Materials Management Program 2019-20 Report to the Legislature

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

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Department of Environmental Quality

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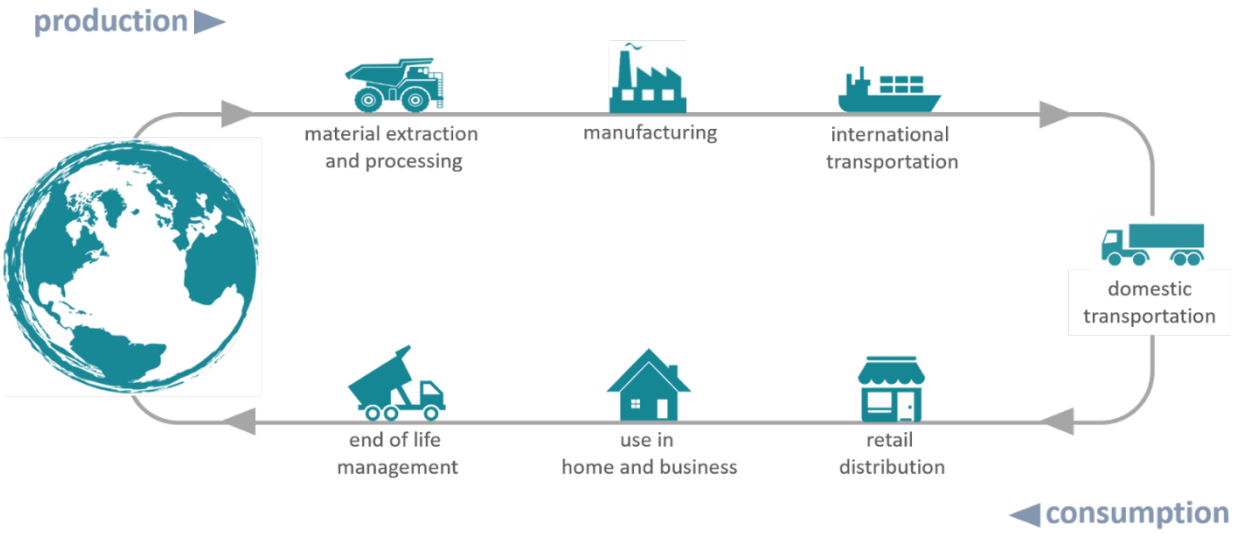
Executive Summary

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 people in Oregon 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, and the operation of Oregon's system for electronics recycling. The report uses 2020 data, unless otherwise specified.

Materials Management's work is guided by *Materials Management in Oregon: 2050 Vision and Framework for Action*, and the updated *2020 Framework for Action*. The Environmental Quality Commission adopted the *2050 Vision* 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.



The materials life cycle

In 2019 and 2020, Materials Management undertook projects and collaborations that maintained this holistic approach to reducing the environmental impacts of materials that we use. These projects and collaborations involve the promotion of food waste prevention, sustainable government procurement, reuse and repair, reducing climate impacts in the built environment, 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 2019 and 2020 include:

- Updating DEQ's *Framework for Action* and adopting a set of core values to complement the *2050 Vision* and guide our work. The core values clarify and strengthen the interdependence between people, planet and the economy. DEQ will use these core values to build support for our initiatives, inform development of strategic plans, and identify emerging issues.

- Collaborating with recycling system stakeholders to consider alternatives and recommend a path forward to modernize Oregon's recycling system, which was disrupted by international recycling market challenges in 2017-2018. DEQ outlined draft legislation for the 2021 Legislative Session. If passed, it would require producers of printed paper and packaging to share responsibility – with local governments, ratepayers, and recycling processing facilities – for the proper handling and recycling of commingled materials.

- Continuing priority work to prevent the wasting of food. This work includes initiating a project to develop research-based messaging targeting residential generators, ongoing support of regional food waste reductions through the Pacific Coast Collaborative, and delivery of commercial food waste prevention workshops across the state. DEQ also conducted a life cycle assessment of food rescue pathways to better understand the relative value and environmental impacts and trade-offs of diverting food from various sources (e.g., farms, groceries, restaurants) to feed Oregon residents experiencing food insecurity. This work is consistent with direction in the Governor's Executive Order 20-04 to reduce food waste by half by 2030.

- Providing a grant program that helps local governments, businesses, nonprofits and schools around the state reduce the environmental and health impacts of materials, while supporting communities and strengthening local economies. In 2019, 17 projects totaling over $594,209 were funded, and in 2020, 17 projects totaling over $595,167 were funded across the state.

- Funding transportation and repacking costs through a $140,000 grant to rescue two million pounds of fresh produce from growers and processors in Oregon, Washington and California. This food rescue represented the equivalent of 1.7 million meals for Oregon residents experiencing food insecurity.

- Advancing Oregon's reuse and repair industry through grants to spur job creation and investment in local reuse and repair businesses. In 2020, DEQ provided $125,000 in funding to 13 organizations to cover the costs of training and capital equipment. DEQ also awarded over $111,000 in 2019 and over $303,000 in 2020 to repair and reuse related projects through the traditional Materials Management grants program.

- Overseeing Oregon's product stewardship programs for collecting electronics waste, Oregon E-Cycles. These efforts resulted in 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 2019, more than

46,000 electronic devices were collected for reuse, and over 18 million pounds of electronic devices were collected for recycling.

- Providing oversight for PaintCare, a paint stewardship organization, where the public can take unwanted, leftover paint for recycling. In 2019, PaintCare maintained 175 permanent collection sites, and collected over 767,000 gallons of paint, varnishes and stains; recycled 64 percent of latex paint; and processed another 6 percent of latex paint for reuse.

- Developing rules to implement HB 3273 (2019) which established a statewide product stewardship program for safely disposing of unused medications.

- Hosting household hazardous waste events in Burns and Sandy that served a collective 380 households. Nearly 100,000 pounds of waste were safely disposed of at these events, protecting both human and environmental health.

- Helping to advance lower carbon concrete manufacturing and consumption through partnerships with concrete producers and public procurement offices. These partnerships were supported by the development and availability of environmental product declarations, which are labels that disclose a selection of environmental impacts from making products.

- Accounting for Oregon's waste flows and recovery rate (the portion of discards recycled or otherwise recovered) through the Material Recovery Survey. In 2018, people in Oregon generated 5.65 million tons of waste and recovered 40.8 percent of the waste generated.

These accomplishments took place while DEQ also swiftly adapted to changes due to the COVID-19 pandemic and responded to the largest Oregon wildfire event in recent memory. DEQ continues to work closely with counties, other state agencies and federal agencies to assist homeowners and businesses impacted by the September 2020 wildfires.

1. Purpose and legal context

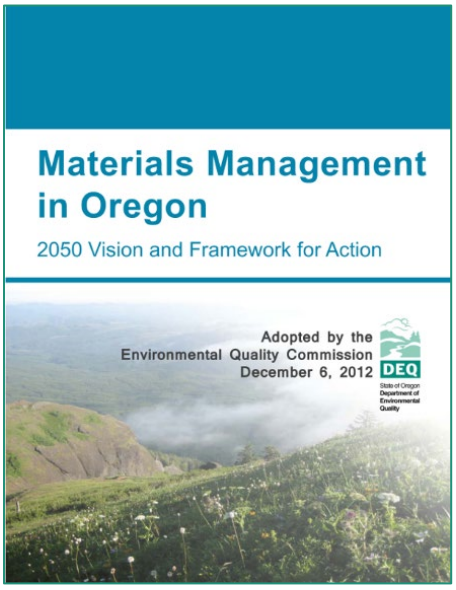
This report informs the Oregon Legislature about the work of the Materials Management Program of the Oregon Department of Environmental Quality, with a focus on work in 2019 and 2020.

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.

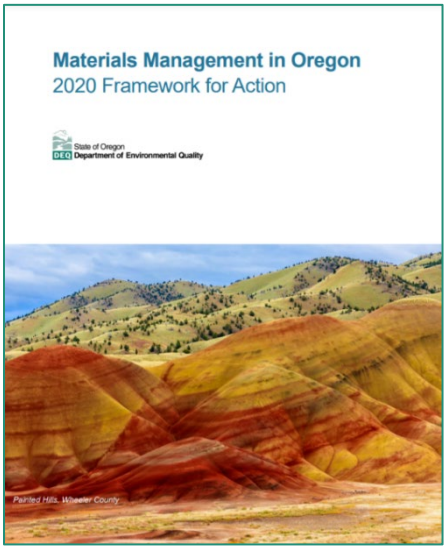
2. Introduction: Our Vision and Framework for Action

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 Oregon's 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 of.[1]

The *2050 Vision* describes an Oregon where producers make products sustainably; 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 2020, the Materials Management program updated the original Framework for Action. The *2020 Framework for Action* elaborates on core values and priorities, including emerging work. Like the original Framework, the 2020 update:

- Serves as a flexible platform to guide progress toward the *2050 Vision*
- Identifies Materials Management's primary priority areas
- Articulates core values and guiding principles
- Provides a framework for how to apply the sustainable materials management approach

The *2050 Vision* remains unchanged and will continue to be DEQ's guiding compass and embody the program's overarching objectives.

[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.

2.1 Core values

When DEQ updated the *2020 Framework for Action*, the program added a new set of "core values" to guide activities to achieve the *2050 Vision*. Since the *2050 Vision* was first adopted in 2012, DEQ has learned a great deal about the connections between DEQ's work and the social, behavioral, economic and myriad other factors that influence consumption patterns and use of materials. Traditional environmental work has sometimes forgotten the "people" part of the equation and, in turn, ignored our humanness, community connections and values. The core values clarify and strengthen that interdependence between people, planet and the economy. The work is not just about materials, but about people and all living things that use and consume those materials, and that are impacted by their use.

DEQ will use the core values to guide decisions and efforts to achieve the *2050 Vision*. The core values will also serve as a foundation on which to build and strengthen partnerships. These values will guide development of strategic plans, as well as project plans for current work and will serve as the foundation for how DEQ will address emerging issues in the future. DEQ began using the core values in the latter part of 2020.

The Materials Management core values complement and build on DEQ's agency-wide values, just as the *2050 Vision* complements DEQ's mission.

Materials Management Core Values:

- **Healthy environment for all.**
  Everyone has a right to live in a healthy environment free of toxics and other environmental threats – now and in the future. We work to protect ecosystems and ensure access to ecosystem services, including clean air, water and land, for all living things.

- **Dignity for all human beings.**
  Everyone is worthy of dignity and respect. A healthy environment is important for preserving human dignity and wellbeing.

- **Social equity is an environmental issue.**
  Improving outcomes for historically marginalized communities is an environmental imperative. When the environmental benefits and burdens of materials are more equitably distributed, only then can every material choice be a sustainable one.

- **Collaboration makes us stronger.**
  We benefit from the experience, knowledge and perspective of others. It is essential for us to cooperatively engage and share power with community members and partners across disciplines.

- **Research and measurement are valuable tools.**
  We use scientific and meaningful measurement to understand where our opportunities are, to guide policy and program decisions, and to be accountable for our decision-making.

- **We can move beyond business as usual.**
  We need significant change in order to produce and use materials responsibly and that

means challenging the status quo. It is important that we continuously pursue better outcomes for our economy, environment and other systems.

- **We must be adaptable to succeed in the face of change.**
  The path to realizing the 2050 Vision will contain unforeseen challenges, roadblocks and new opportunities. In order to achieve our goals, we must be prepared to adjust and adapt our approach to the unexpected.
- **The needs of all communities inform our work.**
  We respect the diversity of perspectives across Oregon. We strive to understand the variety of lived experiences and make our work relevant to each community across the state.

2.2. Foundational report

In 2019, Materials Management wrote *A review of Materials Sustainability Frameworks - An Oregon perspective*, which reviewed five different materials management frameworks. The frameworks are Pollution Prevention, Zero Waste, Circular Economy, Sustainable Materials Management and Lean Thinking. The paper considers prevailing approaches under these frameworks to understand how overlaps in response may create redundant or competitive efforts, thus spreading thin the outcomes for sustainability. The paper also identifies gaps in material sustainability efforts across all the frameworks to highlight failure points, and suggests opportunities for cooperation by leveraging the strengths and resources of each framework to improve sustainable materials management. This paper recommends cooperation and collaboration between the five frameworks to maximize sustainable development. The research paper is available on DEQ's website at https://www.oregon.gov/deq/FilterDocs/mm-matsust.pdf. The content has been disseminated through newsletters, online, and through presentations at academic and professional events.

3. Program priorities

Using the core tenets of sustainable materials management and applying lifecycle thinking, the Materials Management Program has identified a number of priorities critical to achieving the *2050 Vision*. These priorities include a focus on materials that have significant environmental and health impacts (e.g., air pollutants, toxics and major contributors to greenhouse gas emissions); engagement with existing and new partners and stakeholders; and areas that are critical to achieving the *2050 Vision*.

These priorities are divided into four categories: lifecycle programs, community involvement, measurement, and solid waste and recovery.

3.1 Lifecycle programs

3.1.1 Preventing the wasting of food

Growing, eating and disposing of uneaten food contributes to significant environmental impacts. 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*[2] 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. Food production has significant greenhouse gas impacts. The EPA's Waste Reduction Model estimates that potential greenhouse gas savings associated with preventing the wasting of one ton of food are approximately 6-7 times larger than the savings associated with recycling that food through composting or anaerobic digestion.

Priority food projects

In 2019, DEQ continued to carry out projects described in the *Strategic Plan for Preventing the Wasting of Food*.[3] DEQ completed work on this five-part study on wasted food generation in Oregon, publishing the final summary report in April 2019.[4] The study results will inform strategies for future outreach and business partnerships, and establish a benchmark against which future progress will be evaluated. One important finding from the research was that 70 percent of food wasted in Oregon households is food that could have been eaten (i.e., not inedible parts like bones, peels and shells) and is, therefore, waste that could be prevented. This research effort was recognized as a Notable Document by the National Conference of State Legislatures.

DEQ continued a partnership with the Oregon Restaurant and Lodging Association (ORLA) by sponsoring workshops in 2019 for commercial food service businesses in Bend, Eugene and Medford. These workshops helped businesses develop roadmaps for reducing food waste. DEQ is also conducting a study to identify effective messaging to reduce consumer food waste. Research was completed in 2020 and will be used to develop a statewide campaign to promote prevention, help DEQ identify and disseminate best practices for preventing the wasting of food, and provide a basis for more effective policies and programs to address residential food waste generation.

DEQ continues to play a lead role in convening a regional coalition of interested states and cities to advance food waste reduction 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. DEQ and other PCC partners have recruited several major food retailers to join in voluntary effort to reduce food waste by 50 percent reduction goal by 2030 and collaborate on identifying effective, industry-wide actions to reduce wasted food.

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

[3] 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.

[4] Oregon Department of Environmental Quality, "Oregon Wasted Food Study," April 2019, https://www.oregon.gov/deq/mm/food/pages/wasted-food-study.aspx

In 2019, DEQ also completed an ISO-compliant Life Cycle Assessment of nine of the most common food rescue methods in Oregon to better understand the relative value and environmental impacts and trade-offs of diverting food from various sources (e.g., farms, groceries, restaurants) directly to food banks and other organizations that serve food insecure populations.[5] Key findings from that work included learning that the amount of rescued food that is wasted, both at the food rescue organization and by the recipient, is an important driver of overall lifecycle impacts. Mode and distance of transport matter significantly in the level of environmental impacts, with collection and transport of rescued food in passenger vehicles resulting in the highest impacts.

Governor's Executive Order

In March 2020, the Governor formally directed DEQ, through Executive Order (EO) 20-04, to take actions needed to reduce food waste by 50 percent by 2030. DEQ drafted a high-level plan that includes maximizing reductions through continued emphasis on prevention as a first strategy and recognizes that food system partnerships with agriculture, food distributors and retailers and others will be required to achieve the Governor's goal. The plan also recognizes the need to increase reuse and recovery to achieve the EO goal.

COVID-19 pivot

Lucy and Fidela prepping food at Tortilleria y Tienda de Leon, one of many businesses highlighted in DEQ's campaign to support businesses and residents during COVID-19.

In response to the COVID-19 pandemic, DEQ could no longer continue face-to-face outreach to commercial food service. Instead, DEQ focused on completing research and planning the residential food waste prevention campaign. DEQ developed the COVID-based campaign, "Getting Our Food to Go the Distance during COVID-19."[6] The campaign focused on common food waste prevention actions that Oregon residents could take to make shopping trips easier and ensure that they get full value from their food purchases by not wasting food. The campaign also recognized the efforts and risks being taken by Oregon residents across the state to keep getting food to Oregon tables during the pandemic.

[5] Oregon Department of Environmental Quality, "Life Cycle Assessment of Edible Food Rescue," October 2019, https://www.oregon.gov/deq/mm/food/Pages/Food-Rescue.aspx

[6] Oregon Department of Environmental Quality, "Getting Our Food to Go the Distance During COVID-19," https://www.oregon.gov/deq/mm/food/Pages/food-covid19.aspx

Food supply chain disruptions associated with COVID significantly contributed to wasted food in Oregon. DEQ partnered with the Oregon Food Bank to ensure that excess food on farms and at food processors could be collected for distribution to people experiencing food insecurity. Through a $140,000 grant, DEQ funded transportation and repacking costs to allow for the rescue of 2 million pounds of fresh produce from growers and processors in Oregon, Washington and California. This food rescue represented the equivalent of 1.7 million meals for food insecure Oregon residents.

3.1.2 Built environment

The built environment is a complex system of buildings, infrastructure, utilities, and public and private spaces made up of a huge number of materials. We interact with it every day, and it has a significant impact on our environment, health and well-being. The built environment has also been shaped by inequitable systems and policies – such as redlining, disinvestment, and displacement – that disproportionately distribute benefits and burdens. Therefore, some people and communities experience greater impacts to their environment, health, and well-being, especially communities of color, low-income and rural communities.

The construction material sector accounts for eight percent of Oregon's 2016 consumption-based greenhouse gas inventory. The use of energy in buildings accounts for an additional 22 percent of the state's emissions – making the built environment responsible for approximately 30 percent of Oregon's 2016 consumption based greenhouse gas emissions. Based on data from the United Nations[7] and U.S. Energy Information Administration[8], a study by Architecture 2030 indicates that 49 percent of total carbon emissions from new construction by 2050 will be attributed to the embodied carbon of building materials. Between 2020 and 2030, this proportion rises to 74 percent.[9] In order to reach Oregon's greenhouse gas reduction goals, DEQ will need to prioritize reduction in embodied carbon of materials in the built environment.

Concrete and EPDs

In 2020, DEQ completed its voluntary incentive program in partnership with the Oregon Concrete and Aggregate Producers' Association. The program, which lasted for three years, was successful in getting voluntary disclosure of the environmental impacts of concrete mixes through 3rd party verified labels called environmental product declarations (EPDs). These labels help concrete producers identify the environmental impacts in the production process and allow consumers to choose lower impact concrete mixes. The program provided technical and financial support to over 20 individual concrete plants around the state, which helped produce over a thousand concrete EPD labels.

Private and public building projects are using these EPD labels to purchase lower impact concrete mixes. EPD labels help build knowledge and accountability among material producers by increasing transparency in the market. In some cases, it even builds competition for lower impact products. With transparent EPD impacts available, the community is able to develop more focused policies targeting carbon reduction, as outlined below in the City of Portland's Low

[7] UN Environment, "Global Status Report," 2017, https://www.worldgbc.org/sites/default/files/UNEP%20188_GABC_en%20%28web%29.pdf.

[8] U.S. Energy Information Administration, "International Energy Outlook," Sept 2017, https://www.eia.gov/outlooks/ieo/pdf/0484(2017).pdf.

[9] https://architecture2030.org/new-buildings-embodied/[10] https://www.portland.gov/omf/brfs/procurement/sustainable-procurement-program/sp-initiatives#toc-low-carbon-concrete-initiative

Carbon Concrete Initiative.

City of Portland Low Carbon Concrete Initiative[10]

DEQ's Materials Management program is playing a central role in helping the City of Portland develop and implement a low carbon concrete initiative. This initiative leverages DEQ's existing work with concrete companies, which includes both technical and financial support.

One component of this initiative is testing low carbon concrete mixes in pilot projects. In early 2020, the City's Sustainable Procurement Program brought together the Portland Bureau of Transportation, the City's Materials Testing Lab, two minority-owned and/or small-business-certified sidewalk contractors, two concrete producers (Knife River and CalPortland), and DEQ to test low-carbon concrete mixes on sidewalk ramps. The goal was to understand how the mixes perform, both for technical requirements and ease of use. Overall, the low-carbon mixes met the City's concrete performance specifications, were well received by the concrete finishers, were cost-neutral or less expensive, and performed well in the post-project visual inspections – all while reducing the carbon footprint of an average sidewalk ramp by 23- 34 percent.

City of Portland's first round of low-carbon concrete pilot projects, featuring sidewalk ramps supported by DEQ.

These pilot tests will inform the next phase of the initiative, establishing maximum global warming potential thresholds for concrete used on City construction projects. DEQ is playing a central role in data collection and analysis to develop initial recommendations for GWP thresholds for different concrete strength classes.

Deconstruction vs. Demolition Report[11]

At the request of City of Portland, DEQ completed an evaluation of the carbon and energy impacts from deconstructed homes in the City of Portland. This study analyzed the first 36 homes through the City's required deconstruction program and compared the impacts of

[10] https://www.portland.gov/omf/brfs/procurement/sustainable-procurement-program/sp-initiatives#toc-low-carbon-concrete-initiative

[11] Oregon Department of Environmental Quality, "Deconstruction vs. Demolition: An evaluation of carbon and energy impacts from deconstructed homes in the City of Portland," March 2019, https://www.oregon.gov/deq/FilterDocs/DeconstructionReport.pdf.

deconstruction against the alternative scenario of mechanically demolishing the homes. This report, *Deconstruction vs. Demolition: An evaluation of carbon and energy impacts from deconstructed homes in the City of Portland*, was published and delivered to the City of Portland Bureau of Planning and Sustainability in March 2019. DEQ or others may use this information to help inform policy developments in other locations.

A selection of study results indicate:

- The sample of 36 homes had an average age of 112 years and average size of 1,177 square feet.
- The average deconstruction of a single-family home in Portland, Oregon, yielded 39,362 pounds of material (excluding foundation), of which 10,587 pounds (27 percent) was salvaged. The vast majority of salvaged material by weight was softwood lumber, in the form of framing lumber, structural beams, and sheathing (shiplap on walls and plank subfloor). This material made up over 85 percent of the total weight of salvaged materials.
- The average deconstructed home showed a carbon benefit of 13.8 MTCO2e while demolition showed a carbon benefit of 6.2 MTCO2e. Deconstruction yields a net carbon benefit of approximately 7.6 metric tons of CO2eq per house compared to demolition. The carbon benefits are mainly attributed to the avoided production of new materials and the continued sequestration of biogenic carbon in the wood.

Consulting on state buildings

Executive Order 17-20 was introduced to accelerate efficiency in Oregon's built environment to reduce greenhouse gas emissions and address climate change. The vast majority of the order focused on increasing the operational efficiency of new and existing buildings, but also calls for state agencies to play a leadership role in converting state owned structures to carbon-neutral operations. This directive instructs the Department of Administrative Services and the Oregon Department of Energy to partner with DEQ to develop strategies to lower the embodied carbon of building materials in new construction of state buildings.

DEQ is actively working with multiple agencies and design teams to carry out this directive. DEQ completed a life cycle assessment for the new Department of Treasury building that showed that concrete comprised over 50 percent of the initial material emission impacts of the project. This impact could be reduced by the procurement of lower carbon concrete mixes. DEQ has also analyzed a tenant improvement (remodel) project for the Department of Human Services and is working with DHS to identify low carbon flooring options for the frequent remodels that DHS funds. Finally, DEQ is working with DAS to preserve existing building materials and accomplish necessary upgrades on a recently purchased building that will be used to house state laboratories and offices. This project provides an opportunity to analyze carbon emissions avoided through whole building reuse.

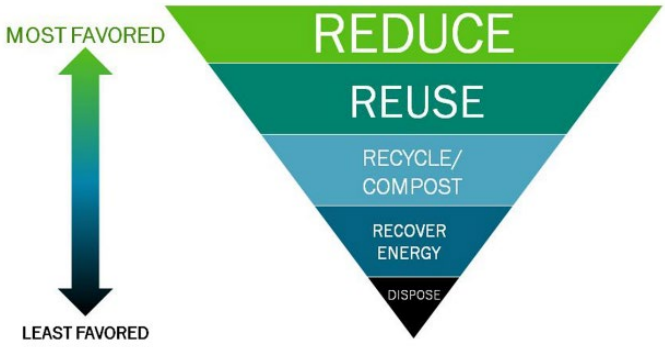
3.1.3 Sustainable procurement

DEQ is 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. In 2019-2020, DEQ continued its work with the Department of Administrative Services to develop their sustainable procurement program via research, technical assistance and strategizing program development. Related to this effort was the collaboration with DAS and ODOE to develop sustainable procurement guidance for purchasing efficient building equipment to fulfill a

requirement of EO 17-20, as well as making priority recommendations for DAS to implement procurement requirements of EO 20-04. DEQ is collaborating with DAS on developing statewide price agreements, with a focus on including robust product and service sustainability criteria. DEQ has collaborated with the Center for Environmental Health (Oakland, CA) and the state of Washington for implementing protocols at Oregon Corrections Enterprises for purchasing products with lower levels of toxic chemicals used in their furniture manufacturing processes. At the national level, DEQ has been part of national stakeholder groups in developing sustainable procurement guidelines for food service ware and climate-friendly refrigerants/energy-efficient equipment.

3.1.4 Reuse, repair and product lifespan extension

In 2019-20, 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.



Oregon's solid waste hierarchy

These projects were pursued under a *Strategic Plan for Reuse, Repair, and Extending the Lifespan of Products in Oregon*, published in 2016.[12] "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.[13] 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.

[12] 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.

[13] 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.

To counter the decades-long decline in reuse and repair, Materials Management is helping to support the growth of the reuse and repair industry through grants to small businesses and non-profit organizations. In 2020, Materials Management relaunched a “micro-grant” program to address 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. Based on the success of a similar grant offering piloted in 2017, Materials Management provided $125,000 in micro-grants of up to $10,000 each to cover the costs of training and capital equipment that could result in increased long-term capacity, new jobs and a better customer experience. In response to the economic disruptions of the COVID-19 pandemic, the 2020 program extended the scope of eligible projects to include those aimed at retaining current repair staff. The grants were awarded to:

Julie Derrick, owner of JD's Shoe Repair in Portland, received funding to hire and train staff.

- Cracked Pots Inc. in Portland, to purchase new tools and provide training for staff;
- iExperts Mobile Repair in Medford, to support mobile repair services for cell phones and tablets;
- Habitat for Humanity in Forest Grove, to fill staffing shortages needed to reopen the ReStore;
- Rugged Thread in Bend, to develop training for sewists /repair apprenticeships in the Outdoor Industry;
- JD's Shoe Repair in Portland, to hire new part-time employee and provide training to enhance the skills of cobbler staff;
- Drexel H. Foundation in Vale, to expand staff hours and provide training for a new part-time employee;
- Viking Sewing Vacuum Spa in Eugene, to fund gig sewists, classroom space and a textile makerspace;
- Green Lents in Portland, to hire a new coordinator for the Community Tool Library;
- Klamath Works in Klamath Falls, to hire a bicycle repair technician;
- Friends of Chehalem House in Newberg, to hire a new half-time manager and support entry-level internships;
- Indigo Proof Denim Repair in Portland, to hire and train a new employee to tailor denim clothing;
- Corvallis Bicycle Collective, to retain existing staff and expand online sales; and
- St. Vincent de Paul Society of Lane County, to support a new position in their appliance repair department.

Materials Management also awarded over $111,000 in 2019 and over $303,000 in 2020 to repair and reuse related projects through its general grants program – roughly a sixth of the total amount of Materials Management grants awarded in 2019 and over half of the amount of grants awarded in 2020.

3.2. Community Involvement

3.2.1 Grants to small businesses, nonprofits, local governments and schools

Through the annual Materials Management grants program, DEQ provides funds to recipients to reduce waste, build capacity for reuse and repair, support responsible recycling in rural communities, or otherwise advance the *2050 Vision*. Past recipients include small businesses, local governments, schools and nonprofits from across the state. In 2019, Materials Management awarded 17 grants totaling over $594,209. Grants supported projects related to food rescue and redistribution; reuse and repair projects; and community recycling and composting projects. Some examples include:

The High Desert Museum in Bend, Oregon, was one of many grant recipients in 2019.

- Marion Polk Food Share worked on preventing wasted food by purchasing freezers and other equipment.
- Rogue Valley Farm to School Project invested in a farm-to-school program in Jackson County and developed a food waste curriculum for Portland Public Schools.
- Bend's High Desert Museum reduced throwaway plastic utensils by purchasing reusable dishware and supporting recycling initiative.
- Source One Serenity Project in Douglas County started a composting project.

In 2020, Materials Management invested $595,167 across 17 projects. During this year, in light of the massive disruptions caused by COVID-19 and our acknowledgment of the critical need to support historically marginalized communities, DEQ prioritized projects that address either of these subjects. Among the recipients:

- Salem Public Library will create a new library collection of nontraditional items – a Library of Things that library patrons will be able to borrow. The project will support the purchase and loan of a variety of consumer goods such as cooking pans and appliances, yard and garden tools, electronic devices, games and toys and sewing equipment.
- Loopt Foundation will introduce students, with a focus on those from historically marginalized communities, to sustainability concepts through a dynamic program using apparel as a vehicle. They will learn how clothes are made, meet the people who make them, complete a life cycle analysis of Portland Trail Blazer star CJ McCollum's game jersey, and pitch their own sustainable business that specifically reduces the environmental and human health impacts of apparel.
- Wallowa County will use the funds to launch a new Mobile Recycling Program. The

project will support a new part-time position, and the purchase of a new trailer and bins to collect sorted recyclable material from local schools, community events and businesses for delivery to the county recycling center.

A full list of 2019 grantee recipients and projects are available at https://www.oregon.gov/deq/mm/Documents/2019AwardedGrants.pdf

A full list of 2020 grantee recipients and projects are available at https://www.oregon.gov/deq/mm/Documents/2020Grantees.pdf

3.2.2 Stakeholder Engagement Efforts in the Northwest Region

In an effort to support Tillamook County with updating their Solid Waste and Materials Management Plan, DEQ utilized a new engagement approach, which sought to systematically explore the interests and perspectives of stakeholders involved with the county's planning efforts. In addition to the Solid Waste Advisory Council, the engagement process included members of the county's Board of Commissioners, Tourism and Visitors Association, Master Recycler Program, as well as the City of Tillamook's Chamber of Commerce. The process helped bring these stakeholders to the table during the early stages of the planning update process so the county could discuss the management of materials and solid waste with stakeholders in a holistic and inclusive fashion.

The specific approach used during the collaborative planning process is known as Q-Methodology, or Q-Sort. Q-Sort is a social science technique that employs both qualitative and quantitative approaches to better understand human perspectives. The Tillamook County Q-Sort data delivered an outcome that allowed the Solid Waste Advisory Council to outline specific planning considerations to be addressed in the immediate, medium-term, and long-term timeframe; and also addressed the necessary action items to be included within the updated plan. Not only did this approach help broaden and inform the planning and decision-making process for Tillamook County, but it also helped DEQ understand the priorities of Tillamook County stakeholders. This information will help DEQ and Tillamook County tailor planning efforts and activities to the needs and interests of Tillamook County's stakeholders.

3.3 Measurement

The Materials Management Program uses research data and analytical models to evaluate and prioritize work, and to predict the consequences of policy options.

Besides fundamental research into key topics like food waste and the built environment (described elsewhere in this report), Materials Management created several innovative models that summarize environmental impacts – for example greenhouse gas emissions, other pollutants, and water use – on a statewide basis.

The *2050 Vision* directs DEQ's Materials Management Program to work to minimize the environmental impacts linked to Oregon's use of materials. This is a change from the conventional way of evaluating the environmental consequences of materials use. Most state and local governments quantify environmental impacts of materials use by measuring total waste generation (in tons), or recovery rates of materials that would otherwise be discarded (the percentage of the total waste that is recycled or composted). State law requires that DEQ also use these measurements, which DEQ publishes annually.

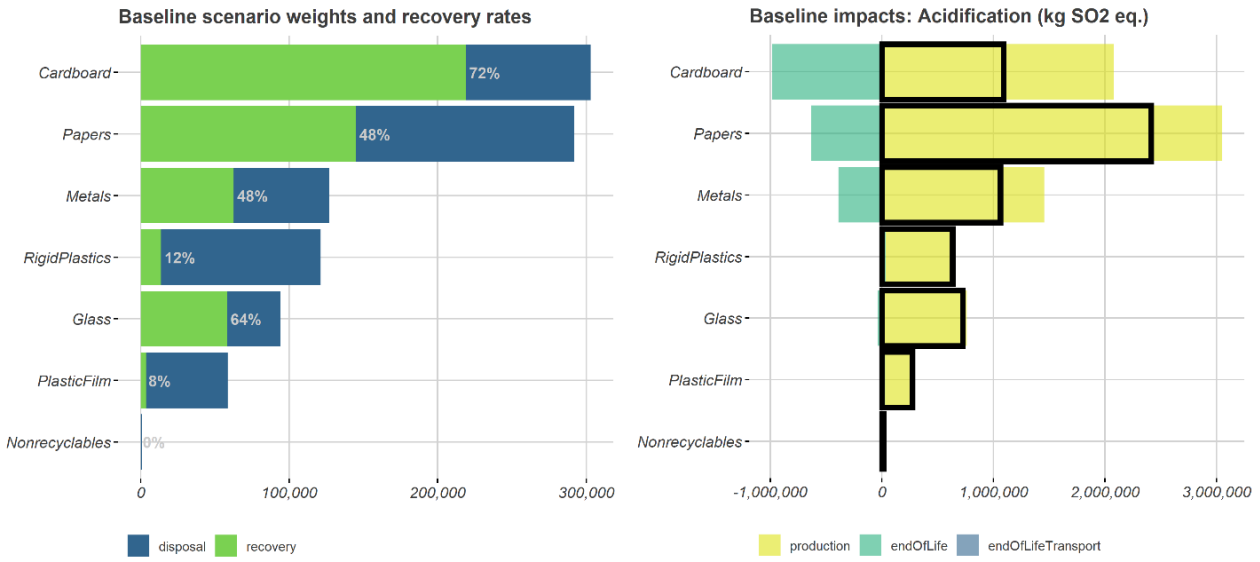
Because the weight of solid waste is a poor indicator of life cycle environmental impacts, DEQ developed the Consumption-Based Emissions Inventory (CBEI), a comprehensive model of the life cycle impacts of Oregon's economy to improve DEQ's ability to better evaluate which actions will really reduce environmental impacts from production, consumption, recovery and disposal of materials. The CBEI has been instrumental in identifying strategic areas for action, such as food waste. The model was described in Materials Management's 2017-18 legislative Report.

Oregon's lawmakers have recognized the need to shift gradually away from a weight-based approach to the life cycle impacts of waste and materials. A recently added statute, ORS 459A.012, allows Oregon "wastesheds" (usually counties) to report their local recovery rates based on an impact-based calculation, the "Alternative Recovery Rate," rather than sheer weight.

In 2019-20, Materials Management created the Waste Impact Calculator, a model that bridges the gap between the weight-based and impact perspectives. The model allows DEQ to input standard weight-based solid waste data, and output estimated life cycle impacts for those same materials. DEQ can use the model to evaluate policy options, such as "increasing composting" or "preventing food waste."

The waste impact calculator model calculates the Alternative Recovery Rate as the law requires, but has many more applications. Results from the model were an instrumental part of the socio-economic projections created by DEQ for the statewide Recycling Steering Committee.

In 2021-22, Materials Management will publish the model online for use by stakeholders, other interested people in Oregon, and peers around the nation. In addition, DEQ will initiate a major revision of CBEI, to broaden that model's focus beyond greenhouse gasses. Looking forward, the measurement work of Materials Management will increasingly focus on evaluating progress toward the state described in the *2050 Vision*.



This graphic generated by the Waste Impact Calculator shows the relationship of solid waste materials to lifecycle impacts.

3.4 Waste recovery and disposal

3.4.1 Product stewardship

Oregon law has special requirements for three materials common in the waste stream: architectural paint, electronics waste and unused or expired medicines. 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 proper waste management of 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.

3.4.1.1. Architectural paint stewardship

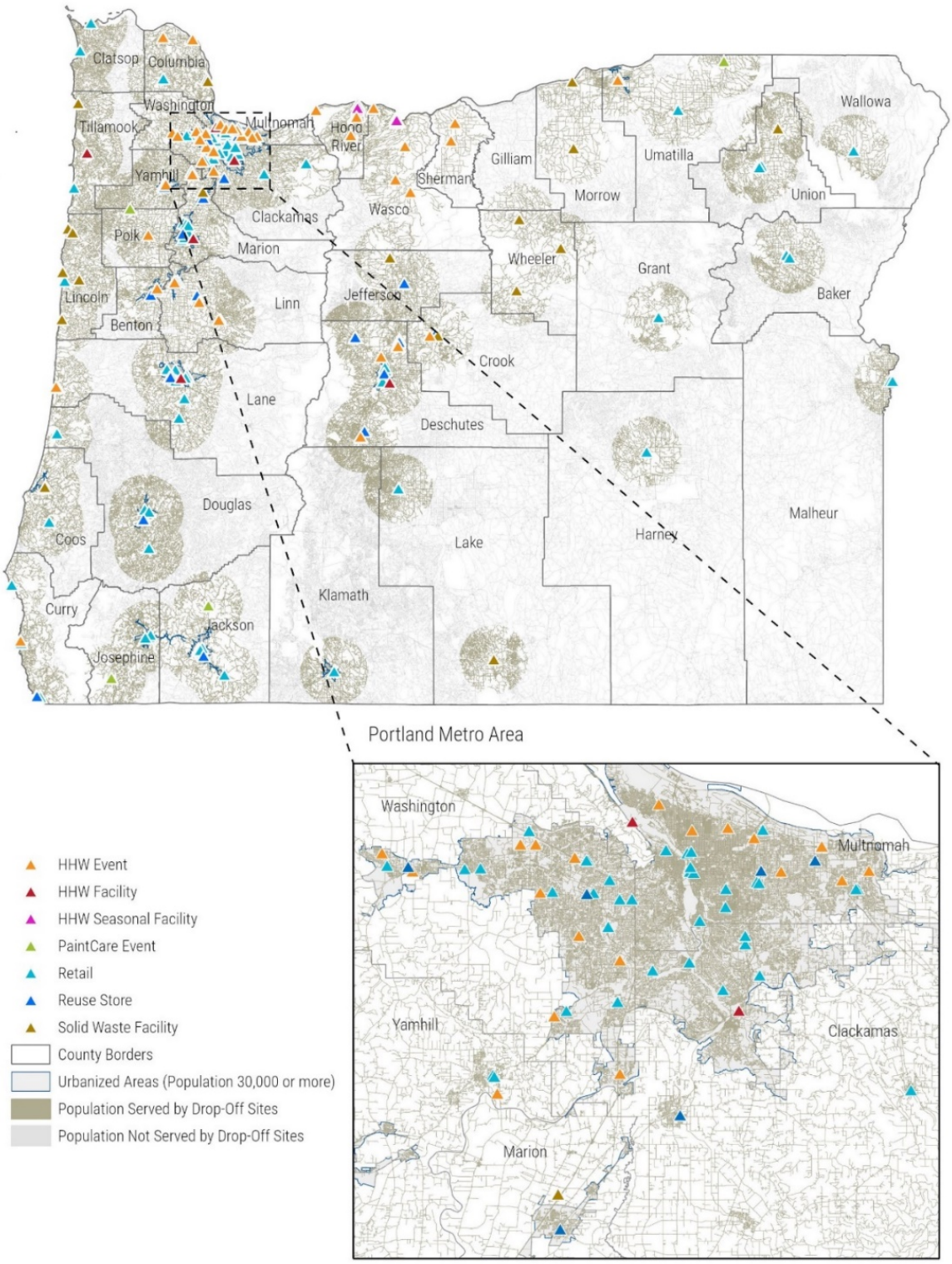
Architectural finishes such as paints, varnishes and stains are the focus of ORS 459A.820-855, which require manufacturers of latex and oil-based architectural paints, stains and coatings to undertake responsibility for reducing the generation of these materials, promote reuse of these materials and provide complete end-of-life management for them, including recycling, energy recovery and disposal. Without an architectural paint stewardship program, these substances would 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. This law has helped to shift much of the cost of paint recycling from local governments to paint purchasers. Metro previously 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 also reported cost savings on paint disposal because quantities of paint disposed have decreased.

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, varnishes and stains purchased in Oregon. From 2010 to December 2019, it is estimated that the Oregon Paint Product Stewardship Program collected over 6.1 million gallons of leftover paint.

In 2019, PaintCare maintained 175 permanent collection sites, mostly at retail locations, but also at many local government and solid waste facilities; collected over 767,000 gallons of paint, varnishes and stains; recycled 64 percent of latex paint; and processed another 6 percent of latex paint for reuse. More details about PaintCare's 2019 operations can be found at https://www.oregon.gov/deq/mm/Pages/Paint.aspx.

PaintCare and DEQ are working on an updated program plan for 2021-2024, which is required by law, and was due by PaintCare on January 1, 2018. PaintCare continues to operate under the existing plan until the updated plan is approved by DEQ.



Map shows permanent PaintCare drop-off sites and events in Oregon

3.4.1.2. Oregon E-Cycles

Oregon E-Cycles is a statewide program, financed by manufacturers, that provides responsible recycling for televisions, computers, monitors, printers, keyboards and mice. Anyone bringing seven or fewer items at a time may recycle their electronics at no charge at participating collection sites. Households, small businesses and small nonprofits may recycle more than seven items at a time.

Electronics recycling is important because electronics contain hazardous substances such as lead, cadmium and mercury that can harm our health and environment. Electronics also contain valuable materials such as copper, gold and aluminum that can be recycled and used in new products. Recycling keeps toxics out of our landfills and incinerators and conserves natural resources.

The Oregon E-Cycles program was created in 2007 by Oregon's Electronics Recycling Law. In its current form, 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 2020, there were 225 collection sites, including public and private transfer stations, landfills, recycling and refurbishment centers, thrift stores and retail locations. DEQ's Oregon E-Cycles webpage provides a search page and a hotline number for locating collection sites and services at https://www.oregon.gov/DEQ/ecycles/Pages/Consumers.aspx.

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 participating manufacturers.[14] 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 collected over 268 million pounds of electronic devices resulting in significant environmental benefits, from preventing toxins from entering Oregon's landfills, to recovering precious and rare earth metals for new electronics that can reduce the need for mining more resources from the earth. In 2019, more than 46,000 electronic devices were collected for reuse and over 18 million pounds of electronic devices were collected for recycling.

Since the program's inception, Oregon E-Cycles has significantly expanded opportunities for Oregon residents to recycle electronic wastes and has shifted responsibility and costs for managing this waste from ratepayers and local governments to product manufacturers.

3.4.1.3 Oregon Drug Take-Back Program

With passage of House Bill 3273 (2019), Oregon became one of a few states to require drug manufacturers to fund and develop a statewide drug take-back program providing safe,

[14] 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.

convenient and secure disposal of drugs for Oregon residents and other covered entities. (Pharmaceutical waste from businesses are excluded.)

Leftover or expired drugs can pose serious environmental and health risks. Drugs left in a household can lead to accidental poisonings, addiction or abuse. Drugs thrown in the garbage or down the drain can release chemical compounds that end up in rivers or groundwater.

Under the new law, manufacturer-funded programs must offer drop-off sites, such as at pharmacies and law enforcement agencies, where drugs can be disposed of in-person. Programs must also offer prepaid, pre-addressed envelopes for unwanted drugs to be returned by mail. They may also hold collection events. Collected drugs will be destroyed at a hazardous waste disposal facility or a municipal solid waste incinerator permitted to accept pharmaceutical waste.

DEQ will work in partnership with the Oregon Board of Pharmacy to ensure compliance. DEQ completed rulemaking in September 2020 to facilitate implementation. In late 2020, DEQ received plans from two potential program operators to operate statewide drug take-back programs on behalf of participating drug manufacturers. DEQ is reviewing these plans to ensure proposed programs will comply with applicable state and federal laws. Approved programs must be operational by July 1, 2021.

3.4.2 Household hazardous waste collection

Household hazardous waste programs are designed to safely manage cleaners, solvents, pesticides, pool chemicals, and a myriad of other products used in households and small businesses that contain toxic or hazardous substances. If improperly stored or disposed of, these products can pollute waterways, poison humans or wildlife, or cause fires.[15]

Oregon law calls for a household hazardous waste program under ORS 459.411-418. While only Metro is required to set up permanent "depots" to serve residences and small enterprises, DEQ has encouraged many other wastesheds to voluntarily build such facilities, often incentivized with DEQ matching grants and design consulting. Clatsop County received partial funding from DEQ to construct a new household hazardous waste facility that opened in 2020. Now residents in 19 Oregon counties have access to permanent facilities for HHW disposal that offer multiple collection opportunities per year. Another seven counties have set a schedule of periodic collection events.

For 21 cities in eight rural counties (as well as rural areas of other counties) with no other collection options, DEQ hires a contractor to provide collection events on a rotating basis, averaging one event every five years in each of 21 select cities across the state.

[15] See Oregon Department of Environmental Quality, "What Is Household Hazardous Waste?," May 2012, https://www.oregon.gov/deq/FilterDocs/WhatisHHW.pdf; and Consumer Product Information Database, managed by DeLima Associates for product manufacturers, accessed December 23, 2020, whatsinproducts.com.

Since 2009, DEQ has served over 450 schools statewide by having a contractor safely remove laboratory wastes from several schools. This work has been on hold since 2019, as DEQ's long-time cleanout and teacher training contractor retired and DEQ is assessing its role in school chemical management.

In 2020, DEQ hosted an event with Clackamas County and the City of Sandy that exceeded expected turnout, with 303 households participating, and 85,072 pounds of material collected – more than twice the normal per-household average. An event in Burns, conducted in partnership with the City of Burns, City of Hines and Harney County, resulted in 8,927 pounds for recycling or proper disposal from 77 households.

Materials collected at the 2020 collection event in Sandy, Oregon.

3.5 The Recycling Opportunity Act and updating Oregon's recycling system

In 2019-2020, DEQ worked with recycling system partners – including local government, collection companies, recycling processors, and industry nonprofit organizations – to respond to international recycling markets disruptions that affected recycling programs in Oregon and around the globe. In 2017, China and then other countries announced they would begin putting strict requirements on the recyclables that the United States and other countries could export to them. The subsequent disruption in recycling markets, called National Sword, caused many recycling programs in Oregon, and around the country, to drop materials, increase customer rates, or both.

Oregon's policy framework for recycling was created in the 1980s and early 1990s when recycling conditions were much different – there was more newspaper, less plastic, and residents and businesses sorted their recyclables by type before putting them at the curb. National Sword helped shine a light on many issues with Oregon's decades-old recycling system. These include product labels that confuse the public, increased contamination in collected materials, higher costs passed on to ratepayers, and reduced collection service, especially acute for small and rural communities that are located farther away from processing facilities. Additionally, there is little oversight of recycling processing facilities, and sometimes recyclables are exported to end markets where they cause environmental and social impacts for communities who receive unwanted plastic and other trash. These issues led to a loss of public trust in the system, as public agencies could not assure that materials were responsibly recycled.

In response to these market disruptions, DEQ convened a broad stakeholder committee, known as the Recycling Steering Committee (RSC), to consider alternatives and ultimately recommend a path forward to modernize the recycling system. The group was facilitated by Oregon Consensus, a program of Portland State University, and operated according to a consensus model. DEQ participated in the Committee as chair and member. The Committee adopted a charter, which included making recommendations in order to optimize environmental benefits, create a system that is resilient to changes in supply and demand, and be deserving of public trust.

The Committee also set out to consider the needs of different parts of the state, to balance recycling solutions with broader lifecycle considerations, and to find opportunities to better integrate with Oregon's *2050 Vision for Sustainable Materials Management.*

The Committee's deliberations were built on a foundation of extensive information gathering. Teams of professional consultants conducted research on behalf of the RSC, looking at policies and legal frameworks used in other states and nations, identifying policy elements that might work in Oregon and combining them in several unique scenarios that were evaluated against the committee's desired outcomes. The Committee included social equity considerations by considering the distribution of both benefits and burdens in our recycling system. DEQ also undertook extensive engagement with other interested parties through a large public workshop, statewide survey, meetings with more than 50 local governments across the state, and targeted discussions with stakeholders that are underserved by the recycling system, including residents of apartments, people in rural communities, people of color, unhoused people, and front-line workers in the facilities that sort recyclables. In these forums, stakeholders expressed dissatisfaction with how Oregon's system currently relies primarily on ratepayer funding, and expressed support for policy frameworks that would share that responsibility with producers of the materials that are placed in recycling bins.

Finally, DEQ evaluated different infrastructure options for the state, considering different materials, collection modes, and processing systems. DEQ estimated the potential costs for items such as labor, trucks, fuel, and freight, as well as an evaluation of environmental impacts and their associated cost to society. Each of the infrastructure improvements studied, compared to the existing baseline, will cost more money – however, the resulting benefits, in terms of reduced costs of mortality, illness, climate change, and other impacts, justify those investments.

The Recycling Steering Committee met for over two years, and in September 2020 reached consensus on a holistic proposal that addresses these system's challenges and supports modernization of Oregon's recycling programs. The proposal is an innovative, shared responsibility framework that assigns producers of printed paper and packaging new obligations to help modernize the system, and updates the roles of local governments, processing facilities, and DEQ. Using the RSC's proposal, DEQ outlined a draft legislative concept that was introduced in the 2021 Legislative Session as House Bill 2065. The bill is uniquely tailored to:

- Decrease public confusion by preventing producers from using misleading labels on their products sold into Oregon.
- Create a consistent statewide recycling collection list informed by economic, technical and environmental considerations.
- Reduce trash that ends up in the recycling system by implementing tested programs that address contamination.

- Create a more accessible and stable system by requiring producers to share costs with ratepayers for expansion of collection services, upgrades to processing facilities, and improving conditions for workers.
- Ensure that materials are recycled responsibly by requiring processing facilities to meet new standards and requiring producers to work with them to ensure that properly collected materials actually get recycled.
- Increase transparency and accountability by requiring local governments to send materials to certified processing facilities and requiring processors to report where they send those materials.
- Optimize environmental benefits, avoid export of plastic and other pollution to end market communities, and restore public trust through strong oversight and enforcement.

3.6 Changes in recycling programs and waste generation and recovery rates

Recent years have seen big changes in factors that impact the disposal and recovery of materials in Oregon, including:

- Doubling of the Bottle Bill refund value in 2017, and adding juices, teas, sports drinks, and most other non-alcoholic beverages to the Bottle Bill in 2018.
- China's ban on importation of plastics, mixed paper, and many other recyclables in 2018, and similar actions by other countries, disrupting the markets for recyclable materials.
- A steep drop in the price of many recyclable materials following this market disruption, and an increase in the cost of processing commingled recyclable materials to meet the higher quality standards demanded by remaining paper mills and plastic markets globally.
- Dropping of plastic tubs and some other forms of plastic from many recycling collection programs outside of Clatsop and Deschutes Counties and the Portland Metro area.
- Disposal of some collected recyclable materials between late 2017 and early 2019 due to poor recycling markets and lack of processing capacity to sort materials to new higher quality standards.
- Emergence of COVID-19, leading to changes in how and where people use material and generate waste.

3.6.1 Oregon's material recovery and waste generation rates

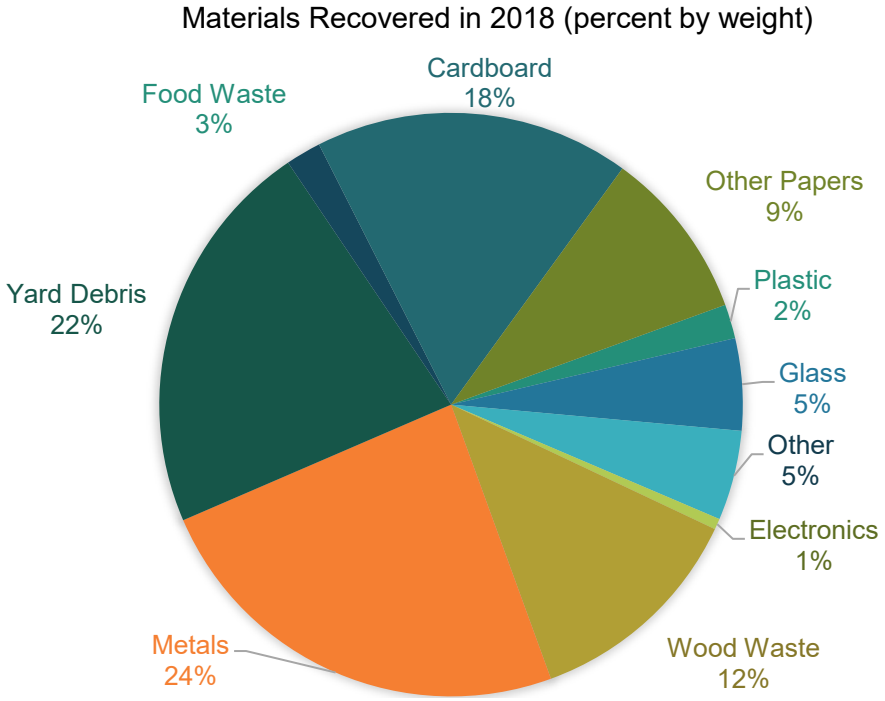
There are two general destinations for materials at the end of their useful lives: disposal and recovery. Disposal is landfilling or incineration. Recovery is recycling, composting, incineration for energy return,[16] or other ways of regaining resources from the material.

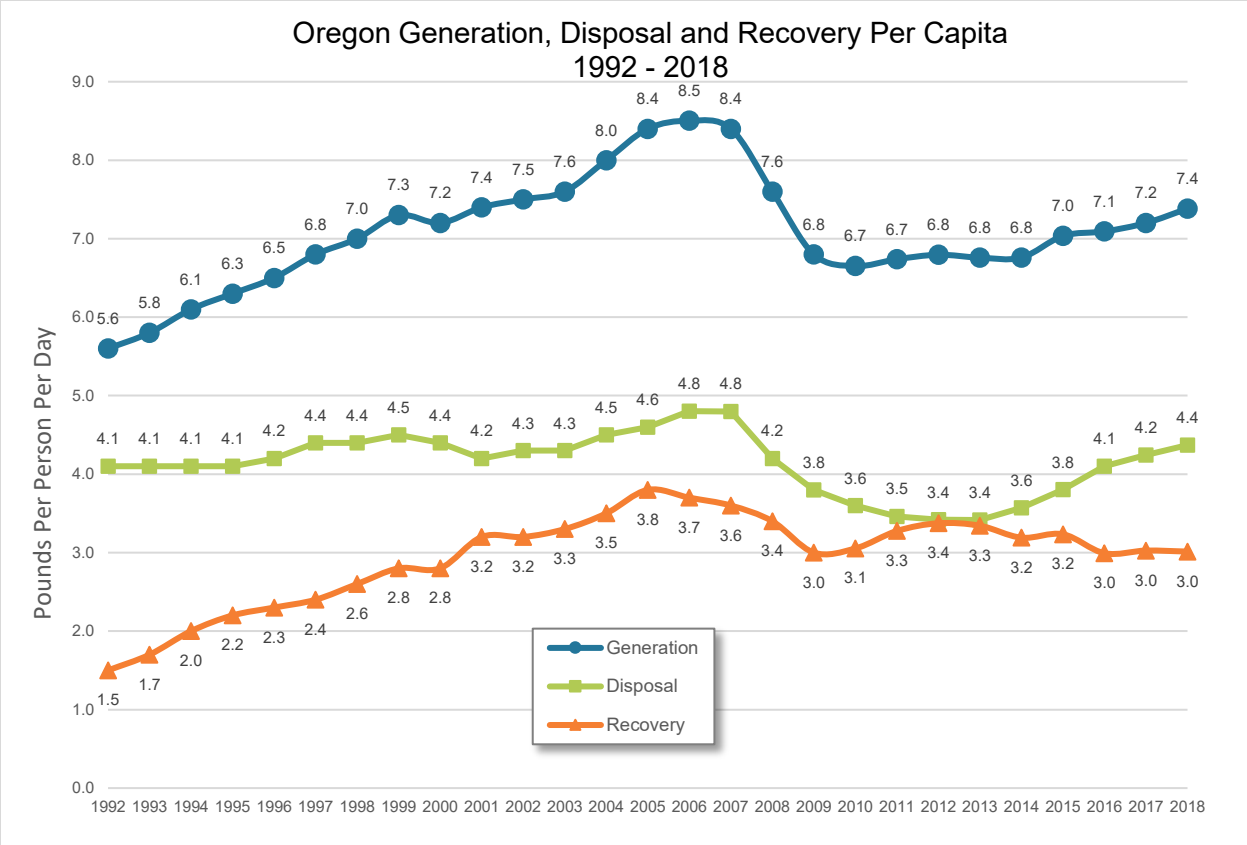
Oregon has long-term goals under ORS 459A.010 to reduce solid waste generation (the sum of disposal and recovery, or total tonnage of the waste stream) and to increase the rate of material

[16] 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 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 that people in Oregon:

- Generated 5,652,826 tons of waste in 2018 compared to 5,494,418 tons in 2017 (a 2.9 percent increase), failing to meet the goal set in ORS 459A.010 of no increase in total generation of waste;
- Disposed of 3,345,053 tons into landfills and incinerators in 2018 compared to 3,207,448 tons in 2017 (a 4.3 percent increase); and
- Recovered 40.8 percent of waste generated in 2018 compared to 42.1 percent of waste generated in 2017. Both numbers are substantially below the 2020 goal of 52 percent recovery of waste generated, set in Oregon Revised Statutes 459A.010.





On a per-capita basis, every Oregon resident generated roughly 7.4 pounds of waste a day in 2018, disposed of 4.4 pounds per person per day, and recovered 3.0 pounds per person per day 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 2018 remained lower than in 2012-2013, due to the continued absence of markets for recovered wood, and the fact that there is significantly less easily recyclable materials such as newspaper and magazines being generated now as compared to a decade ago.

In 2018, the state missed both its goals for no increase in per-capita and total waste generation. 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.[17]

[17] 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.

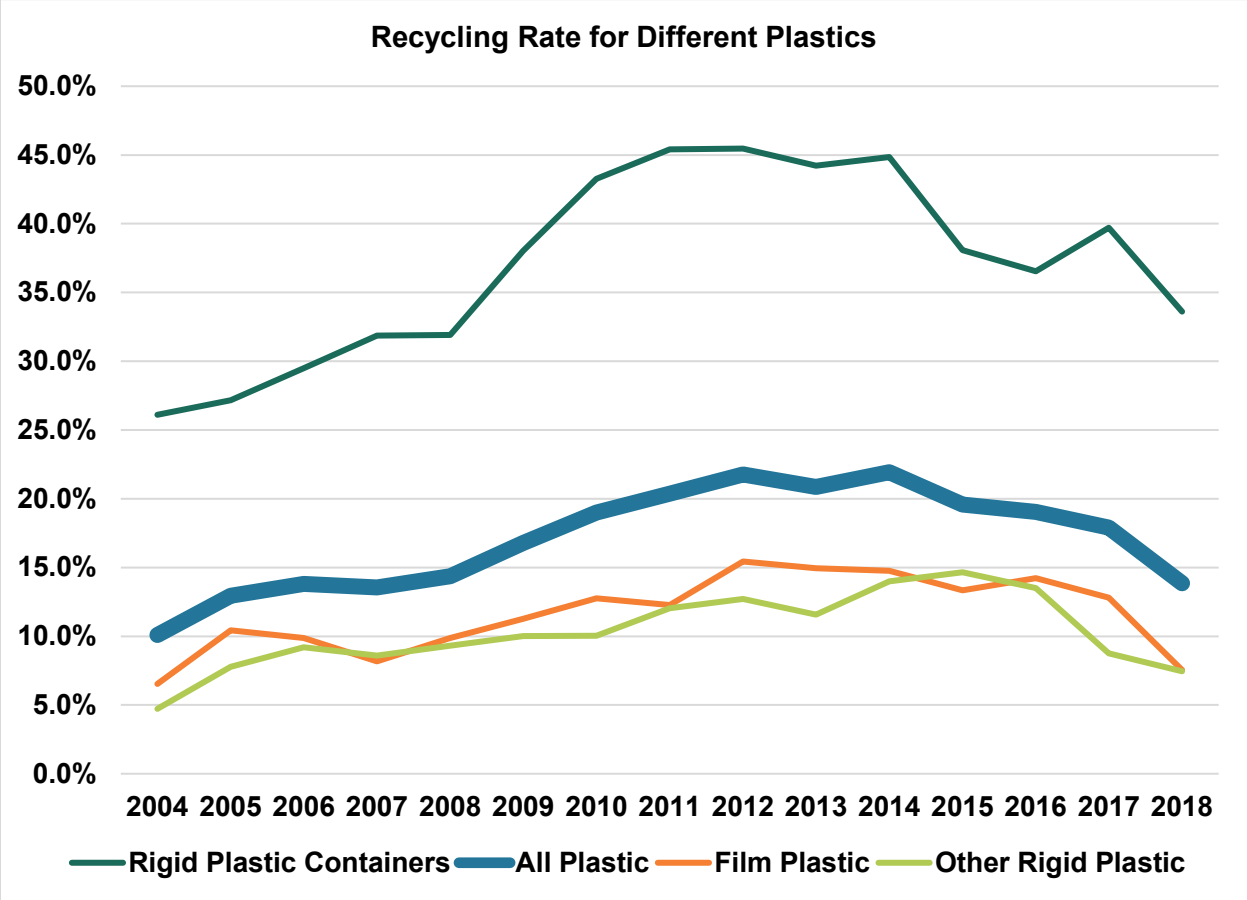
Oregon Amount Disposed and Recovered by Wasteshed, 2018

Wasteshed	2018 Disposed (tons)	Per Capita (lbs.)	2018 Recovered (tons)	Per Capita (lbs.)	2016 Calculated Recovery Rate*
Baker	13,420	1,601	2,624	883	**16.4%**
Benton	64,165	1,498	35,073	595	**35.3%**
Clatsop	36,784	1,877	24,443	303	**39.9%**
Columbia	32,376	1,248	10,443	223	**24.4%**
Coos	51,175	1,618	12,603	286	**19.8%**
Crook	22,949	2,021	5,618	570	**19.7%**
Curry	20,133	1,757	6,444	877	**24.2%**
Deschutes	179,991	1,905	83,472	391	**31.7%**
Douglas	84,736	1,517	33,216	865	**28.2%**
Gilliam	3,946	3,976	301	513	**7.1%**
Grant	4,256	1,150	827	191	**16.3%**
Harney	4,582	1,242	1,056	1,698	**18.7%**
Hood River	23,004	1,818	7,214	768	**23.9%**
Jackson	195,192	1,781	96,147	1,113	**33.0%**
Jefferson	16,036	1,361	4,610	327	**22.3%**
Josephine	80,597	1,866	37,386	1,527	**31.7%**
Klamath	67,382	1,983	17,442	1,206	**20.6%**
Lake	6,467	1,594	774	284	**10.7%**
Lane	273,543	1,458	318,392	906	**53.8%**
Lincoln	58,084	2,410	18,511	886	**24.2%**
Linn	110,534	1,653	74,442	216	**40.2%**
Malheur	26,136	1,637	5,216	823	**16.6%**
Marion	264,973	1,541	262,552	924	**49.8%***
Metro	1,373,608	1,494	1,108,857	519	**44.7%**
Milton-Fr.	1,765	437	1,147	386	**39.4%**
Morrow	19,095	3,213	5,383	400	**22.0%**
Polk	50,788	1,251	35,972	191	**41.5%**
Sherman	1,233	1,382	193	713	**13.5%**
Tillamook	28,233	2,139	10,858	883	**27.8%**
Umatilla	83,104	2,287	33,572	595	**28.8%**
Union	18,944	1,409	6,979	303	**26.9%**
Wallowa	5,105	1,423	1,386	223	**21.3%**
Wasco	22,910	1,685	5,435	286	**19.2%**
Wheeler	376	519	138	570	**26.9%**
Yamhill	99,882	1,845	38,599	877	**27.9%**
OR. TOTALS	**3,345,503**	**1,595**	**2,307,332**	**1,100**	**40.8%**

* does include certain Marion County recyclable materials burned for energy in the Covanta energy recovery facility.

Changes in recycling due to Bottle Bill changes and plastics recycling markets disruption

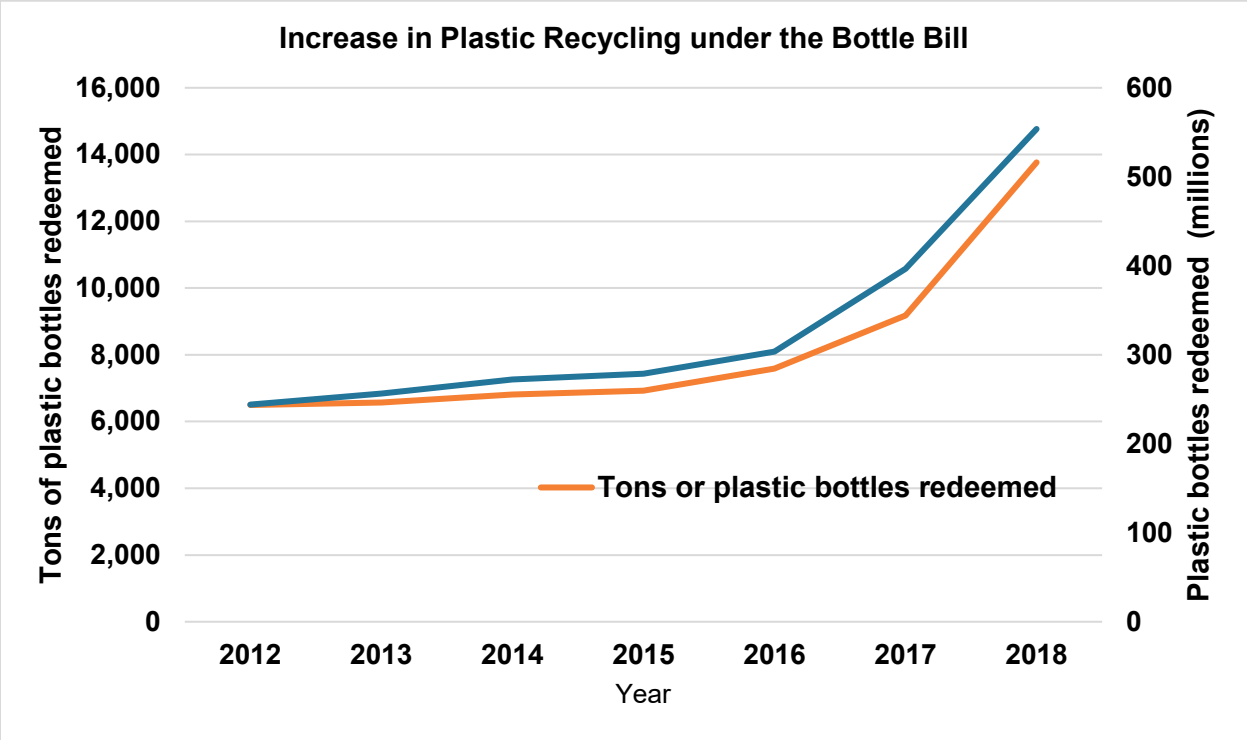
In 2015, the Oregon Legislature set a goal of recycling 25 percent of all plastic by 2020. Although the 2020 plastic recycling data will not be compiled until late 2021, DEQ anticipates that Oregon will not meet that goal. The curtailment of recycling markets based on China's ban and similar actions in other countries has resulted in many Oregon programs dropping the collection of plastic tubs from their program, and also in a large decrease in commercial collection of plastic film and other plastics. The graph below shows the recycling rates for different types of plastics in recent years.



One bright note is that although the overall recycling rate for plastics has declined, the recycling rate for plastic bottles has sharply increased in recent years based on two factors:

- Increasing the refund value to 10 cents in mid-2017 caused a substantial jump in the redemption of all beverage containers, including plastic water and soft drink bottles.
- Adding juices, teas, and many other beverages to the bottle bill in 2018 caused a big jump in plastics recycling, since most of these beverages are packaged in plastic.

The graph below shows the increase in plastics recycling under the bottle bill, both in terms of the number and the weight of plastic bottles redeemed under the bottle bill. Without this increase in bottle bill recycling, the decline in the recycling rate for rigid plastic containers and for all plastics would have been considerably worse due to the overseas market disruptions. The bottles collected under the bottle bill are not shipped overseas, but are instead recycled in the ORPET plant in St. Helens, Oregon.



3.7 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.

3.7.1 Municipal disposal facilities and permits

Materials Management currently oversees approximately 311 disposal site permits and 23 waste tire permits statewide. The numbers of permits in each major category appear in the table below.

	Municipal	Industrial	Total
Open landfills	32	16	48
Closed landfills	36	23	59
Transfer stations & material recovery facilities	138	5	143
Treatment facilities	1	3	4
Incineration/Energy Recovery	1		1
Anaerobic Digester Composting Facility Permit	4		4
Aerobic Composting Facility Permit	13		13
Aerobic Composting Facility Registration	38		38
Conversion Technology Facility Permit		1	1
Tire permits (carrier, storage, and combined storage and carrier)	23		23

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.

3.7.2 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, to improve agricultural soil 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.

3.7.3 Solid Waste Orphan Account

The Solid Waste Orphan Site Account (SWOSA) is a fee funded program ($0.13/ton on all domestic solid waste generated in Oregon) that started collecting fees in 1993 and originally focused on the cleanup of actual or potential hazardous substance releases from local government solid waste disposal sites (e.g., municipal landfills).

DEQ's Environmental Cleanup Program coordinates the agency's efforts to spend funds from the Solid Waste Orphan Account. Information about activities using these funds is provided in the Environmental Cleanup Program's 2021 Annual Legislative Report.

3.7.4 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 be further processed into compost.

The products of composting facilities provide numerous environmental benefits. The use of compost, when incorporated into soil, can improve soil health and provide a more stable form of nitrogen, less susceptible to leaching into water supplies. Compost also helps soil by reducing soil compaction and increasing water 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, creating 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 51 DEQ-permitted aerobic composting facilities. Thirty-eight are assessed as low-risk; 21 are located on farms. There are also approximately 10 farm-composting facilities under Oregon Dept. of Agriculture oversight. In 2019 and 2020 two compost facilities have been reconstructing their facilities to improve processing and reduce environmental impacts, particularly offsite odor reductions.

There are four DEQ-permitted anaerobic digesters: one receives food waste, two accept manure only, and one is permitted for both but is not yet operational. There are also eight anaerobic digesters located on farms under Oregon Dept. of Agriculture oversight using manure as feedstock; three of these receive very small quantities of food waste. Currently only three of these facilities are operating.

3.7.5 Complaints response

Materials Management staff respond to solid waste complaints about illegal disposal and unpermitted disposal, as well as concerns about odors, dust, asbestos or other environmental concerns at disposal sites. In 2019, DEQ responded to 277 complaints about illegal disposal of solid waste or odors, runoff or other environmental concerns at permitted solid waste disposal facilities. In 2020, DEQ responded to 172 complaints (19 in the Eastern Region, 68 in the Northwest Region and 85 in the Western 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 achieve 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 2019-20, 28 companies and individuals subject to some type of Materials Management investigation were assessed civil penalties totaling $1,443,839. In some of these cases, the penalties reflect not only assessments for Materials Management violations, but also for water quality, hazardous waste, or other violations of DEQ rules or permits. Of these 28 cases issued in 2019-2020, 15 were issued to unpermitted sites, nine to sites with some type of solid waste disposal site permit, and two were primarily related to waste tires. Two penalties were issued for violations of the E-Cycles electronic waste reporting requirements, the first time DEQ has issued penalties for these violations.

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

On December 20, 2019, DEQ approved Metro's updated Regional Waste Plan: Equity, health and the environment and Metro's updated Waste Reduction Program.

The Metro 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 through reuse, recovery or ultimate disposal. 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 and implementation of the *2050 Vision* by the Environmental Quality Commission.

The Regional Waste 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.

4.0 Conclusion

Materials play a significant role in human and planetary health. People in Oregon and around the world produce, use, consume and discard materials every day. These materials have environmental impacts as well as health impacts on people who come into contact with the materials, including the workers employed to extract, manufacture and dispose of the materials. The Materials Management Program works to reduce these impacts, using *2050 Vision* as DEQ's guiding compass.

In 2019-2020, the Materials Management program made significant headway toward the *2050 Vision* and will continue to collaborate with federal, state, and local partners to create a more sustainable future – a future where environmental protection and resource conservation enhance the well-being of all the people in Oregon.

To connect with us or learn more about DEQ's Materials Management Program, visit https://www.oregon.gov/DEQ/mm.