State of Oregon
Department of
Environmental
Quality

OREGON DEQ WASTE PREVENTION STRATEGY: TEN-YEAR FRAMEWORK and SHORT-TERM PLAN

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This document describes a framework for DEQ's work to reduce solid waste generation in Oregon over the next ten years, and a summary of actions DEQ is proposing to undertake in the next two to three years as part of its work in this area.

Background: It has long been the policy of Oregon that prevention and reuse, which both reduce waste generation, have priority over recycling, composting, energy recovery and landfilling as methods of managing solid waste. While recycling has environmental benefits, the benefits of prevention and reuse, ton-for-ton, are typically greater. DEQ has worked for many years to support both prevention and reuse. Despite this, the generation of solid waste in Oregon, including both disposal and recovery (recycling, composting, and energy recovery), grew 77% between 1993 and 2006, from 3.3 million to 5.8 million tons/year. While population growth contributed to this increase, Oregonians, including individuals and businesses, produced on average 47% more discards per-capita in 2006 than we did in 1993.

During the period 1993 to 2002, at least half of the increase in Oregon's waste generation – and possibly as much as 80% – was caused by an increase in the acquisition and use of materials, and resulting discards.[1] Increasing waste generation results in greater environmental degradation and cost to society, associated both with the management of discards, and the production of the goods that become waste. In fact, the pollution – including greenhouse gases – associated with production is often much greater than the pollution associated with disposal. In a world of environmental limits and finite resources, perpetually increasing production, consumption, and waste generation cannot be sustained.[2]

The Oregon Legislature recognized this in 2001 when, with the passage of HB 3744, it stated that "there are limits to Oregon's natural resources and the capacity of the state's environment to absorb the impacts of increasing consumption of resources, increasing waste generation and increasing solid waste disposal." The Legislature also affirmed that "it is in the best interests of the people of Oregon to conserve resources and energy by developing an economy that encourages waste prevention . . ." HB 3744 also established statewide goals to prevent waste generation, beginning in 2005.[3]

DEQ has developed this Waste Prevention Strategy Framework to set priorities and define its direction and work for the next 10 years in helping the state prevent waste generation and associated environmental impacts, including greenhouse gas emissions.

Vision: Oregon residents and businesses have made a value shift from a "throw-away" society to living and prospering sustainably and making choices in their consumption and use of resources that result in decreased waste generation and a healthier environment.

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[1] Data to evaluate causes of increasing waste generation for the period 2002 – 2006 are not yet available.

[2] The environmental benefits of prevention are increasingly well documented, particularly as the large greenhouse gas impacts associated with the production of consumer goods becomes better understood. For example, analysis for the Governor's Advisory Group on Global Warming in 2004 demonstrated that achieving the statutory waste generation goals is a key contributor to returning greenhouse gas emissions to 1990 levels. This analysis likely underestimated the greenhouse gas impacts of several materials, as well as the benefits of prevention. Earlier this year, the Oregon Legislature adopted goals to reduce greenhouse gas levels to 10 percent and 75 percent below 1990 levels by 2020 and 2050, respectively. Waste prevention can also reduce energy use, emissions to air and water of toxics and other pollutants, and negative ecosystem impacts.

[3] 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. Waste generation is defined as the sum of recovery and disposal. In 2005 and 2006, the state failed to meet its statutory goal, as per-capita waste generation continued to climb.

Purpose and Scope: The purpose of this ten-year Strategy Framework is to set priorities and define direction and work in *waste prevention* for the Oregon DEQ.[4]

The efforts undertaken by DEQ through this Strategy Framework are meant to prevent waste, but this Strategy does not constitute a plan to achieve the State's waste prevention goals. The specific areas of focus have been chosen because of their ability to benefit the environment through preventing waste generation in Oregon. Many resources and products that ultimately become waste in Oregon are manufactured elsewhere, and the quality of Oregon's environment is impacted by resource extraction, manufacturing, and transportation activities in other states and countries. As a result, reducing "upstream" impacts through waste prevention will have both global and local benefits.

Goal: To provide leadership in Oregon that will protect the environment and human health through prevention of solid waste generation and associated "upstream" (resource extraction and production of goods) and "downstream" (end-of-life/waste management) impacts.

Objectives:

- **Environment –** Take strategic actions that reduce greenhouse gas emissions, waste generation, and other environmental impacts.
- **Sustainability –** Demonstrate that preventing waste can have a positive economic, social, and environmental impact, and that prevention is a relevant component of a sustainable society by addressing the broader impacts of materials and product use and design.
- **Waste Generation** – Take strategic actions that prevent waste generation and contribute to achieving Oregon's waste prevention (generation) goals established in state law.

Department of Environmental Quality (DEQ) Role:

To achieve these objectives, DEQ will:

- Provide policy leadership in waste prevention.
- Conduct and support research.
- Provide technical analysis and assistance.
- Act as facilitator and collaborate/partner with others.
- Inform consumers and producers about their choices related 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 regulatory and compliance activities as authorized.

Guiding Principles:

- Actions undertaken as part of this Strategy Framework will prevent waste, but efforts will be targeted to achieve the 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 is a core cause of waste generation and its associated environmental impacts.
- Protecting the environment and preventing waste is 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 this Strategy.

[4] For the purposes of this Strategy Framework, "waste prevention" means activities that prevent the generation of solid waste in an environmentally beneficial manner. Waste prevention encompasses using fewer materials (sometimes called "pure" waste prevention), reuse, and on-site management of organic wastes. Recycling, centralized composting, and energy recovery do not prevent waste generation (as defined in Oregon) and therefore are outside the scope of this Strategy Framework.

Four Focus Areas
DEQ proposes to focus its waste prevention effort in four "focus areas", summarized below. No prioritization is implied in the numbering of focus areas.

Focus Area 1: Design, Construction, Remodeling and Demolition of Buildings
An increase in construction, remodeling and demolition (CR&D) waste is one of the largest contributors to the recent growth in Oregon's waste generation. Broadly speaking, choices about building design, materials, construction, and remodeling practices all have significant bearing on Oregonians' overall environmental impacts. Because buildings are long lasting, design choices made in the next ten years will impact the environment for decades to follow.

In addition to the compelling environmental and waste issues involving buildings, there are several other reasons for DEQ to focus in this area. Oregon has strong activity and interest in green building. Interest in material selection and design considerations is growing. DEQ, with its waste prevention perspective and broad environmental objectives, can contribute to existing efforts in this area. Focusing in this area also is a good fit with many of the Strategy Framework's Guiding Principles.

A significant distinction can be made between residential and non-residential buildings. DEQ plans to address the residential sector first, and then examine non-residential opportunities later in the ten-year period addressed by this Strategy Framework.

Summary of Proposed Short-Term Work
- Commission an environmental screening of waste prevention "best practices" involving design, construction, remodeling and demolition of residential buildings. The purpose of this evaluation is to identify those practices that not only prevent solid waste but also reduce other environmental impacts (energy, embodied toxics, etc.). The result of this project will be a short list of practices for further consideration.
- Consult with stakeholders to identify and evaluate waste prevention practices, and approaches that DEQ, in collaboration with partners, might take to increase adoption of these practices, considering environmental, economic, and other benefits and barriers, existing efforts, potential partnerships, and the need for flexibility in how designers, builders, and others engage in waste prevention. Potential stakeholders include representatives of the design, construction, remodeling, deconstruction and demolition industries, material suppliers, green building specialists, community development corporations, and government housing, code, planning, and energy agencies.
- Short-term outreach, research, and collaboration with partners as determined through consultations, above.

Focus Area 2: Business Practices
Businesses may generate upward of half of all municipal solid waste. In addition, product design and packaging decisions made by businesses shape the waste generated by other sectors (households, construction). Interest in sustainability and environmental impacts is growing among Oregon businesses. DEQ already has experience, including some notable successes, working with this sector, and several potential partners are already conducting outreach to Oregon businesses. Working with businesses is a good fit with many of the Strategy's Guiding Principles. Enhancing business sector waste prevention efforts also supports the State's efforts to be more sustainable in its own operations.

Initially, DEQ proposes to expand on its recent successful work involving packaging, which contributes 20-30% of waste generation in Oregon. The short-term focus on packaging will capitalize on DEQ's recent experience in this area and the burgeoning interest in "sustainable packaging" at the national level. DEQ will also support other organizations in Oregon that are already conducting business outreach and education. Work involving additional sectors, materials, products, or practices will occur following this initial effort.

Summary of Proposed Short-Term Work
- Consult with stakeholders to plan and conduct outreach to reduce e-commerce/ order fulfillment packaging waste in Oregon.

- Consult with stakeholders to leverage and support existing packaging initiatives (such as projects of the Sustainable Packaging Coalition and the Wal-Mart Packaging Sustainable Value Network) that will impact packaging waste generation in Oregon, such as through outreach, research, and collaboration.
- Develop information resource for Oregon businesses regarding bio-based and degradable packaging.
- Continue training and technical assistance to organizations conducting waste prevention outreach to Oregon businesses.
- Update DEQ's on-line Commercial Waste Reduction Clearinghouse.

Focus Area 3: Consumer Education
Consumption and consumer behavior is a core cause of waste generation and its associated environmental impacts. In this focus area, DEQ plans to help Oregon consumers understand meaningful opportunities for reducing environmental impacts through waste prevention, and to voluntarily translate that understanding into action.

DEQ will review a broad list of waste prevention options for their environmental benefits, so that we can focus on options that make the biggest difference while de-emphasizing activities where waste prevention benefits are small and/or offset by larger negative impacts in other environmental media. Using a community-based social marketing framework, DEQ will evaluate perceived barriers and benefits to desired waste prevention behaviors. Using results of this research, consultation with interested and potential partners will be undertaken to develop and then implement a more detailed outreach plan. Due to resource limitations and the timing of other projects, most of this work will be deferred for several years.

Summary of Proposed Short-Term Work
- Update content of DEQ's web site, including information on the environmental impacts of materials and waste.
- Support local government, waste industry, and media activities in this area.

Focus Area 4: Foundation Research and Analysis
Ongoing research and analysis will improve DEQ's effectiveness in preventing waste. DEQ will continue to research changes in and causes of waste generation. DEQ will also continue to build capacity in Oregon around environmental analysis of materials and wastes. Also under this Strategy Framework, DEQ will conduct special studies including but not limited to an evaluation of the impact of waste prevention on Oregon's economy. In addition, DEQ will support well-thought-out "innovation" proposals, which might demonstrate the potential of new areas worthy of additional focus, as resources allow. Collectively, these research and analysis efforts are referred to as "foundation" because they relate to the whole Strategy Framework, as opposed to one specific sector.

Summary of Proposed Short-Term Work
- Conduct a study of the impact of waste prevention on Oregon's economy.
- Conduct limited internal capacity building to enhance DEQ's ability to evaluate the environmental impacts of materials and wastes.
- Commission a special study of the environmental impacts of packaged vs. non-packaged drinking water, and distribute the results as appropriate.

General Implementation Activities
DEQ will manage the budget and resources necessary to successfully implement work performed under this Strategy Framework, and periodically undertake a review and evaluation of progress, barriers, and challenges to date. DEQ will also provide necessary training for staff to ensure consistent understanding of the Strategy Framework, its goal, objectives, and activities; undertake an internal review of the 2% recovery credit program; update and maintain outreach materials; and integrate waste prevention considerations into new policy development activities, including product stewardship initiatives, when appropriate.

Appendix A:
Project History, Statutory Authority, and Integration with Other DEQ Actions

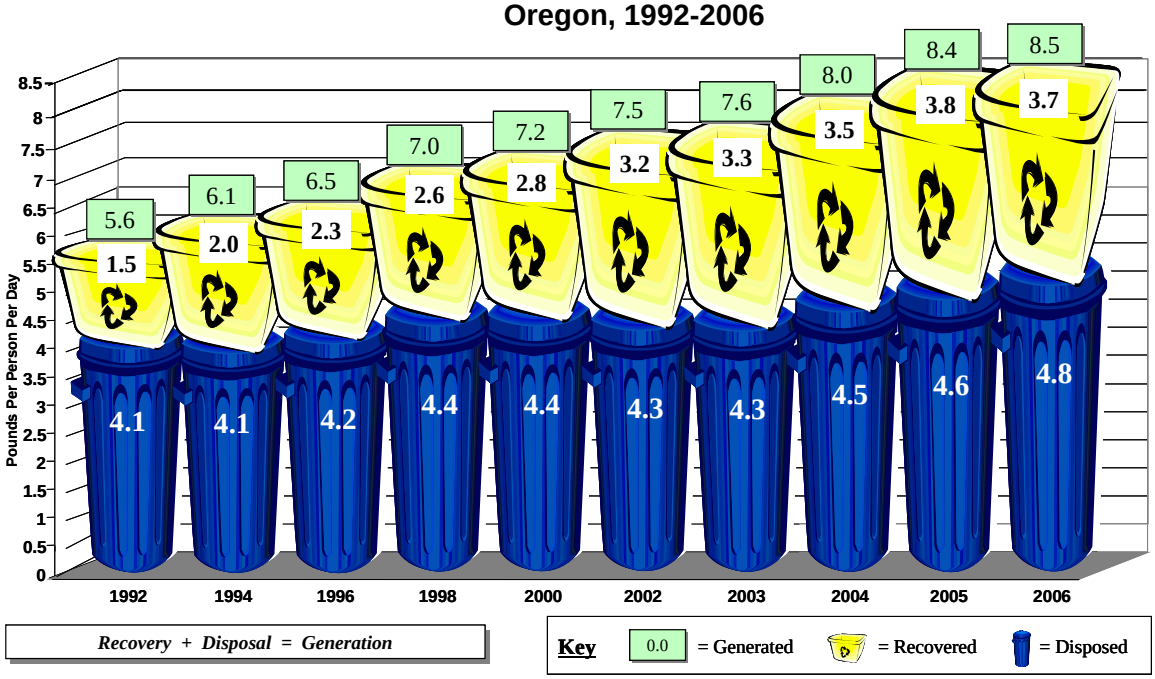
This appendix provides a short history of DEQ's project to develop a Waste Prevention Strategy Framework, summarizes relevant statutory authority, and describes how the Strategy Framework is integrated with other DEQ actions to prevent and manage solid waste.

Why a Waste Prevention Strategy Framework?

After solid waste generation goals were written into Oregon law in 2001, the Oregon Department of Environmental Quality's (DEQ's) Solid Waste Program identified a need to develop a strategy for how it might best help the State achieve these goals. DEQ intentionally delayed development of the Strategy Framework by several years in order to first develop more experience with a variety of efforts to prevent waste. The period 2001 – 2006 saw several waste prevention projects managed by DEQ, as well as a variety of projects funded through DEQ's solid waste grants program. Some of these projects were highly successful, but many were limited to short-term efforts, and projects were not coordinated into a larger strategy.

Figure 1 graphically illustrates the growth in waste generation in Oregon.

Figure 1.
Per-Capita Waste Generation, Recovery and Disposal in Oregon, 1992-2006



By late 2005, when development of this Strategy Framework got underway, the need to develop a Strategy Framework was clear:

- Total generation of solid waste grew 70% between 1993 and 2005.
- Per-capita generation of solid waste grew 43% between 1993 and 2005.

- Approximately 50 – 80% of the increase is likely caused by increasing consumption and use of resources.[5] (The remaining 20 – 50% of the reported increase is due to inconsistencies in reporting and shifts in how wastes are handled and reported.)
- By most measures, production of goods (a corollary of consumption) has significantly greater environmental impacts than the disposal of those goods as waste.
- Increasing consumption and production of materials, as observed through the increase in per-capita waste generation, has large environmental ramifications. For example, analysis for the Governor's Advisory Group on Global Warming in 2004 demonstrated that achieving the statutory waste generation goals is a key contributor to returning greenhouse gas emissions to 1990 levels. This analysis likely underestimated the greenhouse gas impacts of production of several materials, as well as the benefits of prevention. Earlier this year, the Oregon Legislature adopted goals to reduce greenhouse gas levels to 10 percent and 75 percent *below* 1990 levels by 2020 and 2050, respectively.

Oregon statute identifies waste prevention and reuse as priority methods for managing solid waste. The importance of waste prevention and reuse has been affirmed on several occasions. Since 1994, all of the major policy reviews of DEQ's Solid Waste Program have directed DEQ to focus work at the top of the waste management hierarchy – reduce the generation of solid waste, not just recycle and dispose of it. Specifically:

- In 1994, the Environmental Quality Commission adopted the state's 10-year solid waste management plan. This plan clearly identifies reducing waste generation as a top priority.
- The DEQ Waste Policy Leadership Group, an external stakeholder solid waste policy advisory group, in 2000 recommended that DEQ's solid waste program increase its focus on waste prevention and reuse.
- In 2001, the Legislature established statewide goals to curb the generation of per capita waste by 2005 and ultimately by 2009 stop the growth of overall waste generation.[6]

ORS 459A.005 states Oregon's waste generation goals. They are:

1) for calendar year 2005 and subsequent years, no annual increase in per capita municipal solid waste generation; and
2) for calendar year 2009 and subsequent years, no annual increase in total municipal solid waste generation.

Oregon did not meet its waste generation goal for 2005 or 2006, as per-capita generation rose 4.6% and 2.2% over the previous years, respectively.

In addition, preventing waste generation supports DEQ's mission to "be a leader in restoring, maintaining and enhancing the quality of Oregon's air, land and water." Waste prevention also supports all four of the DEQ's strategic directions, especially "promoting sustainable practices" and "involving Oregonians in solving problems," as well as "improving Oregon's air and water" and "protecting people and the environment from toxics."

[5] This only applies to the increase in per-capita generation between 1993 and 2002. The period 2002 – 2005 cannot be modeled until the 2005-2006 waste composition study is completed.

[6] In Oregon law, "waste generation" includes waste that is disposed and recovered (recycled, composted, and burned for energy).

Statutory Responsibilities and Authority
Waste prevention and the need to reduce waste generation are addressed in several different sections of statute. Highlights include the following:

ORS 459.015(1) notes that "there are limits to Oregon's natural resources and the capacity of the state's environment to absorb the impacts of increasing consumption of resources, increasing waste generation and increasing solid waste disposal . . . (and) it is in the best interests of the people of Oregon to conserve resources and energy by developing an economy that encourages waste prevention and recycling."

ORS 459.015(2) states that it is the policy of the State of Oregon to establish priority methods for managing solid waste, with reducing generation as the *first* priority, followed by reuse, and only then followed by recycling, composting, and energy recovery. This statute also states that Oregon's statewide program for managing solid waste should "Promote means of preventing or reducing at the source, materials which otherwise would constitute solid waste" and "Encourage utilization of the capabilities and expertise of private industry."

ORS 459.025 spells out the general powers and duties of DEQ with respect to solid waste. DEQ is directed to "promote and coordinate research, studies and demonstration projects on improved methods and techniques in *all* phases of solid waste management." (emphasis added) DEQ is authorized to enter into agreements with others to carry out the policy direction above (and other portions of statute).

ORS 459A.010 establishes statewide waste generation goals, as discussed earlier. ORS 459A.010 also includes "2% recovery rate credits" as incentives for local governments to implement waste prevention, reuse, and home composting educational activities.

Overview of Waste Prevention Strategy Framework Development
In November 2005, staff prepared a draft workplan for development of DEQ's Waste Prevention Strategy Framework. This draft workplan was announced to a variety of potentially interested parties, from whom DEQ invited comments. Comments on the draft workplan were carefully considered and the workplan was revised. In December 2005, DEQ's Solid Waste Program Management Team (PMT) approved the revised workplan. It was approved by the Land Quality Division Administrator in January 2006.

DEQ convened a project Steering Committee to help develop the draft Strategy Framework. Steering Committee members include David Allaway and Jan Whitworth (of DEQ's Solid Waste Policy & Program Development Section, and also co-managers of the project), Leslie Kochan (DEQ Northwest Region), Meg Lynch (Metro), Mike Riley (reSource [Bend]) and Julie Daniel (BRING [Eugene]). The Steering Committee met nine times in 2006 and 2007 (five times in person and four times by conference call).

The Steering Committee's early effort focused on background research and discussing possible ideas for eventual inclusion in the Strategy Framework. Specifically, eight research reports were drafted and discussed with the Steering Committee. The reports address the following topics:
1. How waste generation has changed and the possible causes of these changes;
2. The relationship between waste prevention, generation, consumption and broader environmental concerns;
3. State of Oregon waste prevention efforts to date;
4. Local government waste prevention efforts to date;

5. Waste prevention/reuse "infrastructure" provided by nongovernmental organizations (NGOs) in Oregon, with a focus on edible food rescue, building material reuse, computer/electronics reuse, clothing/household goods reuse, and educational efforts;
6. Waste prevention opportunities and barriers in the for-profit business sector;
7. Waste prevention initiatives outside of Oregon (both domestic and international);
8. Product stewardship as a tool to achieve waste prevention.

Reports are available on-line at http://www.deq.state.or.us/lq/sw/wasteprevention/wpstrategy.htm and are summarized in Appendix B.

In November and December 2006, the Steering Committee developed an internal draft of the Strategy Framework. This draft underwent several rounds of revisions and was released to the public as a first draft in February 2007. DEQ took comments and held two public meetings on the draft Strategy Framework in February and March. All feedback was reviewed by staff, and a number of substantive changes were made to the document. The revised version was then recommended for adoption by DEQ's Solid Waste PMT, and DEQ's Land Quality Division Administrator, after consulting with DEQ's Regional Division Administrators, adopted the Strategy Framework in November 2007.

Relationship with Other DEQ Activities

Major DEQ activities in recent years to reduce waste generation include the following:

- "Focus area" grants. Prior to 2000, less than 15% of solid waste grant funds went to projects with a significant waste prevention element (including "pure" waste prevention, reuse, and/or home composting). Between 2000 and 2005, however, approximately 60% of solid waste grant funds have gone to these types of projects.
- Administration of the 2% recovery rate credit program, which has caused some local governments to increase education around waste prevention, reuse, and/or home composting.
- A variety of special projects, including:
    - The Resource Efficiency Program (1996 – 2000), which helped five Oregon communities offer waste prevention and energy and water conservation technical assistance to small- and medium-sized businesses.
    - The Northwest Materialsmart promotion of materials exchanges (2002).
    - The Packaging Waste Prevention Project (2002 – 2005), which demonstrated waste prevention benefits and potential in several area businesses, and developed a variety of educational tools. This project, along with work for the Governor's Advisory Group on Global Warming, also involved the development of some life cycle analysis tools that have been used to examine the environmental benefits of waste prevention.
- Technical assistance, outreach, and web presence.

The Waste Prevention Strategy Framework is intended to inform the eventual update to Oregon's Integrated Resource and Solid Waste Management Plan. This Plan, which is mandated by statute, expired in 2005 and has not yet been updated. When it is updated, DEQ intends that the Waste Prevention Strategy Framework – along with relevant background research – will form the basis for waste generation and waste prevention portions of the Plan.

The Waste Prevention Strategy Framework also relates to DEQ's recently developed Household Hazardous Waste (HHW) Management Plan for Oregon (2005 – 2011). The HHW Plan strengthens Oregon's efforts to reduce the toxicity of waste generated in Oregon, through prioritization of targeted materials, products and wastes, behavior-change efforts to reduce the use and generation of hazardous products and wastes, and product stewardship efforts to reduce the toxicity of materials in the market. Organizationally, efforts to reduce the toxicity of solid waste in Oregon fall under the bailiwick of the HHW Plan, while this Waste Prevention Strategy Framework focuses more on the statutory goals of quantity (mass) and associated environmental impacts.

Appendix B:
Summary of Research Results

Waste prevention is not as well understood as other elements of the solid waste management hierarchy.[7] In order to base the Waste Prevention Strategy Framework on facts (where available), rather than conjecture, DEQ conducted a fairly thorough research effort. The purpose of this research was to better understand relevant conditions in Oregon as well as the types of options that might be appropriate to consider during development of the Strategy Framework.

Some of this research was conducted by DEQ staff, and some was conducted on DEQ's behalf by a team of contractors led by Cascadia Consulting Group.

Research was divided into the following topics, and results are organized around a series of eight "Background Papers", as follows:

1. How waste generation has changed and the possible causes of these changes.
2. The relationship between waste prevention, generation, consumption and broader environmental concerns.
3. State of Oregon waste prevention efforts to date.
4. Local government waste prevention efforts in Oregon.
5. Waste prevention/reuse "infrastructure" provided by nongovernmental organizations (NGOs) in Oregon, with a focus on edible food rescue, building material reuse, computer/electronics reuse, clothing/household goods reuse, and educational efforts.
6. Waste prevention opportunities and barriers in the for-profit business sector.
7. Waste prevention initiatives outside of Oregon (both domestic and international).
8. Product stewardship as a tool to achieve waste prevention.

Reports have been published as a series of "Background Papers" and are available on-line at http://www.deq.state.or.us/lq/sw/wasteprevention/wpstrategy.htm. This Appendix provides a summary of key findings from the research effort.

Waste Generation in Oregon: Composition and Causes of Change

Per-capita generation, as reported by DEQ, grew 43% between 1993 and 2005. Background Paper #1 evaluates how this growth occurred, and the reasons behind it.

DEQ estimates waste generation through combining estimates of disposal and recovery, while the U.S. EPA, in contrast, models generation as a function of production, exports, imports, and assumptions regarding the lifetime of packaging and consumer products. EPA states that per-capita generation of MSW, during the same time period studied by DEQ, has been essentially flat. However, EPA's definition of MSW excludes construction and demolition materials, which are responsible for much of Oregon's observed increase. On a material-by-material basis, most other differences between DEQ's and EPA's estimates can be explained by inconsistencies in counting and reporting.

Excluding C&D debris, the EPA holds that the U.S. economy produced less solid waste per unit of personal consumption expenditures (PCE) in 2000 than it did in 1990. This suggests that waste generation (excluding C&D) is, at least partially, de-linking from economic growth. In fact, had the historic (1960 – 1994) relationship between PCE and municipal solid waste (MSW) generation remained constant, MSW would have been 25% greater in 2000 than it was observed to be. EPA

[7] For the purpose of this document and the larger Strategy Framework, "waste prevention" is used to refer to any activity that reduces the amount of solid waste generated (collected for recovery [recycling or composting] or for final disposal in landfills or waste incinerators). It includes home composting, reuse, and "pure" waste prevention (using less).

attributes this change to source reduction in a variety of material categories, especially yard debris, packaging, and paper. Put differently, 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.

Based on DEQ and EPA data, waste generation in Oregon appears to have grown most rapidly among the following materials:

- construction, remodeling and demolition wastes (including lumber and roofing);
- yard debris;
- plastics;
- durable goods such as home furnishings, electronics, and clothing; and
- scrap metal (although most of this increase appears to be associated with inconsistencies in reporting);

DEQ evaluated 16 different hypotheses that might explain why per-capita generation in Oregon grew so steeply during the period 1993 – 2002.[8] For each hypothesis supported by evidence, DEQ also attempted to estimate the magnitude of its contribution to the rise in waste generation.

It appears that 11 – 19% of the increase in per-capita generation can be attributed to changes in the reporting of waste data, particularly scrap metal reported through DEQ's annual material recovery survey. These increases are not real, but rather an artifact of inconsistencies in data collection and interpretation.

An additional 5 – 20% of the total increase in per-capita generation can readily be explained as waste management has shifted away from "non-counting" methods such as burning and home composting and toward "counting" methods such as centralized composting and landfilling. These shifts represent an increase in "waste generation as it is counted," but do not represent a real increase in material use, consumption, or "wasting" behavior. This estimate (5 – 20%) may be low, due to insufficient data.

The remaining growth in per-capita generation – perhaps 50% to 80% of the observed increase – appears to be caused by real increases in waste-generating activities and materials use. Oregonians are, in fact, producing greater discards per person (on average) than we were in the early 1990s. An increase in the generation of building-related wastes (construction, renovation, and demolition debris) appears to be a significant factor, and one that will continue to be of import into the future. Because most building-related waste results from renovation and demolition activities (as opposed to construction), the majority of building materials consumed don't end up as wastes until years or decades after construction. Today's building wastes are largely materials that were purchased and installed years or decades ago. As today's new homes are becoming larger and are potentially even more material-intensive, this portends the possibility of even higher generation of waste in the future, once these buildings eventually undergo renovation and demolition.

Besides increasing waste from buildings, 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.

In addition, real generation of yard debris (leaves, grass, prunings) may also be up although theorized causes of this increase were not confirmed.

[8] Data was insufficient to allow for evaluation of growth in 2003 and subsequent years.

Through this research effort, several popular hypotheses were either disproved or lacked sufficient evidence to be substantiated. For example, the installation of scales at rural transfer stations (replacing volume-based reporting) was not found to have a definitive contribution to rising waste generation (as reported to DEQ). The theory that in-sink food disposal has decreased was also not substantiated. No data was available regarding changes in on-site stockpiling of wastes. And while many Oregonians believe that packaging waste is growing dramatically (and it is for a few types of packaging), the overall trend for all packaging in aggregate, while unclear, appears to be relatively flat, with an increase in the number of packages used offset by lightweighting of packaging.

Environmental Considerations

Background Paper #2 examines the environmental benefits and trade-offs associated with waste prevention. It summarizes existing literature that addresses the connections between waste prevention and sustainability issues; identifies potential measurement tools that could be incorporated into Oregon's Waste Prevention Strategy Framework; compares the relative benefits of waste prevention to other environmental strategies, such as recycling; and examines benefits of waste prevention that particularly affect Oregon.

While waste prevention is sometimes promoted as a method to conserve landfill space and reduce landfill impacts, it more significantly produces benefits that address a host of environmental problems confronting Oregon, including climate change, natural resource depletion, pollution, and water use. By reducing material consumption, waste prevention avoids significant negative impacts upstream and downstream from the consumer at all lifecycle stages: resource extraction, manufacturing, use, and disposal.

Waste prevention can lead to significant benefits in terms of greenhouse gas reductions, conservation of energy, reduced generation of industrial wastes, reduced pressure on biological capacity, reduced depletion of non-renewable resources, and prevention of toxic releases. 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 have relatively little to do with avoided disposal impacts, but rather are primarily the result of reduced impacts in resource extraction and manufacturing.

However, there are some important environmental caveats:

- Waste prevention is a useful tool for environmental protection, but 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 can benefit Oregon's environment, many of the environmental benefits of waste prevention are typically global in nature and don't fit neatly inside Oregon's borders.
- While waste prevention is typically the environmentally preferable choice, there can be trade-offs 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 discussed in Background Paper #2 as accounting models that DEQ might use. Several of these tools are undergoing rapid development and improvement, already enabling more robust and sophisticated analyses than were available when Background Paper #2 was written.

Experience with Waste Prevention – State of Oregon, Local Governments, Non-Profits, and Businesses

The next four Background Papers explore waste prevention in Oregon. Background Paper #3 addresses DEQ's recent experience with waste prevention, including grants and special projects. Background Paper #4 reports on waste prevention from the Oregon local government perspective. Waste prevention/reuse "infrastructure" provided by nongovernmental organizations (NGOs) in Oregon, with a focus on edible food rescue, building material reuse, computer/electronics reuse, clothing/household goods reuse, and educational efforts, is the topic of Background Paper #5. Background Paper #6 explores waste prevention from the perspective of businesses.

Several barriers and challenges were identified that are common to all sectors. These include the following:

- 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, and/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 used materials (reuse), 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. One of DEQ's ongoing efforts with waste prevention in recent years has been the solid waste "focus area" grants. Prior to 2000, less than 15% of regular solid waste grant funds went to projects with a significant prevention component. Since 2000, about 60% of funds have gone to projects with a significant prevention component. Most of these grants have focused on reuse (primarily building materials, edible food rescue, and consumer electronics), with some home composting projects and relatively few "pure" waste prevention projects. Grant-funded projects have varied widely in terms of the quality of evaluation and measurable outcomes.

Another DEQ activity mandated in statute is the 2% recovery credit program, which creates incentives for local governments to implement home composting, reuse, and waste prevention programs. It appears that the 2% credits have led some local governments to increase outreach around home composting, reuse, and/or prevention. However, there has been little evaluation of the effectiveness of these efforts, and confusing statutory language and interpretation of credit applications may generate some confusion about waste prevention.

DEQ has conducted a number of special projects to help move the state up the solid waste management hierarchy, including the promotion of materials exchanges via Northwest Materialsmart (2001), the community-based Resource Efficiency Program (1996 – 2000), and the Packaging Waste Prevention Project (2002 – 2005). These last two projects both involved provision of technical assistance to business waste generators. Both generated significant financial savings for businesses and some compelling case studies.

The Governor's Advisory Group on Global Warming's recommendations to the Governor depend on achievement of the statutory waste generation goals in order for Oregon to stabilize greenhouse gas emissions. DEQ's work in support of the Governor's Advisory Group, as well as the Packaging Waste Prevention Project, also involved the development of some life cycle analysis tools that have been used to examine the environmental benefits of waste prevention. DEQ has a new performance measure that could involve tracking the greenhouse gas emissions associated with the life cycles of materials generated as solid waste in Oregon.

Among **local governments** in Oregon, most waste prevention activities are concentrated in urban centers and along the I-5 corridor, although essentially all communities have adopted pay-as-you-throw pricing mechanisms for garbage in which waste generators pay a variable rate for their garbage based on the quantities they throw away. Other activities by local governments tend to focus on education, although several communities subsidize the distribution of home compost bins and many provide promotion and in some cases financial support of local reuse service providers. There has been little effective evaluation of program outcomes by local governments. 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.

Specific to the **nongovernmental (NGO)** reuse and waste prevention **infrastructure in Oregon**, DEQ's consultant reviewed five sectors: edible food rescue, building material reuse, computer/electronics reuse, clothing/household goods reuse, and educational efforts. Detailed findings for each sector are contained in Background Paper #5. Broadly speaking, the consultant confirmed that material reuse is 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 good reuse. Computer and electronics reuse can also expand if tied to other efforts such as e-waste recycling and expansion of technology access.

Interviewees in all areas stressed the importance of skilled and professional leadership and entrepreneurial approaches among nongovernmental infrastructure providers. Strong leadership can also help counter a reported perception – whether justified or not – that nonprofits lack professionalism. This perception can hamper progress if organizations are overlooked for contracts or funding. DEQ's consultant recommended that State support for infrastructure providers is likely to be most cost-effective if focused on capital improvements and reuse-friendly policy.

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 (BMPs) in various business sectors. Existing adoption rates vary widely across BMPs and sectors. Outreach programs to businesses in Oregon have reported businesses adopting waste prevention recommendations at rates ranging from 20% to 67% (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. A number of techniques have been developed to improve the effectiveness of outreach programs at increasing adoption of waste prevention BMPs among participating businesses.

Experience Outside of Oregon

Background Paper #7 evaluates leading waste prevention programs outside of Oregon (both domestic and international), while Background Paper #8 evaluates product stewardship as a waste prevention tool.

The review of waste prevention programs outside of Oregon identified that while many different approaches have been tried by governments to prevent waste, nearly all have suffered from lack of evaluation of outcomes.

Product stewardship approaches, in theory, can have significant waste prevention potential, depending on the products targeted and the 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. Generally speaking, Europe is far ahead of the United States in terms of documenting environmental impacts and developing efforts around "sustainable consumption", of which waste prevention is one element. This is also true of product stewardship.

Based on the review of programs outside of Oregon, DEQ's consultant 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/or 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, NGOs and other stakeholders are critical for the successful development and implementation of waste prevention programs. Those ultimately responsible for changing their production or consumption patterns need to be involved when programs are being developed; otherwise the programs won't gain the support necessary for effective implementation.