

Packaging Material Attributes Report



State of Oregon
Department of
Environmental
Quality

About the report

When making purchasing decisions, people often make assumptions about the environmental-friendliness of a product based on packaging descriptions. These characteristics, or “attributes,” are commonly used to describe the origin of a material (e.g., made of *recycled content* or *biobased*) and/or what you can do with an item when you’re done with it (e.g., whether it’s *recyclable* or *compostable*). However, only thinking about the beginning and end of a material paints an incomplete picture of environmental impacts.

In 2018, DEQ’s Materials Management program released a report that looks at how common attributes in packaging and food service ware stack up against alternative materials when considering impacts along the entire life cycle of those materials. The report asked the question: How well do attributes predict positive environmental outcomes? Some of the results are surprising and challenge the way we think about materials. These findings can inform future design, buying decisions, and policy incentives—actions that can help the state achieve the [2050 Vision](#). A vision in which Oregonians live within the limits of their sustainable share of the world’s natural resources, making and using materials in a manner that maintains and restores a healthy environment.

Why is this report so important?

Well-intentioned purchasing decisions to reduce environmental impacts and conserve resources are often made by relying on attributes—in this case, *recycled content*, *biobased*, *recyclable* and *compostable*. However, relying on attributes alone may lead to decisions that have unintended and regrettable outcomes.

The majority of environmental impacts take place before a material is discarded (i.e., during the extraction, processing, design, manufacturing and transportation stage). In fact, 39 percent of our domestic greenhouse gas emissions take place before a product even reaches a consumer, and only 2 percent of GHG emissions occurs from

disposal (landfill, compost and incineration). By focusing on disposal, we’re missing out on reducing significant impacts earlier in the process.

This research is not a critique of end-of-life treatment. DEQ supports informed material recovery, and emphasizes reduction and prevention as considered paths forward for solid waste management.

Report Methodology

To see how attributes correlate with reduced environmental impacts, DEQ conducted a study using 17 years’ worth of existing research and commissioned a meta-analysis of existing life cycle assessment literature to see if *recycled content*, *biobased recyclable* and *compostable* are better for the environment than their alternatives.

Although the review of these analyses through the lens of attributes is new, the primary research was drawn from published LCAs conducted by researchers worldwide. The following criteria were applied consistently:

- Publicly available research between 2000-2017
- Published and peer-reviewed studies that followed ISO 14040, 14044
- Limited to credible and publicly accessible sources and journals

Key Findings

Recycled Content: Two critical findings can be gleaned from the analysis for choosing packaging based the amount of recycled content it contains. Recycled content is the portion of materials used in a product that was diverted from the solid waste stream. First, when choosing packaging made of the same material (e.g., both made from PET), the option with higher recycled content generally yields lower environmental impacts. Thus, for the same

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material, more recycled content is a good thing. Second, when considering packaging made from different materials (e.g., PET and glass) recycled content by itself is not a good predictor of lower impacts. For example, a glass container with high recycled content has a much higher environmental profile than an equivalent virgin PET plastic container. In this example, if we selected a product based on recycled content, we'd choose the one with the higher impacts. So, across different materials the recycled content attribute is not useful.

Biobased Content: In general, biobased packaging materials exhibit significant environmental tradeoffs compared to non-biobased counterparts. Biobased materials are made from renewable feedstocks that can be replenished as they are used or within short- or midterm timeframes. For example, a biobased material may have lower GHG profile compared against alternatives, yet it may also increase other impacts such as acidification (acid rain), eutrophication (nutrient loading into waterways), and human and ecotoxicity from the use of chemicals (e.g., pesticides). Agricultural production drives a great deal of the burdens due to the processes being largely powered by fossil fuels. Research suggests that the biobased attribute is consistently unreliable for selecting lower impact packaging across all traditional packaging materials.

Recyclable: Research suggests that the recyclability of packaging is a poor indicator of reduced environmental impacts. Recyclable is defined as materials that have the potential to be recovered from the solid waste stream and turned into secondary feedstock to be made into a new product. The reason why this attribute is a poor indicator of positive outcome, is largely due to the fact that different materials have different environmental profiles, as a consequence of how the materials are produced. As a result, a recyclable package such as a steel container can have a much higher environmental profile than a functionally equivalent non-recyclable flexible pouch.

Compostable: Compostability of a packaging does not appear to be a clear predictor of environmental preference. Compostable materials

are those that degrade by biological processes to yield CO₂, water, inorganic compounds, and biomass at a rate consistent with biodegradation of natural waste while leaving no visually distinguishable remnants or unacceptable levels of toxic residue. Many compostable packages are made of biobased materials and inherit the significant environmental burdens from their production. These burdens are often much greater than the offset benefits that composting provides. In addition, compostable packaging – including food service items – does not always perform as designed or certified in different regional composting facilities, and may contribute to contamination of the final compost.

How can we use this information?

These findings can inform future design, buying decisions, and policy incentives – actions that can help the state achieve the 2050 Vision.

Four technical summaries (one for each of the attributes studied) provide additional information on the research methods and results, and include recommendations for how designers, purchasers, marketers and policy-makers might more effectively utilize these attributes and take more focused actions to reduce environmental impacts. Summaries can be downloaded at:

<https://www.oregon.gov/deq/mm/production/Pages/Materials-Attributes.aspx>

Overall, these findings support the need to evaluate life cycle impacts holistically and to design to optimize for reduced life cycle burdens (i.e., design for environment approach vs. design for recovery or recycling). The amount of material used, and the type of material, are often more important considerations than any of the attributes studied.

Alternative formats

Documents can be provided upon request in an alternate format for individuals with disabilities or in a language other than English for people with limited English skills. To request a document in another format or language, call DEQ in Portland at 503-229-5696, or toll-free in Oregon at 1-800-452-4011, ext. 5696; or email deqinfo@deq.state.or.us.