

Materials Management Program 2017-18 Report to the Legislature

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By: Materials Management Program

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Materials Management Program

700 NE Multnomah St.
Suite 600
Portland, OR 97232
Phone: 503-229-5696
800-452-4011
Fax: 503-229-6124
Contact: Shannon Davis

www.oregon.gov/DEQ

DEQ is a leader in restoring, maintaining and enhancing the quality of Oregon's air, land and water.



State of Oregon
Department of
Environmental
Quality

This report prepared by:

Oregon Department of Environmental Quality
700 NE Multnomah Street, Suite 600
Portland, OR 97232
1-800-452-4011
www.oregon.gov/deq

Contact:
Shannon Davis
503-229-6832

DEQ can provide documents in an alternate format or in a language other than English upon request. Call DEQ at 800-452-4011 or email deqinfo@deq.state.or.us.

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Executive Summary

The Materials Management Program at the Oregon Department of Environmental Quality works to reduce the environmental and human health impacts of products and materials that Oregonians make and use by promoting waste prevention, the sustainable production and use of materials, and proper disposal of hazardous and other waste.

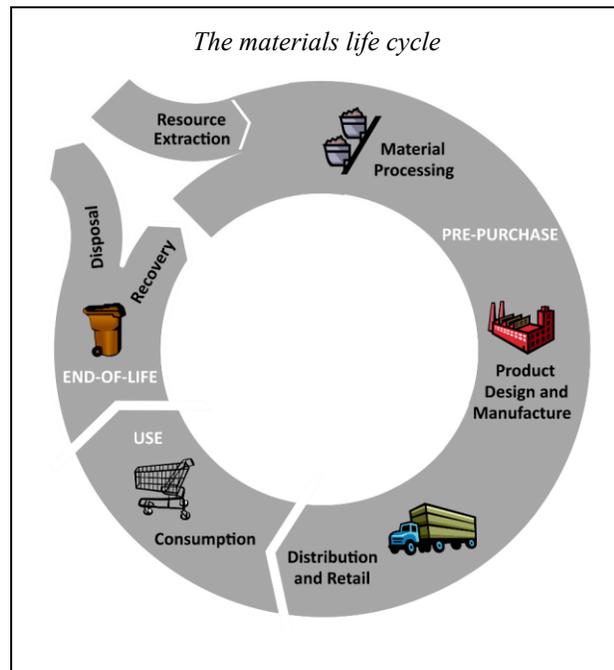
This report contains updates relating to the statewide solid waste management plan, product stewardship, waste prevention, household hazardous waste, Metro’s waste reduction program, Oregon’s waste generation and waste reduction, the permitting of solid waste disposal facilities and solid waste program funding, compliance and enforcement of Materials Management violations, the operation of Oregon’s system for electronics recycling, and the implementation of multitenant recycling throughout Oregon. The report uses 2018 data, unless otherwise specified.

Materials Management’s work is guided by *Materials Management in Oregon: 2050 Vision and Framework for Action*, available at <https://www.oregon.gov/deq/FilterDocs/MManagementOR.pdf>. The *2050 Vision* was adopted by the Environmental Quality Commission in 2012 as an update to Oregon’s solid waste management plan. It outlines an approach to waste management that emphasizes the sustainable use of materials across all stages of their life cycle, from their design and production to their use and final disposal. This approach includes strategies for waste prevention—such as by encouraging reuse and repair to extend the useful life of a product—in addition to the more traditional strategies of increasing rates of recycling, composting and energy recovery.

In 2017 and 2018, Materials Management undertook projects and collaborations that maintained this holistic approach to reducing the environmental impacts of materials that Oregonians use. These projects and collaborations involve the promotion of food waste prevention, sustainable government procurement, reuse and repair, new measures of environmental outcomes, toxics reduction and cleaner production. At the same time, Materials Management continued the vital work in solid waste management – permitting, inspections, and investigation of complaints – crucial to ensuring the proper operation of disposal sites.

Examples of the program’s accomplishments in 2017 and 2018 include:

- Collaborating with communities and businesses to advance materials management plans and projects, including awarding over \$670,000 in grants in 2017 and making \$600,000 available in 2018 to local governments, nonprofits and schools. Through financial and extensive technical assistance, DEQ also helped two Oregon concrete producers develop product labels that measured and disclosed the environmental impacts of their different concrete mixes – allowing concrete purchasers to select lower-impact mixes for construction projects.



- Undertaking key initiatives to prevent the wasting of food. For instance, DEQ conducted a study on the causes of food waste in partnership with Portland State University; made a food waste prevention campaign available for local governments to use; and published reports on the environmental impacts associated with the production and transport of various food products, such as tomatoes, wine, pork, beer and coffee.
- Advancing Oregon’s reuse and repair industry through micro-grants and pilot projects to spur job creation and investment in local reuse and repair businesses. Working with Oregon Health Authority and the Construction Contractor’s Board, DEQ also developed best practices for the demolition of residences with lead-based paint.
- Addressing household hazardous waste through funding events to collect household hazardous waste in areas where local services are lacking; coordinating the cleanout of aging and unsafe chemical stockpiles in 68 school chemistry labs; and supervising the conduct of PaintCare, a paint stewardship organization that has collected over 5.4 million gallons of leftover paint from 2010 to 2018.
- Administering Oregon’s product stewardship programs for collecting electronics waste, Oregon E-Cycles, which collected 20 million pounds of recycled electronic devices in 2018.
- Conducting foundational research projects, such as the Consumption-Based Emissions Inventory, which analyzes global greenhouse gas emissions resulting from Oregon’s consumption and helps measure Oregon’s global “carbon footprint.” DEQ also published a report on popular packaging attributes that reviewed 18 years of data on the comparative environmental impacts of biobased, recyclable, compostable and “made from recycled content” packaging materials and food service ware.
- Conducting extensive research and outreach to help local communities prepare for new multitenant recycling opportunities to be made available in 2022.
- Accounting for Oregon’s waste flows and recovery rate (the portion of discards recycled or otherwise recovered) through the Material Recovery Survey and Waste Composition Study. In 2016, Oregonians generated 5.3 million tons of waste and recovered 42.2 percent of the waste generated. In 2017, Oregonians generated 5.5 million tons of waste and recovered 42.1 percent.

These accomplishments took place amid an increase in Oregon’s waste generation and a disruption to the international recycling markets that has challenged Oregon’s recycling infrastructure. Materials Management is addressing these challenges by evaluating environmental impacts of materials across their whole life cycle and pursuing strategies that can reduce the most significant impacts.

1. Purpose and legal context

This report informs the Oregon Legislature about the work of the Materials Management Program of the Oregon Department of Environmental Quality, with a focus on work in 2017 and 2018.

It fulfills DEQ's requirement under ORS 459A.015 and 459A.020 to report biennially to the Oregon Legislature on Oregon's Integrated Solid Waste Management Plan, updated in 2012 as *Materials Management in Oregon: 2050 Vision and Framework for Action*. DEQ's Solid Waste Program is now called the Materials Management Program to more accurately reflect the focus on addressing environmental impacts of materials across their full life cycle, not only at end of life.

This report also fulfills DEQ's requirement under ORS 459A.340 to report on the operations of Oregon E-Cycles, the statewide system for collection, transportation and recycling of covered electronic devices. Additionally, it fulfills DEQ's requirement to provide information in 2019 on the implementation of multitenant recycling throughout Oregon, as described in ORS 459A.015 (Section 13c of Oregon Laws 2015, chapter 534).

2. Introduction: The 2050 Vision

Oregon law (ORS 459A.020) requires the state to have an integrated solid waste management 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* adopted a “materials management” approach to waste management. This approach takes into account environmental and human health impacts across the full life cycle of materials, valuing strategic choices that reduce the most significant impacts. As detailed in the *2050 Vision*, many environmental impacts – such as resource depletion, pollution and greenhouse gas emissions – stem not just from how materials are disposed, but also how they are produced, used and managed. DEQ estimates that 66.3 percent of greenhouse gas emissions associated with Oregonians’ consumption of goods and services in 2015 occurred before the point of purchase. Less than one percent of emissions are associated with disposal – that is, when a product is landfilled, recycled or otherwise disposed.¹

The *2050 Vision* contemplates an Oregon where producers make products sustainably and every option is a sustainable option; people live well and consume sustainably; and materials have the most useful life possible before and after discard. It includes a list of about 50 actions as a framework to achieve the Vision.

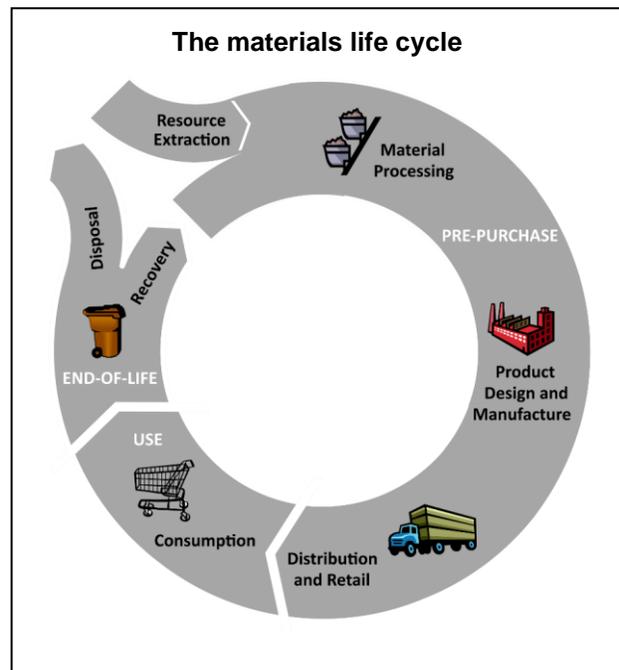
In 2017-18, Materials Management continued work on many of these actions by supporting and performing foundational research; fostering collaborations and partnerships along issues such as the wasting of food; reducing the environmental impacts of construction through the use of green building materials; and promoting reuse and repair.

The *2050 Vision* calls for an update every six years to its framework for action. In 2019, DEQ will begin reevaluating the framework to update existing actions and identify new ones for implementing the Vision.



Materials Management in Oregon

2050 Vision and Framework for Action



¹ Oregon Department of Environmental Quality, “Oregon’s Greenhouse Gas Emissions through 2015: An assessment of Oregon’s sector-based and consumption-based greenhouse gas emissions,” May 2018, <https://www.oregon.gov/deq/FilterDocs/OregonGHGreport.pdf>.

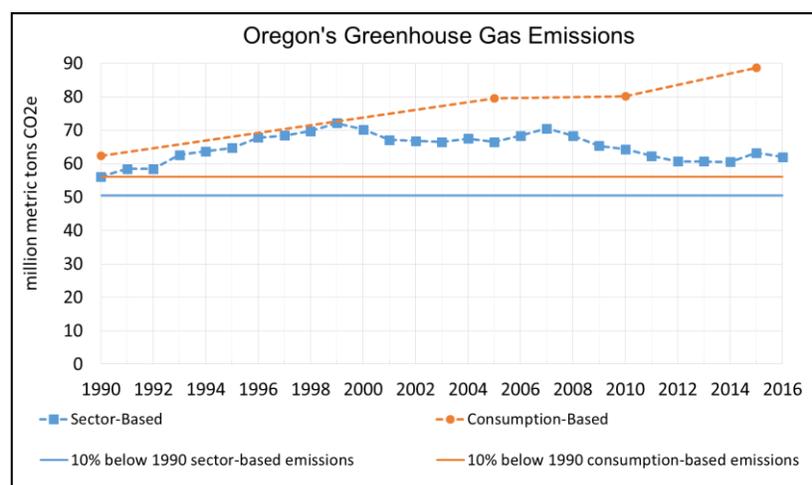
3. Foundational research and policy work

Materials Management’s foundational research helps DEQ and others identify priorities for reducing the environmental impacts of products and materials. In 2017-18, Materials Management conducted a major update to its inventories of Oregon’s greenhouse gas emissions. Materials Management also published numerous reports evaluating the environmental impacts of different foods and product packaging across their whole life cycle.

3.1 Monitoring Oregon’s greenhouse gas emissions

DEQ tracks Oregon’s greenhouse gas emissions through two inventories:

- A **sector-based inventory**, which tracks emissions produced within Oregon from its transportation, residential, commercial, industrial and agriculture sectors, as well as regional emissions from producing electricity used in state; and
- A **consumption-based inventory** (known as the Consumption-Based Greenhouse Gas Emissions Inventory, or CBEL), which tracks greenhouse gases that are emitted across the globe, but associated with energy, goods and services consumed by Oregon.



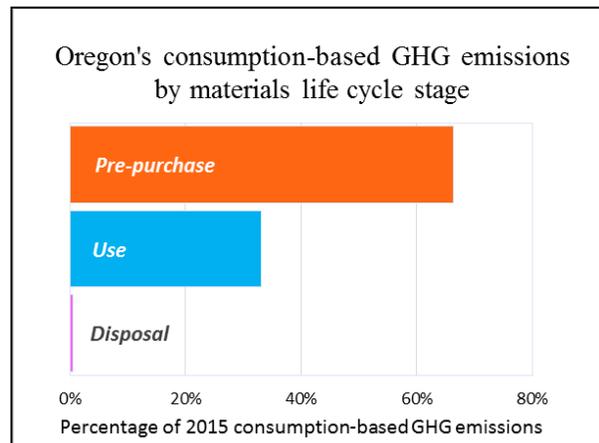
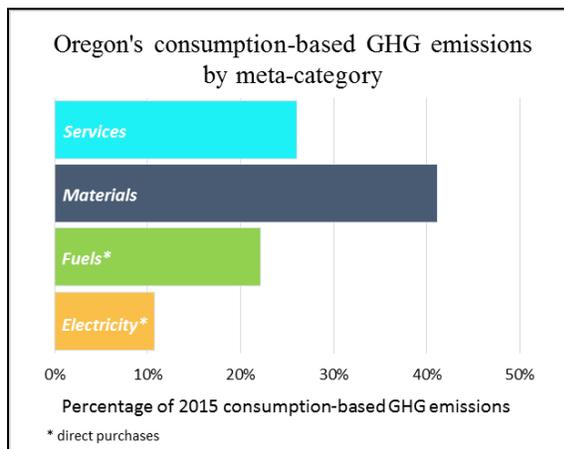
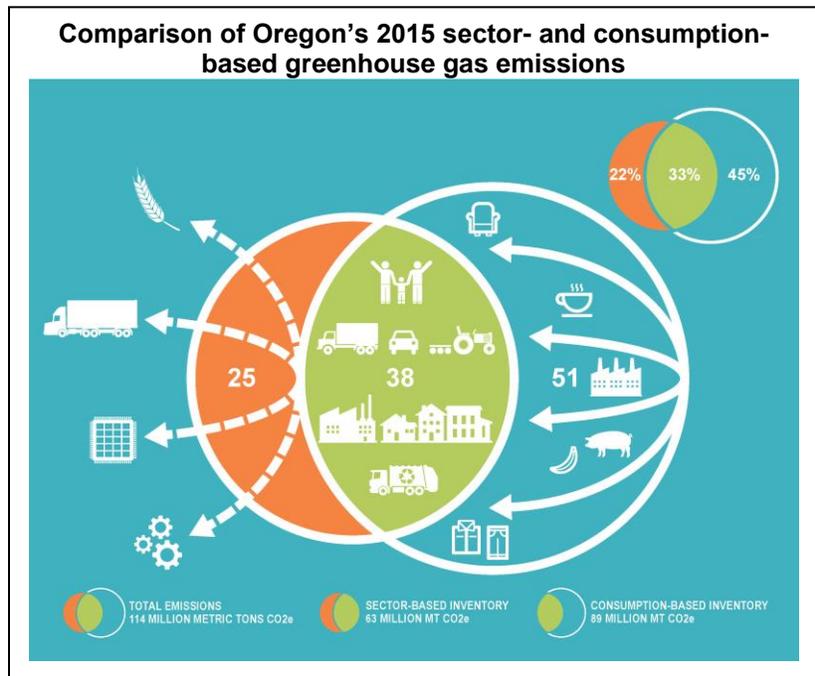
These data help Oregon better understand the sources of its greenhouse gas emissions and supports targeted strategies to reduce them.

The sector-based inventory is the traditional method for tracking Oregon’s emissions and is similar to the methods many other states and countries use. Oregon has statutory goals under ORS 468A.205 to reduce greenhouse gases to 10 percent below 1990 levels by 2020 and 75 percent below 1990 levels by 2050. Oregon’s Global Warming Commission uses the sector-based inventory to track progress toward the state’s goals.

The consumption-based inventory is being increasingly used by local governments to better understand and leverage how purchasing choices and behaviors impact climate change. It helps us to discern whether emission reductions occurring in Oregon are true global reductions or whether Oregon has simply shifted emissions to locations outside the state.

In 2017-18, DEQ updated both inventories with 2015 and preliminary 2016 data emissions. The data suggest that consumption of goods produced outside Oregon is a big part of the story of how Oregonians contribute to climate change and that its role is growing.

Sector-based emissions for 2015 were approximately 63 million metric tons CO₂e emissions, while consumption-based emissions were about 89 million MTCO₂e. Discounting an overlap of 38 million MTCO₂e for goods and services produced and then consumed in Oregon, Oregon's imported emissions in 2015 were double its exports: 51 million MTCO₂e of emissions unique to the CBEL, compared to 25 million MTCO₂e of emissions unique to the sector-based inventory.²



Although Oregon's statutory goals relate to emissions inside Oregon's boundaries, the amount of imported emissions should not be ignored when the ultimate goal is to help reduce global emissions. Oregon governments, businesses and consumers can influence out-of-state emissions through decisions in purchasing and materials selection and use. Oregon's direct consumption of materials in 2015 contributed approximately 41 percent of all consumption-based emissions – more than the emissions resulting from

² Oregon Department of Environmental Quality, "Oregon's Greenhouse Gas Emissions through 2015: An assessment of Oregon's sector-based and consumption-based greenhouse gas emissions," May 2018, <https://www.oregon.gov/deq/FilterDocs/OregonGHGreport.pdf>.

direct consumption of fuels (22 percent) and electricity (11 percent) combined.³ Nearly half of the consumption-based emissions came from three categories: (1) vehicles and parts; (2) food and beverages; and (3) appliances (primarily furnaces). Moreover, the bulk of a good or service's emissions in 2015 came from its pre-purchase, rather than from its disposal: approximately 0.6 percent of emissions were associated with the disposal of goods following their use by consumers, while 66.3 percent were associated with activities that happen in a product's life cycle before it is purchased and used by the consumer, such as resource extraction and product manufacturing.⁴ These figures suggest that strategies related to promoting sustainable production and consumption can effectively reduce Oregon's contribution to greenhouse gas emissions. Examples of such strategies include preventing the wasting of food and advancing the use of low-carbon building materials for construction.

3.2 Studies of environmental footprinting and attributes

Every product has an environmental “footprint” – the resources used and pollutants released over the life of the product, including supply chain, production, use and end-of-life management. “Carbon footprint” is the most common type of footprint, although businesses are exploring other types of footprints that address issues such as the water used to make products or the toxic chemicals released over their life.

Life cycle assessment studies can offer a way for manufacturers, retailers and governments to measure these footprints and better understand how to reduce environmental impacts. Yet while there are hundreds of life cycle assessment studies on the environmental impact of foods and other products, few find their way out of scientific journals. To bridge the gap between scientific data and business needs, DEQ published a series of reports reviewing existing life cycle assessment studies on different products and drawing broader conclusions around categories of materials. In 2017, DEQ contracted with the University of Michigan Center for Sustainable Systems to review available data on the environmental impact of tomatoes, wine, pork, fish from freshwater aquaculture, beer, coffee, citrus fruit and juices. DEQ also reviewed studies related to two issues that cut across multiple types of foods: the environmental “cost” of transportation associated with food, and the potential trade-offs between increased packaging and reduced food waste.⁵ Among other things, DEQ found:

- Heating greenhouses for out-of-season tomato production adds a significant contribution to greenhouse gas emissions and other environmental impacts, and this contribution typically outweighs the impacts of long distance transport from warmer production regions. Local hot-house tomatoes grown in colder seasons may have more environmental impacts than field-grown tomatoes shipped long distances.
- Transportation represents a relatively small contribution to the energy use and associated greenhouse gas emissions of the U.S. food system. Meta-analysis of existing food life cycle assessments suggests that for most foods, distribution is not a dominant contributor of greenhouse gas emissions (although exceptions exist).
- The literature demonstrates that changes in food packaging that lead to food waste reductions can result in net reductions in environmental impacts, even if the impacts of the packaging itself increases.

³ Ibid.

⁴ Oregon Department of Environmental Quality, “Appendix A and B: Oregon’s Greenhouse Gas Emissions through 2015: An assessment of Oregon’s sector-based and consumption-based greenhouse gas emissions,” May 2018, <https://www.oregon.gov/deq/FilterDocs/OregonGHGreportAB.pdf>.

⁵ More information is available on the DEQ website. Oregon Department of Environmental Quality, “Environmental Footprints of Foods,” accessed March 18, 2019, <https://www.oregon.gov/deq/mm/food/Pages/Product-Category-Level-Footprints.aspx>.

DEQ, the Washington Department of Ecology and the Oregon Sustainability Board also published four case studies on businesses that used product environmental footprinting in business practice. One case study focused on HP's use of life cycle assessment to demonstrate the environmental benefits offered by small batch digital printing. Another case study focused on Impossible Foods, Inc., a producer of plant-based meat alternatives that uses life cycle assessment to evaluate the impacts and resource use along the supply chain of its flagship product, communicate with customers, and help inform business decisions. These case studies offer insight into the benefits the businesses gained with environmental footprinting, the challenges faced, lessons learned and best practices.⁶

In 2018, DEQ published a review of the comparative environmental impacts of “eco” packaging materials and service ware ascribed with such attributes as “biobased,” “recyclable,” “compostable” and “recycled content.”⁷ This review encompassed 18 years of life cycle assessment research and tested the widespread assumptions that packaging and service ware comprised of biobased, recycled content, recyclable, or compostable materials would yield lower environmental impacts than other types of packaging. DEQ found that these attributes did not reliably or consistently equate with lower environmental impacts – something that was hinted at in DEQ's prior work in life cycle assessments. For example, DEQ's e-commerce packaging assessment identified lightweight shipping bags – even if made from mixed materials such as paper/plastic blends that were difficult to recycle and contained limited recycled materials – often resulted in lower environmental burdens across their production, use, and disposal than recyclable paperboard boxes.

DEQ is distributing the results of these reviews in presentations, informational sheets and other forms to engage peers in other states, businesses, academia, and the food and packaging design community.

⁶ Oregon Department of Environmental Quality, “Product Environmental Footprint Case Studies,” accessed March 18, 2019, <https://www.oregon.gov/deq/mm/production/Pages/Product-Case-Studies.aspx>.

⁷ Additional information is available on the DEQ website. Oregon Department of Environmental Quality, “Popular Packaging Attributes,” accessed March 18, 2019, <https://www.oregon.gov/deq/mm/production/Pages/Materials-Attributes.aspx>.

4. Collaborations with communities and businesses

4.1 Grants to local governments, nonprofits, and schools

Through its general grants program, Materials Management helps recipients fight waste, build capacity for reuse and repair, support responsible recycling in rural communities, or otherwise advance the *2050 Vision*. Past recipients include local governments, schools and nonprofits from across the state. In 2017, Materials Management awarded 20 grants totaling over \$670,000, which included \$100,000 in funds provided by Metro for edible food rescue projects in the Portland metropolitan area. Grants supported projects related to food waste reduction; food rescue and redistribution; reuse and repair projects; school programs; and community recycling and composting projects. For example:



- Marion-Polk Food Share was awarded \$13,960 to implement a six-month pilot project to reduce the environmental impacts of its Meals on Wheels program through the use of reusable trays and containers for home-delivered meals and take home meals.
- Lincoln County Solid Waste District was awarded \$10,359 to implement food waste composting, reestablish recycling and seek Green School certification at Sam Case Elementary and Newport Middle Schools.
- Tillamook County was awarded \$28,180 to produce a master site operations plan for its waste, recycling and reuse facilities that will accommodate growth in the next 20 years.

In 2018, Materials Management invested \$600,000 across 16 projects, again with a focus on food waste prevention and on projects that served economically distressed or otherwise distressed communities. Among the recipients:

- Heartwood Resources was awarded \$48,549 to purchase heavy equipment to help create a retail warehouse for used building materials in Grants Pass.
- Marion County was awarded \$76,685 to provide milk dispensers and durable dishes to local public schools, with the goal of reducing food and solid waste in schools and teaching students the importance of waste reduction.
- Garten Services was awarded \$82,242 to purchase new recycling processing equipment to allow more materials to be processed and recycled for rural collectors.

4.2 Business initiatives

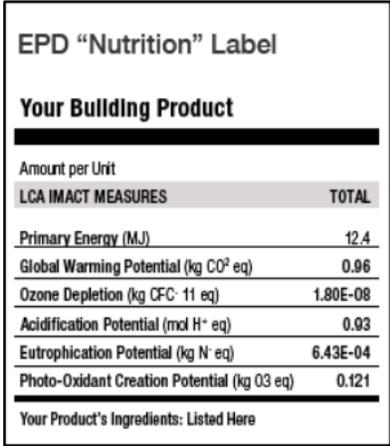
Business and the environment are closely connected. In many cases, the majority of a product’s environmental footprint often comes from business decisions – about a product’s design, the raw materials required for production and the type of transportation used for delivery – made long before the product reaches the end customer.⁸ The Business Initiatives program aims to help businesses reduce environmental impacts along the whole life cycle of their products. It collaborates with businesses and organizations to develop tools and resources for measuring impacts, provide technical support, build capacity, conduct research and contribute to the broader conversation about environmental impacts.

Concrete and EPDs

One area for such collaboration lies in the building and construction sector. Concrete consumption in Oregon accounts for over one percent of greenhouse gas emissions in the state – a significant amount for an individual material.⁹ Cement, a main component of concrete that binds the rocks together, carries a high carbon footprint for its production, and contributes roughly 85 percent of the greenhouse gas impacts of most concrete mixes. Overall, cement production represents an estimated five to seven percent of global emissions.¹⁰

Replacing cement with alternative materials in a concrete mix can reduce the carbon and energy impact by as much as 40 percent. Previously, the market lacked standardized ways to measure and disclose the environmental impacts of different concrete mixes. That has begun to change with the help of green building certification programs such as Leadership in Energy and Environmental Design. These programs provide “points” to products that measure and disclose their environmental impacts on third-party verified product labels known as Environmental Product Declarations.

DEQ is collaborating with the Oregon Concrete and Aggregate Producers Association to help Oregon concrete producers create EPDs for their concrete mixes. Through this partnership, concrete producers in Oregon gain free access to an online EPD tool, technical support from DEQ and reimbursements for the verification of the EPD.¹¹ With EPDs, purchasers of concrete can select low-impact mixes while potentially contributing to public or private carbon reduction targets. In 2017, CalPortland became the first concrete producer in Oregon to have registered EPDs for approximately 150 concrete mixes. In 2018, Knife River published EPDs for four of its Oregon plants, covering 479 mixes.



EPD “Nutrition” Label

Your Building Product

Amount per Unit

LCA IMPACT 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

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

⁸ For example, production and transportation accounts for 83 percent of the product footprint of an iPhone 6s. https://www.apple.com/environment/pdf/products/iphone/iPhone6s_PER_sept2015.pdf

⁹ Oregon Department of Environmental Quality, “Oregon’s Greenhouse Gas Emissions through 2015: An assessment of Oregon’s sector-based and consumption-based greenhouse gas emissions,” May 2018, <https://www.oregon.gov/deq/FilterDocs/OregonGHGreport.pdf>.

¹⁰ 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, <https://doi.org/10.1016/j.jclepro.2012.10.049>.

¹¹ More information is available on the OCAPA website. OCAPA, “Oregon Concrete EPDs,” accessed March 18, 2019, <https://www.ocapa.net/oregon-concrete-epds>.

5. Sustainable production and consumption

5.1 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. Both the *2050 Vision* and the Oregon Global Warming Commission's *Interim Roadmap to 2020*¹² identify preventing food waste as a priority for Oregon because of the environmental burdens associated with the food production, distribution, refrigeration, preparation and final disposal of food. A significant amount of greenhouse gas impacts associated with food comes from its production. The EPA's Waste Reduction Model estimates that potential greenhouse gas savings associated with preventing the wasting of one ton of food are approximately 20 times larger than the savings associated with recycling that food through composting.¹³

In 2017, DEQ identified nine projects to pursue in the next five years to prevent the wasting of food.¹⁴ The first project, a five-part study on wasted food generation in Oregon, is nearly complete. Conducted in partnership with Portland State University's Community Environmental Services, this study included qualitative interviews¹⁵ with Oregon residents that raised issues such as the aspirational nature of food purchases; the roles that the source (e.g., grocery versus farmers markets) and available quantities of food played in their waste; commonly discarded items; and the perception that composted food is not "wasted." The second part of the study used a statewide phone survey of 486 households in Oregon and more in-depth studies using food diaries in 272 Oregon households as ways to assess what and how much food Oregonians waste, and why.¹⁶ DEQ expects to complete and publish the remaining components of the study in 2019. The study results will inform strategies for future outreach and business partnerships, and establish a benchmark against which future progress will be evaluated.

As part of a project on messaging, DEQ developed a food waste prevention campaign that local governments can use in their communities. This "Wasted Food Wasted Money" campaign contains flyers and brief guides in English, Spanish, Vietnamese, and Russian that offer grocery stores, restaurants, and other food service businesses tips on how to prevent wasted food. This campaign is gaining wider distribution through a partnership with Metro regional government and the Oregon Restaurant and Lodging Association, where it serves as the base material for the prevention component of ORLA's program to promote prevention, food donation and composting among its members. As part of the ORLA partnership, DEQ also has co-sponsored workshops for commercial food service businesses that help them develop roadmaps for reducing food waste. DEQ is also conducting a study to identify effective messaging to reduce consumer food waste. This study will further support development of a statewide campaign to promote prevention, help DEQ identify and disseminate best practices for preventing wasting of food, and provide a basis for more effective policies and programs.

¹² Oregon Global Warming Commission, "Interim Roadmap to 2020," October 29, 2010, <https://digital.osl.state.or.us/islandora/object/osl%3A6221/datastream/OBJ/view>.

¹³ 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.

¹⁴ Oregon Department of Environmental Quality, "Oregon DEQ Strategic Plan for Preventing the Wasting of Food," March 2017, <https://www.oregon.gov/deq/FilterDocs/foodstrategic.pdf>.

¹⁵ Oregon Department of Environmental Quality, "Oregon Wasted Food Study: Measurement, motivations and opportunities to waste less food," May 26, 2017, <https://www.oregon.gov/deq/FilterDocs/WastedFoodStudyTask1.pdf>.

¹⁶ Oregon Department of Environmental Quality, "2017 Oregon Wasted Food Statewide Phone Survey," October 11, 2017, revised May 28, 2018, <https://www.oregon.gov/deq/FilterDocs/wastedfoodsurvey2017.pdf>.

DEQ is also playing a lead role in convening a regional coalition of interested states and cities to advance food waste reduction. DEQ is doing this work through the Pacific Coast Collaborative. PCC is an intergovernmental partnership aimed at fostering collaboration among its members and is comprised of British Columbia, the states of Washington, Oregon and California, and the cities of Vancouver (BC), Seattle, Portland, San Francisco, Oakland and Los Angeles. In spring 2017, DEQ hosted a summit for PCC to discuss opportunities to work together on wasted food prevention and recovery research and program implementation needs. At the Global Climate Action Summit in September 2018, the PPC partners announced a commitment to a regional goal of halving food waste by 2030. This includes efforts to prevent, rescue and recover wasted food. DEQ and other PCC partners are now reaching out to food retailers and manufacturers to join in adopting a 50 percent reduction goal for 2030 and collaborate on identifying effective, industry-wide actions to reduce wasted food. DEQ has separately adopted a goal of reducing the generation of wasted edible food by 15 percent by 2025 and 40 percent by 2050 in Oregon.

5.2 Reuse, repair and product lifespan extension

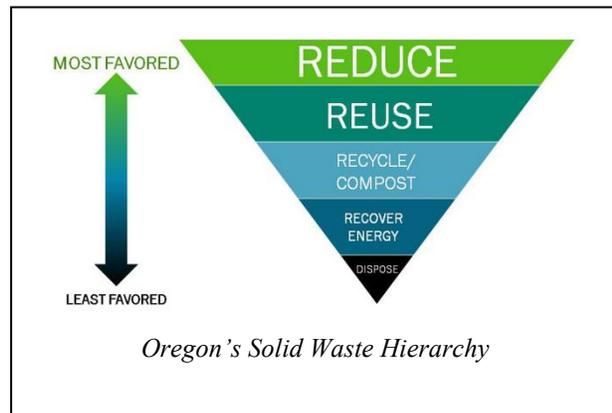
In 2017-18, DEQ conducted and supported several projects to advance repair and reuse. Many projects directly spurred job creation or investment in the local repair and reuse industry. Some, such as those related to deconstruction and demolition of buildings, also helped promote practices intended to reduce harm to human health.

These projects were pursued under a Strategic Plan for Reuse, Repair, and Extending the Lifespan of Products in Oregon, published in 2016.¹⁷ “Reduce” and “reuse” are listed above

“recycling” in DEQ’s hierarchy for managing solid waste. Life cycle analysis by DEQ and others have shown that the hierarchy generally provides good guidance relevant to energy, resource, and pollution impacts for different methods of managing solid waste.¹⁸ Much of the environmental impacts for many products and materials come from their production, rather than from their use, recycling or disposal. Reuse and repair, by extending the functional lifespan of products, help reduce the environmental impacts associated with producing new products.

But the everyday practice of reuse and repair has waned in recent decades. Reasons for this decline include industry practices to discourage repair and reuse; planned obsolescence for some products; a lack of infrastructure or financial incentives for repairing and reusing products; and concerns about exposure to toxics and mixed materials in products and packaging.

Materials Management is helping to support the growth of the reuse and repair industry through grants and pilot projects. In 2017, Materials Management launched a “micro-grant” pilot project to address



¹⁷ The Strategic Plan identifies building materials, textiles, and remanufactured goods as priority materials to target. The plan also identifies four basic strategies: (1) conduct foundational research, (2) support infrastructure and build capacity, (3) drive users to that infrastructure, and (4) provide policy support where needed. Oregon Department of Environmental Quality, “Strategic Plan for Reuse, Repair, and Extending the Lifespan of Products in Oregon,” December 2016, <https://www.oregon.gov/deq/FilterDocs/wprStrategicPlan.pdf>.

¹⁸ Oregon Department of Environmental Quality, “Briefing Paper: Oregon’s Solid Waste Hierarchy - Intent and Uses,” September 2011, <https://www.oregon.gov/deq/FilterDocs/2050-SWHierarchy.pdf>.

workforce development needs of small reuse or repair businesses in Oregon. Many of these businesses have strong demand for their services; often comprised of only one or two staff members, however, they lack the time or resources to train new staff. Materials Management provided micro-grants of up to \$10,000 to cover the costs of training and capital equipment that could result in increased long-term capacity, new jobs and a better customer experience. Grants were awarded in 2017 to:

1. The Renewal Workshop in Cascade Locks, to invest in capital equipment and train two new sewists to repair and renew high-end clothing that has been returned to stores;
2. Salvage Works in Portland, to train and hire a new employee to increase capacity for reusing salvaged wood;
3. JD's Shoe Repair, to train a cobbler;
4. Garten Services, to train two adults with disabilities to work in the careful disassembly and reuse of electronic components; and
5. The Toolbox Project in Eugene, to hire an operations manager to improve financial self-sufficiency and expand services.



JD's Shoe Repair. Photo credit: Simon Love



Salvage Works. Photo credit: Hali Boyd

Materials Management also awarded over \$152,000 in 2017 and over \$140,000 in 2018 to repair and reuse related projects through its traditional grants program – roughly a fifth of the total amount of grants awarded in 2017 and a quarter of the amount of grants awarded in 2018.

Other examples of Materials Management's work in advancing reuse and repair include:

- A small project with Free Geek to recruit and train seven mobile device repair technicians on smartphone and tablet repair. Trainees receive hands-on experience, a full toolkit from iFixit, and assistance in achieving iFixit MasterTech Certification, the industry's first technical certification for smartphone repair. The aim is to help participants increase their repair proficiency, start their own repair shop or get their repair shop certified.
- A pilot project to install filtered filling stations in several schools in Gresham and compare their usage rates with those of vending machines selling single-use bottled water. Materials Management found that the new filling stations saw significant use, even in schools that had existing filling stations. Meanwhile, vending machine sales of bottled water decreased – in some cases, sales had so declined that the vending companies removed the machines from the schools. Students were surveyed on the taste of the water and most could not tell the difference between bottled water and water from the filling stations. This project included accompanying environmental educational programs at some schools. Materials Management found there was

little difference in filler usage from the schools that received education compared with those that didn't. This suggests that the presence of the fillers was enough to encourage their use.

- The completion of a workforce development project, begun in 2015, to grow the Portland area's building deconstruction industry. Deconstruction is the systematic dismantling of a structure that prioritizes salvage of materials for reuse. It is a gentler alternative to mechanical demolition, where heavy machinery is used to take down a structure quickly, leaving little material available for salvage. An ordinance passed in Portland in 2016 required projects seeking a demolition permit of a house or duplex to fully deconstruct the structure if it was built in 1916 or earlier, or if it was a designated historic resource. While the ordinance would create an instant supply of work and materials, the city had concerns about the potential high price of deconstruction and the ability of existing firms to meet the workload. DEQ helped the city address these concerns in three ways, offering grants to assist with deconstruction projects in 2015, supporting the first training for contractors in July 2016, and helping to fund on-the-ground worker training to build the workforce in March 2017. Prior to the ordinance's adoption, there were three firms in Portland that solely focused on deconstruction, with no special certification requirements for these firms.¹⁹ As of December 2018, there are 12 Certified Deconstruction Contractors.²⁰

5.3 Sustainable procurement

DEQ is also collaborating with other departments in Oregon and the nation to promote sustainable procurement. The goal of sustainable procurement is to incorporate criteria related to environmental, social and economic sustainability into government procurements. As part of this effort, DEQ staff participated as an Oregon representative in a multi-state team to develop a national price agreement for Facilities, Maintenance, Repair and Operations. In this capacity, DEQ provided technical support in defining product sustainability criteria and evaluating vendor applications. DEQ also provided technical support for the separate development of Oregon's state price agreement for Facilities, Maintenance, Repair and Operations, with a focus on including additional product sustainability criteria. These price agreements provide access for both local and state governments to products with lower environmental impacts.

5.4 Preventing Lead-based Paint Dispersion during Building Demolitions

In addition to the projects described above, DEQ is providing technical support for a project led by the Oregon Health Authority to address lead-paint dispersion during building demolitions.

Older housing with lead-based paint is known to be a major source of exposure to lead in both adults and children in Oregon. Despite the residential use of lead-based paint being banned in 1978, many homes still contain it, providing a pathway (through paint chips and dust) to exposure. Regulations exist to limit lead exposure during renovation, repair and repainting of residences with lead-based paint present, yet no regulations exist for controlling lead dust from demolitions. Oregon Senate Bill 871, which was passed in the 2017 legislative session, aims to close the regulatory gap by allowing local permitting authorities to adopt an ordinance for controlling lead dust from demolitions that includes:

- a. A permit to demolish;

¹⁹ City of Portland Bureau of Planning and Sustainability, "Portland's Deconstruction Program 12-month Status Report," March 12, 2018, <https://www.portlandoregon.gov/bps/article/679905>.

²⁰ City of Portland Bureau of Planning and Sustainability, "List of Certified Deconstruction Contractors," accessed April 15, 2019, <https://www.portlandoregon.gov/bps/article/595154>.

- b. A lead-based paint certification for contractors performing demolitions; and
- c. A set of best practices chosen from the list developed by the Oregon Health Authority, DEQ, and the Construction Contractor's Board.

DEQ worked with OHA and CCB to develop Best Practices for the Demolition of Residences with Lead-Based Paint, which was published on January 1, 2018.²¹ Since the publication, the City of Portland has adopted an extensive residential demolition ordinance that implements many of the practices recommended in this document. Overall, the publication of best practices provides an important resource for cities wanting to limit the dispersion of lead-paint dust during residential building demolitions. DEQ will continue to support the update and implementation of these best practices.

²¹ Oregon Health Authority, "Best Practices for the Demolition of Residences with Lead-Based Paint," January 1, 2018, <https://www.oregon.gov/oha/PH/HEALTHYENVIRONMENTS/HEALTHYNEIGHBORHOODS/LEADPOISONING/Documents/Best-Practices-Demolition-of-Residences.pdf>.

6. Waste recovery and disposal

6.1 Household hazardous waste collection

Cleaners, pesticides and pool chemicals are just some of the many household and business products that contain toxic substances. If improperly stored or disposed of, these products can pollute waterways, poison humans or wildlife, or cause fires.²²

Oregon law calls for a household hazardous waste program under ORS 459.411-418. However, limited DEQ funding was available for such a program from 2008 to 2014.

With the change in funding levels brought about by Senate Bill 245 (2015), DEQ was able to restart 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.

For 2017-18, residents in 18 counties had access to permanent facilities for HHW disposal that offer multiple collection opportunities per year. Nine other counties provided drop-off events only. DEQ funded an additional 13 local collection events in areas with no other collection options.

DEQ also funded work on a lingering long-term issue: aging and unsafe chemical stockpiles in school chemistry labs. In 2017 and 2018, 68 schools labs were cleaned out.

A breakdown of household hazardous waste collection activities in 2017-18 is shown in the map on the next page.

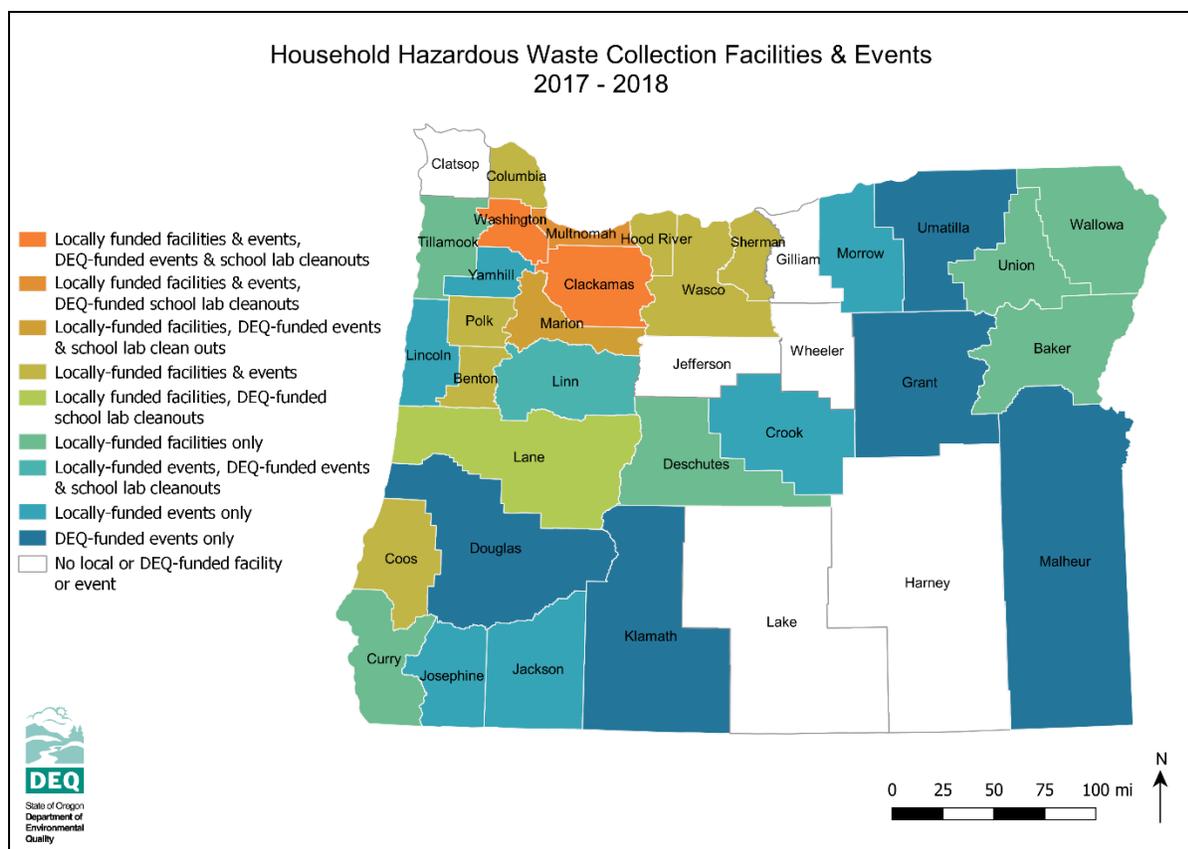


Workers at 2018 hazardous waste collection event in North Plains. Photo: DEQ.



Chemicals prepped for disposal from a school laboratory in Marion County, 2018. Photo: Dave Waddell.

²² See Oregon Department of Environmental Quality, “What Is Household Hazardous Waste?,” May 2012, <https://www.oregon.gov/deq/FilterDocs/WhatisHHW.pdf>; and US Department of Health & Human Services, “Household Products Database: Health & Safety Information on Household Products,” accessed March 18, 2019, <https://householdproducts.nlm.nih.gov/index.htm>.



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

Oregon law has special requirements for two materials common in the waste stream: architectural paint and electronics waste. They are the subject of product stewardship requirements.

Product stewardship is an approach to environmental management in which those who design, manufacture, sell and use consumer products take responsibility for reducing negative impacts to the economy, environment, public health and worker safety. For manufacturers, this can include assuring convenient collection of their products and recycling their share of returned products. For retailers and consumers, this can mean taking an active role in recycling or disposing of a product in a proper way.

Architectural paint stewardship

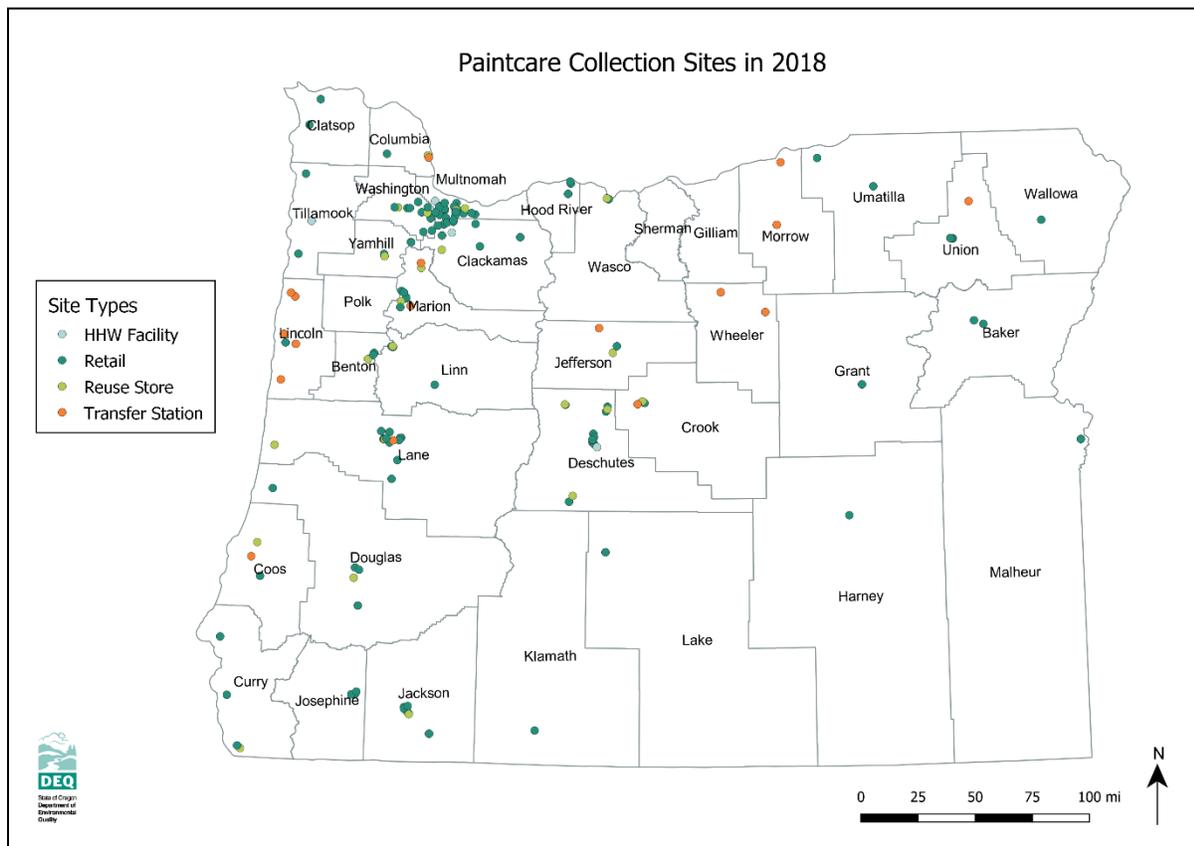
Architectural finishes such as paints, varnishes and stains can be a large component of materials delivered to household hazardous waste collection programs. When stored or disposed of improperly, these materials can be hazardous to human health, wildlife and water quality. Managing waste paints is also expensive for local governments. These substances are the focus of ORS 459A.820-855, which require manufacturers of latex and oil-based architectural paints, stains and coatings to 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 other 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 2018, it is estimated that the Oregon Paint Product Stewardship Program:

- Maintained over 172 permanent collection sites, mostly at retail locations, but also at many local government and solid waste facilities;
- Collected over 5.4 million gallons of leftover paint;
- Recycled over 50 percent of the latex paint collected back into latex paint; and
- Shifted much of the cost of paint recycling from local governments to paint purchasers. 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.



In 2018, a third party audit of PaintCare was completed, at DEQ’s request, to assess PaintCare’s performance, operations and finances. This type of audit had not been previously commissioned by DEQ. The findings of the audit supported many of DEQ’s recommendations for improving program performance. Also in 2018, DEQ approved a fee increase. PaintCare requested the fee increase because funds from the fee assessment, which is applied at the time of purchase of paint, were insufficient to cover program costs.

manufacturers.²³ Retailers must inform consumers about recycling opportunities under Oregon E-Cycles. More details about the implementation of the program are available at the Oregon E-Cycles website, www.oregonecycles.org.

Since operations began in 2009, Oregon E-Cycles has produced significant environmental benefits, from preventing toxins from entering our landfills, to recovering precious and rare earth metals for new electronics that can reduce the need for mining more resources from the earth. In 2018, collections totaled 20 million pounds of devices recycled and more than 50,000 units dedicated to reuse. The program is now celebrating its tenth anniversary and has collected a total of over 250 million pounds.

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.

6.3 The Recycling Opportunity Act and Changes under Senate Bill 263 (2015)

Oregon's Opportunity to Recycle Act of 1983 was the first legislation in the United States to assure access statewide to recycling programs. It required cities and counties to 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, the Act also requires these cities and counties, depending on their size, to choose and implement a certain number of recycling program elements. Senate Bill 263 updated the Act with new goals and requirements; it also expanded the opportunity to recycle to people living in multifamily housing and to tenants in multitenant commercial buildings, effective July 1, 2022.

In 2017-18, DEQ continued to work with local governments and other stakeholders to prepare for new requirements in Oregon for recycling, as created by SB 263 (2015). At the same time, DEQ is addressing an unexpected test to Oregon's recycling system: a disruption in the international recycling markets caused by China's ban on imported post-consumer plastics and unsorted paper.

A Disruption to the Recycling Market

In March 2017, China began to severely restrict its importation of recyclable materials in a series of actions collectively called "National Sword." In January 2018, China further banned the import of some grades of post-consumer plastic and unsorted paper, and tightened the amount of contamination – e.g., non-recyclable materials, such as food, liquids, oil and hazardous chemicals, that are mixed in with recyclable materials – that it would accept.

Prior to that, China had taken much of the recyclable paper and mixed plastics generated by the rest of the world. In fact, up to 60 percent of the world's recycling went to China. Oregon sent most of the recyclable material collected in curbside programs to China. This practice was a result of the loss of local markets, the low cost of shipping to China, and China's then acceptance of materials often containing higher levels of contamination than U.S. markets would accept.

²³ 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.

To meet China’s new contamination standards, Oregon processors added more workers, slowed down their sort lines, and made other sorting improvements to remove more contaminants. Despite these efforts, meeting China’s stringent contamination standards became infeasible for Oregon recycling processors, and selling materials to China was no longer a viable solution. Alternate markets in Southeast Asia, India and elsewhere have been identified, but are insufficient to absorb the loss of China’s markets.

The increase in global competition for the remaining and emerging recycling markets and the cost of producing cleaner materials to compete for those markets have strained Oregon’s recycling programs. Some communities in Oregon have suspended the collection of some materials for recycling, such as plastics. Others have maintained services with rate increases. In a few cases, as a last resort, materials collected for recycling have been disposed as garbage. (This practice is legal when the cost to recycle exceeds the cost to landfill.) From September 1, 2017 to January 31, 2019, 15,388 tons, or approximately two percent of all materials collected for recycling, have been sent to landfills.²⁴ DEQ is working closely with local governments, collectors, processors and industry representatives to continue recycling as much as possible in Oregon and to explore long-term strategies to make Oregon’s recycling system more resilient.

Preparing for SB 263 compliance

The disruption exposed weaknesses in Oregon’s recycling system and the worldwide market. Some of the recovery goals set forth by SB 263 may now be more difficult to achieve. However, many of SB 263’s requirements – for instance, the education and promotion program addressing contamination – also offer opportunities to make Oregon’s recycling system more resilient and effective. The disruption also underlines the importance of promoting the prevention of waste generation, and why reduce and reuse are prioritized above recycling in DEQ’s solid waste hierarchy. DEQ is planning and undertaking various projects related to SB 263 compliance with this in mind. Among them:

- The new laws require certain local governments to implement three to five waste prevention and reuse program elements. In 2017, DEQ developed two campaigns that local governments can use for this requirement: “Wasted Food Wasted Money,” a campaign for food service businesses on preventing food waste, and “Make Every Thread Count,” a campaign for consumers on how to be more thoughtful about clothing purchases and to extend the useful life of their clothing.²⁵ These multilingual campaigns include toolkits that allow local governments to use the campaigns as-is or to customize campaigns to fit their communities.
- Senate Bill 263 sets a goal of 25 percent food waste recovery by 2020. DEQ will conduct a statewide survey of the recovery rate for food waste in 2020, and, if the recovery rate is below 25 percent, include an evaluation of options to improve recovery, along with recommendations for meeting or modifying the recovery goal for food waste. As described in more detail in the “Sustainable production and consumption” section of this Report, DEQ is doing significant work in promoting the prevention of food waste and regards strategies to prevent the wasting of food as a priority, even if prevention is not counted in the recovery rate (which only tracks food once it has been disposed).
- DEQ plans to research recycling contamination, and model contamination-sampling methods that local governments can choose to implement.
- DEQ is also planning future projects related to carpet waste and plastic waste. Both have recovery rate goals under SB 263. China’s current ban has complicated the picture, particularly for plastics,

²⁴ Oregon Department of Environmental Quality, “Disposal Occurrences,” March 4, 2019, <https://www.oregon.gov/deq/FilterDocs/mm-disposalconcurr.pdf>

²⁵ These campaigns can be accessed at <https://www.oregon.gov/deq/mm/wpcampaigns/Pages/Wasted-Food-Wasted-Money.aspx> and <https://www.oregon.gov/deq/mm/wpcampaigns/Pages/textiles.aspx>, respectively.

as it has removed the largest market for recyclable materials at present. DEQ intends to survey the recovery rates for plastic waste and carpet waste in 2020 and 2025, respectively. DEQ will also conduct a broader review of options available for promoting the sustainable production and consumption of these materials.

Improving Access to Recycling Services for Tenants throughout Oregon

Oregon's strong recycling tradition is built on the idea that everyone should have the opportunity to recycle. However, many people who live in multifamily communities or work in multitenant commercial properties have inconsistent, inadequate access to recycling collection services.

To support improvements to multitenant recycling services and reduce contamination, DEQ has been leading an ongoing, collaborative effort with involvement from many stakeholders. This work will help communities implement the expanded Opportunity to Recycle Act that will explicitly include tenants—effective July 1, 2022 and in cities over 4,000 people, cities in the Metro Service District and associated urban growth boundaries.

To date, DEQ has undertaken the following efforts:

- Conducted research on the current state of multitenant recycling in Oregon. Research findings can be viewed on the DEQ website at <https://www.oregon.gov/deq/recycling/Pages/Multi-Tenant-Stakeholder-Resources.aspx>.
- Facilitated a stakeholder workgroup to develop a draft plan for how DEQ and other parties can support recycling and reduce contamination at multitenant properties.
- Collected feedback from stakeholders on the draft plan, through online comments and four public meetings across the state.
- Analyzed the cost of implementing a range of actions from the draft plan.

The stakeholder involvement and public outreach across the state significantly shifted DEQ's approach to this project. DEQ learned a great deal about the practical implications of the draft plan, and as a result, will be revising it to create a simplified, more cost effective path forward. DEQ staff are now working on that revision and will circulate it with stakeholders before proceeding with implementation.

Following an update of the draft work plan, DEQ plans to complete the following activities before July 2022:

- Create a toolkit of templates, best practices, model language and other resources for communities to use in their multitenant recycling programs.
- Consider developing potential baseline rules to support successful, cost effective implementation of state statute.
- Consider the use of other resources, such as technical assistance or grants to help local communities implement multitenant recycling.
- Conduct outreach and educate communities around the state about how to reduce contamination in recycling, access supporting tools from DEQ and meet new statutory requirements.

6.4 Permitting of solid waste facilities and complaint response

To ensure the continued proper operation of these landfills and other disposal facilities, Materials Management staff does substantial work in advising, overseeing and managing 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, conversion technology and anaerobic digester and other 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 help educate the public on waste prevention, waste recovery and waste disposal.

Municipal Disposal Facilities and Permits

Materials Management currently oversees approximately 321 disposal site permits²⁶ and 15 tire carrier permits statewide. The numbers of permits in each major category appear in the table below.

	Municipal	Industrial	Total
Open landfills	31	18	49
Closed landfills	36	24	60
Transfer stations & material recovery facilities	141	3	144
Treatment facilities	1	4	5
Incineration/Energy Recovery	1		1
Anaerobic Digester Composting Facility Permit	4		4
Aerobic Composting Facility Permit	14		14
Aerobic Composting Facility Registration	41		41
Conversion Technology Facility Permit		1	1
Sludge Lagoons & Transfer	2		2
Tire permits (carrier, storage, and combined storage and carrier)	15		15

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. Facilities also monitor and report to DEQ. DEQ inspects closed landfills every two or three years to verify that post-closure care (gas and groundwater monitoring) and maintenance of closed landfills are being carried out as required.

A list of active permitted facilities (including municipal solid waste disposal landfills, transfer stations, and compost, material recovery, waste tire and household hazardous waste facilities) is available at <https://www.deq.state.or.us/lq/sw/disposal/permittedfacilities.htm>. DEQ receives approximately 10-to-15 new permit applications each year.

²⁶ Does not include short term solid waste letters of authorization.

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 used as fill or to make new products. DEQ receives approximately five-to-15 short term disposal authorization requests per year and two-to-five beneficial use applications per year. A list of Beneficial Use Determinations is available at <https://www.oregon.gov/deq/mm/Pages/Beneficial-Use-Determinations.aspx>.

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. SWOSA 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 2017-18, DEQ used SWOSA funds at five approved sites. These sites are: the Creswell Landfill (Lane County), Shinglehouse Slough Landfill (Coos County), Hawks Landfill (Multnomah County), KFD Landfill (now Cully Park in Multnomah County) and Santosh Landfill (Columbia County). In 2019, DEQ plans to continue work at these sites and also conduct cleanup activities at the Kelso Street Waste Tire site (Lane County).

In 2019-20, DEQ intends to focus more effort on conducting a site assessment program that evaluates and prioritizes disposal sites throughout Oregon for SWOSA eligibility and funding. DEQ will initiate cleanup activities at emergency sites as they are identified and annually approve funding at non-emergency sites according to their priority.

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 55 DEQ-permitted aerobic composting facilities. Forty-one are assessed as low-risk; 21 are located on farms. There are also approximately ten on-farm composting facilities under Oregon Dept. of Agriculture oversight.

There are four DEQ-permitted anaerobic digesters; two receive food waste; one is located within the Portland Metro boundary but is not yet operational. There are also eight 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

Materials Management 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 2017, Materials Management received 200 solid waste complaints in its Western region, 80 solid waste complaints in its Northwest Region and 25 solid waste complaints in its Eastern region. In 2018, Materials Management received 219 solid waste complaints in its Western region, 257 solid waste complaints in its Northwest Region and 30 solid waste complaints in its Eastern region.

Materials Management’s investigations of complaints are part of DEQ’s overall effort to ensure that businesses and individuals comply with state and federal environmental laws. DEQ uses a variety of tools to bring about compliance, including technical assistance, compliance inspections, investigation of complaints, warning letters, assessment of civil penalties and compliance orders. Most violations are resolved through informal enforcement: Warning Letters or Warning Letters with Opportunity to Correct. Repeated or more serious violations can result in a formal enforcement action that includes a civil penalty. Formal enforcement actions are handled by the Office of Compliance and Enforcement.

For 2017-18, 22 companies and individuals subject to some type of Materials Management investigation were assessed civil penalties totaling over \$480,000. In many cases, these penalties reflect not only assessments for Materials Management violations, but also for water quality, hazardous waste, or other violations of DEQ rules or permits.

In 2017, DEQ successfully enforced against a virtual floating landfill of over 24 vessels on the Columbia River. The sinking vessels contained numerous types of hazardous and solid waste. The project involved significant coordination and collaboration between DEQ, U.S. Coast Guard and the Department of State Lands, and DEQ was awarded a Certificate of Merit from the Coast Guard for its “actions to protect the public and sensitive ecosystem in and around the Columbia River by eliminating all oil and hazardous material threats associated with 26 vessels located at the leased Department of State Lands property in Goble, Oregon.”

6.5 Metro's waste reduction program: compliance with state requirements

Metro is completing an update of its 10-year solid waste management plan, also known as its Regional Waste Plan.

The 2030 Regional Waste Plan is a blueprint to guide investments in the Metro region's solid waste system and reduce the environmental and health impacts of products, from their manufacturing to final disposition. The plan is intended to move the Metro region towards a sustainable materials management approach that identifies and addresses impacts across the full life cycle of materials and products. This shift is based on recent changes in policy guidance at the federal and state levels, including the adoption of the *2050 Vision* by the Environmental Quality Commission and its implementation by DEQ.

The plan also marks another shift in the region's approach to waste management by incorporating actions that will advance progress towards meeting the goals of Metro's *Strategic Plan to Advance Racial Equity, Diversity and Inclusion*. This *Equity Strategy* focuses on eliminating the disparities that people of color experience, especially in those areas related to Metro's policies, programs and services. Under Oregon state law (ORS 459.055), any jurisdiction sending more than 75,000 tons of solid waste per year to a permitted disposal site, including landfills in exclusive farm use zones, is required to prepare a waste reduction program for review and approval by DEQ. With over one million tons of garbage sent to Oregon landfills, the Metro region is subject to the statutory waste reduction program requirements. Metro has created an appendix to the Regional Waste Plan that describes the elements of the 2030 Regional Waste Plan that make up the waste reduction program and demonstrate the region's compliance with specific statutory and regulatory requirements. All local jurisdictions in the Metro region are required to comply with the waste reduction provisions set forth in state law (ORS 459A.005 to 459A.010 and Oregon Administrative Rule 340-090-0030 to 340-090-0050). Metro has been designated by the state as the compliance reporting agency for the region's three-county area. Local jurisdictions provide data to Metro to assist with this annual responsibility.

The Metro waste reduction program provides:

- A commitment by Metro and other local governments in the region to reduce the volume of waste that would otherwise be disposed of in a landfill through techniques such as waste prevention, recycling, reuse, composting and energy recovery;
- Energy efficient, cost-effective approaches for waste reduction; and
- Strategies that are commensurate with the type and volume of solid waste generated in the Metro region.

The statutory waste reduction program requirements in ORS 459.055(3)(B) also include the requirement to meet or exceed the waste prevention, reuse and recycling requirements in ORS 459.250 (requiring the provision of a place for collecting source-separated recyclable materials as a condition to a disposal site permit being issued or renewed) and ORS 459A.005 to 459A.085 (collectively referred to as the *opportunity to recycle* statutes). Most of the *opportunity to recycle* requirements in ORS 459A are currently met through existing requirements for local governments set forth in the Metro Code. However, the 2030 Regional Waste Plan contains additional actions that help Metro and other local governments in the region meet or exceed these requirements.

The 2030 Regional Waste Plan also includes a measurement framework to evaluate progress towards the plan's vision and goals. The measurement framework consists of six key indicators and many goal-level

indicators. Five of the key indicators are directly related to the statutory waste reduction program actions. They are:

1. Greenhouse gas emissions associated with the products and services consumed in the Metro region.
2. Annual tons of waste generated.
3. Number, geographic location and demographics of youth reached through education programs.
4. Share of multifamily communities with adequate collection services.
5. Recycling contamination by sector.

Metro, and the cities and counties in the region will be responsible for collecting the necessary data for constructing the plan's indicators. On an annual basis, Metro will report on the status of each action in the 2030 Regional Waste Plan and whether it has been implemented. Reporting on the key and goal indicators will occur at least every three years. In addition, Metro, in consultation with DEQ, will meet its statutory reporting responsibilities by periodically reporting to the Environmental Quality Commission on the implementation of the waste reduction program.

More information on the Metro Regional Waste Plan is available at www.oregonmetro.gov/public-projects/2030-regional-waste-plan.

6.6 Studies of recovery rates and waste composition

In 2017-18, DEQ completed the Material Recovery Survey and Waste Generation reports for 2016 and 2017. These reports show an increase in the amount of waste generated by Oregon from 2016 to 2017 by about three percent. However, Oregon also saw an increase from 2016 to 2017 in the percentage of waste that was recovered. DEQ also conducted and published a Waste Composition Study for 2016. This study provides a detailed breakdown of Oregon's waste stream that sheds light on what materials dominate the waste stream and how much recyclable material is being thrown away. The last Waste Composition Study was conducted in 2010.

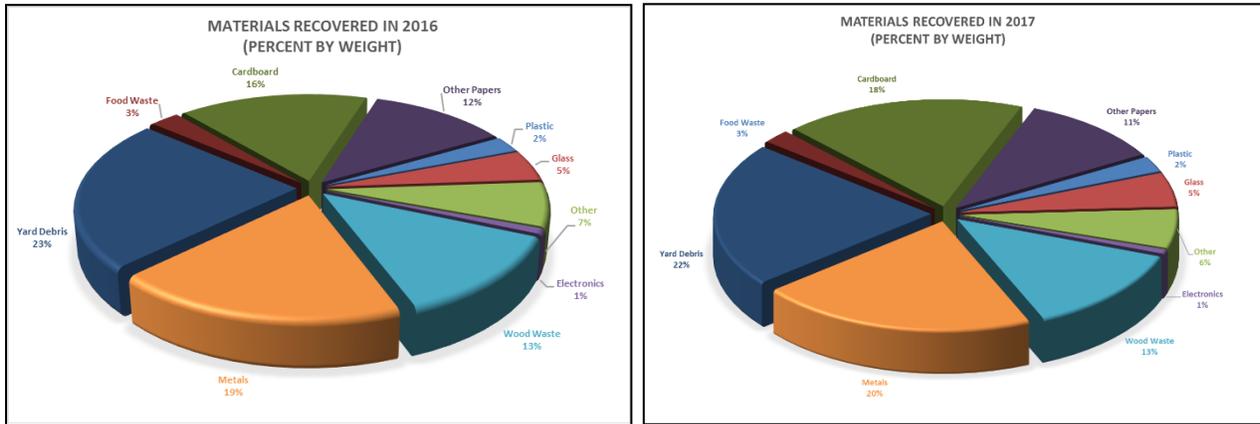
Oregon's Material Recovery and Waste Generation Rates

There are two general destinations for materials at the end of their useful lives: disposal and recovery. Disposal is landfilling or incineration. Recovery is recycling, composting, incineration for energy return,²⁷ or other ways of regaining resources from the material.

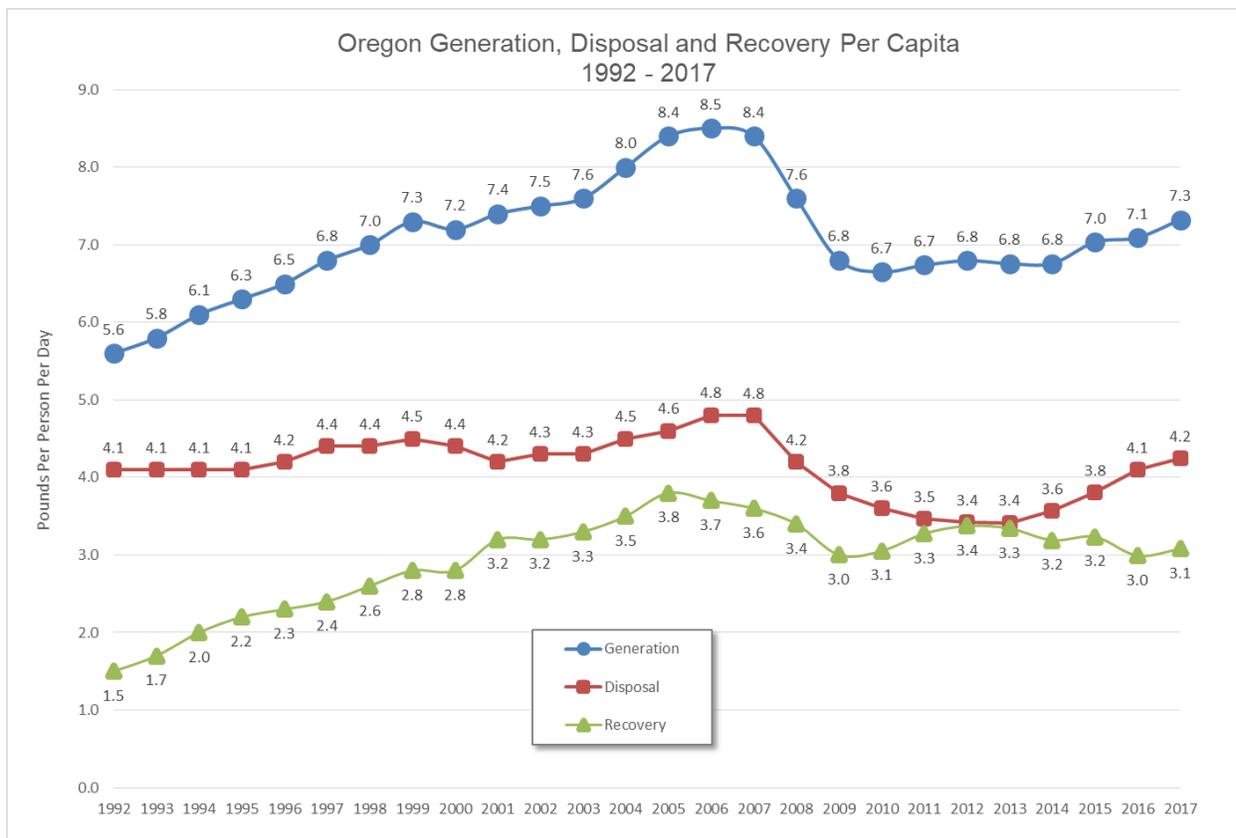
Oregon has long-term goals under ORS 459A.010 to reduce solid waste generation (the sum of disposal and recovery, or total tonnage of the waste stream) and to increase the rate of material recovery from the general solid waste stream (also known as the "recovery rate" or the percentage of generation that is recovered). DEQ's most recent data shows Oregonians:

- Generated 5,276,375 tons of waste in 2016 and 5,534,877 tons of waste in 2017 (a nearly five percent increase);
- Disposed of 3,050,432 tons into landfills and incinerators in 2016 and 3,207,448 tons in 2017 (a five percent increase); and
- Recovered 42.2 percent of waste generated in 2016 and 42.1 percent of waste generated in 2017.

²⁷ Under ORS 459A.010(4), materials burned for energy recovery are only counted as recovered if no viable market exists to recycle the material, or, in the case of mixtures of materials burned for energy recovery, if half, or less than half, of the mixed materials by weight could have been recycled if properly source separated.



Recovery rate calculations had previously 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. In 2015, the Oregon Legislature eliminated these credits from the calculation, and these credits are not counted in the recovery rates for 2016 and 2017.



On a per-capita basis, every Oregonian generated roughly 7.1 pounds of waste a day in 2016 and recovered three pounds; in 2017, every Oregonian generated roughly 7.3 pounds of waste a day, recovering 3.1 pounds for re-utilization. The rise in generation was likely the result of a busy economy

with abundant construction activity and purchasing of consumer goods. Recovery in 2016 and 2017 remained lower than in 2012-2013, due to the continued absence of markets for recovered wood.

In 2017, the state missed both its goals for no increase in per-capita and total waste generation. Still, total waste generation in 2017 was well below (195,002 tons less) its peak in 2006. This is a drop of 3.4 percent in total waste generation between 2006 and 2017, or a 13.9 percent drop in the per-capita amount.

Generation can be seen as a crude measure of consumption, and for many materials, the environmental impacts of production (the corollary of consumption) are many times higher than the impacts of disposal. For example, EPA has estimated that roughly 40 percent of the country's greenhouse gas emissions are associated with the production and transportation of goods.²⁸ The leveling off of waste generation in 2006, the sharp decline in 2007 through 2009, and lack of restoration to pre-recession levels since then suggests that some of the changes in waste generation that occurred during the last recession may be long-lasting, and that the reduction in use of materials is not temporary.

Oregon Amount Disposed and Recovered by Wasteshed, 2016-2017										
Wasteshed	2016 Disposed (tons)	Per Capita (lbs.)	2017 Disposed (tons)	Per Capita (lbs.)	2016 Recovered (tons)	Per Capita (lbs.)	2017 Recovered (tons)	Per Capita (lbs.)	2016 Calculated Recovery Rate*	2017 Calculated Recovery Rate*
Baker	12,432	1,506	14,078	1,681	3,111	377	3,554	424	20.0%	20.2%
Benton	61,999	1,482	63,167	1,489	34,311	820	33,217	783	35.6%	34.5%
Clatsop	34,076	1,783	33,381	1,720	20,671	1,082	24,546	1,265	37.8%	42.4%
Columbia	28,657	1,128	31,937	1,244	13,786	543	10,682	416	32.5%	25.1%
Coos	45,445	1,438	48,726	1,539	13,215	418	14,928	472	22.5%	23.5%
Crook	20,340	1,885	20,558	1,860	5,302	491	6,470	585	20.7%	23.9%
Curry	19,222	1,701	20,287	1,779	6,989	618	5,922	519	26.7%	22.6%
Deschutes	161,087	1,824	182,095	1,991	79,755	903	88,563	968	33.1%	32.7%
Douglas	75,054	1,360	79,113	1,423	27,725	502	33,110	596	27.0%	29.5%
Gilliam	2,247	2,270	2,038	2,043	358	361	383	384	13.7%	15.8%
Grant	3,868	1,044	4,089	1,103	1,457	393	852	230	27.4%	17.2%
Hamey	4,036	1,103	4,137	1,124	1,156	316	1,340	364	22.3%	24.5%
Hood River	20,187	1,632	23,135	1,840	7,437	601	6,801	541	26.9%	22.7%
Jackson	175,856	1,645	188,625	1,739	110,460	1,033	103,729	956	38.6%	35.5%
Jefferson	13,348	1,171	15,157	1,307	6,161	541	5,878	507	31.6%	27.9%
Josephine	70,076	1,655	76,898	1,796	38,476	909	43,106	1,007	35.4%	35.9%
Klamath	58,112	1,724	59,154	1,748	20,055	595	19,016	562	25.7%	24.3%
Lake	6,496	1,621	6,428	1,583	897	224	660	163	12.1%	9.3%
Lane	258,041	1,410	274,802	1,483	258,360	1,412	306,541	1,654	50.0%	52.7%
Lincoln	47,700	1,999	50,902	2,123	17,012	713	15,706	655	26.3%	23.6%
Linn	97,379	1,496	106,751	1,618	60,100	923	63,794	967	38.2%	37.4%
Malheur	22,205	1,401	23,262	1,461	7,973	503	6,867	431	26.4%	22.8%
Marion	243,107	1,457	263,789	1,556	237,150	1,421	251,456	1,484	**49.4%	**48.8%
Metro	1,259,663	1,416	1,281,096	1,414	1,116,712	1,255	1,130,317	1,248	47.0%	46.9%
Milton-Fr.	4,670	1,169	2,527	628	1,884	472	1,531	380	28.7%	37.7%
Morrow	17,477	2,976	22,055	3,710	5,635	960	5,959	1,002	24.4%	21.3%
Polk	46,533	1,180	51,179	1,277	39,526	1,002	46,101	1,151	45.9%	47.4%
Sherman	1,219	1,358	1,213	1,347	158	176	151	168	11.5%	11.1%
Tillamook	26,403	2,037	27,325	2,088	9,331	720	10,721	819	26.1%	28.2%
Umatilla	72,808	2,025	78,725	2,173	24,276	675	29,501	814	25.0%	27.3%
Union	20,625	1,542	22,504	1,673	6,916	517	6,755	502	25.1%	23.1%
Wallowa	4,091	1,146	4,434	1,232	1,513	424	1,480	411	27.0%	25.0%
Wasco	19,419	1,455	22,232	1,641	6,892	516	5,670	418	26.2%	20.3%
Wheeler	371	507	378	511	55	74	87	118	12.8%	18.8%
Yamhill	96,181	1,817	101,268	1,890	41,125	777	42,033	784	30.0%	29.3%
OR. TOTALS	3,050,432	1,497	3,207,448	1,549	2,225,943	1,092	2,327,428	1,124	42.2%	42.1%

*does not include 2% credits
 ** does include certain Marion County recyclable materials burned for energy.

²⁸ US EPA, "Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management Practices," Sept. 2009, Figure ES-1, <https://www.epa.gov/sites/production/files/documents/ghg-land-materials-management.pdf>.

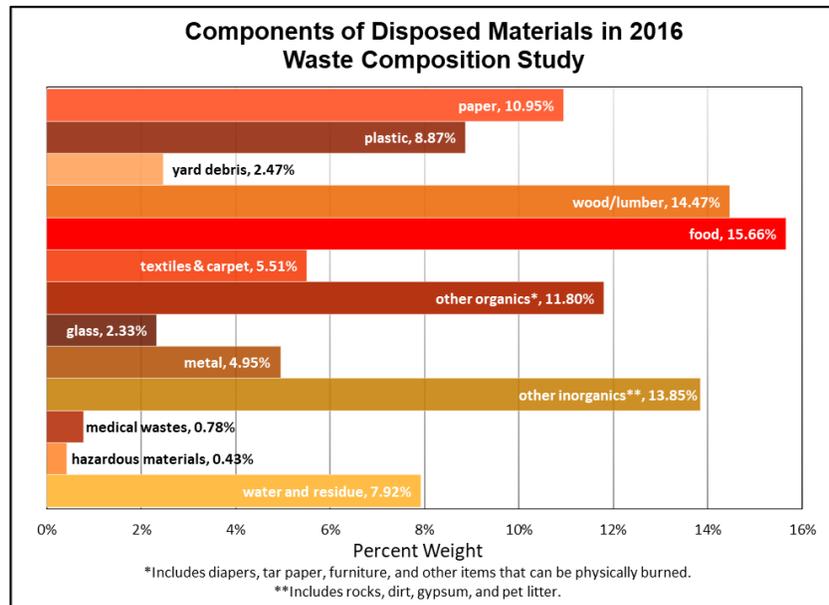
Pursuant to ORS 459A.012, DEQ is actively researching and developing a method for calculating an additional, alternative set of recovery rates for wastesheds based on the energy savings represented by recovery efforts. ORS 459A.012 allows DEQ to calculate alternative recovery rates based on reductions in greenhouse gas emissions, or other environmental impacts.

In 2018 and 2019, Oregonians will be challenged to increase their recovery rate to approach the 2020 and 2025 goals. Equally important, they will be challenged to reduce overall environmental impacts by reducing generation, and acting throughout the materials life cycle.

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. DEQ began fieldwork on the most recent study in May 2016. The statewide results of that study are shown in the “Components of Disposed Materials in 2016 Waste Composition Study” graph.



DEQ provides additional waste composition sampling and analysis for local governments that have contributed funds for information beyond the basic design of the Waste Composition Study. These local governments include Marion County, Lane County, Washington County, Metro, and the City of Portland. The statewide results and additional sampling and analysis are available at <https://www.oregon.gov/deq/mm/Pages/Waste-Composition-Study.aspx>.