

# Overview of Scenario Modeling: Oregon Plastic Pollution and Recycling Modernization Act

Prepared by the Oregon Department of Environmental Quality with Cascadia Consulting Group in partnership with Bell & Associates and Circular Matters

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## Executive Summary

The Oregon Department of Environmental Quality commissioned research to evaluate the potential environmental and economic impacts of 24 different recycling scenarios that involved more than forty types of materials collected and processed in various combinations and methods.

The research was undertaken in 2022 and 2023 in order to implement Oregon’s Plastic Pollution and Recycling Modernization Act (RMA). The study was designed to satisfy ORS 459A.914(3), which requires DEQ to consider economic and environmental impacts (and other factors), when recommending to the Environmental Quality Commission which materials should be accepted for recycling and how they should be collected. The study evaluates narrow questions such as, “what are some of the impacts of collecting material X on-route vs. at depots?”

## Methods

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A team of contractors led by Cascadia Consulting Group projected material flows and estimates of direct costs such as labor, transport and capital for multiple scenarios, each representing a possible future recycling system. DEQ used the resulting material flow projections to estimate a variety of different environmental impacts, such as carcinogenic health potential and smog formation potential. These impacts were then expressed as indirect costs, such as the cost to society associated with illness and disabilities resulting from such pollution. Direct and indirect costs were then summed together for a more complete assessment of economic impacts.

This robust modeling effort drew on a team of contractors and DEQ staff with expertise in modeling, recycling and waste system economics, recycling systems, processing technologies, and life cycle assessment. Data sources included waste composition and material recovery survey data; program-specific material capture data; on-route and depot collection costs drawn from dozens of programs serving hundreds of thousands of customers across Oregon; multiple life cycle assessments of different materials; a survey of hundreds of depot users; and many other data points.



## Key findings

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Key findings of this research include the following:

- **Oregon’s current garbage and recycling services cost ratepayers (Oregon households and businesses) nearly \$1 billion annually in direct costs.**<sup>1</sup> Garbage collection and disposal contributes significantly more to these totals than recycling. Note these costs are limited to the “in-scope” services described in this report, which are primarily on-route collection service and depots for traditional recyclables (excluding yard debris and food scraps) and garbage.
- **Recycling reduces indirect costs through reducing pollution.** When compared against a hypothetical scenario where none of the evaluated materials are recycled, existing recycling services assessed in this report already create around \$1.1 billion in environmental benefits annually, not including impacts such as plastic pollution and marine debris. These benefits can be considered savings in indirect costs.
- **A commingled recycling collection list of moderate length is ideal from an economic perspective.**
  - Collection programs with shorter lists (fewer materials) would be less expensive to operate but also generate lower environmental benefits (due to less recycling).
  - Adding more materials to commingled service increases recycling and reduces pollution (and indirect costs) but also increases direct costs particularly as commingled processing and marketing becomes more difficult.
  - DEQ’s rule concept of Dec. 28, 2022 appears close to the optimal (minimized net cost) point on a spectrum of shorter vs. longer lists.
- **Collecting materials through commingled on-route collection is generally more cost-effective than at depots.** This is the case whether considering direct, indirect, or total (net) costs. However, not all materials are suitable or cost-effective to collect commingled.
- **If materials are collected at depots, increasing the number of depots improves convenience to the public and environmental outcomes.** This is due to higher quantities of materials recycled and lower vehicle impacts per ton delivered by depot users who will drive a shorter distance to deliver materials. More depots also result in

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<sup>1</sup> All costs in this report are expressed in 2021 dollars and are expressed as “system-wide” costs unless noted otherwise. The report was not designed to estimate or allocate system-wide costs to the different parties who will share financial responsibility for effective recycling under the Recycling Modernization Act.



higher direct and net (direct + indirect) costs. This demonstrates a trade-off between environmental and economic criteria.

- **Scenarios that most closely mirror DEQ’s rule concepts for materials acceptance lists published Dec. 28, 2022 would increase direct costs by \$47 - \$52 million/year, while reducing some indirect costs (pollution) by approximately \$29 million/year.<sup>2</sup>** The estimate of direct costs is more comprehensive, while the estimate of indirect costs excludes many important benefits that will accrue from the RMA and which were not studied here (see “Conclusion and Limitations” below).
- **Cost differences (direct, indirect, and total) between all scenarios evaluated are relatively small compared to the overall system-wide cost.** This suggests that other criteria – such as environmental factors or public convenience – may offer more compelling guidance when choosing between alternatives.

## Conclusion and Limitations

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This report provides information about the projected impacts of recycling specific materials under multiple scenarios. The assessment of direct costs is robust and comprehensive. The report also considers indirect costs associated with 13 different categories of pollutants and environmental impacts resulting from material recycling and disposal. These costs – while traditionally excluded from prices and economic decision-making in the waste and recycling system – are similar in magnitude to the direct costs such as fuel and labor. As such, including this assessment of indirect costs is both a novel and important step in advancing understanding of economic impacts.

Despite this, this report does not assess the full range of societal benefits expected to result from implementation of the RMA. The RMA is also expected to:

- Reduce the leakage of plastics from Oregon’s recycling system into vulnerable communities and the environment;
- Improve working conditions in processing facilities;
- Reduce volatility and prevent further reductions in delivery of recycling services; and
- Restore and sustain public confidence in the recycling system, as well as the social-emotional benefits that accrue from such a system.

Those benefits are all real, but their economic consequences have not been quantified here.

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<sup>2</sup> These are midpoint estimates and do not reflect uncertainty in estimates – actual costs and benefits could be lower or higher than shown here.



In addition, while the underlying model provides information that could help assess the magnitude of several financial obligations of producer responsibility organizations, this study was not designed to provide such an assessment.

As noted above, other criteria – such as environmental factors not already considered and public convenience – should also be considered when weighing alternatives.

## Translation or other formats

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