sup> into compost, mulch, or similar uses; and landspreading of leaves <sup>5</sup> .	Mulching of tree stumps <sup>4</sup> from C&D debris, backyard (onsite) composting, grasscycling, landspreading of leaves <sup>5</sup> , and combustion of yard trimmings for energy recovery.	In MSW unless reported as landclearing debris or from land application reports; all combustion is excluded from MSW.
Other	Household hazardous waste (HHW) <sup>6</sup> , oil filters, fluorescent tubes <sup>7</sup> , mattresses, circuit boards, and consumer electronics <sup>8</sup> .	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.	Used motor oil that is recycled is counted as MSW; reuse such as mattresses and electronics are excluded from MSW; fats & oils are counted as MSW.

**Notes (Table 3)**

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.

Ecology continued to use this calculation for the MSW recycling rate through 2016:

(MSW collected for recycling)

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(MSW collected for recycling + MSW disposed in landfills and incinerators)

## Measuring Landfill Diversion<sup>6</sup>

In the late 1990s, Ecology noticed the need for tracking activities and materials separately from MSW recycling that were either not part of MSW or were diverting materials from landfills using other methods besides recycling, and thus had not been included in the numerator nor denominator of the Washington MSW recycling rate. In 1999, the “diversion rate”<sup>7</sup> was created as an alternative metric that would account for these beneficial uses of other recoverable wastes. The other recoverable wastes added in 1999 to both the numerator and denominator to create the new diversion rate calculation are:

- Construction and demolition (C&D) debris
- Industrial materials
- Organic materials from large scale commercial operations, such as agricultural wastes and food processing wastes
- Materials burned for energy recovery
- Reused materials

The diversion rate was available along with the recycling rate for 1999 to 2015 datasets.

The calculation for the diversion rate is:

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<sup>6</sup> Diversion is defined as waste diverted from landfills, which includes materials reused and burned for energy in addition to those that are recycled. Includes materials collected for recycling; diverted materials were tracked in addition to materials collected for recycling starting in 1999. ([Ecology, 2020](#))

<sup>7</sup> Diversion rate is the percentage of materials that are diverted from disposal in landfills and incinerators for recycling, reuse and other beneficial uses. ([Ecology, 2020](#))

(MSW collected for recycling + diverted materials)

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(MSW collected for recycling + diverted materials + MSW disposed  
in landfills and incinerators + other recoverable wastes disposed)

## Diversion to Recovery<sup>8</sup>

Diversion from landfill as the point of success should not be the goal. We want to focus on positive outcomes and putting a material to a useful purpose. For this reason, starting with 2016 data, Ecology began to shift emphasis and terminology used for solid waste metrics from “diversion” to “recovery”. This shift was due to an increasing focus on sustainable materials management, which places greater importance on the environmental benefits of recovering wastes, such as greenhouse gas and other environmental emissions savings, and lesser importance on the amount of material diverted from landfills.

For the 2016 data, this shift was focused on terminology, and simply the words “diversion” and “recovery” were switched.

The recovery rate<sup>9</sup> was available along with the recycling rate for the 2016 dataset.

The calculation for the recovery rate is:

(MSW collected for recycling + recovered materials)

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(MSW collected for recycling + recovered materials + MSW disposed  
in landfills and incinerators + other recoverable wastes disposed)

This terminology shift sparked a change in methodology as well. For 2017 and going forward, another paper is available that explains the methodology for counting solid waste materials, including recovery and waste generation.

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<sup>8</sup> Recovery is defined as material that is diverted from the solid waste stream for the intended purpose of recycling, composting, burning source-separated materials for energy, anaerobic digestion, land application, and other beneficial uses. Similar to **Diversion** (however focuses on the resource aspect instead of offsetting landfill). ([Ecology, 2020](#))

<sup>9</sup> Recovery rate is the percentage of materials collected for recycling, composting, and burning source-separated materials for energy. Similar to the previously calculated diversion rate.