



State of Oregon
Department of
Environmental
Quality

2015-16 Materials Management Program Information Update

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Materials Management

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DEQ's mission is to be a leader in restoring, maintaining and enhancing the quality of Oregon's air, land and water. DEQ works collaboratively with Oregonians for a healthy, sustainable environment.

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Executive summary

The DEQ Materials Management program works to reduce the environmental and human health impacts of the products and materials Oregonians make and use. It was formerly known as the Solid Waste program. Materials Management:

- Performs foundational research and policy analysis about environmental impacts;
- Administers permits and complaint response for facilities managing solid waste;
- Provides direct services to residents and communities; and
- Conducts strategic collaborations with businesses, local governments, and others.

This report fulfills DEQ's requirement to report to the legislature about the statewide solid waste plan (ORS 459A.015-020) and electronics recycling (ORS 459A.340).

The 2050 Vision and the Materials Life Cycle

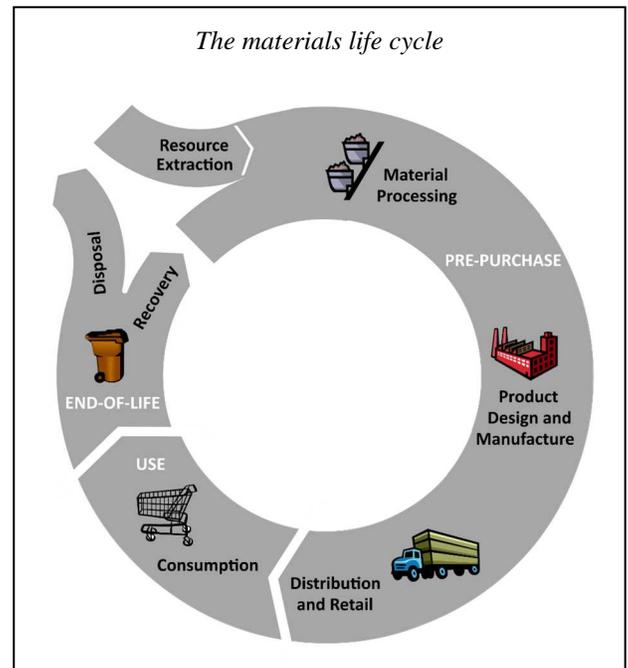
The work of Materials Management is guided by *Materials Management in Oregon: 2050 Vision and Framework for Action*.¹ This plan was approved by the Environmental Quality Commission in 2012 after an extensive collaboration with stakeholders.

The plan adopts a life cycle view of materials and products. This recognizes that environmental impacts occur not only at “end of life,” when items are discarded or recycled, but throughout a cycle that includes resource extraction, production, distribution, and use. An estimated 65 percent of greenhouse gas emissions associated with Oregonians' consumption of goods and services occur before the point of purchase, while less than 1 percent occur during disposal.² Any effort to reduce the impacts of materials must address the whole life cycle.³

The *2050 Vision* recognizes that materials, environment, and quality of life are linked. It describes an Oregon of 2050 where producers make products sustainably, people live well and consume sustainably, and materials have the most useful life possible before and after discard.

Growth and change under new guidance and law

2015 and 2016 were years of growth and change for Materials Management, as it continued to respond to the new direction in the *2050 Vision*. Achieving sustainable production and use of materials in Oregon by 2050 is a significant endeavor, and the *Vision* lists four tasks as foundations for that work. These are: securing sustainable funding for Materials Management, establishing goals, performing key research and building the *Vision* into DEQ's operations.



¹ This document is the state's integrated solid waste plan, required by ORS 459A.020. <http://www.deq.state.or.us/lq/pubs/docs/sw/2050vision/MaterialsManagementinOregon.pdf>

² Oregon Department of Environmental Quality, "Oregon's 2005-2014 Consumption-Based Greenhouse Gas Emissions," March 1, 2016, <http://www.deq.state.or.us/lq/pubs/factsheets/GHGInventory2014.pdf>.

³ US EPA, "Sustainable Materials Management: The Road Ahead," June 2009, <https://www.epa.gov/sites/production/files/2015-09/documents/vision2.pdf>.

The 2015 legislature began building this foundation with two bills:

- **Senate Bill 245** changed the structure of landfill tipping fees, the primary source of Materials Management program funding. This provided adequate and stable funding, allowing Materials Management to restore several priority services lost during the recession, and fund the highest priority projects identified in the *2050 Vision*.
- **Senate Bill 263** updated the state’s Recycling Opportunity Act, revising waste prevention and recovery goals, adding new waste prevention and recycling program elements for local governments, and allowing outcome-based recovery rates that support the *2050 Vision*.

EQC adopted rules to implement SB 245 in early 2016 and portions of SB 263 in early 2017.

Materials Management work in 2015-16

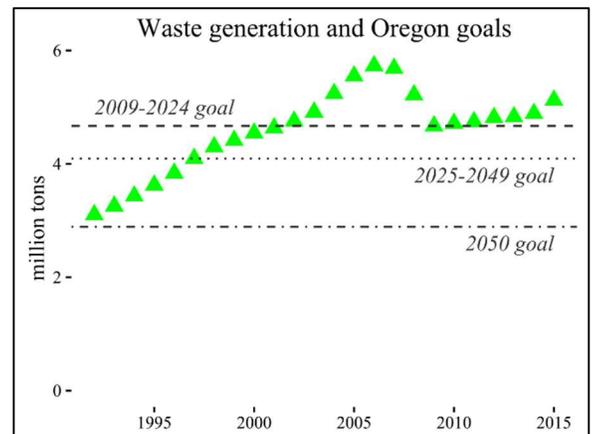
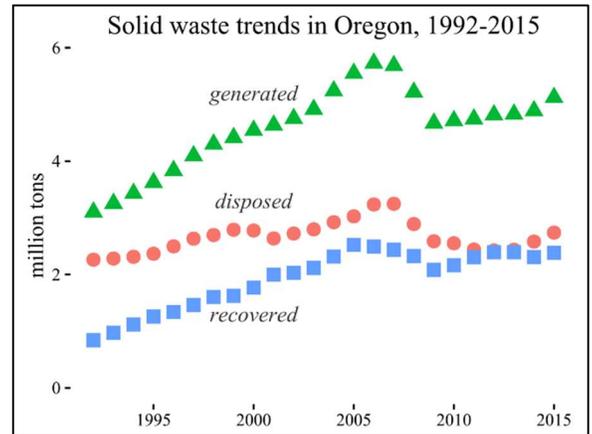
In 2015-16 Materials Management worked on two main tracks. First, it continued positive work in end-of-life management. For example,

- In 2015 Oregon E-Cycles recycled more than 29,000,000 pounds of consumer electronics.
- Staff administered disposal site permits, investigated complaints, and assisted local governments in fulfilling the requirements of the Recycling Opportunity Act.
- The 2015 Materials Recovery Survey⁴ reported on solid waste trends and goals. The recovery rate (the portion of discards recycled or otherwise recovered) was little changed from 2014. However, the tonnage of materials disposed increased, as did waste generation (the total of recovered and disposed tons).
- These data show that in 2015, Oregon moved away from its SB 263 goals for lowering waste generation. To meet those goals, waste must be prevented earlier in the materials life cycle.

The second track of activity responded to that need, as well as broader opportunities in sustainable production. In 2015-16, Materials Management initiated strategically chosen projects across the materials life cycle. For example, Materials Management:

- Awarded more than \$2 million in grants to local governments and nonprofits, often for projects focusing on preventing waste and encouraging repair and reuse.
- Initiated key research on materials with high environmental impacts, including designing a study on the prevention of wasted food with Portland State University.
- Pursued initiatives with businesses to make products with lower environmental impacts, such as working with concrete producers to reformulate their mixes.

SB 245 and SB 263 have placed Materials Management on a strong footing to work toward the *2050 Vision*. In the next two years, the results of this investment should become visible in research reports, policy analyses, and service to local governments, businesses, and residents.



⁴ Oregon Department of Environmental Quality, “2015 Oregon Material Recovery and Waste Generation Rates Report,” November 2016, <http://www.deq.state.or.us/lq/pubs/docs/sw/2015MRWGratesReport.pdf>.

Purpose and legal context

This report informs the Oregon Legislature about the work of Materials Management Program of the Oregon Department of Environmental Quality, with a focus on work in 2015 and 2016.

It fulfills DEQ's requirement, in ORS 459A.015 and 459A.020 (2015), to report biennially to the Oregon Legislature about the status of Oregon's Integrated Solid Waste Management Plan. It also fulfills DEQ's requirement, in ORS 459A.340 (2015), to report on operations of "the statewide system for collection, transportation and recycling of covered electronic devices," which is known as Oregon E-Cycles.

Introduction: changing focus under a new vision

Oregon law (ORS 459A.020) requires the state to have an integrated solid waste plan. In 2012 the Environmental Quality Commission approved a major update to that plan, *Materials Management in Oregon: 2050 Vision and Framework for Action*.

The *2050 Vision and Framework for Action* reflects an extensive collaboration among DEQ and many stakeholders. It contains a new consensus about how materials impact the environment and why those impacts matter.

From Solid Waste to Materials Management

Historically, the environmental impacts of solid waste have been pictured in terms of “discards” or “end-of-life”: what happens when materials or products are disposed of, recycled, or otherwise “recovered.”

However, impacts also occur earlier in the “materials life cycle,” as materials are extracted, transformed into products, and used.

“It is now clear that the vast majority of environmental impacts result from decisions made in design, production and consumption—not end-of-life management,” states the *2050 Vision*. For example, DEQ estimates that 65 percent of greenhouse gas emissions associated with Oregonians’ consumption of goods and services occur before the point of purchase, while less than 1 percent occur during disposal.⁵

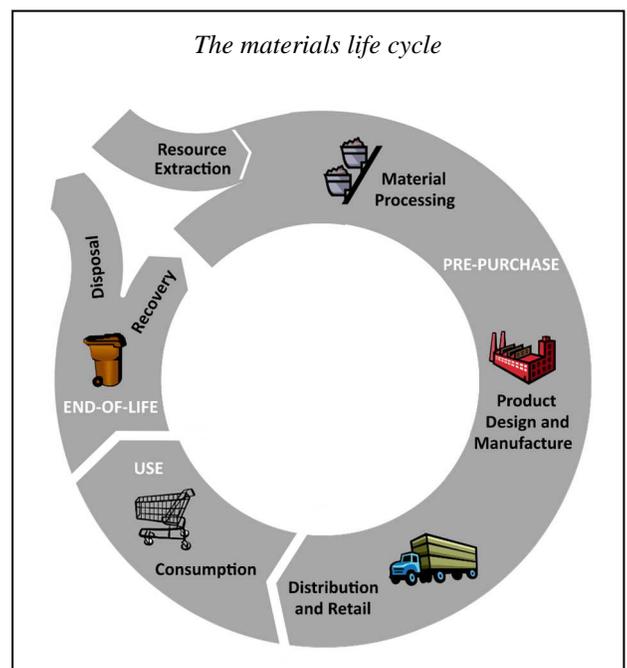
Materials are central to those impacts. DEQ estimates that 44 percent of the state’s consumption-based greenhouse gas emissions are linked to the purchase of materials by consumers, more than the emissions linked to direct purchases of electricity (13 percent), fuels (20 percent), or services (23 percent).⁶ The way materials are produced, used, and managed influences air quality, water quality, and land quality alike – all the areas on which DEQ as an agency works.

In response, DEQ and the *2050 Vision* have adopted a “materials management” approach, where environmental and human health impacts are addressed across the full life cycle of materials, and strategic choices are made to reduce the most significant impacts. To reflect this broader approach, DEQ’s Solid Waste program changed its name to Materials Management.



Materials Management in Oregon

2050 Vision and Framework for Action



⁵ Oregon Department of Environmental Quality, “Oregon’s 2005-2014 Consumption-Based Greenhouse Gas Emissions.” <http://www.deq.state.or.us/lq/pubs/factsheets/GHGInventory2014.pdf>

⁶ Ibid.

The Vision and a foundation for realizing it

The *2050 Vision* provides a prospect of Oregon in the year 2050. “*Oregonians live within the limits of their sustainable share of the world’s natural resources,*” it says. “*Materials and products support human health, well-being and healthy, resilient environments and communities—whether those goods are made in Oregon, used in Oregon, or both. Sustainable use of resources allows all people to enjoy a prosperous, clean economy and fulfilling lives.*”

Such a future is likely only with a strong basis of action today. The *Vision* lists four tasks for beginning work: securing sustainable funding for Materials Management work, establishing goals, performing key research, and building the *Vision* into DEQ’s operations.

The 2015 legislature began building that foundation with two bills:

- **Senate Bill 245** changed the structure of landfill tipping fees, the primary source of Materials Management program funding. This provided adequate and stable funding, allowing Materials Management to restore several priority services lost during the recession, and fund the highest priority projects identified in the *2050 Vision*.
- **Senate Bill 263** updated the state’s Recycling Opportunity Act, revising waste prevention and recovery goals, adding new waste prevention and recycling program elements for local governments, and allowing outcome-based recovery rates that support the *2050 Vision*.

On the strength of these bills, in 2015-16 Materials Management began to shift its personnel, expertise, and projects to place more emphasis on waste prevention and full life cycle materials management. Personnel and projects are now spread across the materials life cycle:

- *Foundational research projects provide data for understanding the impacts of materials and identifying strategic priorities.* For example, the Consumption-Based Emissions Inventory analyzes the root drivers of greenhouse gas emissions, while the Material Recovery Survey and Waste Composition Study provide a detailed accounting of the waste stream. In 2015-16 DEQ also initiated key research on high-impact materials, for example designing a major study on the prevention of wasted food with Portland State University.
- *Staff administer permits, inspections, and complaint response for Oregon’s solid waste facilities,* such as landfills, transfer stations, and composting operations.
- *Staff provide direct services to residents and communities, and administer other consumer-oriented services.* For example, DEQ supervises the collection of household hazardous waste in certain counties, contracting for collection events where there are no local services. It also administers Oregon’s product stewardship programs for collecting electronics waste (“E-Cycles”) and leftover architectural paint.
- *Collaborations with communities, businesses, and academics extend DEQ’s expertise and resources to reduce impacts.* For example, in 2015-16 DEQ awarded more than \$2 million in grants to local governments and nonprofits for projects across the materials life cycle, such as reuse and repair programs. It collaborated with concrete producers on reducing the environmental impacts of their products while taking advantage of market interest in lower-impact concrete. And it engaged researchers in a study of the impacts of food products.

SB 245 and SB 263 have placed Materials Management on a strong footing to work toward the *2050 Vision*. In the next two years, the results of this investment should become visible in research reports, policy analyses, and improved services to local governments, businesses, and residents.

Foundational research and policy work

Consumption-based greenhouse gas emissions inventory

Greenhouse gases are the main driver of global climate change, a process that threatens the welfare of human and nonhuman species alike.⁷ Greenhouse gasses are linked to rising sea levels, changes in the frequency of extreme weather events, the spread of human and agricultural disease vectors, and numerous other hazards to human health and quality of life.⁸

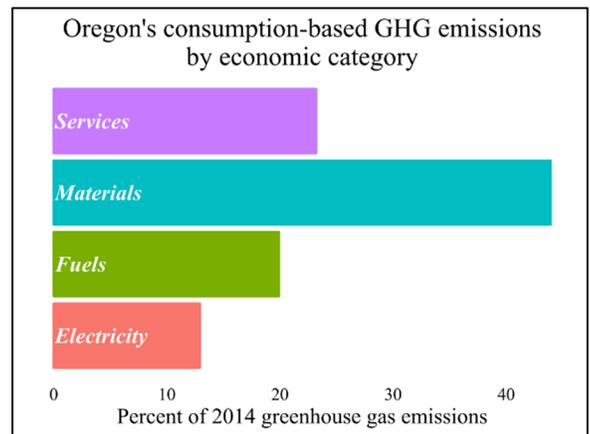
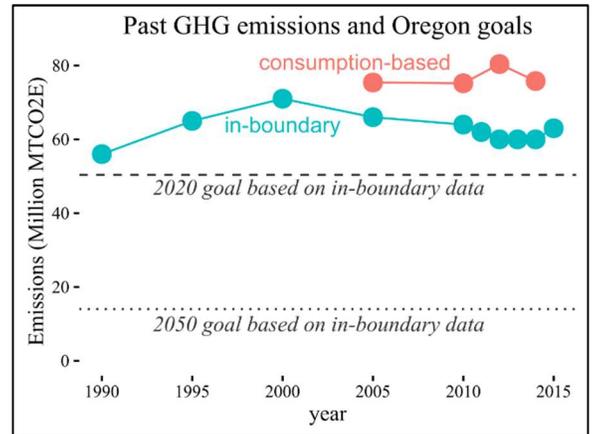
In the Pacific Northwest, the impacts of climate change are already visible in changed patterns of precipitation and snowmelt, creating significant risks to agricultural production. Meanwhile, rising sea levels threaten coastal communities.⁹

Oregon law (ORS 468A.205 2015) recognizes these hazards, and has a goal of reducing greenhouse gasses to 10 percent below 1990 levels by 2020, and 75 percent below 1990 levels by 2050.

Efforts to reduce GHG emissions should be based on a factual understanding of how and where Oregonians contribute to emissions. The consumption-based greenhouse gas emissions inventory is a key part of that understanding, helping DEQ identify promising opportunities for emissions reduction.

Two accounting systems

Two methods have been used to account for the state’s emissions. Historically, Oregon inventoried its emissions using only the “in-boundary” accounting, focusing on in-state emissions plus certain emissions associated with imported electricity.¹⁰ The in-boundary approach, while valuable, tells an incomplete story of how Oregon contributes to emissions. Greenhouse gasses are a diffuse, global problem. The materials and products that Oregonians use contribute significantly to emissions, but are often created elsewhere; the in-boundary accounting does not reflect such emissions.



⁷ Intergovernmental Panel on Climate Change, “Climate Change 2014: Synthesis Report,” 2014, https://www.ipcc.ch/pdf/assessment-report/ar5/syr/SYR_AR5_FINAL_full_wcover.pdf; Brett R. Scheffers et al., “The Broad Footprint of Climate Change from Genes to Biomes to People,” *Science* 354, no. 6313 (November 11, 2016): aaf7671, doi:10.1126/science.aaf7671.

⁸ Anthony J. McMichael, “Globalization, Climate Change, and Human Health,” *New England Journal of Medicine* 368, no. 14 (April 4, 2013): 1335–43, doi:10.1056/NEJMr1109341; Intergovernmental Panel on Climate Change, “Climate Change 2014: Synthesis Report.”

⁹ Jerry M. Melillo, Terese Richmond, and Gary W. Yohe, “Climate Change Impacts in the United States: The Third National Climate Assessment,” 2014, http://s3.amazonaws.com/nca2014/low/NCA3_Climate_Change_Impacts_in_the_United%20States_LowRes.pdf?download=1.

¹⁰ Oregon Department of Environmental Quality, “DEQ Air Quality Oregon Greenhouse Gas In-Boundary Inventory Data,” accessed January 5, 2017, <https://www.oregon.gov/DEQ/AQ/Pages/Greenhouse-Gas-Inventory-Report.aspx>.

To account for such impacts, the DEQ has introduced a second accounting system, the Consumption-Based Greenhouse Gas Emissions Inventory (CBEI).¹¹ The CBEI estimates the greenhouse gas emissions resulting from the real economic activity of Oregonians, in particular the purchases of goods and services (including energy) by Oregon households and governments, plus inventory and capital formation by businesses. This includes emissions in other states and nations that Oregon cannot directly regulate, but that Oregon governments, businesses and consumers can influence through decisions involving purchasing and materials selection and use.

The consumption-based inventory allows DEQ to estimate emissions by important category or industry. For example the 2014 update to the CBEI, published by Materials Management in 2016, showed that Oregon's direct consumption of materials contributed 44 percent of all consumption-based emissions – more than the emissions resulting from direct consumption of fuels (20 percent) and electricity (13 percent) combined. Three major categories of consumption continue to represent close to half of all consumption-based emissions: vehicles, appliances (primarily furnaces) and food.

Another key analysis showed the way emissions relate to stages in the materials life cycle. Less than 1 percent of emissions were associated with disposal, while 65 percent were associated with pre-purchase activities, such as resource extraction and product manufacturing.

Such results are strategic information for DEQ and others. They help Materials Management prioritize its work. The CBEI's results support, for example, the major project on the prevention of wasted food Materials Management initiated in 2016. The CBEI also informs the decisions and work of many other public and private entities.

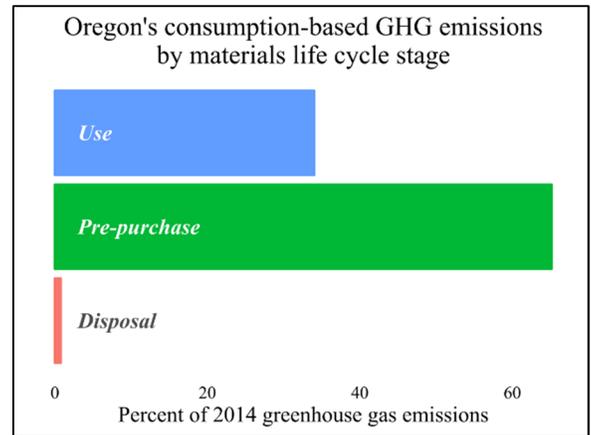
Updating the CBEI is a major effort, so DEQ plans full updates every five years, with lesser updates to the results in between. In 2016, DEQ published the 2014 inventory. In 2017, DEQ will estimate consumption-based emissions for 2015 with a full update to the inventory model.

Studies of recovery rates and waste composition

Though the *2050 Vision* emphasizes the need for Materials Management to address all stages of the materials life cycle, the traditional work on end-of-life management must continue. End-of-life statistics are an irreplaceable source of information about the materials ecosystem in Oregon, and Materials Management devotes considerable attention to them.

There are two general destinations for materials at the end of their useful lives: *disposal*, meaning landfilling or incineration; and *recovery*, meaning recycling, composting, incineration for energy return,¹² or other ways of regaining resources from the material.

To give a reliable accounting of end-of-life processes and quantities in Oregon, Materials Management needs to know the quantities of individual materials (for example, glass, paper, metal, etc.) in each of those end-of-life streams. These are calculated with two different studies.



¹¹ Oregon Department of Environmental Quality, "Consumption-Based Greenhouse Gas Emissions Inventory in Oregon," accessed January 5, 2017, <http://www.deq.state.or.us/lq/consumptionbasedghg.htm>.

¹² Materials burned for energy recovery are only counted as recovered if they have real fuel value and if no viable market exists to recycle the material; see ORS459A.010.

Material Recovery Survey

The Material Recovery Survey quantifies the weight of individual materials recycled or otherwise recovered. It also quantifies the total weight disposed each year. It allows DEQ to answer essential questions like “how much was put in landfills?” and “how much of Oregon’s waste is recycled?”

To collect this data, DEQ sends survey forms to all collection service providers and private recycling companies that handle materials for recycling, composting and energy recovery in Oregon. These responses are combined with data gathered from disposal site reporting forms.

From this information Materials Management staff can calculate:

- The total tonnage of materials disposed, recovered, and generated (*generation* is simply the sum of disposal and recovery), for each watershed and for the state as a whole.
- The recovery rate, defined as the proportion of generated material which is recovered. Oregon Revised Statute 459A.010 gives recovery rate goals for each watershed.

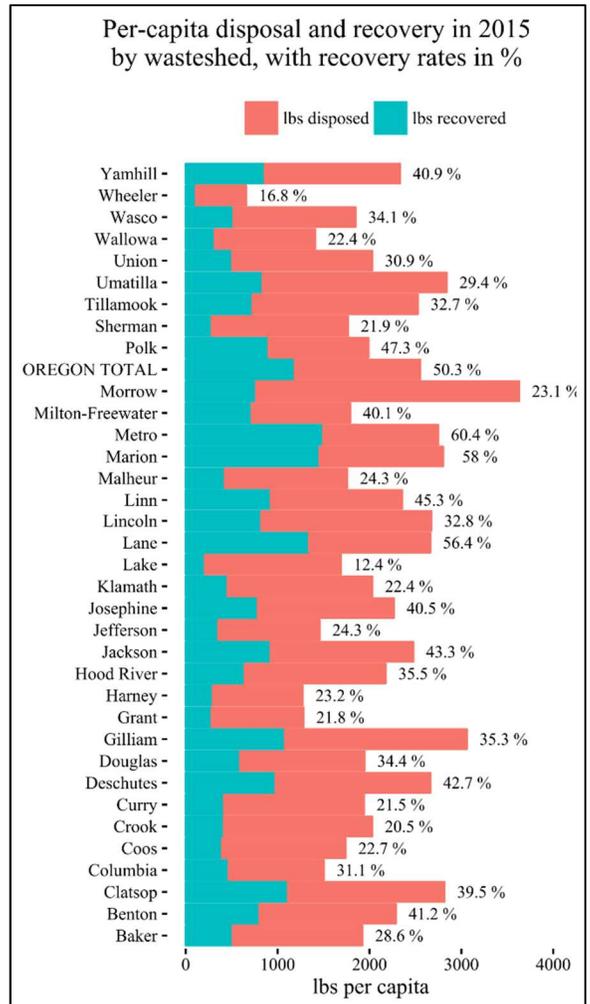
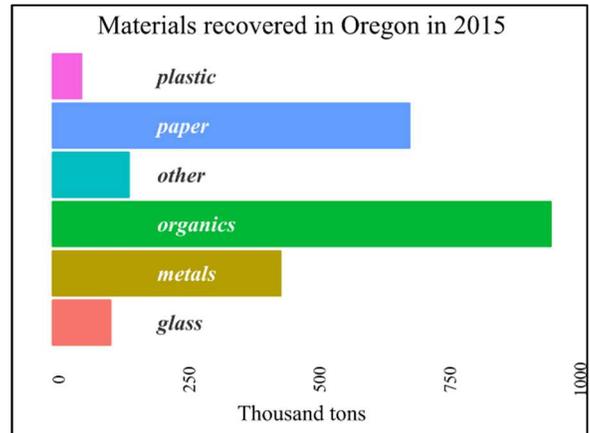
The annual Material Recovery and Waste Generation Rates reports are available on the DEQ web site.¹³

Waste Composition Study

The Waste Composition Study complements the Material Recovery Survey by filling in information about quantities of individual materials in the disposal stream. It helps DEQ answer questions like “What materials dominate the disposal stream?”; “How much recyclable material is being thrown away?”; and “Which disposed materials deserve greater focus in recovery efforts?”

The Waste Composition Study is conducted at least once every three biennia, with assistance of more than 50 disposal site operators throughout the state, as well as most of the solid waste collection companies in the state. The last study was completed in 2010; a new study is being conducted in 2016-2017.

DEQ provides additional waste composition sampling and analysis for local governments who have contributed funds for information beyond the basic design of the Waste Composition Study. These governments currently include Marion, Lane, and Washington Counties, Metro, and the cities of Portland, Beaverton, and Eugene.



¹³ Oregon Department of Environmental Quality, “2015 Oregon Material Recovery and Waste Generation Rates Report.” <http://www.deq.state.or.us/lq/pubs/docs/sw/2015MRWGratesReport.pdf>

Recovery rates and rule changes

Recovery rates have been a focus of solid waste policy and examination in Oregon. The Opportunity to Recycle Act sets recovery rate goals for wastesheds in the state. In recent years, an average 23 of the 35 individual wastesheds have met these goals.

Recovery rate calculations have been affected by a provision of law allowing individual wastesheds to claim “recovery credits” for waste prevention, reuse and residential composting. Many wastesheds applied for credits as part of their annual Opportunity to Recycle Report submitted to DEQ. (These credits are included in the recovery rates on the chart on the previous page.) In 2015, the Oregon Legislature eliminated these credits from the calculation.

In 2017 or 2018, DEQ will calculate an additional, alternative set of recovery rates for wastesheds. Under SB 263, ORS 459A.012 now requires DEQ to calculate a set of recovery rates based on the energy savings represented by recovery efforts. DEQ may also calculate alternative recovery rates based on reductions in greenhouse gas emissions, or other environmental impacts. This is an area of active research and development.

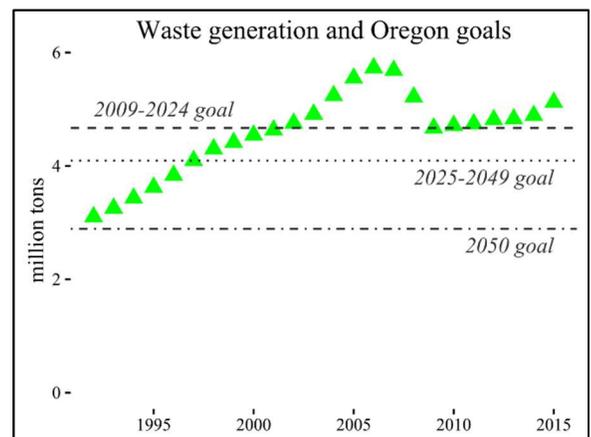
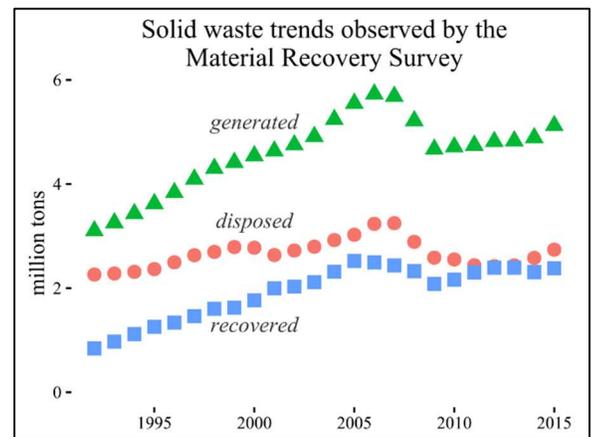
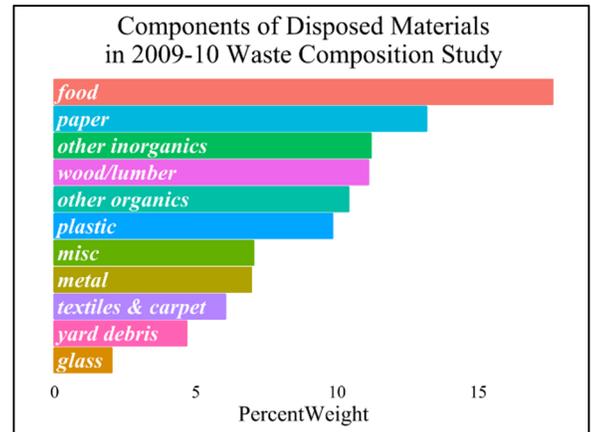
Solid waste trends and their implications

For the state as a whole, solid waste trends hinted at the limitations of an exclusive focus on end-of-life. The total tons recovered climbed slightly from 2014 to 2015, but the recovery rate (the percentage of waste recycled or otherwise recovered) was little changed from the previous year. The *tonnage* of materials disposed increased from 2014 to 2015, as did waste generation (the total of recovered and disposed tons).

Oregon actually moved *away* from the new SB 263 goals for lowering generation. Generation is significant because it serves as a crude proxy for overall material use. Materials that end up being discarded have to be produced in the first place, and the production of these materials has environmental impacts significantly greater than the impacts of disposal.

The next Waste Composition Study report, due out in 2017, may shed some light about the reasons for the recent increase in generation. Some of the increase may be due to increased building construction and demolition following the 2008 recession. Increased overall consumption associated with economic recovery may also be a factor.

Regardless of the cause, there is little doubt that to meet Oregon’s long-term waste generation goals, waste must be reduced with changes earlier in the materials life cycle.



Collaborations with communities and businesses

Grants to local governments and nonprofits

Many Oregon communities have good ideas for activities or projects that could reduce the environmental and human health impacts of materials – but lack the time, expertise, or money to execute them.

Some of those activities might meet specific local needs, such as the creation of a solid waste plan. Others might provide data and experience instructive to other communities – such as evaluating the effectiveness of “repair cafes.”

To respond to needs and encourage a diversity of projects, Materials Management offered grants in 2015 and 2016.

In the 2015 round of applications, grants were offered to local governments for the purposes of preventing, reusing and recovering solid and household hazardous wastes; preparing solid waste and household hazardous waste (HHW) plans; and constructing HHW facilities. Some nonprofits could apply through a government sponsor. Over \$584,000 was awarded.

For the 2016 round of applications, grant eligibility was expanded so that some nonprofits could apply directly. Funds for HHW facility construction were not offered in 2016 because no local governments were at that time ready to construct new facilities. Over \$1.2 million was awarded, and grant agreements with awardees will be finalized in 2017.

Grants were diverse in purpose and approach, and served every county in the state. For example:

- Douglas County was awarded \$37,000 to conduct a feasibility study of expanded recycling services to County residents with the intent of increasing recycling and delaying closure of the Roseburg Landfill.
- Tualatin School House Pantry was awarded \$6,000 to purchase a commercial freezer, allowing it to accept and redistribute more nutritious frozen foods recovered from grocers and food manufacturers.
- Metropolitan Contractor Improvement Partnership (MCIP), in collaboration with City of Roses Disposal, was awarded \$117,293 to purchase equipment, supplies and fund start-up expenses for a reclaimed lumber processing and distribution outlet. This is intended to expand the market for quality reused and reclaimed lumber by serving large-scale end users such as those in the construction, manufacturing and design industries.

In 2017-18, Materials Management intends to continue to offer local grants.



A DEQ grant paid to repair this forklift in a Harney County recycling center. Photo: Rimrock Recycling.



A DEQ grant helped buy this foam plastic processing machine for Tillamook County. Photo: David McCall.

Business initiatives

Business and the environment are closely connected. The way businesses design, produce, and deliver products and services greatly influences their environmental impact. In many cases the majority of a product’s environmental footprint comes from design decisions (including material choices) made long before it is ever delivered to the end customer.¹⁴

In addition, businesses cannot avoid the impacts of global environmental change. “Rising commodity prices, increasing global population, pollution and the depletion of natural resources all pose significant threats to businesses,” says the *2050 Vision and Framework For Action*. “But with these challenges come new opportunities.”

The new Business Initiatives program of Materials Management addresses this situation. Its purpose is to advance material management principles in the business community, by developing voluntary collaborations and partnerships with businesses and organizations.

In particular it searches out strategic opportunities to help businesses reduce environmental impacts along the whole life cycle of products -- from design, production, delivery, to use and post-use -- while competing successfully in the marketplace. This work may include creating and distributing tools and resources for measuring impacts, conducting research, providing technical support, building capacity by working with universities, and engaging in relevant national dialogues.

Concrete and EPDs

One such opportunity is in the field of construction materials. Concrete is a ubiquitous product, and the production of one of its main components, cement, has a high carbon footprint. Cement production in Oregon represents roughly 1 percent of all greenhouse gas emissions in the state,¹⁵ and an estimated 4-7 percent of global emissions.¹⁶

The carbon and energy impacts of concrete mixes can vary widely based on the raw material formulations used. Impacts can be reduced as much as 40 percent by simply choosing different raw materials. Concrete producers in Oregon have the knowledge and the materials to produce lower impact mixes at little or no increase in cost.

However, until recently, there were not standardized ways to measure and disclose the impacts of concrete mixes, which would allow buyers of concrete to make more informed decisions about their purchases.

That dynamic is starting to change, with the help of green building certification programs such as LEED. These programs are now providing “points” to

EPD "Nutrition" Label

Your Building Product

Amount per Unit

LCA IMACT MEASURES	TOTAL
Primary Energy (MJ)	12.4
Global Warming Potential (kg CO ₂ eq)	0.96
Ozone Depletion (kg CFC-11 eq)	1.80E-08
Acidification Potential (mol H ⁺ eq)	0.93
Eutrophication Potential (kg N eq)	6.43E-04
Photo-Oxidant Creation Potential (kg O ₃ eq)	0.121

Your Product's Ingredients: Listed Here

OCAPA

DEQ

State of Oregon
Department of
Environmental
Quality

Part of a flyer promoting DEQ’s collaboration to concrete producers. Environmental Product Declarations (EPDs) for concrete mixes are similar to nutrition facts labels on food. Both measure and disclose information to the consumer.

¹⁴ For example, production and transportation accounts for 83 percent of the product footprint of an iPhone 6s. http://images.apple.com/environment/pdf/products/iphone/iPhone6s_PER_sept2016.pdf

¹⁵ Oregon Department of Environmental Quality, “Oregon’s Greenhouse Gas Emissions Through 2010: In-Boundary, Consumption-Based, and Expanded Transportation Sector Inventories,” July 18, 2013, https://www.oregon.gov/deq/AQ/Documents/OregonGHGInventory07_17_13FINAL.pdf.

¹⁶ Emad Benhelal et al., “Global Strategies and Potentials to Curb CO₂ Emissions in Cement Industry,” *Journal of Cleaner Production* 51 (July 15, 2013): 142–61, doi:10.1016/j.jclepro.2012.10.049.

products that measure and disclose their environmental impacts through product labels called Environmental Product Declarations (EPDs).

In 2015-16, DEQ began collaborating with the Oregon Concrete and Aggregate Producers Association to help concrete producers create verified EPDs. This collaboration provides free access to an online EPD tool to all concrete producers in Oregon, technical support from DEQ, and financial support for verification of the EPD.

Buyers of concrete now can choose higher-performing products with more confidence. Meanwhile, concrete makers get practice applying a life-cycle environmental analysis to their products. The market availability of lower-carbon concrete mixes should expand as a consequence.

In 2017, DEQ will work to expand the user base of the tool and provide technical assistance to expand adoption of EPDs.

Product environmental footprinting

“Product environmental footprinting” is the act of quantifying environmental impacts (such as greenhouse gas emissions, or water consumption) on a materials lifecycle basis for specific products.

Footprinting analysis can have benefits for both environment and business. In environmental terms, it may identify the most and least impactful parts of the life cycle. For the business, the same kind of information may identify cost cutting opportunities, spur innovation, or improve market share. However, there are barriers to the business use of footprinting, including cost, staff time, and the difficulties of collecting data.¹⁷

In 2014 DEQ collaborated with the Oregon Sustainability Board, the Washington Department of Ecology, and an advisory group of business leaders and others to investigate the value of promoting and supporting footprinting analyses. These partners reviewed the results of research it had commissioned¹⁸ and advised on possible next steps.

Two current DEQ projects emerged from this work:

Food product footprinting. As a broad category of materials, foods are highly impactful to the environment. Many food producers and purchasers are interested in reducing the environmental impacts of foods, and there are hundreds of ideas of how to do this, but very rarely are these ideas ranked or evaluated for their relative environmental benefit. Similarly, there are hundreds of academic studies of the life cycle environmental impacts of foods, but few of these have made their way out of the scientific journals and into the world of business. There is a gap between the world of scientific research and the needs of area businesses.

DEQ’s food product environmental footprinting study will test the idea of bridging this gap. The objective of this research is to review and summarize existing literature regarding the environmental impacts of a selection of specific foods, some produced in whole or in part in Oregon, and some not produced here but consumed in significant quantities. These include tomatoes, wine, pork, fish from freshwater aquaculture, beer, coffee, and citrus fruit and juices. Each food will be evaluated on a generic basis, without reference to individual brands. The end

¹⁷ Quantis USA, “Evaluation of Actions to Support Product Environmental Footprinting in the Pacific Northwest: Findings and Recommendations from Research, Surveys, and Interviews of Business Leaders,” December 12, 2014, <https://www.oregon.gov/deq/LQ/Documents/SWdocs/QuantisPEFResearchReport.pdf>.

¹⁸ Ibid.

products of the research will be accessible summaries of the lifecycle environmental impacts of each food, usable by anyone in the food business.

In addition, DEQ is evaluating two issues that cut across multiple types of foods: the relative importance (or lack thereof) of transportation in the larger life cycle of foods, and potential trade-offs between increased packaging and reduced food waste. These topics were chosen after a broader literature scan and consultation with food producers and purchasers in Oregon.

DEQ commissioned this research in 2016 and shared with stakeholders initial prototypes of literature summaries for two foods. In 2017, DEQ plans to publish and seek comments on all other draft summaries, review and finalize all summaries, and share them with interested businesses.

Business footprinting case studies

DEQ is also working with the Washington Department of Ecology to study instances where companies have used footprinting to assess the life cycle impacts of individual products. These examples should provide realistic perspective on the business motivations for undertaking footprinting, the obstacles encountered, the outcomes of the work, and the lessons learned. DEQ will publish the results of this study in an accessible “case study” format in 2017, and use the case studies as a tool for further engaging businesses in voluntary initiatives.

Sustainable production and consumption

Preventing the wasting of food

Food is a significant material in terms of environmental impacts, and an estimated 25 to 40 percent of all food produced or imported for consumption in the United States is never eaten.¹⁹ Both Oregon's *2050 Vision* and the Oregon Global Warming Commission's *Interim Roadmap to 2020*²⁰ identify wasted food prevention as a priority for Oregon because of the combined environmental burdens of food production, distribution, refrigeration, preparation, and final disposal.

Efforts in the state to date have mainly focused on the environmental burdens of the last step on the list – final disposal – by diverting wasted food from landfills through composting or anaerobic digestion. While diversion does reduce the greenhouse gases generated by wasted food in landfills, an emphasis on end-of-life management cannot address the large environmental impacts embodied in the production and distribution of wasted food. These impacts are significantly greater than impacts from disposal. For example, the EPA's Waste Reduction Model estimates the greenhouse gas savings associated with preventing the production and waste of one ton of food are approximately 20 times larger than the savings associated with producing and composting that food.²¹

Materials Management has initiated a major effort to promote reductions in the wasting of food in Oregon. In 2016, Materials Management staff surveyed the current landscape around this subject. It found that the issues involved in the wasting of food are complex, and can reflect deeply held values and cultural norms. Tackling those issues will require a long-term effort based on a better understanding of the roots of the problem and effective means to change behavior.

More than 80 potential projects were assessed. As the result of this work, Materials Management staff identified nine priority projects to pursue over the next five years. These projects are summarized in the *Oregon Department of Environmental Quality Strategic Plan for Preventing the Wasting of Food*.²²

In 2017, Material Managements staff will begin implementing the projects described in the Strategic Plan. Early projects will focus on research that will guide future work. Specifically, Materials Management staff will oversee a groundbreaking study that will help identify the quantity of food wasted in Oregon and the reasons that food is wasted. In addition, staff will engage in a study to identify effective messaging to encourage the public to reduce their wasting of food. That study, in addition to informing future Agency outreach efforts, will be used to help develop campaigns for local governments to use in complying with the new waste prevention and reuse requirements of SB 263. A final piece of foundational research will build on the outcomes

¹⁹Venkat, Kumar, "The Climate Change and Economic Impacts of food waste in the United States," *International Journal on Food System Dynamics* 2 (4), pp. 431-446, and Hall, K.D., J. Guo, M. Dore, C.C. Chow, National Institute of Diabetes and Digestive and Kidney Diseases, "The Progressive Increase of Food Waste in America and Its Environmental Impact," *PLoS ONE* 4(11):e7940, 2009.

²⁰ Oregon Global Warming Commission, "Interim Roadmap to 2020," October 29, 2010, http://www.keeporegoncool.org/sites/default/files/Integrated_OGWC_Interim_Roadmap_to_2020_Oct29_11-19Additions.pdf.

²¹ US EPA, "Organic Materials Chapters [Documentation for Greenhouse Gas Emission and Energy Factors Used in the Waste Reduction Model (WARM)]," February 2016, https://www.epa.gov/sites/production/files/2016-03/documents/warm_v14_organic_materials.pdf.

²² This Strategic Plan is currently in the final review process. Once that process is complete, the Strategic Plan will be posted to DEQ's website and available to the public.

of the measurement study and compare actions to reduce the wasting of food to identify the actions with the highest benefit.

This research will lay the foundation for work in 2018 to identify and disseminate best practices for preventing wasting of food in commercial kitchens, to refine campaigns developed for food-related SB 263 compliance, and to generally promote effective policies and programs.

Reuse, repair, and product lifespan extension

A large part of the environmental impact of products and materials comes from their production - not their use, recycling, or disposal.²³ As a consequence, extending the useful lifespan of products and materials is an important strategy for reducing those impacts.²⁴

However, as the *2050 Vision* notes, the everyday practice of reuse and repair has waned in recent decades, and is actively discouraged by many industry practices. Planned obsolescence has become the standard for some products. Lack of infrastructure or financial incentives for repairing and reusing products can discourage design for repair and disassembly. Toxics and mixed materials in products and packaging can impede reuse and harm human health.

The *2050 Vision* looks forward to an Oregon where repair and reuse are normal.

Materials Management has initiated a Reuse, Repair, and Product Life Extension project. Its strategic plan, published in December 2016,²⁵ anticipates efforts in four areas:

- *Performing foundational research.* As an example, one project focuses on understanding where, when and why textiles are discarded in Oregon. This is important for designing future actions to increase reuse and repair of apparel and other textile products.
- *Creating infrastructure and capacity for reuse and repair.* A project will financially support and study workforce development in the reuse and repair industry. This should provide much-needed workforce capacity and training opportunities.
- *Creating demand for re-used and repaired products and materials.* Giving preference to reused, remanufactured and durable products in state and local government procurement is one way to embed and encourage this behavior. A dedicated DEQ staff member will act as subject matter expert to Oregon's Department of Administrative Services to implement new procurement strategies.
- *Exploring policy options.* Examples of possible policy initiatives include support for remanufacturing businesses and remanufactured products; tax credits for whole building reuse; and policies related to "right-to-repair" such as requiring that manufacturers make



This DEQ-grant-funded deconstruction project will allow reuse of building materials. Photo courtesy: Shawn Wood.

²³ Oregon Department of Environmental Quality, "Oregon's 2005-2014 Consumption-Based Greenhouse Gas Emissions." <http://www.deq.state.or.us/lq/pubs/factsheets/GHGInventory2014.pdf>

²⁴ Oregon Department of Environmental Quality, "Background Paper: Reuse, Repair, and Product Lifespan Extension," June 6, 2016, <http://www.deq.state.or.us/lq/sw/prodstewardship/BackgroundPaperF.pdf>.

²⁵ Oregon Department of Environmental Quality, "Strategic Plan for Reuse, Repair, and Extending the Lifespan of Products in Oregon," December 2016, <http://www.deq.state.or.us/lq/sw/prodstewardship/Strategicplan.pdf>.

diagnostic codes available for electronic goods. DEQ does not anticipate active policy development in the next few years, but will be focusing instead on research, infrastructure and demand-side solutions.

In 2017-18, the Reuse, Repair and Product Lifespan Extension project will focus on:

- Workforce development in the reuse, repair and remanufacturing industries, including funding training programs
- Informing local and state government procurement decisions to include reuse, repair and durability
- Researching textile flows in Oregon to identify fundamental system issues.
- Evaluating environmental impacts of buildings and building materials, including opportunities to reduce lead dispersion through deconstruction, as well as comparing the environmental impacts of whole building reuse versus replacement for non-residential buildings.

Waste recovery and disposal programs

Household hazardous waste collection

Many household and business products – for example, cleaners, pesticides, and pool chemicals -- contain toxic substances which, if improperly stored or disposed of, can pollute waterways, poison humans or wildlife, or cause fires.²⁶

Oregon law addresses this matter in ORS 459.411-418, which calls for a household hazardous waste program. However, little or no DEQ funding was available for such a program from 2008-2014.

Senate Bill 245 (2015) changed funding levels, and in 2015 and 2016 DEQ re-started a program that provided additional opportunities for households, small businesses, and other “conditionally exempt generators” to dispose of their hazardous waste. DEQ provided collection events in communities that did not have other collection options.

In 2015-16:

- Residents in 16 counties had access to permanent facilities for HHW disposal that offer multiple collection events throughout the year.
- 10 counties provided drop-off events only.
- DEQ funded 11 additional local collection events, in areas with no other collection options.

In addition, Materials Management-supervised contractors continued work on a lingering long-term issue: aging and unsafe chemical stockpiles in public school chemistry labs.

- In 2015 and 2016, 56 schools labs were cleaned out.
- By the end of January 2017, DEQ will have performed school lab clean out services in every county of the state.

The geographic breadth of household hazardous waste activities is visible in the following map of service locations and events. Symbols may not represent exact coordinates within each county.

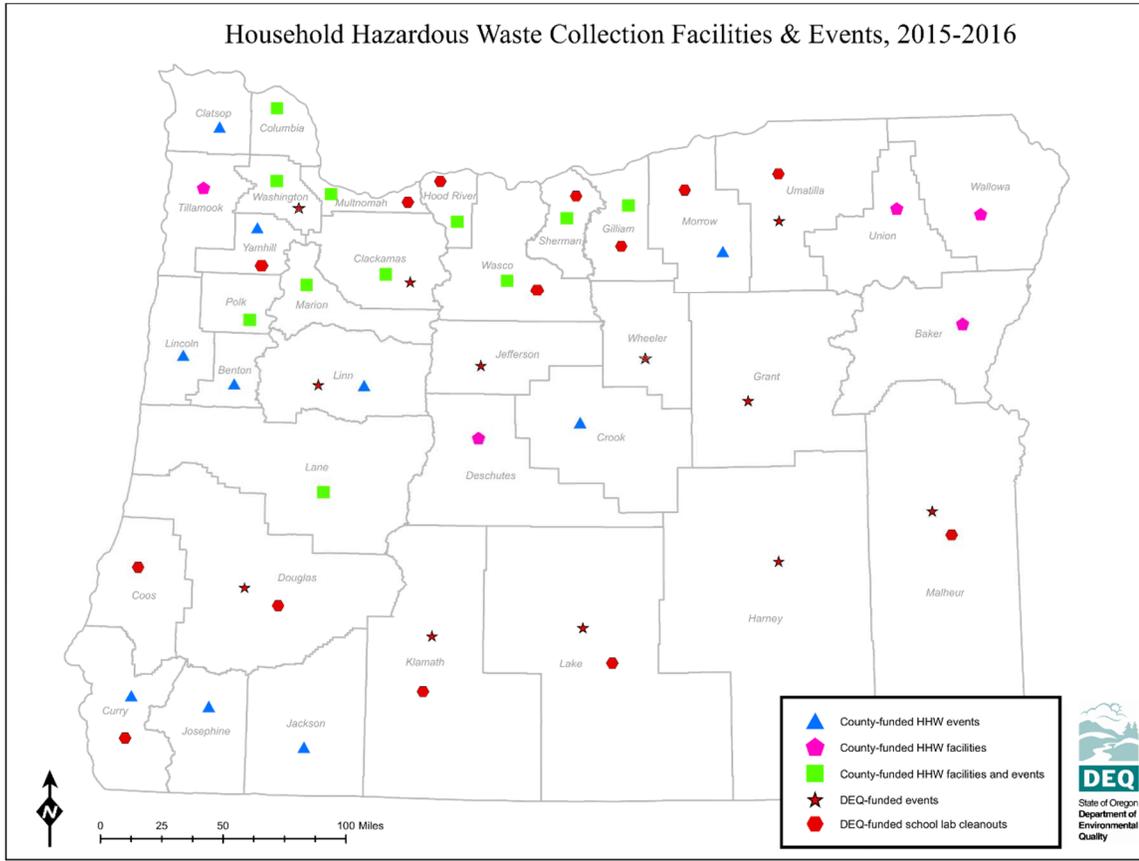


Workers at 2016 hazardous waste collection event in Pendleton. Photo: DEQ/Jamie Jones.



Degrading containers collected from a school laboratory in Corbett, 2016. Photo: Dave Waddell

²⁶ Oregon Department of Environmental Quality, “What Is Household Hazardous Waste?,” May 2012, <http://www.deq.state.or.us/lq/pubs/docs/sw/hhw/WhatisHHW.pdf>; US Department of Health & Human Services, “Household Products Database: Health & Safety Information on Household Products,” accessed January 9, 2017, <https://householdproducts.nlm.nih.gov/index.htm>.



In 2017-18 Materials Management will continue offering school lab cleanouts and additional HHW collection events, and update the state’s Household Hazardous Waste Strategic Plan for the next six years.

Product stewardship for electronics waste (E-Cycles) and architectural paint

Oregon law has special requirements for several materials common in the waste stream: beverage containers, architectural paint, and electronics waste. These are all the subject of *product stewardship* requirements.

Product stewardship refers to actions that minimize environmental, health, safety and social impacts while maximizing economic benefits of a product and its packaging throughout all life cycle stages. Product stewardship shifts primary responsibility for impacts over the life of a product to the producers of the product. The producer has the greatest ability to minimize adverse impacts, but other stakeholders such as suppliers, retailers and consumers also play a role.

The beverage container program (“the Bottle Bill”) is overseen and reported on by the Oregon Liquor Control Commission. The DEQ oversees the electronics and paint programs, which are described below.

Architectural paint stewardship

Architectural finishes such as paints, varnishes, and stains can be a large component of materials delivered to household hazardous waste collection programs. When stored or disposed of

improperly, these materials can be hazardous to human health, wildlife, and water quality. Managing waste paints is also expensive for local governments.

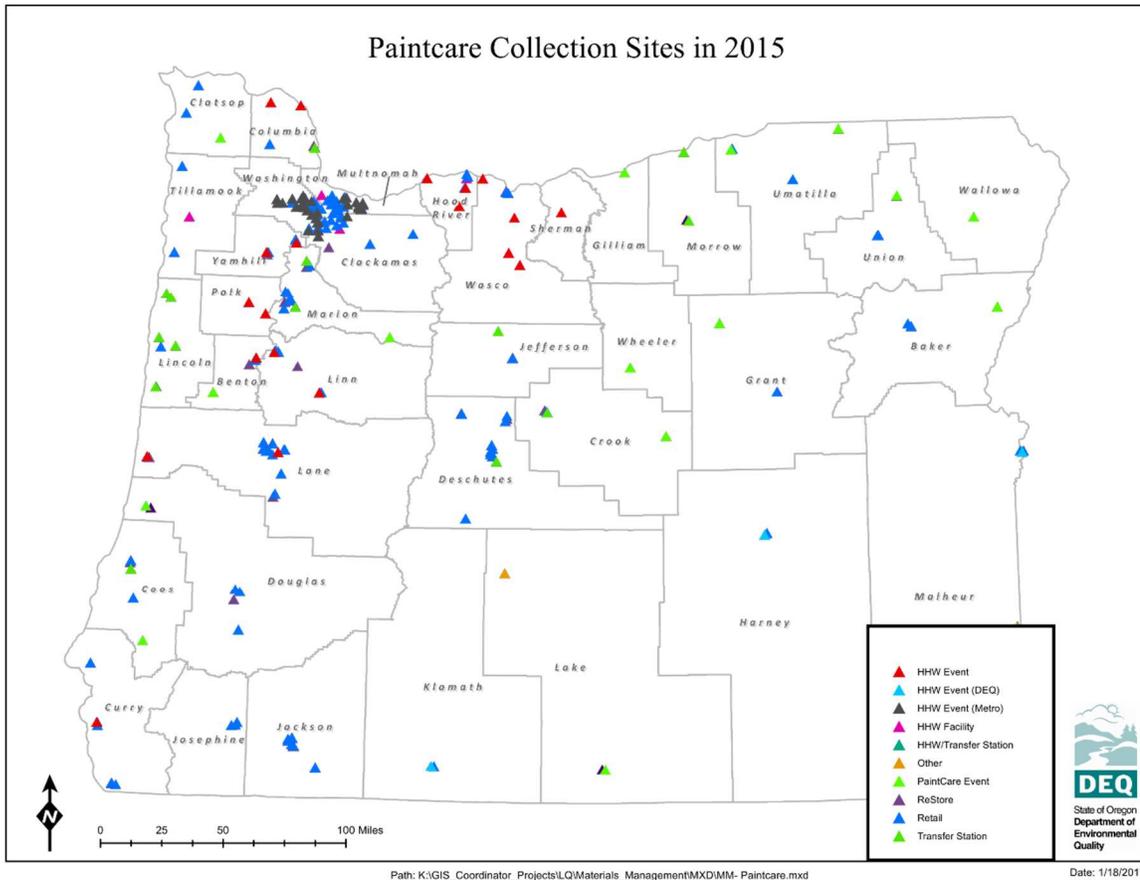
These substances are the focus of Oregon law (ORS 459A.820-855), which requires that manufacturers of latex and oil-based architectural paints, stains and coatings undertake responsibility for reducing the generation of these materials, promote reuse of these materials, and provide complete end-of-life management for them, including recycling, energy recovery and disposal.

PaintCare, an industry-run product stewardship organization, implements this recovery program in Oregon on behalf of architectural paint manufacturers, under a Plan approved by DEQ. As in all states with paint product stewardship, Oregon's program is funded by a fee assessed on cans of paint purchased in Oregon.

From 2010 to December 2015, the Oregon Paint Product Stewardship Program:

- Established over 150 permanent collection sites, mostly at retail locations, but also including many local government and hauler facilities;
- Collected over 3 million gallons of leftover paint;
- Recycled over 60 percent of the latex paint collected back into latex paint; and
- Shifted much of the cost of paint recycling from local governments to those who purchase paint. Metro reported that the paint product stewardship program saves the regional government more than \$1 million annually. Many Oregon counties that operate household hazardous waste programs report cost savings on paint disposal, but most still pay for the cost of collecting paint, which increases as volume of paint collected increases.

The geographic breadth of architectural paint program collection sites is visible in the following map. Symbols may not represent exact coordinates within each county.



Amendments to the architectural paint program in 2013 required establishment of program goals for latex paint recycling, program awareness, and paint waste reduction.

In 2017-18, DEQ will work with PaintCare on projects to increase awareness of the program, and to work toward paint waste reduction goals.

Oregon E-Cycles

The ubiquitous availability and quick obsolescence of electronic devices has led to a global surge in “e-waste” – discarded devices whose components contain both valuable metals and pollutants. The improper disposal or recycling of these devices has been associated with contamination of air, soil, and water, as well as negative health effects for the people handling the materials.²⁷

Oregon’s Electronics Recycling Law, adopted in 2007, established a product stewardship program for electronics, Oregon E-Cycles.

The law requires electronics manufacturers to provide free, convenient, statewide recycling for computers, monitors and TVs. Amendments in 2011 (Senate Bill 82) added printers and computer peripherals, specifically keyboards and mice, beginning in 2015.

²⁷ Brett H. Robinson, “E-Waste: An Assessment of Global Production and Environmental Impacts,” *Science of The Total Environment* 408, no. 2 (December 20, 2009): 183–91, doi:10.1016/j.scitotenv.2009.09.044.

From the citizen’s perspective, the program is simple. Any person may drop off up to seven computers, monitors, TVs, or printers at a time at a collection site free of charge. Households and small non-profit organizations and businesses having 10 or fewer employees may recycle any amount without charge. The law also bans computers, monitors and TVs from disposal at solid waste disposal facilities.

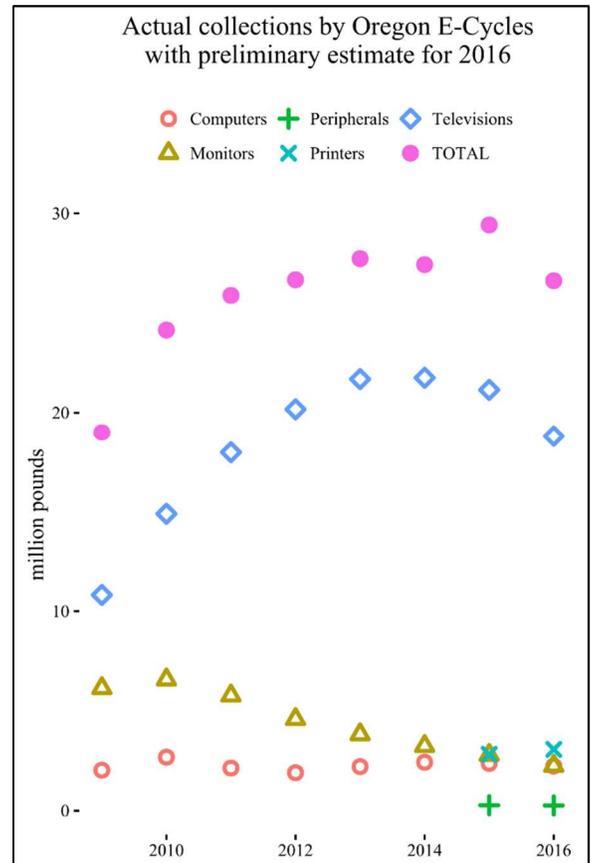
The law mandates a minimum level of collection service in each county, with at least one site for every city with a population of 10,000 or more. In 2015 there were nearly 300 collection sites, including public and private transfer stations, landfills, recycling and refurbishment centers, thrift stores and retail locations. DEQ’s E-Cycles web pages provide a search page and hotline number for locating collection sites and services.

For manufacturers and retailers, there are requirements to meet. Manufacturers whose devices are sold in or into Oregon must register their brands with DEQ and join either a state-contracted recycling program or a manufacturer-run recycling program. Each recycling program operates under a plan approved by DEQ and is funded by its participating manufacturers.²⁸

Only registered brands of manufacturers in compliance with the law may be sold in or into Oregon. Retailers must also inform consumers about recycling opportunities under Oregon E-Cycles. More details about the implementation of the program are available at the E-Cycles web site, <http://www.deq.state.or.us/lq/ecycle/>.

Oregon E-Cycles has produced significant environmental benefits since operations began in 2009. In 2015 collections totaled more than 29 million pounds of devices recycled, and more than 53,000 units dedicated to reuse. DEQ estimates E-Cycles recycling in 2015 saved approximately 400 billion BTUs of energy, and prevented the emission of 35,000 metric tons of carbon dioxide equivalents. Recent collection trends suggest that the total weight of collections may be leveling off, perhaps because of reduced collections of televisions. In 2017-18 DEQ will investigate this issue and adapt as appropriate.

Oregon E-Cycles is a successful product stewardship program where stakeholders have worked cooperatively to provide convenient, responsible recycling for the growing electronics waste stream. The program has significantly expanded opportunities for Oregonians to recycle electronic wastes and has shifted responsibility and costs for managing this waste from rate payers and local governments to product manufacturers.



²⁸ Manufacturers in the state contractor program pay recycling fees to DEQ to cover that program’s recycling costs. Manufacturers in manufacturer-run programs pay recycling fees according to their program agreements.

The Recycling Opportunity Act, and recent changes under SB 263 (2015)

Oregon's ground-breaking Recycling Opportunity Act²⁹ from 1983 was the first legislation in the United States to assure access statewide to recycling programs. It requires that cities and counties ensure that regular recycling collection, or an acceptable alternative program, is provided to all garbage service customers within the urban growth boundary of cities of 4,000 or more population and within the Metro district. As subsequently amended, these cities and counties must also choose and implement a number of recycling program elements, depending on the city's size. Recycling is also required to be provided at disposal sites or alternative locations.

SB 263 from 2015 made a number of updates to Oregon's recycling laws. Among other things, this new legislation:

- Adds four new options to the list of recycling program elements that cities and counties can choose from, providing more flexibility.
- Increases the number of recycling program elements that cities near Portland recycling markets must implement. For cities further from recycling markets, there was no increase in the number of recycling program elements required.
- Provides emphasis on reducing contamination in collected recyclable materials.
- Requires that larger cities implement new waste prevention and reuse program elements, taking the place of similar programs that most of these cities and counties were previously implementing under recycling credit programs that were eliminated by SB 263.
- Extends the opportunity to recycle to people living in multifamily housing and to tenants in multitenant commercial buildings, effective July 1, 2022.
- Provides new wasteshed (county) and statewide waste recovery goals, and also updates the statewide waste generation goal.
- Provides new emphasis and goals for recovery of high-impact materials, including plastics, food waste, and carpet.

DEQ worked closely with stakeholders to develop draft rules to implement these changes in SB 263. The EQC adopted those rules in January 2017.

There are 88 cities in Oregon required to provide the recycling services and program elements discussed above. All 88 have been in compliance with the requirement prior to passage of SB 263, and many have been implementing more program elements than required. DEQ's analysis shows that only 6 cities will need to add a new recycling program element to those currently provided, and none will have to add more than one. Cities and counties required to implement waste prevention and reuse program element are already implementing many of the new requirements under SB 263, but may need to conduct some planning and adjust some of the services they are providing.

DEQ will continue to work closely with local governments and other affected persons to help implement these changes. In addition, assuming funds are available, the Materials Management

²⁹ Also known as SB 405 (1983)

grant program may be able to provide financial support for some local program development, as it did in 2015-16.

DEQ has numerous projects in the formative state that respond to the new requirements of SB 263. These include:

- The development of sample waste prevention campaigns that local governments can choose to implement;
- Research on the assessment of recycling contamination, and model contamination-sampling methods that local governments can choose to implement;
- A comprehensive project designed to increase the recovery of food waste, to meet the SB 263 goal of 25 percent food waste recovery by 2020.
- The planning of future projects focused on carpet waste and plastic waste, which also have goals mandated by SB 263.

Permitting of solid waste facilities and complaint response

As the *2050 Vision* notes, in previous decades, the environmental impacts of materials were largely seen in terms of the impacts of discards filling up landfills and polluting water. Some landfills were badly located, operated and regulated. There was fear of a “garbage crisis” where Oregon would run out of places to dispose of its waste. The 1970s energy crisis and growing environmental concerns also led to public support for resource conservation through recycling.

Since then, perceptions of the problem have changed. A “garbage crisis” is no longer imminent for most areas of the state. Recycling programs are firmly established, and the state has an abundance of disposal capacity, in landfills that are better operated and less polluting than their predecessors. Oregon has sufficient disposal capacity for many years to come. Materials Management is expanding its work over the rest of the materials life cycle, from which the majority of environmental impacts arise.

This expansion is possible because of the substantial work Materials Management staff do to advise, oversee and manage recovery, recycling and disposal of waste. They permit and inspect solid waste facilities including: municipal, construction and demolition and industrial waste landfills, waste tire disposal sites, transfer stations, and material recovery, solid waste treatment, anaerobic digester, conversion technology and composting facilities. They provide technical assistance to counties and cities for recovery, recycling, management and disposal of waste. They respond to complaints, ensure compliance, and provide information and help educate the public on waste prevention, waste recovery and waste disposal.

Municipal Disposal Facilities and Permits

The DEQ Materials Management Program currently oversees approximately 340 disposal site permits,³⁰ and 13 tire carrier permits³¹ statewide. The numbers of permits in each major category appear in the table below.

³⁰ Does not include short term solid waste letters of authorization

³¹ The 13 tire carrier permits total does not include 4 tire combo permits (combined storage and carrier) since they are included in the disposal sites permit numbers, and in the tire storage/use line in the table.

	Municipal	Industrial	Total
Open landfills	32	18	50
Closed landfills	35	24	59
Transfer stations & material recovery facilities	143	3	146
Treatment facilities	1	5	6
Incineration/Energy Recovery	1	-	1
Anaerobic Digester Composting Facility Permit	5		5
Aerobic Composting Facility Permit	15	-	15
Aerobic Composting Facility Registration	39	-	39
Conversion Technology Facility Permit		1	1
Sludge Lagoons & Transfer	2	-	2
Tire storage/use	13	-	13

Many Oregon landfills were closed in the past three decades and continue to be permitted to make sure that in closure they do not contaminate surface or ground water, create harmful landfill gases, or cause other environmental problems over time.

DEQ inspects active disposal sites annually or biennially. DEQ inspects closed landfills every 2 or 3 years to verify that post-closure care (gas and groundwater monitoring) and maintenance of closed landfills is being carried out as required.

A list of current active permitted facilities (including municipal solid waste disposal landfills, transfer stations, and compost, material recovery, waste tire and household hazardous waste facilities) is available on the DEQ web site. DEQ receives 10 to 15 new permit applications each year.

Short-term Disposal Permits and Beneficial Use Determinations

In addition to permitting solid waste disposal sites, DEQ works with businesses, local governments, the Oregon Department of Transportation, Army Corps of Engineers, ports and others to permit one-time or short-term disposal of slightly contaminated soil or sediment at locations where environmental impacts will be minimal. . DEQ also reviews applications to beneficially use waste in ways that are productive and still protect human health and the environment. Expensive and unnecessary disposal costs can be avoided when waste materials are beneficially used. Through these efforts, DEQ provides ways to allow redevelopment of contaminated sites or brownfields and construction of roads and other infrastructure to take place in a more cost-effective manner. These options also allow waste to be reused as fill or to make new products. DEQ receives five to 15 short term disposal authorization requests per year and two to five beneficial use applications per year. To date, DEQ has issued 19 beneficial Use Determinations which are listed on the DEQ web site.

Solid Waste Orphan Account

Since 1993, DEQ has collected \$0.13/ton on all domestic solid waste disposed in Oregon or transported out-of-state for disposal. This solid waste orphan site fee funds the Solid Waste Orphan Site Account. Funds can be used for cleanup of hazardous substances at solid waste disposal sites owned or operated by a local government and at privately owned or operated sites that have received domestic solid waste where the responsible party is unknown, unwilling or

unable to undertake the cleanup. The statute also includes requirements for matching funding from local governments to access the account and caps their liability.

In 2015-2016 DEQ provided \$100,000 to Deschutes County Demolition Landfill to help cover site investigation costs. DEQ declared the Hawks Landfill an orphan landfill in late 2016 and initiated site investigation activities. DEQ also used Solid Waste Orphan Account funds for ongoing expenses to address contamination at the orphaned Santosh Landfill in Columbia County (initially addressed in 2003).

Looking forward, DEQ is evaluating site investigation and corrective action needed at additional disposal sites for potential funding in 2017-2018. .

Composting Facilities

Composting facilities are operations that use biological processes (microorganisms) to decompose organic feedstocks such as yard debris, animal manures and food discards. In Oregon, composting facilities include aerobic composting facilities and anaerobic digestion facilities. Aerobic composting facilities use microorganisms that prefer oxygen and produce compost. Anaerobic digesters use microorganisms that thrive in low oxygen environments and create and capture methane gas to produce electricity or other fuel products. Digesters also produce liquid and solid by-products called digestate that can be used for soil fertilizing and conditioning or further processed into compost.

The products of composting facilities provide numerous environmental benefits. The use of compost, when incorporated into soil, can improve soil tilth and fertility and provide a more stable form of nitrogen less susceptible to leaching into water supplies. Compost also helps reduce compaction and increases infiltration. Incorporation of compost into soil stores carbon, helping to reduce atmospheric carbon. By capturing methane gas, anaerobic digesters avoid the release of methane to the atmosphere, a significant component of greenhouse gas.

Composting operations use various methods to compost feedstocks such as yard debris, food waste and manure into finished compost. Primary aerobic composting methods include: 1) large static pile composting (this was used in the past and continues in some places in Oregon) and 2) turned windrow composting with or without installed piping and motorized blowers to force-aerate the piles. Anaerobic digestion is a common technology used at municipal wastewater treatment plants, food processing facilities, and in processing manure on farms. The digestion process takes place in sealed tanks to create an oxygen free environment needed for microorganisms to breakdown the feedstocks. Methane gases generated can be used to create heat, electricity or transportation fuels. Some wastewater treatment plants burn-off or “flare” the gases because they lack equipment to utilize the methane.

Oregon currently has 54 DEQ-permitted aerobic composting facilities. 40 are assessed as low-risk; 20 are located on farms (only one is located within the Portland Metro boundary). There are also approximately 10 on-farm composting facilities under Oregon Dept. of Agriculture oversight.

There are 5 DEQ-permitted anaerobic digesters; two receive food waste; one is located within the Portland Metro boundary but is not yet operational. There are also 8 anaerobic digesters operating on farms under Oregon Dept. of Agriculture oversight using manure as feedstock; three of these receive very small quantities of food waste.

Complaints response and an emerging issue

DEQ staff respond to solid waste complaints about illegal disposal, unpermitted disposal, as well as concerns about odors, dust asbestos or other environmental concerns at disposal sites. In 2016,

DEQ received 130 complaints in its Western region, 193 complaints in its Northwest Region, and 39 complaints in its Eastern region.

One issue receiving increased attention is the processing of food wastes. In 2015 Oregon law (SB 263) established that 25 percent food discards are to be recovered by 2020. Landfilling food discards not only wastes valuable resources but decomposing organic material generates greenhouse gases including methane, a very potent greenhouse gas. Instead, food discards can be used as feedstock for aerobic composting facilities or anaerobic digesters, creating soil nourishing compost and clean energy while reducing greenhouse gas emissions. Anaerobic digestion and aerobic composting of food discard feedstocks contribute to achieving this goal.

Compostable organic material, such as yard debris and food discards, makes up about 26 percent of waste sent to landfills or incinerators in Oregon (source - 2009 Oregon waste composition study). Using the most recent 2014 disposal data, that represents over 668,000 tons of organic material that could be recovered for making compost, creating energy or feeding livestock. For example, if 50 percent of the food discards currently disposed of were redirected to composting instead, Oregon could reduce greenhouse gas emissions by approximately 140,000 metric tons of CO₂ equivalents each year – about the same as tailpipe emissions from 31,000 cars. Sending some of these food discards to anaerobic digestion would result in even higher greenhouse gas reductions, while also producing fuel.

While adequate composting capacity exists in parts of Oregon, some areas do not have enough capacity to handle material generated and some lack organic material processing options. For example, no facility is receiving food discards along the Oregon coast, although Newport sends commercial food discards to a composting facility in the Willamette Valley. Southern Oregon is served by several yard debris composting facilities, but no facilities that receive food discards on a regular basis. Bend, LaGrande and Pendleton in eastern Oregon have aerobic composting facilities that receive both yard debris and food discards, while the other cities in eastern Oregon have no composting services.

Probably the best served are the cities in the mid and south Willamette Valley with a number of large composting facilities that receive both yard debris and food discards. In addition, JC Bio Anaerobic Digester in Junction City receives food discards from Eugene, the Portland Metro area and a few other locations.

The Portland Metro area does not have adequate food discard processing capacity. Nine yard debris composting facilities are located within the Metro boundaries with only one facility receiving residential food discards and no facilities receiving commercially generated food discards. In 2015, over 30,000 tons of commercially generated food discards were collected and distributed to facilities outside the Metro boundary; most destined for either the Pacific Region Composting Facility near Corvallis or the JC Bio Anaerobic Digester near Junction City. In the future, Metro plans to increase recovery of food discards.

Metro's waste reduction program: compliance with state requirements

Metro's Waste reduction program has been incorporated as an integral part of the Regional Solid Waste Management Plan 2008-2018 Update, which DEQ approved on April 24, 2009. The Regional Solid Waste Management Plan identifies strategies that Metro and Metro-area local governments will pursue to increase the recovery of waste to meet the watershed's 64 percent statutory recovery goal. Strategies include targeted efforts in the single-family, multi-family, business and building industry sectors. The plan also identifies strategies to reduce the amount of solid and household hazardous waste generated. Strategies include education on waste prevention

and alternatives to household hazardous waste products, product stewardship initiatives and implementation of sustainability measures for the region's solid waste vehicles and facilities. The report provides information to the Environmental Quality Commission demonstrating how Metro and local governments work together to ensure that the Metro region's activities comply with the waste reduction program and waste reduction goals outlined in Metro's plan.

Metro completed a midterm review of the plan in 2015, and concluded that no changes were needed at that time. The full regional solid waste management plan, and the 2015 midterm review report, are available at <http://www.oregonmetro.gov/regional-solid-waste-management-plan>.