



State of Oregon Department of Environmental Quality
Materials Management Program

Strategic Plan for Measurement, 2021-2050

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Introduction and purpose

Measurement in a general sense – the quantification or cataloguing of things or activities – is a constant part of any government agency’s work. But for the Materials Management program (MMP) of the Oregon Department of Environmental Quality, measurement has a special importance.

MMP is tasked by the state’s Environmental Quality Commission with realizing a far-reaching vision for sustainability, the *2050 Vision and Framework for Action*.¹ MMP must use formal measurements of the state’s environment, communities, and impact on the wider world to mark progress towards that *Vision*, and to provide intelligence on how to progress further.

This document provides direction for the use of measurements by MMP in the years 2021-2050. It asserts that measurement work must embody certain principles, and that a general cycle of measurement activity should connect MMP’s specific, localized activities to its concerns for the whole state.

The relationship of mission and measurement

The *2050 Vision* describes a world where:

Recognizing that Earth’s resources are finite, Oregonians live within the limits of our sustainable share of the world’s natural resources. We make and use materials and products in a manner that maintains and restores a healthy environment and fertile soils. Materials and products minimize the use and release of toxins, the release of greenhouse gases and pollutants, the use of energy and water, and the extraction of nonrenewable materials.

We take into account the full impacts of materials throughout their life cycle. We minimize harmful disturbance of land and natural ecosystems, using resources in a responsible way only as necessary to meet human needs and maintain healthy, vibrant and prosperous communities. When materials and products are no longer useable or wanted, they are recovered for their next highest and best use.

We use renewable resources at levels that can be sustained in perpetuity while maintaining the resiliency of natural systems. Wherever they are made, the materials and products we purchase in Oregon similarly are made in a manner that supports human health, well-being and healthy, resilient environments and communities.

¹ Oregon Department of Environmental Quality, “Materials Management in Oregon: 2050 Vision and Framework for Action,” 2012, <http://www.oregon.gov/deq/FilterDocs/MManagementOR.pdf>.

All Oregonians have access to the knowledge, capabilities, resources and services required to use materials responsibly. This Vision provides for a prosperous and clean economy that allows all people to live fulfilling lives, now and in the future.

These words paint an inspiring picture, but converting them to reality is an immense task. The *Vision's* Oregon of 2050 is worlds away from the one of 2021. Huge changes are involved in this transition – in the ways Oregonians relate to materials, the environment and each other.

Realizing the *2050 Vision* involves numerous practical challenges.

- Transformations of the *Vision's* import cannot be realized by MMP staff on their own. Over the decades, nearly every government agency, community, and individual in the state must be engaged.
- Information is never perfect, and conditions change. “We must be adaptable to succeed,” advises MMP’s 2020 update to its *Framework for Action*.²
- The scope of the *Vision* is broad enough that there are thousands of possible activities that might be initiated to pursue it – but MMP cannot do them all. MMP must prioritize.
- There is a difference between the scale at which MMP wants to affect change (the whole state of Oregon) and the scale at which it can practically work (with specific communities, industries, statutes, etc.). These scales must be logically connected.

MMP’s measurement system, as described in this document, addresses these fundamental challenges. This measurement system provides an *objective basis for action*, informing MMP’s priorities, strategy and direction.

In particular, it answers central questions in the field of environment and sustainability – for example, “what are Oregon’s high-impact materials and processes?” – in a straightforward way. Negative and unexpected results are as valued as positive ones, because MMP is interested in understanding the facts. It informs crucial decisions about *what to work on and who to work with*, winnowing the huge field of possible projects down to the most promising candidates. And it endeavors to bridge the gulf between everyday work and ultimate purpose.

The roles of measurement

Much of MMP’s work involves measurement, which consumes resources of time, labor, money and attention. In the years 2021-2050, MMP commits significant resources to measurement only when it fulfills one or more of these roles:

- To evaluate and illustrate Oregon’s progress (or lack thereof) towards the state described in the *2050 Vision*;
- To identify the best opportunities to act to reduce environmental impacts;
- To evaluate the success, performance or relevance of MMP’s activities; or
- To fulfill requirements in the law.

Measurements which do *not* embody one or more of the roles above are deprioritized or dropped. For example, some measurements may have no clear relationship to the *Vision*. Others may be too theoretical or too detailed to provide a realistic basis for action.

² Oregon Department of Environmental Quality, “Materials Management in Oregon: 2020 Framework for Action,” 2020, <https://www.oregon.gov/deq/mm/Documents/mmFramework2020.pdf>.

A historical example

The challenge MMP faces is to use measurements in a cohesive way, funneling overarching concerns into workable projects, checking for signs of progress, and maintaining relevance to the *Vision* – all over a period of years. Fortunately, MMP’s own history provides positive examples of that pattern.

One such example is MMP’s work on housing. As described by longtime MMP staffers, this work illustrates a logical progression of activities, where big-picture research is funneled down into practical projects with engaged partners. MMP’s work is evaluated on the local project level, but always with the intention of connecting that work to statewide totals.

The effort began in the 2000’s, when there was widespread acknowledgment that Oregon’s greenhouse gas emissions were too high. There was a desire to use materials management principles to reduce them.

Multiple large-scale greenhouse gas inventories, such as US EPA’s national inventory,³ and Oregon DEQ’s own Consumption-Based Emissions Inventory,⁴ identified economic sectors with high greenhouse impacts, among them buildings, food, health care and electronics.

Within MMP, discussion on the practicality of projects in those high-impact areas led to a focus on buildings and food. In the area of buildings, MMP partnered with Earth Advantage, Inc. (an advocate for sustainable housing) and the Oregon Home Builders Association (an industry group) to design and commission a life cycle assessment to investigate factors contributing to the environmental impacts of housing. The results⁵ indicated that dwelling size was a powerful factor influencing impacts.

Based on the finding about dwelling size, MMP coordinated and contributed to a community working group advancing “space efficient housing” in Portland, most notably accessory dwelling units (ADUs). Over several years, the number of ADUs permitted in Portland climbed dramatically,⁶ and Portland’s example began to be cited by other cities and think tanks, objectively communicating the success of MMP’s effort.

At this point, MMP withdrew from the space-efficient housing working group to focus on other building-related topics, but as the decades pass, MMP will look to see if its work on housing is reflected on a statewide level – for example, in lower-than-expected GHG emissions numbers for housing in future Consumption-Based Emissions Inventories.

³ United States Environmental Protection Agency, “Inventory of US Greenhouse Gas Emissions and Sinks: 1990-2005,” 2007, <https://www.epa.gov/sites/production/files/2015-12/documents/07cr.pdf>.

⁴ Most recent version at 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>.

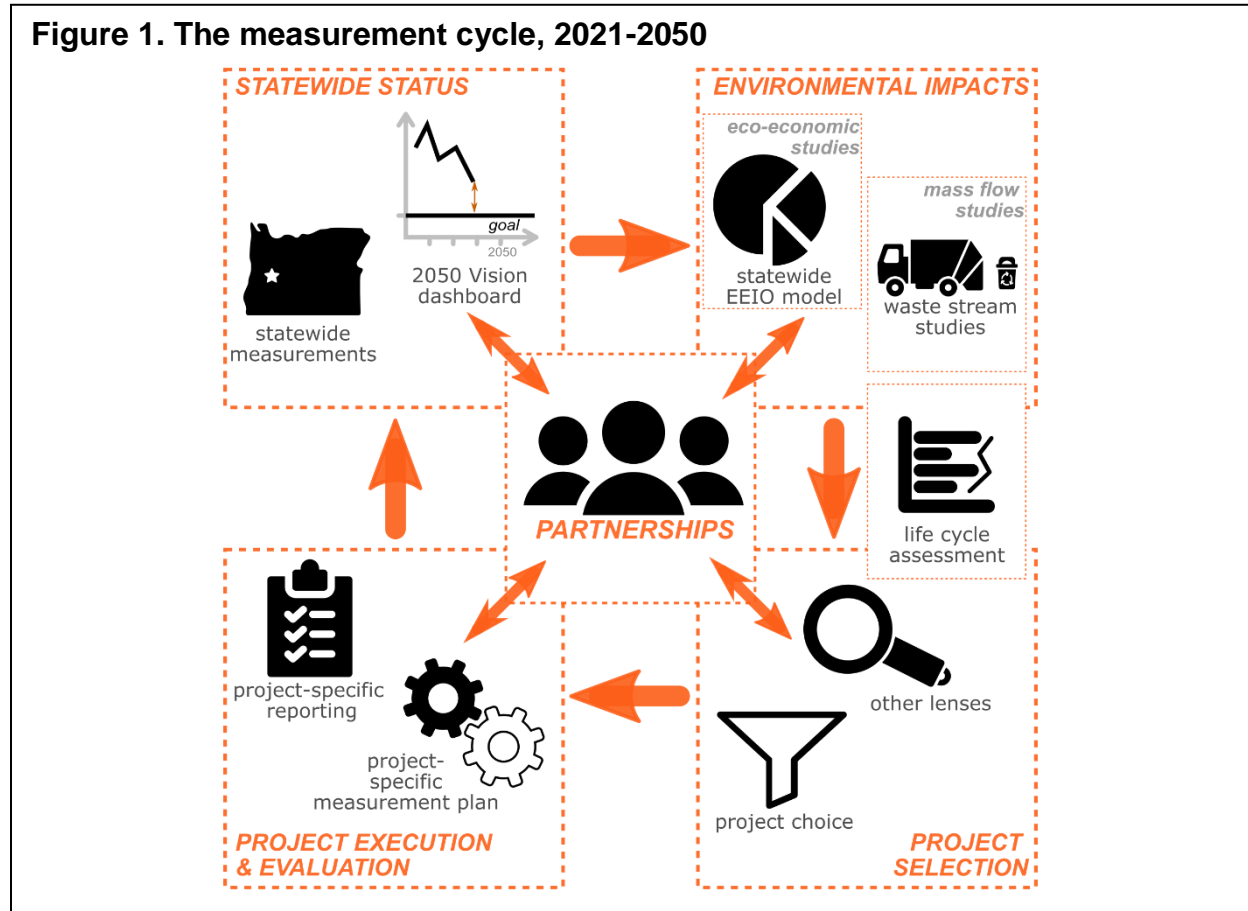
⁵ Quantis et al., “A Life Cycle Approach to Prioritizing Methods of Preventing Waste from the Residential Construction Sector in the State of Oregon,” September 29, 2010, 222.

⁶ Kol Peterson, “The Ascent of ADUs in Portland,” *Accessory Dwellings* (blog), February 27, 2017, <https://accessorydwellings.org/2017/02/27/the-ascension-of-adus-in-portland/>.

The measurement cycle

In the years 2021-2050, MMP’s measurement work builds on and formalizes the pattern described in the historical example. Measurement activity follows a cycle that is illustrated schematically in Figure 1 and described in detail below.

This cycle is a loose framework, not an inflexible lockstep. There are times when some elements of the cycle occur simultaneously, or out of the specified order. The important point is that measurement is used conscientiously to engage partners, pursue the *Vision*, and relate everyday work to ultimate mission.

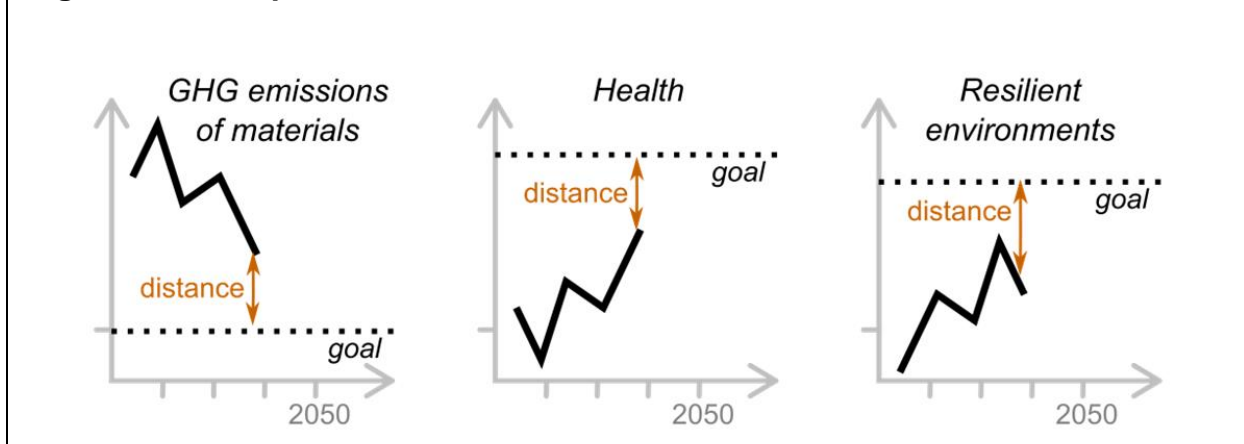


Evaluating statewide status

To pursue the *Vision*, MMP must understand where Oregon currently stands in relation to the conditions desired for 2050. For which of the *Vision*’s themes (health, prosperity, environmental impact, etc.) is Oregon close to success, and for which themes is much improvement necessary? Are there any areas where no change is necessary? Such comparisons help define priorities.

The primary tool for this work is the “**2050 Vision Dashboard**,” a collection of timeline charts expressing each theme of the *Vision* with one or more objectively measured variables. A mockup of the dashboard appears in Figure 2, but the real dashboard has as many as a dozen charts.

Figure 2. Mockup of the 2050 Vision Dashboard



The dashboard has several important qualities.

- It represents the *whole state*. Its data all come from credible statewide measurements.
- It contains two kinds of values: (i) historical and current values, and (ii) goal values indicating desired levels for 2050.
- It relies greatly on data and expertise contributed by partnerships – for example in the areas of health, prosperity, habitat, and so on. MMP is concerned with such themes because they figure prominently in the *Vision* – but MMP acknowledges it is not expert in them. Creating and updating the dashboard is a key way that MMP engages partners and comes to understand their perspectives.
- It is adaptable. The choice of individual charts, and the goal values in them, are not set in stone – they are adjusted as understanding of the issues improves.
- It requires specificity about abstract concepts. The *Vision* often speaks in aspirational terms, without specifically defining them, for example “sustainable share” and “resilient environments.” Creating and updating the dashboard forces MMP and its partners to interpret those terms in measurable ways – and to thereby work together to create a shared concept of Oregon’s future.

The 2050 Vision Dashboard should be differentiated from another periodic assessment associated with Oregon DEQ. Every year, DEQ submits “Key Performance Measures” to the Oregon legislature,⁷ reporting on a dozen or so metrics including DEQ’s work efficiency (e.g. “permit timeliness”) and air quality conditions (e.g. “diesel emissions”). These “Key Performance Measures” do not represent the breadth of concerns in the *Vision*, so MMP supplements them with its Dashboard until the two perspectives are united.

Quantifying environmental impacts

The next part of the cycle addresses the *Vision*’s repeated emphasis on the environmental impacts of materials. Environmental impacts are comprehensively addressed with a mix of studies using different scales and methods. Used together, these studies begin the process of funneling statewide concerns into strategically chosen, manageable projects.

- The broadest picture of environmental impacts is provided by **eco-economic studies**, for example an environmentally-extended input-output analysis (EEIO). The EEIO – a successor to MMP’s Consumption-Based Emissions Inventory – provides a breakdown of the total environmental

⁷ Oregon Department of Environmental Quality, “Oregon DEQ: Key Performance Measure Reports [February 11, 2019],” 2019, <https://olis.leg.state.or.us/liz/2019R1/Downloads/CommitteeMeetingDocument/159220>.

impacts linked to Oregon’s economic activity. It is MMP’s key source for understanding Oregon’s impact on the global environment—knowledge which is clearly demanded by the *Vision*.⁸ The EEIO covers at least a dozen impact categories (GHG emissions, water use, etc.) and informs relevant parts of the dashboard. Its results – for example, that there are high impacts in the areas of food and housing – help reveal potential areas for action. MMP’s 2020 update to the *Framework for Action*⁹ calls for focusing on such “high impact materials and processes.”

- Materials are studied in more detail with **mass flow studies** – for example solid waste studies that quantify the weights and impacts associated with solid waste generation, disposal and recovery. These studies suggest additional areas for action – perhaps materials where impact reductions could be achieved through waste reduction or recovery. It is acknowledged that the scope of waste is considerably smaller than the total scope of materials. For example, calculations by MMP suggest that solid waste represents only about a third of the total impacts of materials. Resources allocated to waste studies are scaled with this reality in mind.
- The most specific tool MMP has for investigating the impacts of materials is process-based **life cycle assessment (LCA)**. When the eco-economic studies, mass flow studies, or MMP’s partners suggest potential areas for action, LCA is used to evaluate specific materials and alternatives in detail. For example, if solid waste studies find that glass beverage bottle disposal has increased, LCA investigates the potential impact changes associated with each of the different recovery and reuse options available for glass – and the prospect of replacing glass with a different material.

LCA has a special role in MMP’s work, because it can serve either as an exploratory research tool or as a testbed for specific project ideas – for example, converting from “recyclable” glass to reused bottles. LCA’s role extends into the next step in the cycle: project selection.

Project selection

So far, potential areas of action (e.g. “food waste” or “building materials”) and specific project ideas (e.g. “reuse bottles instead of recycling or disposing them”) have been identified via environmental impact studies such as EEIO, solid waste studies, LCA work, or all three. This is appropriate because MMP is part of an environmental agency, and the *Vision* repeatedly references specific environmental impacts.

But technical impact statistics are not the only concern when choosing projects. Sheer practicality in terms of logistics, budget, staff time and other resources must be considered. Beyond that, the *Vision* and MMP assert expansive values. For example, the *Vision* calls for human “well-being” and “fulfilling lives,” and MMP’s 2020 update to its *Framework for Action* asserts that “social equity is an environmental issue” and “the needs of all communities inform our work.”

MMP’s partners, for their parts, are often primarily concerned with matters outside the realm of technical environmental impacts. A city government might be concerned with *prosperity* – which is a clear theme of the *Vision*, but not an area of MMP’s expertise.

All such concerns are collectively called “other lenses,” because they serve as tools or viewpoints with which to examine MMP’s proposed areas of action or project ideas, which were generated from an environmental perspective. Perhaps if two projects have equal practicality and environmental value, but only one can be done, then other lenses such as prosperity, fulfillment, or social equity can break the tie.

⁸ The EEIO model is also utilized in a similar way at smaller scales, for example in investigating the supply chain impacts of state purchasing.

⁹ Oregon Department of Environmental Quality, “Materials Management in Oregon: 2020 Framework for Action.”

PROJECT-SPECIFIC MEASUREMENT PLANS

Each project-specific measurement plan answers these questions:

- What data will be collected?
- How will the data be analyzed and reported?
- Which of the four roles of measurement does this work fulfill?
- How can the results help MMP pursue its mission to realize the *2050 Vision*?

The level of detail and statistical rigor in measurement plans varies greatly from project to project. Simple projects have simple measurement plans. For example, MMP might host a one-day tour of low-impact housing types. This project's measurement plan might be as short as four or five sentences:

"After the tour, MMP staff will call 5 attendees and get impressions via open-intended phone interviews. The responses will be summarized in a memo. This measurement fulfills the second role of measurement, identifying the best opportunities to act to reduce environmental impacts, because it helps MMP sense if people find these housing types desirable. In the bigger picture, this work helps test a key assumption of MMP's work toward the Vision: that high quality of life need not necessitate large life cycle impacts."

More complex projects require more complex measurement plans. A million-dollar research contract might be expected to incorporate academic characteristics such as power analysis, professional peer review, and publication of algorithms.

Beyond these common themes, the requirement for project-specific data plans is very flexible.

- Measurement types can vary. Some plans use "hard" data such as engineering outputs, others use "soft" data such as verbal responses. Some plans focus on environmental outcomes (e.g. a study of life cycle impacts for reused appliances). Others focus on MMP's internal performance (e.g. the number of applications received for a grant program encouraging appliance reuse).
- When "negative" or unexpected results occur, it is of no concern. Negative results are as valuable as positive ones, because MMP is honest with itself and others. MMP is not trying to "prove" the merit of particular solutions, it is trying to answer questions.

This project selection effort does not imply that environmental values are more important than the ones expressed by other lenses. MMP's funneling process starts with environmental concerns simply because MMP is part of an environmental agency. In reality, project choice and planning work is iterative, with project ideas evolving as partnerships are worked out, other lenses applied, and LCA studies completed.

The end of the project selection process is a commitment for MMP to work on a specific project.

Project execution and evaluation

This document does not describe the actual operations of MMP's diverse projects over the decades before 2050. But it does assert the relevance and importance of measurement to all of them. In the years 2021-2050, nearly every project of MMP, large or small, has its own ***project-specific measurement plan***, one that is drafted before project operations begin.

This requirement is not onerous, because it is applied in a reasonable and adaptable way, as detailed in the accompanying sidebar. Simple projects require only simple measurement plans – in some cases, just a few sentences. Often no special labor or statistical expertise is required (see example in sidebar). Complex projects require more involved plans. MMP's "goals & measures" staff are available to all project designers for consultations, and give those consultations high priority.

Indeed, project-specific measurement planning markedly *conserves* effort. Planning prevents the labor and expense of unnecessary data-gathering. Its purpose is to encourage project designers to "connect the dots" between day-to-day work and long-term goals. They are obligated to spell out *how they are going to use the data*, and how any results obtained (expected or unexpected) could meaningfully aid MMP's progress towards realizing the *2050 Vision*.

Some of MMP's existing projects have measurement planning built in. When "projects" are ongoing activities like permitting, inspection, or generating statistics required by rule or law, some parts of the measurement plan will be answered by the relevant legal text.

However, in these cases, it is still required to explicitly state which role(s) of measurement the work fulfills, and how the findings contribute to MMP's mission. Addressing these topics occasionally reveals conflicts between the *traditions* MMP follows and the demands of the *mission* that MMP has been given by the Environmental Quality Commission. When such conflicts arise, they are honestly acknowledged and addressed in a straightforward way. When necessary, MMP pursues rule and statute changes so that its obligations are better matched with its mission.

The final step in a project's execution is the production of the report specified by the project's measurement plan. MMP uses this report to draw lessons from its immediate experience – to see if, in this particular instance, the project demonstrates concrete results or insights that aid MMP's mission.

Closing the loop

The final step in the overall measurement cycle is also the first step. After MMP evaluates the reporting from its individual projects, it turns back to the big scale. It reviews statewide measurements, often from its partners, and updates the 2050 Vision Dashboard. This contrast of perspectives – immediate experience vs. statewide statistics – is intentional. Taken together these views allow MMP and its partners to evaluate if the state is moving closer to or farther from the Oregon described in the *2050 Vision* – and to adapt and improve to make greater progress in the future.

Alternative formats

DEQ can provide documents in an alternate format or in a language other than English upon request. Call DEQ at 800-452-4011 or email deqinfo@deq.state.or.us.