



State of Oregon  
Department of  
Environmental  
Quality

## Briefing Paper: Waste Prevention

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This paper examines waste prevention – the “reduce, reuse” part of the solid waste management hierarchy. It summarizes research findings on prevention – some generated as background papers in 2007 as part of DEQ’s Waste Prevention Strategy development — and supplements with a more recent literature review. DEQ’s Waste Prevention Strategy is also summarized. This paper concludes with a status report on the Waste Prevention Strategy and a short discussion of key challenges moving forward.

For the purpose of this paper, “waste prevention” means activities that prevent the generation of solid waste in an environmentally beneficial manner.<sup>1</sup> Waste prevention encompasses using fewer materials (sometimes called “pure” waste prevention), reuse, and on-site management of organic wastes. “Pure” waste prevention and reuse constitute the top (most preferred) positions in Oregon’s statutory [solid waste management hierarchy](#). Recycling, centralized composting and energy recovery do not prevent waste generation (as defined in Oregon) and therefore are outside the scope of waste prevention.

Waste prevention can be thought of as a subset of the larger field of “sustainable consumption.” DEQ explores the relationship between waste prevention and sustainable consumption in a [separate paper](#). This paper is limited to waste prevention.

### Summary of Background Research

In the preparation of its Waste Prevention Strategy, DEQ published a series of eight background research papers on waste prevention. These background papers, written in 2006 and 2007, can be viewed [here](#). A summary of the papers follows.

#### *Waste Generation in Oregon: Composition and Causes of Change*

- Waste generation is, at least partially, de-linking from economic growth.
- There’s already been a huge amount of waste prevention going on, of a magnitude as large as recycling, but it has gone largely unrecognized by the solid waste community.
- Per-capita generation, as reported by DEQ, grew 43 percent between 1993 and 2005.
- Between 50 to 80 percent of the observed increase in per-capita generation appears to be caused by real increases in waste-generating activities and materials use (as opposed to artifacts of measurement inconsistencies or shifts in discards from “non-counting” to “counting” methods). An increase in the generation of building-related wastes (construction, renovation and demolition debris) appears to be a significant factor. Other likely causes of increasing waste generation in Oregon include: increased purchases of household furnishings, decreases in the durability and repair of furnishings and other “durable goods,” and other increases in consumption associated with rising average incomes, falling prices (associated with globalization), increased access to credit, more pervasive marketing, changes in social norms, and other factors.

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<sup>1</sup> Consistent with Oregon’s statutory waste generation goals, generation is defined as the sum of materials discarded for “counting recovery” and disposal. The goals, as contained in ORS 459A.010, are: a) no increase in per-capita waste generation in 2005 and subsequent years, and b) no increase in total waste generation in 2009 and subsequent years.

### *Environmental Considerations*

- Ton-for-ton, the benefits of prevention are typically greater than the benefits of recovery, although recovery is sometimes easier to accomplish and is often easier to measure. The benefits of prevention have relatively little to do with avoided disposal impacts and rather are primarily the result of reduced impacts in resource extraction and manufacturing.
- While waste prevention is a useful tool for environmental protection, it isn't necessarily the most effective way to accomplish certain sustainability goals. For example, a recent review of 11 European studies on the impact of household consumption concluded that the greatest negative environmental impacts from households are caused by the consumption of food, housing and transportation, not the purchase of (non-food) goods and packaging (or generation of waste).
- While waste prevention is typically the environmentally preferable choice, there can be tradeoffs and prevention can sometimes shift impacts from one media to another.
- Measuring the environmental benefits (and impacts) of waste prevention requires the use of analytical tools that extend beyond merely accounting for avoided disposal. Life cycle analysis, materials flow analysis, input-output economic analysis, and "ecological footprint" analysis are all options.

### *Experience with Waste Prevention – State of Oregon, Local Governments, Nonprofits and Businesses*

- Several barriers and challenges are common to all sectors. These include:
  - Resource constraints and competing priorities.
  - Lack of understanding about waste prevention, conflation with recycling, and perceptions that waste prevention is not needed because recycling is as good as or better than prevention, or that recycling has "solved the problem."
  - Perceptions that waste prevention is vague, difficult, ineffective and/or bad for the economy.
  - Difficulty measuring benefits and results.
  - Specific to re-use of materials, market imbalance (supply exceeds demand or vice versa), and the costs of infrastructure and transportation.
- State legislation provides DEQ with a strong foundation for work to prevent waste generation.
- DEQ has conducted a number of special projects to help advance waste prevention, including a refocusing of the (now-dormant) solid waste grants program, promotion of materials exchanges via Northwest Materialsmart (2001), the community-based Resource Efficiency Program (1996-2000), and the Packaging Waste Prevention Project (2002-05). These last two projects both involved provision of technical assistance to business waste generators. Both generated significant financial savings for businesses (collectively, savings of more than \$1 million annually) and some compelling case studies.
- For many local governments, solid waste is a low priority compared to other government functions, and for nearly all local governments, prevention is a low priority compared to recovery and disposal.
- Material reuse is generally not highly profitable, although opportunities for expansion exist for organizations that benefit from local community support. Clear opportunities exist in building material reuse, food rescue and household goods reuse. Computer and electronics reuse can also expand if tied to other efforts such as e-waste recycling and expansion of technology access.
- The potential for waste prevention in businesses is generally not well documented, and is challenging to evaluate. Studies have identified more than 100 different waste prevention best management practices in various business sectors. Existing adoption rates vary widely across best management practices and sectors. Outreach programs to businesses in Oregon have reported businesses adopting waste prevention recommendations at rates ranging from 20 percent to 67 percent (program-wide).

- Financial savings to businesses are driven by material costs and labor efficiencies. Avoided waste management costs are rarely a motivator for waste prevention. A large number of barriers often limit adoption of waste prevention practices.

### *Experience Outside of Oregon*

- A review of waste prevention programs outside Oregon identified that while governments have tried many different approaches to prevent waste, nearly all have suffered from lack of evaluation.
- Based on this review, DEQ's contractor offered the following key recommendations:
  - Individual waste prevention and reuse programs should be integrated in a coherent overall strategy to maximize effectiveness. Education, for example, is most effective when coupled with economic or policy incentives.
  - Based on experience in Europe, sustainable consumption initiatives offer significant waste prevention potential. Potential is greatest where the focus is not limited to technological improvements but includes consideration of values and lifestyle changes.
  - It is important to focus on priority materials and sectors, although defining priorities can be very challenging.
  - Economic instruments such as taxes or fees should be part of the mix. Getting price signals right by including environmental externalities is an important element of a sustainable production and consumption system.
  - Measuring effectiveness is challenging but important.
  - Government partnerships with the private sector, non-governmental organizations and other stakeholders are critical for successful development and implementation of waste prevention programs.
- Product stewardship approaches, in theory, can have significant waste prevention potential, depending on products targeted and tools or approaches applied to those products. However, most product stewardship efforts and programs are relatively new in implementation so little evaluation or measurement is available. In addition, much of the evaluation information that is available is focused on recovery, not prevention.

Since DEQ's Waste Prevention Strategy was adopted in 2007, additional research has been conducted in the area of waste prevention, especially in Europe. DEQ just in a review of waste prevention literature in support of the West Coast Forum on Climate and Materials Management. DEQ thanks EPA for contributing funding towards that literature review, and Colleen Hetzel of the Minnesota Pollution Control Agency for reviewing documents with DEQ in greater detail. Highlights from this review include the following:

- Actual evaluation of waste prevention potential of instruments and measures is severely lacking. The literature found some evaluation, but it was generally not comprehensive (e.g., some focused only on household consumption).
  - Among household waste, activities with the potential for greatest reductions in waste generation (tonnage) include food waste prevention, food waste composting and bulky item reuse. Food waste prevention may offer the greatest potential but hasn't been sufficiently evaluated.
  - Waste prevention outreach campaigns to households that address multiple waste prevention behaviors (as opposed to single behaviors) may reduce waste generation tonnage 2 to 4 percent.
  - Unlike recycling, waste prevention actually consists of hundreds of discrete and largely independent actions (measures). Instruments aimed at individual measures (junk mail, diapers, bags, etc.) each have limited tonnage potential (typically less than 3 percent reduction of total municipal solid waste) but collectively may be more significant.
  - Reducing the weight of materials (lightweighting), especially of packaging, has resulted in significant waste prevention.

- “Upstream” policy changes aimed at increasing product durability, such as through extending warranties, may lead to greater prevention of waste but have not been sufficiently evaluated.
- Life cycle analysis can be used to rank the relative environmental benefits/impacts of different waste prevention measures, as demonstrated by Oregon DEQ’s green building study. Not all measures (practices) are equal; the environmental benefits of different measures may be several orders of magnitude (a factor of 1,000 or more) apart. However, evaluation of the potential impact of policy instruments is less advanced.
- The rebound effect needs to be considered.<sup>2</sup>
- Green purchasing may be a barrier to prevention – if the conservation-minded think that their purchased product or service is “eco-groovy,” evidence suggests that some may think “why bother to use less of it?”
- Recycling can also be a barrier to waste prevention. As with green purchasing, the belief that one has already “done one’s part” may absolve her/him from changing consumption patterns. In addition, recycling is often confused with waste prevention, making it difficult to focus on prevention.
- To the extent that waste prevention is about “being less bad” as opposed to a more holistic “good,” it may not align with broader changes that are advocated to move to sustainability (a shift from “lower environmental impact” approaches to “low/no impact” approaches).
- So far product stewardship has not led to waste prevention, but the potential is still believed to be there in extended warranties and other potential options.
- Waste prevention programs - especially outreach/education programs - are often informed by the “rational choice” model of consumer behavior. This model has been widely discredited as incomplete and insufficient (by itself) to inform meaningful changes in behaviors. Simply providing information and changing financial incentives may not be sufficient to significantly change behavior. (In fact, more information isn’t necessarily better.)
- Pro-environmental behavioral change has to be a societal process; it is more important (and effective) to change social norms than to change individuals’ practices. Collective solutions are needed that change the circumstances in which individual choices are made.
- Potential roles for government, as identified in the literature, include the following:
  - Establish a strong policy foundation for waste prevention.
  - Provide positive, inspiring, paradigm-shifting examples.
  - Provide convincing evidence via research.
  - Compile a user-friendly database with life-cycle environmental, social and economic impacts of products.
  - Support broader value and science-based discussions, information provision and campaigns.
  - Support incentive structures (taxes, subsidies, penalties). Remove virgin material extraction subsidies.
  - Facilitate conditions to support prevention.
  - Strengthen product standards.
  - Develop building standards.
  - Strengthen/establish media standards (e.g., advertising aimed at children).
  - Help/encourage/require businesses to change practices.
  - Improve governments’ own operation/performance, including the providing of clearer/better environmental purchasing criteria.

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<sup>2</sup> “Rebound effect” refers to the phenomena that when a consumer engages in a waste prevention (or other conservation) activity that saves them money, the savings may be reallocated to other expenditures that result in countervailing economic and environmental impacts.

- According to literature reviewed, efforts to prevent waste should keep in mind:
  - Single actions will be less effective; interventions need to be integrated in a coherent overall strategy.
  - Consider operating waste prevention in a broader/more holistic sustainable consumption framework.
  - Focus on priority materials and/or sectors.
  - Partnerships will be very important.
  - Policy approaches should be flexible and will require a wide set of new skills.
  - Policy instruments should be checked with respect to their ability to react quickly and dynamically to changes in markets.
  - Good evaluation is important.
  - Be very careful with incremental measures, which may undermine deeper change.
  - Be very careful with economic instruments, which can erode the more fundamental values-based approach aimed at shifting cultural foundations of household behavior.
  - Reducing overall consumption should not be conflated with increasing efficiency.

### **DEQ's Waste Prevention Strategy**

DEQ adopted its [Waste Prevention Strategy](#) in December 2007. The strategy set priorities and defined direction and work for the next 10 years in helping Oregon prevent waste generation and associated environmental impacts. The strategy identifies the following roles for DEQ:

- Provide policy leadership in waste prevention.
- Conduct and support research.
- Provide technical analysis and assistance.
- Act as a facilitator and collaborator/partner with others.
- Inform consumers and producers about their choices and how their choices relate to waste generation and environmental impacts.
- Demonstrate how design, manufacturing and consumption practices can be modified to prevent waste, reduce environmental and human health impacts, and improve sustainability.
- Conduct environmental regulatory and compliance activities as authorized.

In addition, the strategy contains the following guiding principles:

- Actions undertaken as part of the strategy will prevent waste, but efforts will be targeted to achieve greatest environmental benefits.
- Environmental benefits will be determined by examining the entire life cycle of materials, not just waste-related impacts.
- Actions are not limited to reducing impacts within Oregon's borders. Oregon's environment is fundamentally connected to and part of the global environment.
- Consumption and consumer behavior are core causes of waste generation and its associated environmental impacts.
- Protecting the environment and preventing waste are ultimately the shared responsibility of consumers and producers.
- Consumer choices related to waste generation and environmental impacts can be influenced through both "demand pull" and "supply push" techniques.
- DEQ will focus on a limited number of achievable activities that can significantly impact environmental quality.
- Waste prevention represents a significant societal shift. Collaboration with partners is essential to the successful execution of the strategy.

Oregon's Waste Prevention Strategy included a summary of actions DEQ proposed to take in the first three years of implementation (2008-10). The actions fell into four focus areas: 1) design, construction, remodeling and demolition of buildings; 2) business practices; 3) consumer education; and 4) foundation research and analysis.

Since adopting the strategy, DEQ has made significant progress in implementing some of the strategy's elements. DEQ:

- Developed a residential green building program focused on waste prevention. Please see the [briefing paper on residential green building](#) for details.
- Completed a major [life cycle impact analysis](#) of 48 different methods of delivering drinking water. The study conclusively demonstrates the importance of prevention and reuse (relative to both recycling and disposal).
- Joined and participated in the steering committee of Wal-Mart's Packaging Sustainable Value Network.
- Conducted limited outreach to businesses and consumers.
- Provided limited on-call technical assistance to businesses.
- Developed a [consumption-based greenhouse gas emissions inventory](#) for Oregon, which highlights life-cycle emissions associated with materials consumption (and by extension, opportunities to reduce emissions through waste prevention). Advocated for related work at the local government level (and in other states) via the West Coast Climate and Materials Management Forum and ICLEI – Local Governments for Sustainability USA.

DEQ has not been able to implement as much of the strategy as originally planned due to budget constraints, particularly in the area of consumer outreach. An update to the implementation plan is also on hold, pending completion of DEQ's Materials Management 2050 Vision project.

### **Conclusion: Key Challenges and Opportunities**

Through its Waste Prevention Strategy, DEQ has leveraged very limited resources in a strategic manner to effect changes in how materials are used. Looking ahead, the following key challenges and opportunities are worth noting:

- DEQ has been effective in developing new partnerships with organizations such as the Earth Advantage Institute and Wal-Mart. These partnerships have broadened its reach.
- There is generally strong support for the types of research, analysis and information-providing functions that DEQ has provided in the last several years. In providing research results we consider our role as a state agency that represents diverse stakeholders and the distinction between information provision and advocacy.
- The framework of "waste prevention" is sometimes a constraint. The environmental impacts of prevention are largely upstream, and often not related to impacts from waste handling and disposal. The use of the term "waste" is confusing to many stakeholders, and often leads to conflating prevention with recovery. Some waste prevention actions actually increase environmental impacts, such as reusing highly-inefficient appliances or highly-polluting cars.
- To the extent that waste prevention is about changing how materials are purchased and used, it can be thought of as a subset of "sustainable consumption." Three other papers explore that broader topic in more detail. The [first](#) introduces sustainable consumption and its relation to prevention; the [second](#) summarizes a literature review of key challenges in sustainable consumption; the [third](#) summarizes types of interventions available to make consumption (and its corollary, production) more sustainable.

- There is strong external interest in prevention and, more broadly, understanding and reducing environmental impacts of materials through better purchasing decisions. DEQ receives far more requests for consumer and business-oriented information and analysis than it can respond to, given limited resources and current priorities. (An example that is generating a lot of information requests right now is life cycle analysis on different “take-out” food containers, including compostable products.) DEQ must determine how it can most effectively use its limited resources. Much of the literature indicates that a focus on individual purchasing choices may not create the changes needed to address significant environmental challenges, although there is still a high level of demand for this kind of information, and sometimes this type of information can be used to encourage discussions around more significant changes.
- Waste prevention is not one activity but many. The diverse nature and large number of waste prevention actions is a challenge.
- Measurement of program effectiveness continues to be a challenge. Waste prevention is notoriously difficult to measure (although not always impossible; DEQ has evaluated prevention impacts in both tonnage and broader environmental impacts on several occasions). The effectiveness of interventions intended to lead to waste prevention is even more difficult to evaluate.