Goals, Metrics, and More: Defining Success in Materials Management Symposium

(*SPU Measurement Symposium*)

Summary Report

February 16, 2018

Seattle Public Utilities

700 Fifth Avenue | PO Box 34018 | Seattle, WA 98124-4018 | 206-684-3000 | seattle.gov/util

SPU Measurement Symposium Summary Report

Background and Goals

In preparation for Seattle Public Utilities' (SPU) upcoming Comprehensive Solid Waste Management Plan Amendment, SPU was interested in evaluating how "success" in the solid waste industry is defined and the use of new metrics to better measure and communicate the success of Seattle's solid waste management policies, operations, programs, and services.

SPU was interested in creating a "discussion" around what defines success and new ways to measure that success with both regional and national stakeholders. On November 2, 2017, SPU held a one day, invitation-only Measurement Symposium entitled *Goals, Metrics, and More: Defining Success in Materials Management*. The Measurement Symposium was held at the University of Washington's Center for Urban Horticulture in Seattle, Washington.

SPU hired Cascadia Consulting Group (Cascadia) to help design, prepare, and facilitate the Measurement Symposium.

The primary goals of the Measurement Symposium were to:

- Initiate a dialogue with regional and national stakeholders from across the materials management lifecycle.
- Explore options for defining success in materials management beyond a weight-based recycling rate.
- Identify possible new goals and metrics for inclusion in SPU's upcoming Comprehensive Solid Waste Management Plan Amendment and Annual Recycling Rate Report.

Among the 107 Measurement Symposium attendees, the following sectors were represented:

- Education
- Environmental consulting
- Government departments and agencies (e.g., city, county, state, and federal)
- Grocery
- Non-governmental organizations (e.g., local, regional, national, and global)
- Retail and reuse
- Technology
- Waste haulers and processors
- Waste industry media

Structure of SPU Measurement Symposium Summary Report

A video compilation of the Measurement Symposium is available online at:

- SPU Measurement Symposium Morning Program & Participants: https://youtu.be/Ztbzei-EBmk
- SPU Measurement Symposium Small Group Exercise & Reporting Out: https://youtu.be/IaOT9BcMftg
- SPU Measurement Symposium Afternoon Participants Part 1: https://youtu.be/d6iu1Pui9GU
- SPU Measurement Symposium Afternoon Participants & Panel Discussion Part 2: https://youtu.be/Xn1n5gDIDFY
- SPU Measurement Symposium Morning Panel & Afternoon Full Panel Discussion: https://youtu.be/Bkd75wbFhzU
- **Playlist:** https://www.youtube.com/playlist?list=PLO5EstoEwik2EOAmjpYk58yD68x53ZySd

Approach

The Cascadia team worked closely with SPU staff and speakers to design an informative, thought-provoking, and interactive event that would stretch participants' thinking and encourage greater collaboration across the supply chain. The hope was to create a discussion that would lead to future actions, including deep-dives into future topics and the development of strategies that would inform SPU's Comprehensive Solid Waste Management Plan Amendment.

The day's agenda included:

- Presentations by local, regional, and national experts.
- A facilitated small group exercise.
- Three speaker panels with questions posed by moderators and audience members.
- Real-time graphic recording provided by Maketa Wilborn of Maketa Wilborn Consulting.

Presentation and Discussion Themes

National and State Frameworks

Sustainable Materials Management

In 2009, the U.S. Environmental Protection Agency (EPA) introduced a new framework called Sustainable Materials Management (SMM), which the EPA defined as "[a]n approach to serving human needs by using/reusing resources productively and sustainably throughout their life cycles, generally minimizing the amount of materials involved and all associated environmental impacts." SMM represents a shift from an end-of-life approach to an approach that considers the impacts of materials and products across the life cycle. Since the 2009 publication of the report *Sustainable Materials Management: The Road Ahead*, the EPA has been promoting the framework and developing policies and tools to support application of the SMM framework and life-cycle thinking by state and local agencies and with stakeholders across the material life cycle.

Cheryl Coleman, Director of the Resource Conservation and Sustainability Division at the U.S. EPA, kicked off the Measurement Symposium by introducing the SMM framework and the benefits of life-cycle thinking.

According to Coleman, the SMM framework challenges preconceived ideas about how materials can and should be managed, using life-cycle information to avoid unintended consequences and increase the "return on investment" of materials management activities.

Coleman described how the EPA itself applied the SMM framework to identify the following priority areas for its own work in its FY 2017-2022 SMM Strategic Plan:

- Built environment
- Sustainable management of food
- Packaging
- Electronics
- Life-cycle thinking
- Measurement
- International efforts

Coleman noted that goals have a significant impact on state programs, and pointed to data gathered by the EPA that found that 41 states identify diversion goals as a key driver of their programs. Although the EPA's waste management hierarchy establishes source reduction and reuse as the most preferred options, Coleman pointed out that state goals are typically set at the second tier only—recycling and composting—while other areas of the hierarchy are left out.

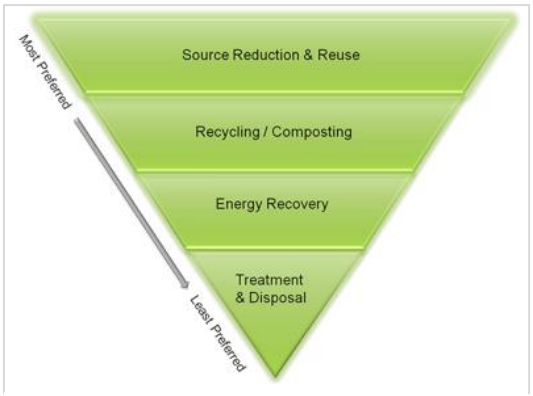


Figure 1 U.S. EPA Waste Management Hierarchy

Successful sustainable materials management requires collaboration at all levels of government and with stakeholders across the material life-cycle. The EPA is continuing to develop tools to advance adoption of the SMM approach and application of life-cycle thinking at state, local, and corporate levels. (See the "Existing and In-Progress Tools" section below for more details.)

New Frameworks and Vision at the State Level

At least six state environmental agencies around the country have taken initial steps to adopt the SMM framework in state planning and policies. Most of these efforts are early and generally not well-defined. However, the dialogue is growing as states see the importance of using life-cycle thinking to prioritize programs and drive agency goals.

The Oregon Department of Environmental Quality (OR DEQ) has been a leader at the state level, serving as a model for how life-cycle thinking changes the definition of roles, goals, and measures of success. In 2012, OR DEQ used a consensus-based process to develop a groundbreaking *2050 Materials Management Vision and Framework for Action*. In his presentation, David Allaway, Senior Policy Analyst at OR DEQ, described how the 2050 Vision prompted the agency to think differently about how materials impact the environment and explore where opportunities for reducing those impacts lie. Adoption of the 2050 Vision led to significant adjustments to state goals and investments, as well as development of new programs and priority focus areas. (These are described in more detail under "Goals and Metrics in Action" below.)

In its latest *State Solid and Hazardous Waste Plan, Moving Washington Beyond Waste and Toxics*, updated in 2015, the Washington State Department of Ecology (WA DOE) has also adopted a vision of sustainable materials management and a focus on moving upstream to consider and address environmental impacts of materials beyond the end-of-life phase. Janine Bogar, Environmental Planner and Policy Specialist for the Waste 2 Resources Program at WA DOE, presented the vision, priorities, and goals of the plan and how the SMM framework informs the agency's work. Bogar also described how WA DOE measures and tracks progress on the goals in this plan using a set of indicators that extend beyond the weight-based diversion rate. One of these indicators, the Consumer Environmental Index (CEI), was created especially for WA DOE. It looks at life-cycle impacts of materials and products purchased in Washington. (This and other WA DOE indicators are described in more detail under "Goals and Metrics in Action" below.)

Bogar highlighted that the 2015 plan includes a goal of developing and adopting new statewide quantitative goals that encourage waste reduction, quality recycling, and the highest and best use of materials based on environmental and health criteria. That process is just getting underway and current disruptions in the recycling markets are likely to delay development of new statewide goals in the near term. However, the plan also encourages local governments to add goals appropriate to their jurisdiction to their local plans. Bogar commended SPU's work in this area, noting that WA DOE sees it not only as a great step for Seattle, but also an important and helpful step for advancing work on this issue statewide.

Weight-Based Landfill Diversion Goals

Weight-based landfill diversion goals have been the standard practice since the late 1980s. Throughout the Measurement Symposium, speakers described how such goals have clear advantages to prior methods, but are insufficient on their own.

Cost-Effective and Easy to Communicate

Dr. Jenny Bagby of SPU described the economic analysis that went into establishing Seattle's weight-based recycling goals in the wake of the city's 1987 landfill crisis. City of Seattle economists applied principles from the local electric and water utilities to develop the Recycling Potential Assessment Model (RPA). This model calculated that conservation of landfill space through increased recycling—versus building more disposal capacity—was the most cost-effective option for managing the City's trash. Bagby emphasized that in addition to being cost-effective, weight-based diversion goals had the benefits of being easy to communicate and useful for motivating the public.

And it has worked. Recycling is second nature for most residents of Seattle and many other American cities. Susan Robinson, Senior Public Affairs Director at Waste Management (WM), said that we've successfully taught consumers that recycling is the most important thing, which drives brands to tell material processors that they must accept more and more materials in the cart. This market pressure has contributed to unprecedented recycling rates.

Unfortunately, this market pressure has also led to increased contamination and processing costs. Many speakers lauded the groundbreaking work of Seattle, while also making the case for a shift to a materials management approach that considers a broader range of environmental impacts. "I do not regret that I spent decades supporting weight-based recovery rates," said David Allaway of OR DEQ.

Figure 2: Graphic recording of morning presentations. Credit: Maketa Wilborn

Absolutely Necessary, and Not at All Sufficient

Allaway posited that "recycling primarily helps the environment because it conserves resources and reduces pollution," and that while "recycling is absolutely necessary, it is not at all sufficient" when you consider that over 50 percent of greenhouse gas (GHG) emissions in King County are attributable to the upstream production of materials, not an overabundance of "heavy landfills."

Over the course of the day, speakers raised many limitations and unintended consequences of weight-based landfill diversion goals, including:

- By measuring in weight and treating all materials equally, they render invisible the different environmental benefits of recovering different materials (e.g., glass vs. aluminum, recycling vs. composting).
- They are easily gamed (e.g., each jurisdiction calculates their recycling rate differently, and some include dubious materials).
- They can reinforce the (untrue) perception that we are running out of landfill space.
- In isolation, they send the signal that recovery is sufficient.
- In isolation, they foreclose other actions that may have greater environmental benefits, such as focusing on reducing waste generation or material toxicity.
- They can lead to increased contamination rates of recycling streams.
- They can lead to counterproductive actions, such as discouraging or prohibiting the use of materials with lower overall environmental impacts simply because they are not recyclable.

Several speakers also discussed how changes in the composition of the waste stream and shifts in packaging technology toward lighter, multilayered materials have also shifted the equation. Specifically, the lighter-weight nature of the material stream today makes it difficult to compare current diversion outcomes to those of years past, as both the numerator and the denominator of the

equation have been transformed over the past two decades and those changes have accelerated in recent years.

In addition, a number of speakers noted that under current conditions, life-cycle analyses show that using lighter-weight material is often the best choice for the environment, even if that material is bound for the landfill.

As Allaway and others pointed out repeatedly during the day, the environmental benefits of recycling come from off-setting the use of virgin feedstock with recycled material in production, not from landfill diversion. Measuring program success based on landfill diversion alone confounds the two outcomes. Identifying better measures and setting goals that connect to the true environmental benefits of recycling should therefore be a top priority for public agencies responsible for addressing the environmental impacts of materials and for all stakeholders involved in recycling.

Alternative Concepts, Goals, and Metrics

Applying Life-Cycle Thinking: Areas of Control, Influence, and Concern

After hearing a review of existing national and state frameworks for measuring success in solid waste management, a history of how Seattle's waste diversion goals were developed, and a discussion of some of the benefits and limitations of those goals, attendees participated in a small group exercise at their respective tables. Table assignments ensured that a variety of sectors were represented at each table.

The underlying objectives of the exercise were:

- To provide participants with an opportunity to practice life-cycle thinking.
- To push them to consider environmental impacts outside their normal purview.
- To encourage greater collaboration across the supply chain.

During the exercise, participants were asked to explore their individual organizations' areas of control, influence, and concern in helping the community to achieve an assigned environmental goal.

The activity instructions and images of each table's completed exercise template can be found in Appendix F.

Goals and Metrics in Action

In addition to highlighting the limitations of weight-based landfill diversion goals, the Measurement Symposium provided an opportunity for speakers to introduce alternative goals and metrics for measuring the environmental impacts of materials.

Reducing Waste Generation

All state and federal agencies represented at the Measurement Symposium track municipal solid waste generation at total and per capita levels. Oregon has gone further, setting statewide weight-based waste generation reduction goals in statute (15 percent below 2012 levels by 2025, 40 percent below 2012 levels by 2050). Allaway noted that these waste generation reduction goals serve to maintain a focus on waste prevention in all OR DEQ programs and actions.

The Sustainable Materials Management Coalition (SMMC)—a diverse public private partnership made up of representatives from business, academia, environmental and community organizations, and state and local governments, in partnership with the U.S. EPA—has also endorsed the use of reduction in per capita material generation rates from a base year as the recommended metric for goal setting in support of an overarching materials management goal to reduce the life-cycle impacts of materials. Susan Robinson of Waste Management, who was representing the SMMC at the Measurement Symposium, asserted that per capita tons, measured by specific materials types, can create a form of measurement that captures reduction goals based on environmental benefits.

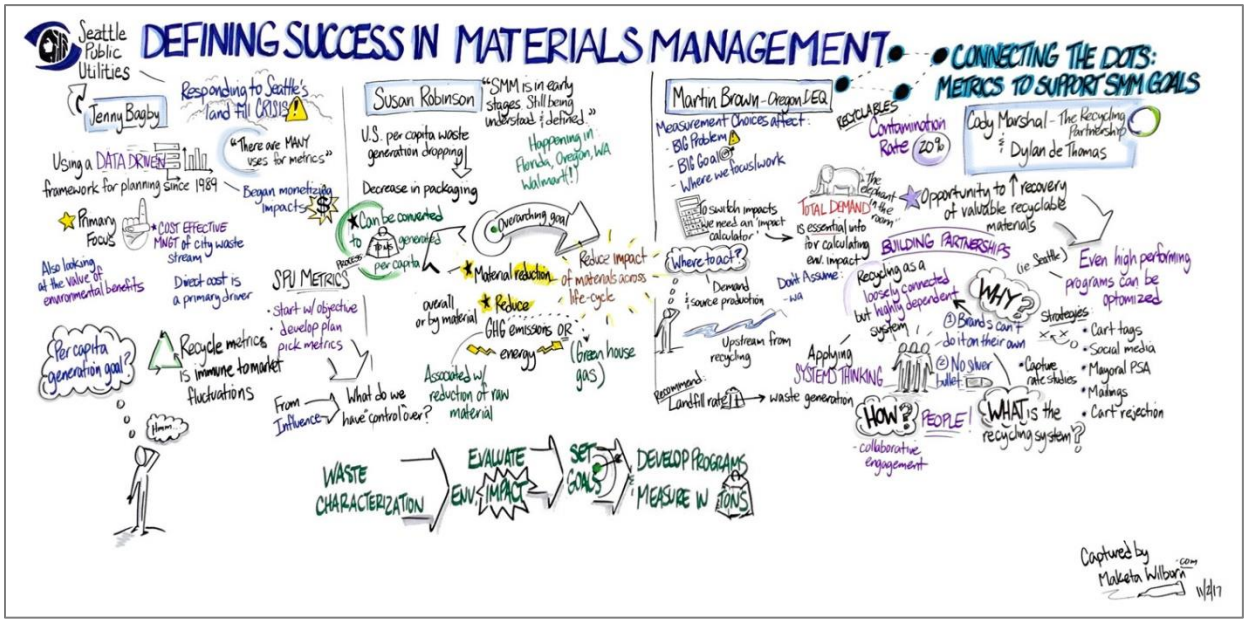


Figure 3: Graphic recording of afternoon presentations. Credit: Maketa Wilborn

Non-Weight-Based Waste Recovery Goals

OR DEQ has also expanded how waste recovery goals are measured at the state and local levels. All local governments in Oregon are still required to set voluntary waste recovery goals, but local agencies are now given the option of setting their goal denominated in mass (i.e., a traditional weight-based formula) or denominated in environmental impacts (i.e., an outcome-based formula). OR DEQ has also established a statewide recovery goal that can be denominated and tracked either by weight or in terms of energy savings over time.

This approach better illuminates the environmental benefits of recovery and links progress toward increased waste recovery with the overarching goal of reducing the life-cycle impacts of materials on the environment.

Recycling Capture Rates and Material-Specific Recovery Goals

Another approach to addressing the environmental impacts of materials is to focus more specifically on the recovery of materials that deliver the greatest environmental benefits. Robinson suggested that jurisdictions start by conducting waste characterizations and evaluating the environmental impacts of waste by material, and then set goals on a material-specific basis based on greenhouse gas emissions reduction or energy savings associated with potential generation reductions and/or recovery increases.

Goals can be translated into tons for tracking, but should not drive goal-setting or program development on their own.

OR DEQ has followed this approach and set material-specific recovery goals, including aiming for 25 percent recovery of food waste by 2020, 25 percent recovery of plastic waste by 2020, and 25 percent recovery of carpet by 2025.

The Recycling Partnership (TRP), a national non-profit organization dedicated to improving recycling outcomes, has led the shift toward focusing on recycling capture rates rather than landfill diversion rates. Cody Marshall, Vice President of technical assistance for TRP, emphasized that opportunities remain to increase recovery of valuable recyclable materials and to decrease the contamination of the recycling stream, both of which enhance the environmental benefits associated with recovery.

TRP is helping cities across the country gather and use data related to material-specific capture rates to drive program improvement. For example, TRP partnered with the City of Denver to pilot a campaign specifically focused on increasing residential recycling of metal food and beverage cans. Metal cans, which deliver the highest environmental benefits of all standard curbside materials when recycled, were selected as a focus because baseline capture rate data indicated nearly half of all metal cans generated by households participating in the City of Denver's recycling program still ended up in the garbage. Marshall encouraged municipalities to use cart-level studies to look beyond weight-based measures, noting that household-level participation and recycling capture data help cities better understand and influence behavior.

Connecting Material Recovery to the Circular Economy

Dylan de Thomas, also with TRP, reiterated that under the current materials management system, manufacturer demand for recycled feedstock drives the environmental gains associated with material recovery. As a result, ensuring that the material recovery system can produce reliable quantity, quality, and cost in recycled feedstock supply is essential for the environmental benefits of recycling to be realized.

TRP is working with the Sustainable Packaging Coalition on an initiative called Applying Systems Thinking to Recycling (ASTRX) to foster dialogue and collaboration across the material value chain to support recycling system improvements and better environmental outcomes from material recovery. De Thomas encouraged cities to set goals and track metrics that extend beyond tons collected at the curb for recovery, focusing instead on the effectiveness of sortation and reprocessing systems and the extent to which materials collected for recovery actually have viable end markets so that materials collected can serve as feedstock in manufacturing.

Other speakers also addressed the importance of considering the relationship between materials management and economic metrics. Bogar noted that WA DOE tracks solid waste generation per dollar of state GDP and Robinson pointed out that decoupling growth in per capita waste generation and GDP has long been viewed as a turning point in measuring the environmental impacts of materials.

Martin Brown, Goals and Measures Specialist for OR DEQ's Materials Management Program, introduced the concept of total demand and explained that the environmental impacts of material extend beyond just what is represented in the waste stream. This is because more material is produced than what ends up in the waste stream, with many products and materials being consumed and accumulating in homes and in the built environment. Understanding the relationship between the

amount of a material available for recovery and the total demand for that material in manufacturing (i.e., how much is used in production) in a given year is important for generating realistic estimates of the full environmental impacts of materials produced and consumed, not just those that end up in the waste stream. OR DEQ is using this concept to calculate a material's "mass circularity rate" (i.e., the amount of a material that is recycled divided by the total demand for that material) rather than a material-specific recovery (i.e., capture) rate. The goal associated with a mass circularity rate is to reduce total demand as well as increase recycling.

Existing and In-Progress Tools

Measurement Symposium speakers touched on several existing and new tools designed to help cities and other stakeholders quantify the environmental impacts of materials and to support selection of goals and prioritization of actions.

Measuring the Life-Cycle Impacts of Materials

The U.S. EPA's Waste Reduction Model (WARM) has long been the most accessible and widely used tool for measuring and comparing the relative impacts of different materials management approaches. Coleman announced that an update to WARM is in process, which will make the tool even more flexible and interoperable with other life-cycle assessment (LCA) tools.

MEBCalc is a tool that SPU has used for more than a decade to calculate the environmental footprint of its municipal solid waste management system.

WA DOE plans to continue using the GHG Index and Ecosystem Toxicity Index elements of the Consumer Environmental Index (CEI) to track the life-cycle impacts of materials and products purchased in Washington and hopes to have updated data available through its Beyond Waste and Toxics Progress Report.

Selecting Goals and Prioritizing Actions

U.S. EPA's Coleman also announced that the agency is preparing to release a new SMM Prioritization Tool Suite, which will allow users to model and compare impacts of potential actions across the material value chain. Results will be able to be modeled at the national, state, or individual stakeholder level.

Robinson noted that WM is engaged in development of its own tool, called Spectrum, to evaluate the environmental impacts and costs within the solid waste industry, and to drive planning and decision-making in partnership with its customers.

At OR DEQ, Brown is leading development of Impacts of Material Flows in Oregon (IMFO), which will calculate and compare total impacts (based on total demand estimates) in categories most important to the user. It will also identify the component drivers of impacts, enabling users to identify materials with the greatest potential for impact reduction and the biggest component drivers of total impacts.

Key Takeaways and Next Steps

Some of the key messages that rose to the top from the content-filled day include:

- Genuine and uncritical stakeholder engagement is essential for buy-in and success in achieving SMM goals. Bring everyone to the table, listen to everyone's ideas, encourage all to think about how their decisions impact others, and meet people where they are.
- Be honest about costs, i.e., recycling is NOT free (even when it's a better deal than landfilling).
- The greatest impacts of materials come from production, not disposal. The environmental benefits of recycling come from off-setting production using virgin feedstock, not from landfill diversion.
- Set goals related to reducing waste generation. Although still imperfect, this is the best option for something simple, easy to calculate, and easy to communicate, that better connects to the overarching goal of reducing the life-cycle environmental impacts of materials.
- In terms of material recovery, focus on quality over quantity and make sure that collected materials are reaching viable end markets.
- Unified goals across a state's jurisdictions are important, but first we need unified terms and definitions. A harmonized vision that reflects the big picture is helpful, but individual jurisdictions can (and have always had) have their own interests with additional goals and metrics.
- Integrate environmental equity into planning and decision-making. Ensure equitable access to services.

Participant Feedback

Following the Measurement Symposium, Cascadia solicited feedback from event participants through a web-based survey conducted November 8-21, 2017. The survey asked respondents about the following topics:

- Overall impressions.
- Impressions of each agenda segment.
- Impressions of suggested readings distributed prior to the event.
- Assessment of how much of the presented content was new to them.
- Likelihood of sharing learnings from the day.
- Ratings of event logistics, including overall organization, venue, food, and zero waste practices.
- Topics of interest for possible future symposiums.

Overall, 37 people responded to the survey. A summary of survey results is provided below. Verbatim responses are attached in Appendix K.

In general, participants found the Measurement Symposium to be informative, thought-provoking, and well-organized, with 92 percent of respondents rating it as very good or excellent (Figure 4). The most popular elements of the day were speaker presentations and panel discussions, with 95 percent and 81 percent of respondents rating those segments very useful, respectively (Figure 5).

Figure 4: Overall Ratings

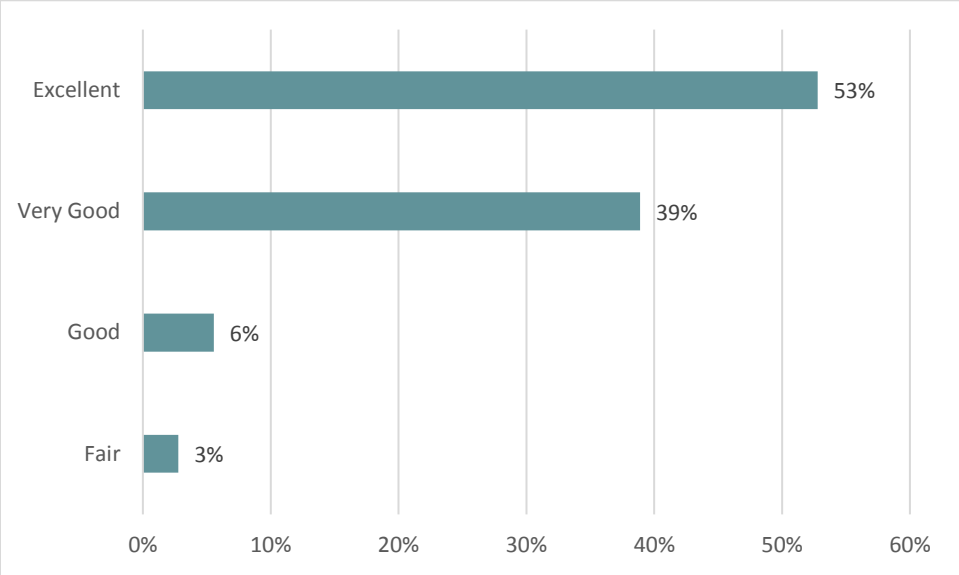
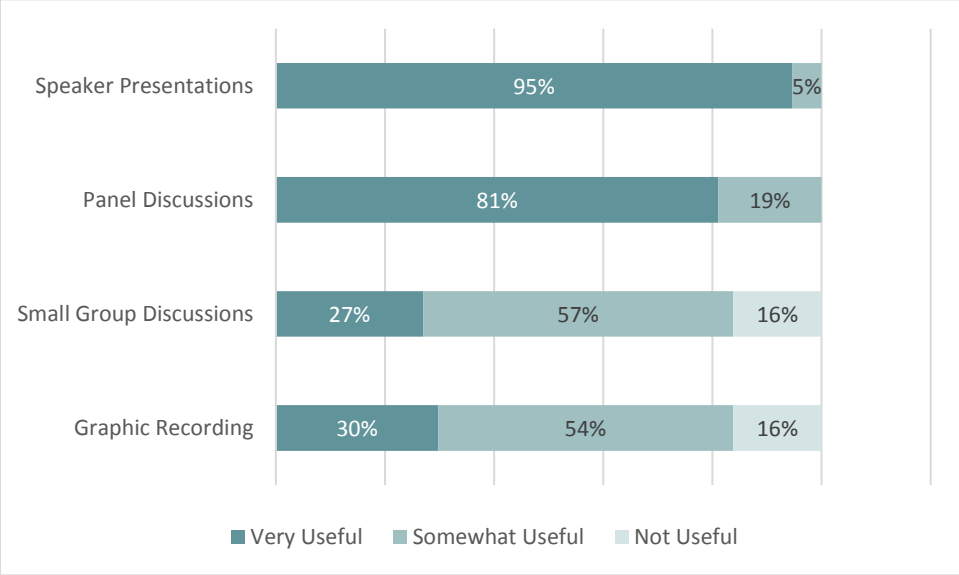


Figure 5: Ratings by Segment



Opportunities for Future Exploration

When asked about topics for future symposiums like this one, respondents expressed a variety of interests, key themes of which are listed below. Verbatim participant responses to this question are included in Appendix K.

Overall, respondents were keen for future sessions to dig deeper into specific strategies and tactics and allow more time for group discussion to grapple with associated implementation challenges. Specific topics of interest included how to:

- Measure waste prevention.
- Put equity and racial justice at the center of solid waste management policies and practices.
- Move upstream in solid waste management.
- Calculate environmental footprints, including public health, ecosystem, and climate impacts.
- Uncover barriers, work together on challenges/solutions, and identify metrics for use in public/private partnerships.
- Achieve greater transparency in the chain of custody of materials placed in recycling bins to see whether and how they are actually being converted into new products.
- Find and use the data to assess comprehensive environmental impact of different behaviors.
- Compare and contrast principles related to SMM, such as zero waste, circular economy, cradle-to-cradle, or how to integrate those approaches at the local level to provide benefit to ratepayers, the economy, society, and the environment.
- Apply SMM—practically—as a local government.
- Expand recycling market development.
- Think about solid waste contracting through an SMM lens.
- Know which metrics are best for cross-jurisdiction use and comparison.
- Measure and communicate the affordability of recycling versus landfilling.
- Increase planning and policy coordination across government sectors (e.g., climate change, air quality, economic development, solid and hazardous waste, and water quality).
- Identify how to best handle categories of materials found to have low life-cycle benefits from recycling.
- Collect and recover flexible packaging for circularity.

In addition to interest in the specific tactics outlined above, respondents expressed interest in:

- Extended producer responsibility.
- How the private sector is thinking about and implementing these strategies.
- Detailed looks at specific materials in the recycling stream and where they rank as collectable, recyclable, and best bang for the (environmental) dollar.
- Existing and in-progress tools supporting development and measurement of new metrics.
- Case studies of how a SMM perspective has been used to prioritize staffing and dollar resources.

Figure 6 provides a visual representation of the most used words and phrases in response to the survey question: “Please indicate one or two topics you would be interested in covering in a future symposium like this one.”

Figure 6. Word cloud generated from survey respondents' future topics of interest

Appendices

Appendix A: Measurement Symposium Invitation

Seattle Public Utilities

Please be our guest at an exciting invitation-only event!

Goals, Metrics, and More:

Defining Success in Materials Management

Seattle Public Utilities invites you to join us for a one-day symposium to explore innovative options for defining success in materials management beyond the traditional weight-based recycling rate.

Hear regional and national thought leaders, including representatives from the Washington Department of Ecology, Oregon DEQ, and The Recycling Partnership, speak about how to expand our perspective to consider the full life cycle of materials management.

WHEN: November 2nd, 2017
8:30 am-4:30 pm

WHERE: UW Center for Urban Horticulture
3501 NE 41st St
Seattle, WA 98105

Join us as we:

- Evaluate the limitations of traditional weight-based diversion goals.
- Explore alternative goals and metrics for measuring success in materials management.
- Hear case studies from organizations that are defining and measuring success in new and innovative ways.
- Investigate the role of local governments in advancing sustainable materials management goals.

Register Now!

Appendix B: Measurement Symposium Attendees

Name	Organization
Allaway, David*	Oregon Department of Environmental Quality
Anayas, Sheryl**	Seattle Public Utilities
Antonakos, Jetta	City of Tacoma
Apuzzo, Quinn	Recology Cleanscapes and SPU SWAC member
Atcheson, John	Stuffstr
Bagby, Jenny*	Seattle Public Utilities
Banerjee, Debolina	Puget Sound Sage
Bogar, Janine	Washington State Department of Ecology
Brown, Martin*	Oregon Department of Environmental Quality
Calabro, Domenic	U.S. EPA, Region 10
Christiansen, Peter	Washington State Department of Ecology
Coleman, Cheryl*	U.S. EPA
Curtis-Murphy, Megan	City of Issaquah
Dale, Eva	Zero Waste Washington
Daniels, Dan	City of Olympia
Dawson, Karen	Cedar Grove
De Thomas, Dylan*	The Recycling Partnership
Dobroski, Laura	RRS
Duarte, Jesse	City of Phoenix
Dyer, Anna	Seattle Housing Authority and SPU SWAC member
Epstein, Jeff	Carton Council
Feld, Sheri**	Seattle Public Utilities
Fife-Ferris, Susan*	Seattle Public Utilities
Fincher, Veronica**	Seattle Public Utilities
Fisher, Kyla	Three Peaks Consulting
Flory, Bruce	Seattle Public Utilities
Fong, Becca**	Seattle Public Utilities
Frerichs, Brent	Goodwill
Gaisford, Jeff	King County Solid Waste Division
Galang, Joy	Metro Vancouver, BC

Name	Organization
Garvey, Alan	Tilth Alliance and SPU SWAC member
Gignilliat, Liz	University of Washington
Goodrich, Nina	Sustainable Packaging Coalition
Gordon, Miriam	UPSTREAM Policy Institute
Gowing, Stephanie	Seattle Office of Economic Development
Greene, Rosalynn	Oregon Metro
Griffith, Holly	Ecova and SPU SWAC member
Griffith, Lewis	City of Tacoma
Hanna, Jim	Microsoft
Hare, Dave*	Seattle Public Utilities
Hart, Abby	Republic Services
Hillon, Luis	Seattle Public Utilities
Hulsman, Sally**	Seattle Public Utilities
Huntington, Trent	Amazon
Jackson, Sego	Seattle Public Utilities
Johnson, Anne	RRS
Johnson, Carla	Republic Services
Johnson, Michael	Microsoft
Jones, Linda**	Seattle Public Utilities
Jones, Ron	City of Olympia
Kaufman, Pat	Seattle Public Utilities
Kellogg, Ryan	King County
Kelly, Kevin	Recology Cleanscapes
Kingfisher, Alli	Washington State Department of Ecology
Knight, Linda	City of Renton
Lagreid, Jessica	Cedar Grove
Landry, Diane	Sustainable Bainbridge
Langdon, Allen	Recycle BC
Leif, Dan	Resource Recycling
Levy, Heather*	Cascadia Consulting Group and SPU SWAC Member
Liu, Patty	Green Eileen

Name	Organization
Long, Sue	REI Co-op
Lumper, Amity*	Cascadia Consulting Group
MacGillivray, John	City of Kirkland
Marshall, Cody*	The Recycling Partnership
McDonald, David	Seattle Public Utilities
McFarlane, Chris	Starbucks
McKenzie, Andrea	City of Vancouver, BC
Medina, Socorro**	Seattle Public Utilities
Metzler, Michelle	Waste Management
Moore, Bree	The Bill and Melinda Gates Foundation
Morrigan, McKenna*	Cascadia Consulting Group
Morris, Jeff	Sound Resource Management Group
Navarro, Richard	Google
Neuner, Jeff**	Seattle Public Utilities
Newcomer, Emily	Waste Management and SPU SWAC member
Newman, Gretchen	Washington State Department of Ecology
Pham, Lien	Chinatown-International District Business Improvement Area
Piacentino, Anne	Washington State Recycling Association
Piercy, Chris	Kitsap County
Robinson, Susan*	Waste Management
Ruckman, Derek	Recology Cleanscapes
Saam, Shannon	The Bill and Melinda Gates Foundation
Sandoval, Luis	Oregon Metro
Schmitt, Beth	The Recycling Partnership
Schwenger, Stephanie	City of Bellevue
Scott, Charlie	Cascadia Consulting Group
Sepanski, Lisa	King County
Snipes, Ken*	Seattle Public Utilities
Starkey, Meghan	StopWaste
Stitzhal, David	Full Circle Environmental
Subocz, James	QFC and SPU SWAC member

Name	Organization
Thermos, Peter	Northwest Product Stewardship Council
Thoman, Susan	Compost Manufacturers Alliance
Toman, Chris	Amazon and SPU SWAC member
Trim, Heather	Zero Waste Washington
Uhlar-Heffner, Gabriella**	Seattle Public Utilities
Van Dusen, Hans**	Seattle Public Utilities
Van Orsow, Rob	City of Federal Way
Wadley, Diana	Washington State Department of Ecology
Wallis, Angela**	Seattle Public Utilities
Wassink, Dirk	Second Use Building Materials
Whitley, Ben	Seattle Public Utilities
Wilborn, Maketa*	Maketa Wilborn Consulting
Wolf, Sally	Zero Waste Washington board of directors
Zimmer, Rebecca	Starbucks

* Speaker, Moderator, or Event Coordinator
** Table Facilitator

Appendix C: Measurement Symposium Agenda

Start Time	Topic	Speaker / Moderator
8:00am	Check-in and be seated	
8:30am	Welcome and Opening Remarks	• Susan Fife-Ferris, *SPU* • Ken Snipes, *SPU*
8:50am	Evolving goals and roles through lifecycle thinking: Sustainable Materials Management (SMM) • Introduction to SMM at the national level • Lifecycle leadership at the state level in Oregon • Supporting local government SMM goal-setting in Washington State	• Cheryl Coleman, *US EPA* • David Allaway, *Oregon DEQ* • Janine Bogar, *Washington State Department of Ecology*
9:50am	Speaker Panel: Evolving goals and roles in SMM	Moderated by Susan Fife-Ferris
10:35am	Short Break	
10:45am	Small Group Exercise: Bringing it Home	Moderated by Heather Levy, *Cascadia Consulting Group*
12:00pm	Buffet Lunch	
12:45pm	Connecting the Dots: Metrics to support materials management goals • Seattle's calculated approach to goals and metrics • Per capita metrics, EPA Facts & Figures, and GHGs • Developing holistic materials management metrics in Oregon • Using data to drive recycling improvements across the U.S. • Building partnerships across material value chains	• Jenny Bagby, *SPU* • Susan Robinson, *Sustainable Materials Management Coalition* • Martin Brown, *Oregon DEQ* • Cody Marshall, *The Recycling Partnership* • Dylan de Thomas, *The Recycling Partnership*
2:15pm	Speaker Panel: Putting measurement into action in a local government context	Moderated by McKenna Morrigan, *Cascadia Consulting Group*
3:00pm	Small Group Reflection and Discussion	Moderated by Heather Levy
3:30pm	Short Break	
3:45pm	Large Group Q&A	Moderated by Susan Fife-Ferris
4:15pm	Closing Remarks	Susan Fife-Ferris

Appendix D: Suggested Readings

The below list of suggested readings (except Post-Symposium Press) was provided to invited guests prior to the symposium.

Post-Symposium Press

- D. Leif, "Heavy Lifting," 28 November 2017. Available: https://resource-recycling.com/recycling/2017/11/28/heavy-lifting/.

Core Recommended Readings

- K. Fisher, "Aligning recycling goals to assist with climate objectives," 23 August 2017. Available: https://www.wastedive.com/news/aligning-recycling-goals-to-assist-with-climate-objectives/503334/.
- S. Hartwell, "In My Opinion: Bringing nuance to the numbers," 4 September 2017. Available: https://resource-recycling.com/recycling/2017/09/04/opinion-bringing-nuance-numbers/.
- K. Bailey, "One Metric to Rule Them All," 12 January 2017. Available: http://www.waste360.com/waste-reduction/one-metric-rule-them-all.

Other Relevant Documents

- M. Haupt, C. Vadenbo and S. Hellweg, "Do We Have the Right Performance Indicators for the Circular Economy?: Insight into the Swiss Waste Management System," Industrial Ecology, vol. 21, no. 3, pp. 615-627, 2016.
- C. Lakhan, "Optimizing emissions targets for residential recycling programmes: Why 'more' is not necessarily better with respect to diversion," Waste Management and Research, vol. 34, no. 11, 2016.
- D. Allaway and P. Spendelow, "Briefing Paper: What is Sustainable Materials Management," 4 October 2011. Available: http://www.oregon.gov/deq/FilterDocs/2050-SustainableMaterials.pdf.
- J. M. Cullen, "Circular Economy: Theoretical Benchmark or Perpetual Motion Machine?," Industrial Ecology, vol. 21, no. 3, pp. 483-486, 2017. Available: http://onlinelibrary.wiley.com/doi/10.1111/jiec.12599/full.
- Oregon Department of Environmental Quality, "Food Product Environmental Footprint Literature Summary: Packaging and Wasted Food," September 2017. Available: http://www.oregon.gov/deq/FilterDocs/PEF-Packaging-FullReport.pdf.

National and State Framework Documents

- U.S. Environmental Protection Agency, "Sustainable Materials Management: The Road Ahead," Available: https://www.epa.gov/smm/sustainable-materials-management-road-ahead.
- Oregon Department of Environmental Quality, "2050 Vision of Materials Management in Oregon," Available: http://www.oregon.gov/deq/mm/Pages/2050-Vision-Workgroup.aspx.
- Washington Department of Ecology, "The State Solid and Hazardous Waste Plan: Moving Washington Beyond Waste and Toxics," June 2015. Available: https://fortress.wa.gov/ecy/publications/documents/1504019.pdf.

Appendix E: Speaker Bios

David Allaway is a senior policy analyst at the Oregon Department of Environmental Quality's Materials Management Program. David led efforts to develop and update the first sub-national consumption-based greenhouse gas emissions inventory in the US, served as an invited science advisor to Wal-Mart's Packaging Sustainable Value Network, and most recently served as an Advisor to Paul Hawken's Project Drawdown and the New York Times bestseller *Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming.* Before joining DEQ in 2000, David worked for a decade in the private sector, including developing waste plans and programs for Kitsap, Snohomish, King and Clark counties. A member of the West Coast Climate and Materials Management Forum's leadership team, and reported to eat all of the apple—even the core—David has a B.A. in physics from Carleton College, Minnesota.

Dr. Jenny Bagby is the Director of Corporate Services at Seattle Public Utilities where she provides leadership and direction for three teams: Economic Services, Climate Resiliency, and Asset Management. She has been with the City of Seattle since 1984, where she has also served as a Principal Economist. Jenny is one of the principal authors of Seattle's Recycling Potential Assessment Model which was groundbreaking in its use of economic analysis to chart the path for recycling, composting, and solid waste disposal for the City of Seattle. She has co-authored articles in economics and solid waste including *Measuring Environmental Value for Natural Lawn and Garden Care Practices*, *Participation in Seattle's curbside recycling collection program* and *Looking into a crystal ball: What explains the value of recovered paper.* Jenny has a PhD in Economics from the University of Washington.

Janine Bogar is an Environmental Planner and Policy Specialist for the Waste 2 Resources Program at the Washington State Department of Ecology. She oversees the solid waste portion of *The State Solid and Hazardous Waste Plan: Moving Washington Beyond Waste and Toxics*. Janine works on a variety of sustainable materials management issues in the plan, including waste reduction, recycling, and composting. She also has served as legislative coordinator for the program. Before joining Ecology in 2008, Janine worked for the Washington State Department of Corrections as the sustainability coordinator, helping prisons facilities make less waste, build green, and use less water and energy. She also worked with Thurston County, Washington, implementing a variety of waste reduction and recycling programs. Janine has a Bachelors Degree in Zoology, and a Masters Degree in Environmental Studies.

No picture

Martin Brown is the Goals and Measures Specialist for Oregon DEQ's Materials Management Program. He is new to government work after spending two decades as a freelance researcher and data analyst, mostly in the fields of forest ecology and housing. His writing and research have been published in both peer-reviewed and popular venues such as Sierra, the Journal of Ecology, Air & Space Smithsonian, and the Appraisal Journal. His "Tabletop Biosphere" was one of MAKE magazine's most popular projects.

Cheryl Coleman is the Director for the Resource Conservation and Sustainability Division (RCSD) within the Office or Resource Conservation and Recovery at the U.S. EPA, which is responsible for: promoting the reduction, reuse, recovery, and recycling of municipal, industrial, and extractive wastes and the long-term sustainable management of these materials; establishing collaborative partnerships with businesses and state, territorial, and local governments; and developing policy, technical guidance, tools, and public information on sustainable materials management. Ms. Coleman has over thirty years of experience with materials/waste management. She came to U.S. EPA Headquarters from the SC Department of Health and Environmental Control where she was the Director of Compliance and Enforcement for waste programs and mining. Additionally, she served in several leadership capacities for the Association of State and Territorial Solid Waste Management Officials (ASTSWMO).

Dylan de Thomas is Vice President of Industry Collaboration for The Recycling Partnership, working with the team there to increase the quantity and quality of the curbside collected recyclables across the U.S. as well as working to boost the economic health of the recycling industry as a whole. Prior to joining the Partnership, he worked for Resource Recycling, Inc. for a decade, directing and producing editorial content for three publications and three conferences covering various aspects of the recycling industry.

Susan Fife-Ferris is the Director of Solid Waste Planning and Program Management for Seattle Public Utilities, where she provides leadership and directs all aspects of the City of Seattle's solid waste policy, planning, and program development, including the oversight of $100+ million in annual service contracts and approximately $20 million in annual capital improvements. Previously, she spent 15 years at the City of Bellevue where she oversaw all aspects of the environmental programs and communications for the City's Utilities Department. Prior to entering public service, Susan worked as an environmental consultant and a lawyer, specializing in municipal finance and general municipal law. During this time, she was on the forefront of research that showed the economic reasons of why recycling made sense. Susan received her bachelor's degree in Applied Mathematics from the University of California, Berkeley, and a law degree from the University of Southern California.

Cody Marshall is the Vice President of Technical Assistance for The Recycling Partnership. Cody is currently working with local governments around the country to incorporate best management practices into their recycling systems. Cody's background includes working as a Senior Consultant for RRS and managing Orange County, North Carolina's recycling programs where he oversaw daily operations such as curbside, multi-family, electronics, drop-off, commercial, and food waste collection. Cody is based in Chapel Hill, North Carolina.

Susan Robinson is Senior Public Affairs Director at Waste Management. Susan is responsible for WM's public policy efforts around recycling, organics management, natural gas, and new technologies. She is Vice President of AMERIPEN (American Institute for Packaging and the Environment), Co-Chair of SWEEP (Solid Environmental Excellence Protocol), a member of the Sustainable Materials Management Coalition, and is on the Board of Directors for the American Biogas Council and the Southeast Recycling Development Council. Her 30+ years in the industry includes work in the public sector at the City of Seattle, non-profit work for The Washington Environmental Council, consultancy, and over twenty-five years in the private sector. Susan's experience includes global commodity marketing, research and analysis of industry trends, and twenty years managing municipal solid waste and recycling contracts. She is a frequent speaker at conferences across the country on recycling, lifecycle thinking, and goal-setting.

Ken Snipes is the Chief Administrative Officer and acting Solid Waste Line of Business Manager for Seattle Public Utilities. Ken has been with SPU since 2007 where he has also served as the Solid Waste Line of Business Deputy Director, Director of Solid Waste Operations, Facilities Maintenance Supervisor, Transfer Station Manager, Out of Class Water Operations Director, and Maintenance Manager. Before joining SPU, Ken was a long-time member of the United States Air Force, serving as an operations chief, combat commander, construction manager, electrical superintendent, and emergency management chief. He led large teams responsible for coordinating humanitarian aid relief efforts and managing the restoration of utility services after major storms. Ken received dual bachelors' degrees in business administration and occupational health from Wayland Baptist University, and has associate degrees in several technical areas, including applied science and mechanical and electrical technology. Ken has also begun work toward a Master's Degree at the University of Arkansas.

Appendix F: Small Group Exercise Description and Images

Activity Instructions

Activity Objective: Explore how each of us can support life cycle goals using areas of control, influence, and concern.

Step 1 (10 min): Each table will receive one goal to use for the exercise that completes the below statement:

"As a community, our goal is to _____."

Step 2 (30 min): Table facilitators will ask their tablemates to answer the below questions and then record their answers on the provided tabletop template. For each comment, try to capture one or more of the following: sector, organization, source.

- What is your organization's role in helping the community to achieve this goal?
- What are your organization's areas of control, influence, and concern in helping the community to achieve this goal?

Tip: If your tablemates are all from the same or similar sectors, invite them to explore the question from a variety of perspectives:

- Public Sector: Utilities, Cities, Counties
- Private Sector: Technology, Retail, Grocery, other
- NGOs

Step 3 (15 min): As a group, review what you've recorded and identify a maximum of 2-3 areas that your group thinks a local jurisdiction should focus on.

Step 4 (20 min): Heather will invite a few tables to share answers to one of the following questions (table facilitators should ask if anyone at their table would like to answer on their behalf):

- What overlap did you see between sectors?
- What opportunities exist for collaboration?
- What areas did your group "assign" to the local jurisdiction?

Tabletop Template

Each table was provided a 36” x 36” tabletop template of the below image.

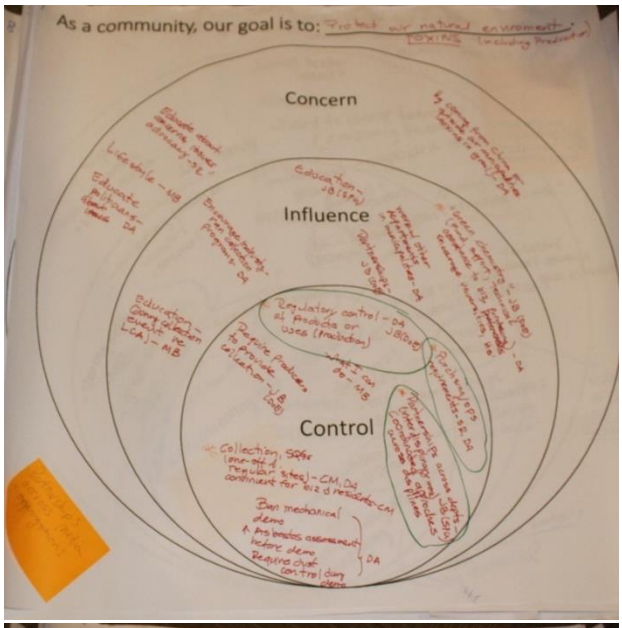
Activity Assignments

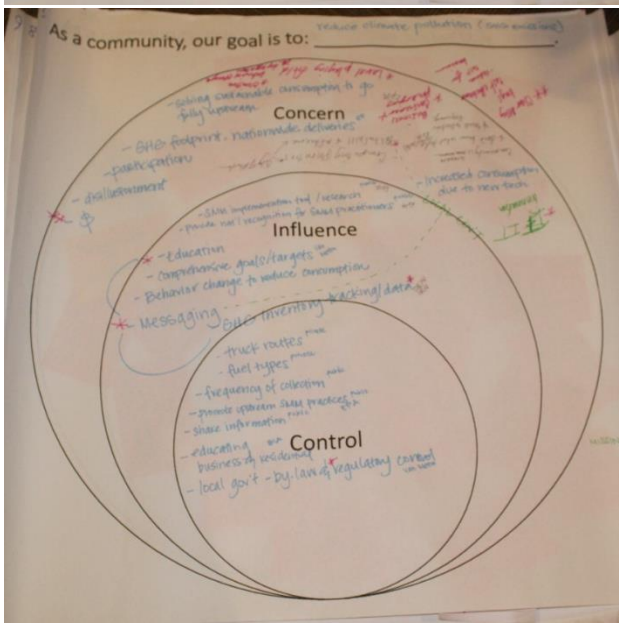
Each table was assigned one of the below goals that finished the question “As a community, our goal is to…”

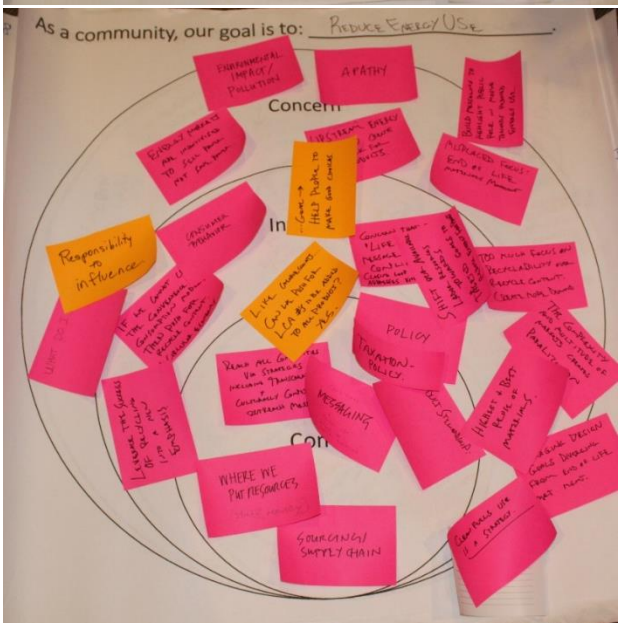
- **Reduce climate pollution** (i.e. greenhouse gas emissions) associated with materials throughout the life-cycle.
- **Reduce energy use** associated with materials throughout the life-cycle.
- **Reduce water use** associated with materials throughout the life-cycle.
- **Reduce natural resource extraction and depletion** associated with products/material production.
- **Reduce human exposure to toxins** associated with materials throughout the life-cycle.
- **Reduce release of environmental toxins** associated with materials throughout the life-cycle.
- **Maximize the economic value achieved from material use across the life-cycle,** factoring in "full" costs of externalities and willingness to pay for pro-environmental, pro-social outcomes.
- **Reduce air pollution** associated with materials management, especially in the local community.
- **Protect our marine environment** and the animal life it supports.
- **Strengthen local economic vitality and support community livelihoods** through materials management activities that enable well-being and sustainable consumption of materials.
- **Ensure equitable access** to sustainable products/materials impact information and choices.

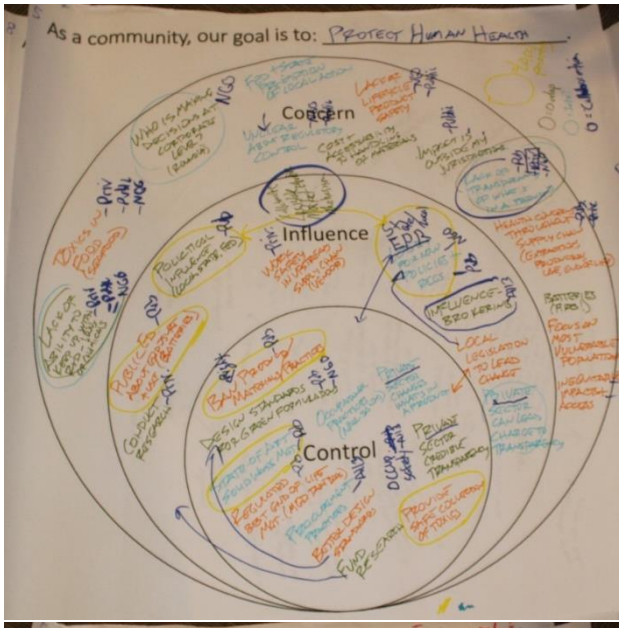
Activity Outputs

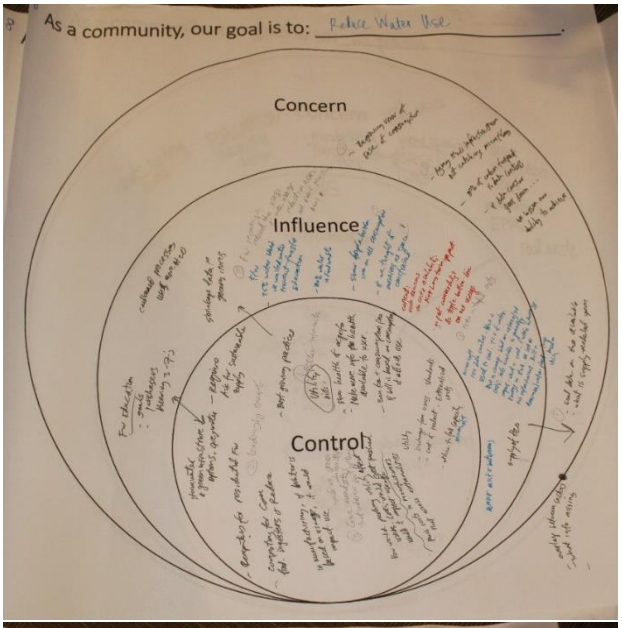
Small images of each table's completed activity template are included below. The original paper templates will also be provided to SPU.

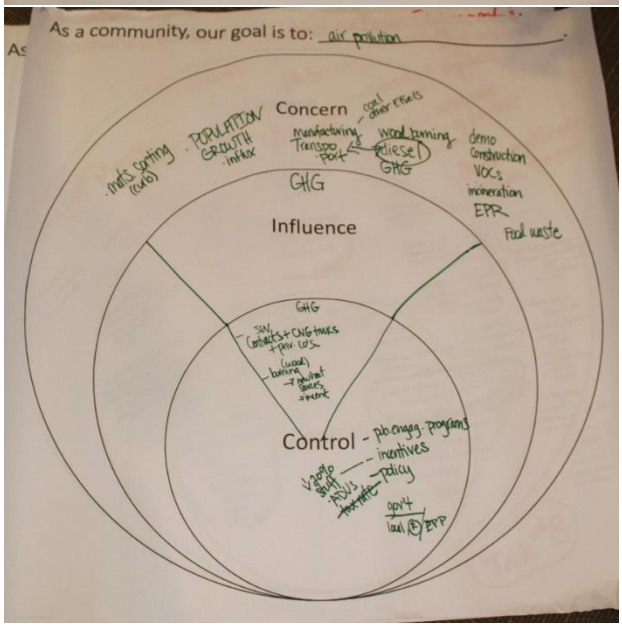


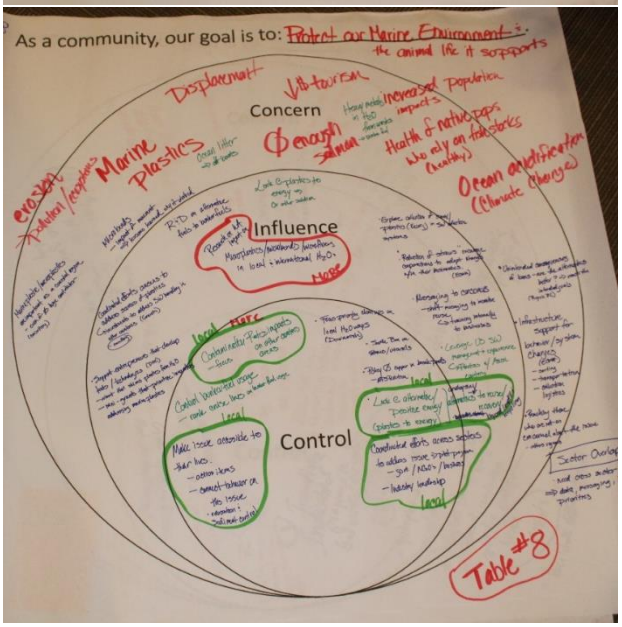


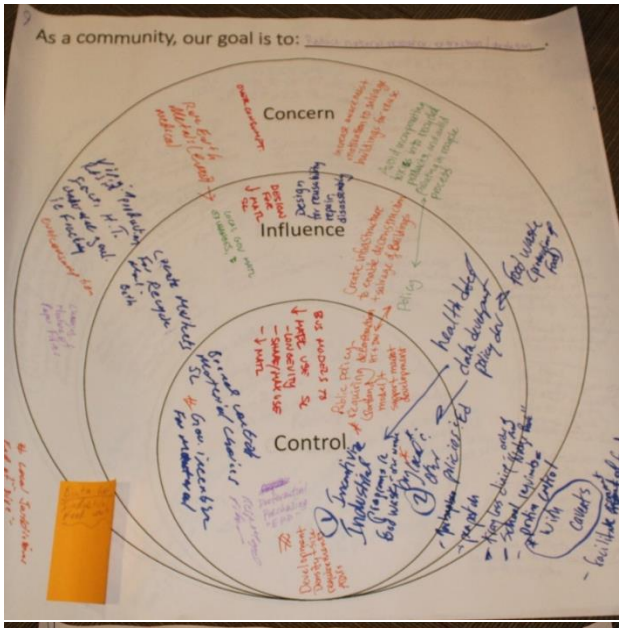



As a community, our goal is to: Protect Human Health
Concern
Influence
Control

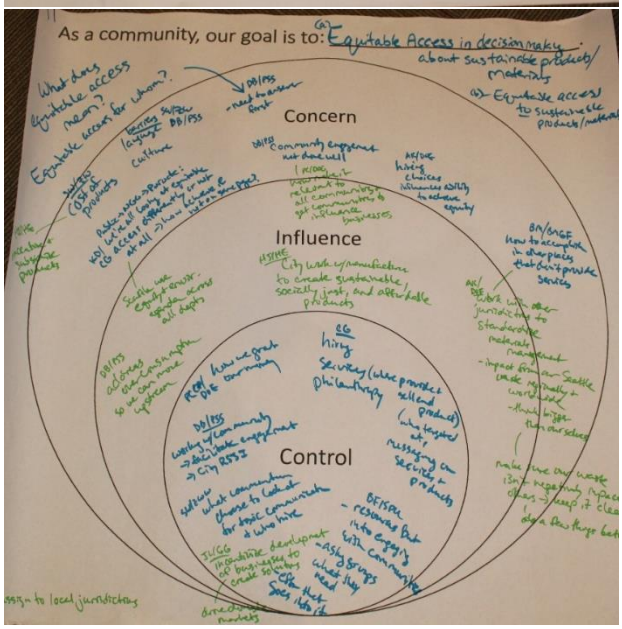

As a community, our goal is to: Reduce Water Use
Concern
Influence
Control


As a community, our goal is to: air pollution
Concern
Influence
GHG
Control


As a community, our goal is to: Protect our Marine Environment
Concern
Influence
Control
Table #8


As a community, our goal is to:
Concern
Influence
Control


As a community, our goal is to: strengthen local economic vitality & support community livelihoods
Concern
Influence
Control


As a community, our goal is to: Equitable Access in decision making about sustainable products/materials
Concern
Influence
Control

Appendix G: Moderator Bios

Heather Levy is a Senior Associate at Cascadia Consulting Group, where she provides public and private sector clients with project management, stakeholder engagement, and facilitation services in support of their solid waste programs and triple bottom line initiatives. Prior to joining Cascadia, Heather worked for 18 years as a management and IT consultant helping clients execute on their most strategic initiatives, including: planning and leading complex projects, leading organizations through transformational change, designing and operationalizing portfolio and program management functions, and optimizing business processes through detailed analysis. Through these experiences she acquired expertise in stakeholder engagement and communications, cross-functional group facilitation, and whole systems thinking. Heather holds a Bachelor's Degree in Management Information Systems from the University of Iowa.

McKenna Morrigan is a Senior Associate at Cascadia Consulting Group. McKenna provides clients with in-depth research, analysis, program design, and project management services. Passionate about helping communities use data to improve recycling and composting programs and achieve their zero waste goals, McKenna has led Cascadia's work designing and conducting innovative household recycling/composting behavior studies on behalf of clients around the country. McKenna brings expertise in community-based social marketing, program design and evaluation, and policy analysis, and has worked on a wide range of environmental issues, including recycling and waste prevention, product stewardship, clean energy development, and energy conservation. Prior to joining Cascadia, McKenna conducted focus groups and qualitative research around the country as a public opinion researcher at Public Agenda, a nonpartisan organization based in New York City, and served as an environmental management fellow for the U.S. EPA Region 10 in Seattle.

Maketa (pronounced Ma-kay-ta) Wilborn is an organizational development consultant, artist, educator, and master facilitator who designs and leads team development, strategic planning, and equity and inclusion trainings. He is the Principal of Maketa Wilborn Consulting and a Senior Associate of the Grove Consultants International, a global leader in visual meeting facilitation. For over 15 years he has been applying his artistic approach to leading individuals and groups toward their highest potential. Visual mapping is foundational to his approach and in all that he does. Maketa integrates creative expression to elicit active engagement and inspire deeper insight. He will be supporting today's symposium as a graphic recorder - listening and capturing key elements of our presentations and discussions.

Appendix H: Prepared Panel Questions

Morning Panel

Q1. As the EPA and state agencies formally adopt full life-cycle materials management frameworks, how do you think the roles and responsibilities of local governments change? It seems natural that agencies like yours, which have explicit mandates to advance broad environmental goals, should expand their perspectives and goals. But for local governments and others with direct responsibility for waste prevention, composting, recycling, and disposal, as well as handling toxic products, what is the justification for adopting this broader life-cycle approach?

Q2. One of the central elements of the sustainable materials management framework is that it requires a more holistic consideration of environmental impacts of materials beyond any one metric. But sometimes this use of more than one metric points you in competing directions. As an agency, how do you decide which goals to prioritize?

Q3. The public has growing expectations and concerns about the impacts of some materials that may be greater than their quantity in the materials stream would suggest. And some of these impacts are often not included in life-cycle assessments. For instance, plastic pollution impacts on wildlife and the marine environment, micro plastics in fish and seafood, medications in our surface waters, hormone disruptors in plastics. We also hear concerns about flexible packaging since it is not recyclable. How does responding to public expectations and addressing their concerns align with setting SMM goals and measurements?

Q4. What are the biggest criticisms you've received or pitfalls you've observed regarding SMM and related goals, and how do you respond to them?

Q5. Many in the room are charged with providing affordable, reliable, and equitable solid waste management. Resource are stretched thin. Developing goals and measurements that address all phases and impacts of materials throughout their full life-cycle may seem daunting, expensive, and hard to accomplish at the local level. How do you see local governments taking on this challenge?

Q6. What is your top recommendation to Seattle Public Utilities as the agency sets new goals in the context of SMM?

Afternoon Panel

Q1. It is one thing to identify metrics to track how you're doing, but it's another thing to set a specific goal, a target you are aiming for. What are the key considerations that need to be taken into account when selecting and setting targets? (Jenny start)

Q2. What life-cycle materials management goals are not represented in the metrics we've discussed thus far (e.g. social goals, economic goals, other environmental goals)? Any ideas about how to measure progress in these areas? (Martin start)

Q3. As we've discussed already today, there is no single goal and no single measure of sustainable materials management, but we know that we need something simple and memorable to communicate to the public. In your view, what is the #1 goal to communicate to the public and what is the best metric to represent that goal? (ALL)

Q4. Even under a more holistic life-cycle materials management framework, recycling continues to play an important role in the recovery of materials that serve as valued inputs to production. But recycling's environmental benefits are only realized if those materials actually make it into new products. China's National Sword campaign has laid bare how tenuous and uncertain this is. What should local governments and others do to ensure that the materials they are collecting through recycling programs have real markets and able to be incorporated into new products in ways that offset the use of virgin feedstock? (Dylan start)

Q5. It is clear that weight-based diversion rates are not sufficient (or perhaps even appropriate at all) in a sustainable materials management framework, and each of you has proposed one or more metrics or alternative approaches for measuring success. How important do you think it is it to have harmonized metrics, to be able to compare community to community, state to state? Or are we getting to a point where each community or organization has its own definition and measures of success? (Cody and/or Susan start)

Appendix I: Audience Question/Comment Cards

The table below contains all of the comments and questions collected via table comment cards throughout the course of the day. A handful of these questions were posed by moderators in the morning and afternoon panel discussions.

Addressed To (if noted):	Comment / Question
All	Why is energy being called an environmental impact? Isn't energy one resource among all our goods and services, and isn't the environmental impact of different kinds of energy fuels the impact we should be using in SMM?
All	SIMPLICITY VS. COMPLEXITY. SMM uses economic data to estimate upstream impacts – i.e., have to convert to physical.
All	There is so much changing around technology, how people buy, engage, get to where they want to go. Is there anything going on to predict impacts, positive or negative, from these shifts?
Anyone	How does looking upstream in the example of flexible packaging actually change the public's behavior to be more sustainable? Ex: tons of flexible packaging on the shelf = still mindless consumption by consumers and throwaway society.
Anyone	Are there metrics for the military bases and are they very different than civilian communities?
Economists in the room	Have there been analyses of a non-consumption-based economy, and how/if we could continue to grow and prosper?
<none noted>	Who are the stakeholders we need to engage in conversation about materials management? About metrics?
<none noted>	Why does recycling only result in a 6% reduction in materials impacts since it consumes upstream use of resources?
<none noted>	Doesn't a lot of the "stuff" that is not in the MSW stream get reused or beneficially used. How can this be measured, is it considered in your analytical tool?
<none noted>	Shift all resources to upstream energy reduction. Find out where…
<none noted>	Sugar Beverage Tax coming to Seattle. How will this affect metrics?
Cheryl, David A., and Susan R.	How can we track what actually happens to recyclables once they leave the curb/MRF so we can prove/disprove how well the various recyclables are being used and thus decrease resource use and decrease pollution? What chain of custody/validation tools exist/could be made?

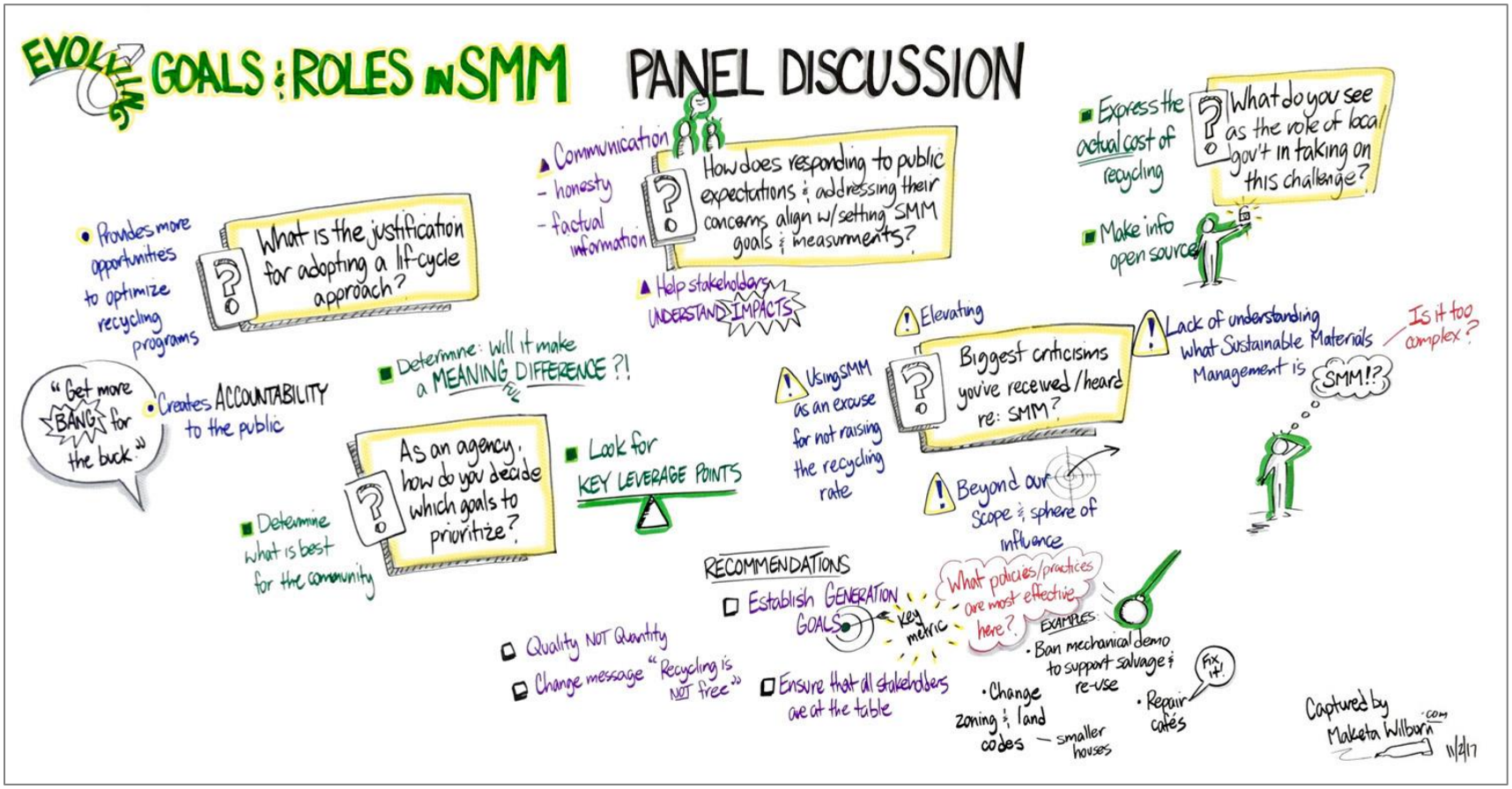
Addressed To (if noted):	Comment / Question
Cheryl/EPA, Susan Robinson, David Allaway, Martin Brown	You've told us that SMM requires new ways to measure programs—Oregon is adding a generation reduction/source reduction measurement in order to drive down resource & environmental impacts. But, like recovery, generation will be measured by weight—therefore driving light-weighting and resulting in more pouches and film. These things are single-use—they don't obviate the use of virgin materials—they don't get recycled—conversion/burning/energy recovery are the only options for EOL. Wouldn't it be better to measure decreased generation by UNITS? Why not drive reusable & refillable—the coffee can example shows that this isn't considered.
David Allaway	I appreciate & respect the transition to having statewide generation goals. However, since this will still be measured by weight in Oregon, it will favor plasticizing products & packaging. What does that mean in terms of resource conservation & environmental impact? Don't plastics often perform less well in these measures? How do you address this? Can you correct for this by having higher reduction goals for plastics than other materials?
David Allaway	How do you frame life cycle thinking (instead of landfill=bad, recycling=good) when talking to the public and policy makers?
David Allaway	You cautioned about measuring reuse in an unproductive way. What would be a better way?
David Allaway	A lot of talk about flexible packaging over rigid (recyclable) packaging, etc. What about "manufactured compostable products"—where do they fit into the SMM approach?
David Allaway	David, where do you and can we get the environmental impacts data to help us make better decisions?
David Allaway or anyone	How do we go about deconstructing the fabric of consumer culture, when the economy rely on, at least in part, selling more stuff, and the need for that stuff to wear out?
David? Others?	Ok so folks like waste generation as a metric. And folks like LCA view for SMM planning or prioritizing. But are folks suggesting any LCA metric for performance tracking? What is it?
Dave	What about toxic chemicals (endocrine disruptions) leaching from plastics into food?
Dylan de Thomas	Re: People are the answer & if it's proven that the most successful recycling programs have local government involvement—is there a risk that recycling programs will work less well where EPR/product stewardship schemes take over operational responsibility for PPP collection, & other streams?
Janine Bogar	What is the state doing to promote Green Chemistry/product design? How does that fit into WA's SMM framework?

Addressed To (if noted):	Comment / Question
Mark/TRP/WM	If we are just working on the environmental fringes through recycling (since the main impacts are production) perhaps the biggest impact of local government + recycling is creating better environmental stewards—with much broader benefits as they make better choices about cars, energy, etc… Maybe we are not seeing the forest for the trees? Thoughts?
Martin Brown	Mass circularity index—need data on what is the total materials demand for a city, region, etc. How do you propose to calculate that?
Martin or anyone	How do we obtain total waste generation data? These data/tons of waste may be collected by various companies/cities who do not cross pollinate (share) information.
Martin	The graphs with the expanded view showed small differences. How does this help with new actions? What would you suggest? Why does composting food have such low environmental value?
Susan Robinson	Using GHG "savings" as the determinant of whether a packaging should be recycled (like aseptic/gable top cartons) is misleading. The lower GHG impact of the package to start—means there will be less GHG "savings" to measure—effectively penalizing the "lower impact" package!
Susan	Food composting. Why is the environmental value so low?

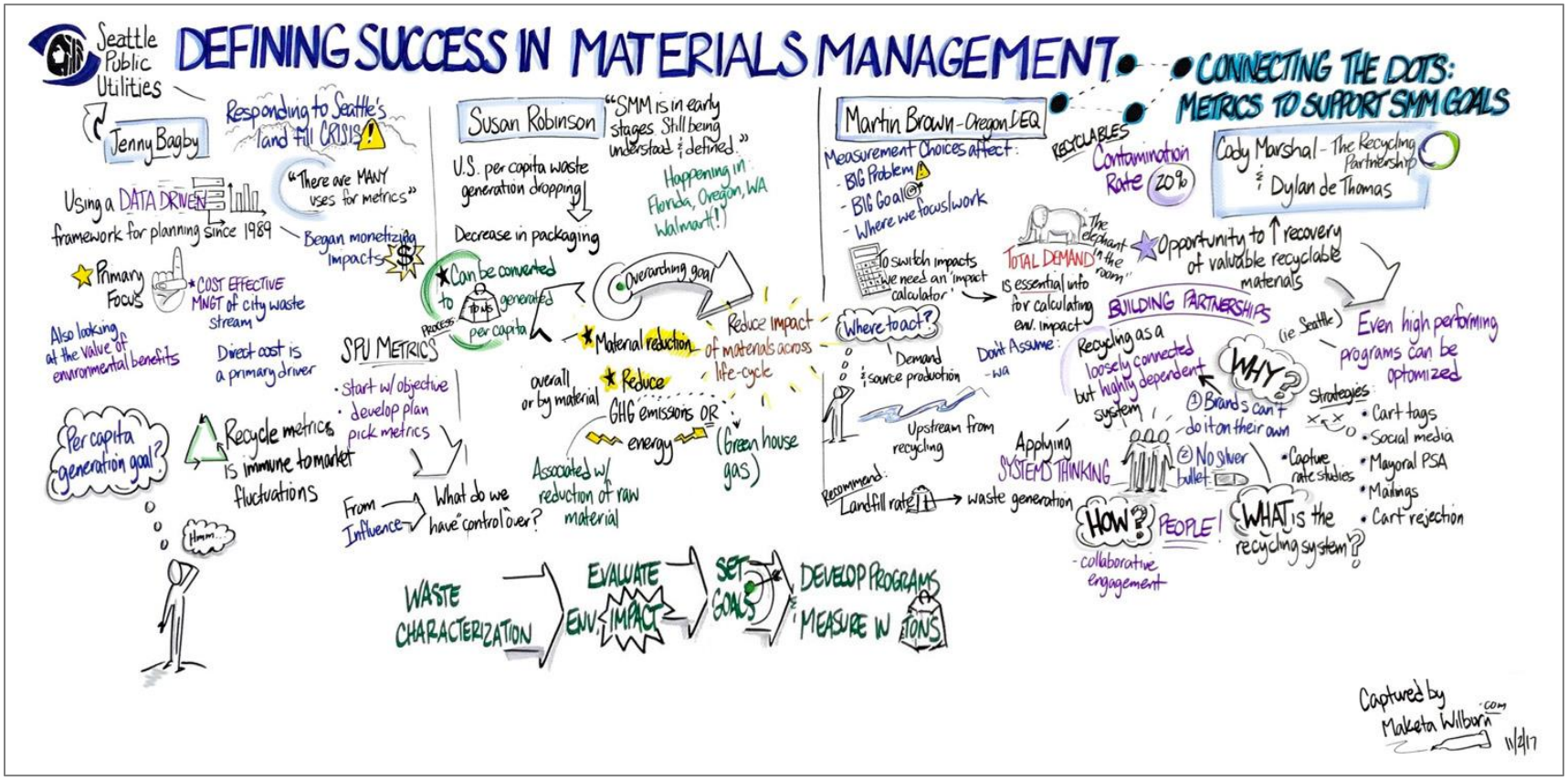
Appendix J: Graphic Recordings

Morning Speakers

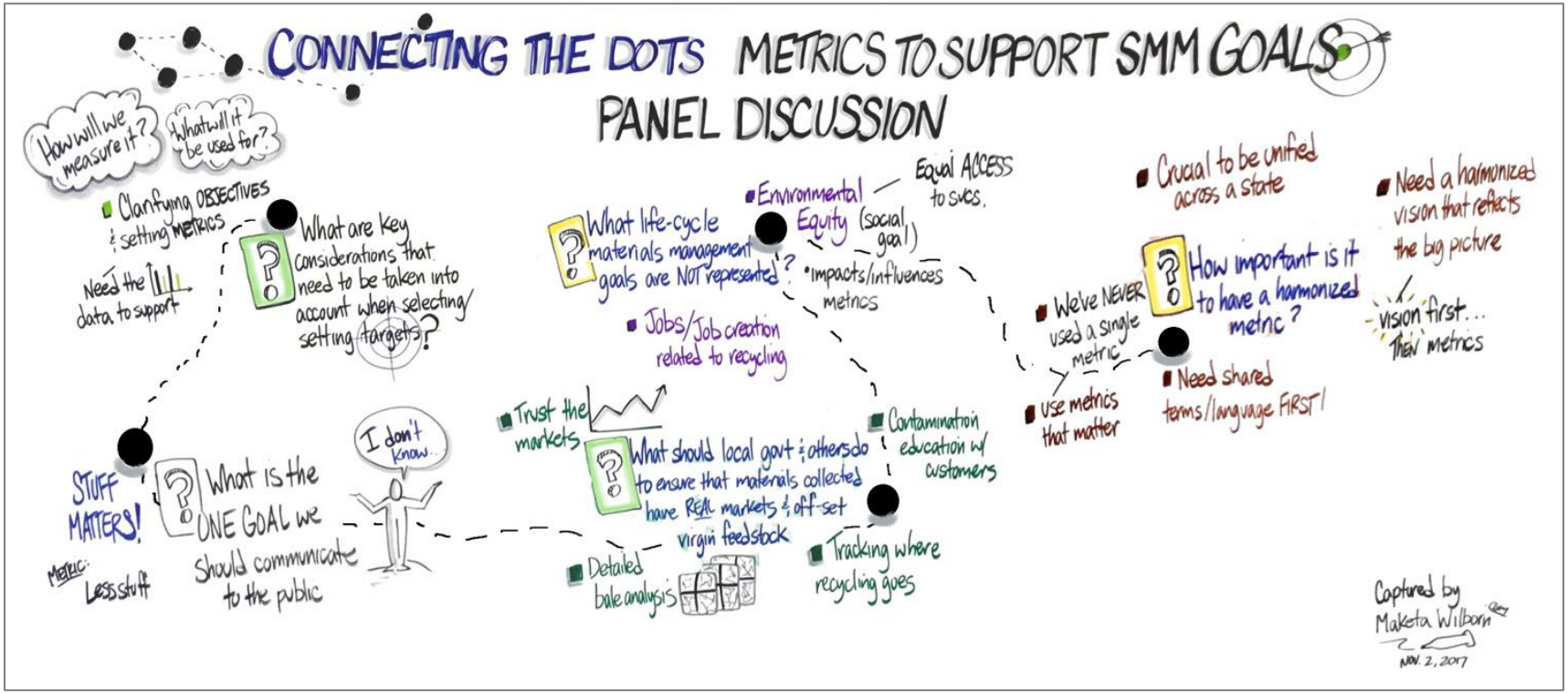
Morning Panel Discussion



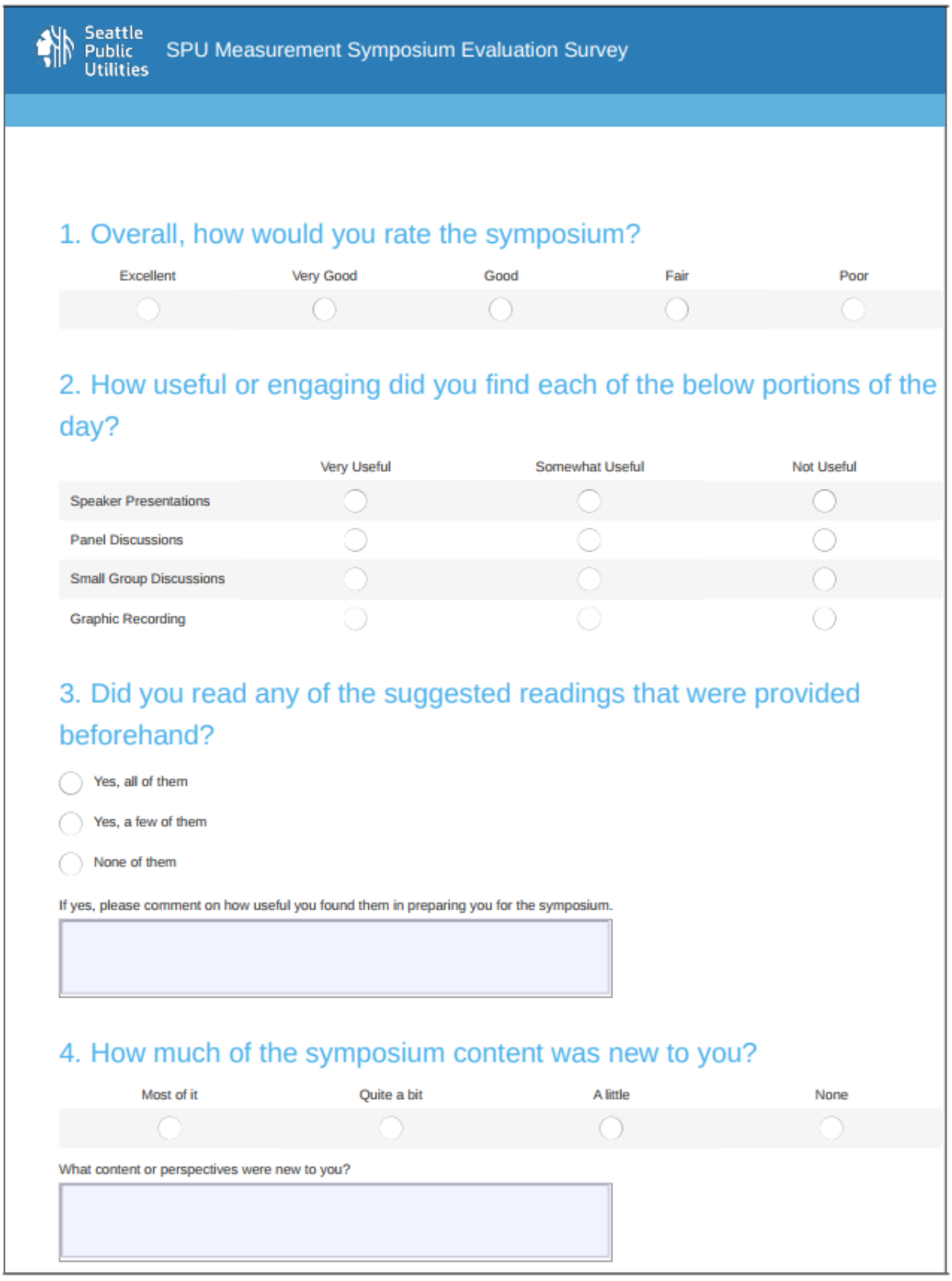
Afternoon Speakers



Afternoon Panel Discussion



Appendix K: Post-Symposium Survey and Responses



Seattle Public Utilities

SPU Measurement Symposium Evaluation Survey

1. Overall, how would you rate the symposium?

Excellent	Very Good	Good	Fair	Poor
○	○	○	○	○

2. How useful or engaging did you find each of the below portions of the day?

	Very Useful	Somewhat Useful	Not Useful
Speaker Presentations	○	○	○
Panel Discussions	○	○	○
Small Group Discussions	○	○	○
Graphic Recording	○	○	○

3. Did you read any of the suggested readings that were provided beforehand?

- ○ Yes, all of them
- ○ Yes, a few of them
- ○ None of them

If yes, please comment on how useful you found them in preparing you for the symposium.

4. How much of the symposium content was new to you?

Most of it	Quite a bit	A little	None
○	○	○	○

What content or perspectives were new to you?

5. How likely are you to share what you learned?

Very Likely	Somewhat Likely	Unlikely
○	○	○

What are you most likely to share and with whom?

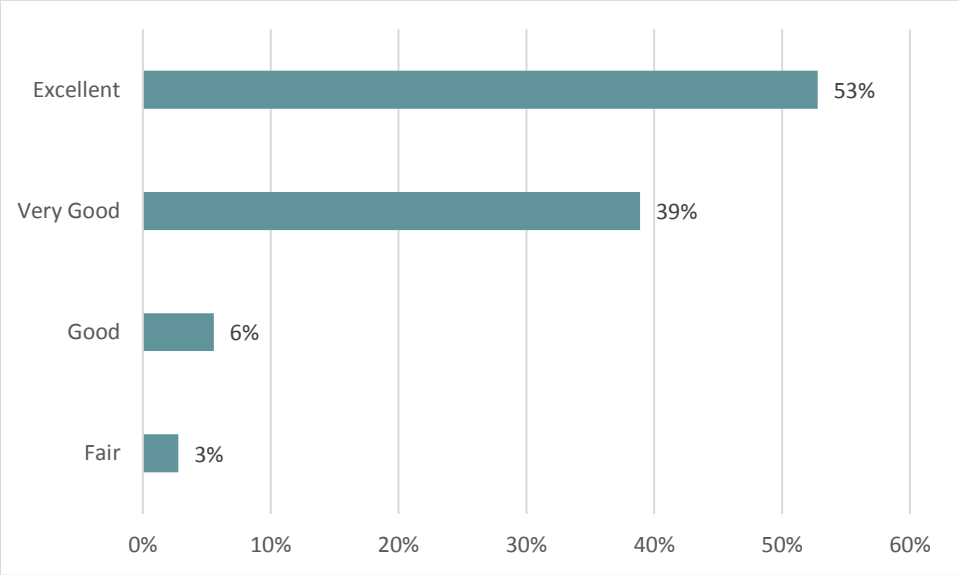
6. How would you rate the:

	Excellent	Good	OK	Poor
Overall organization of the event	○	○	○	○
Venue itself	○	○	○	○
Ease of getting to / parking at venue	○	○	○	○
Food	○	○	○	○
Zero waste practices, such as use of durables	○	○	○	○

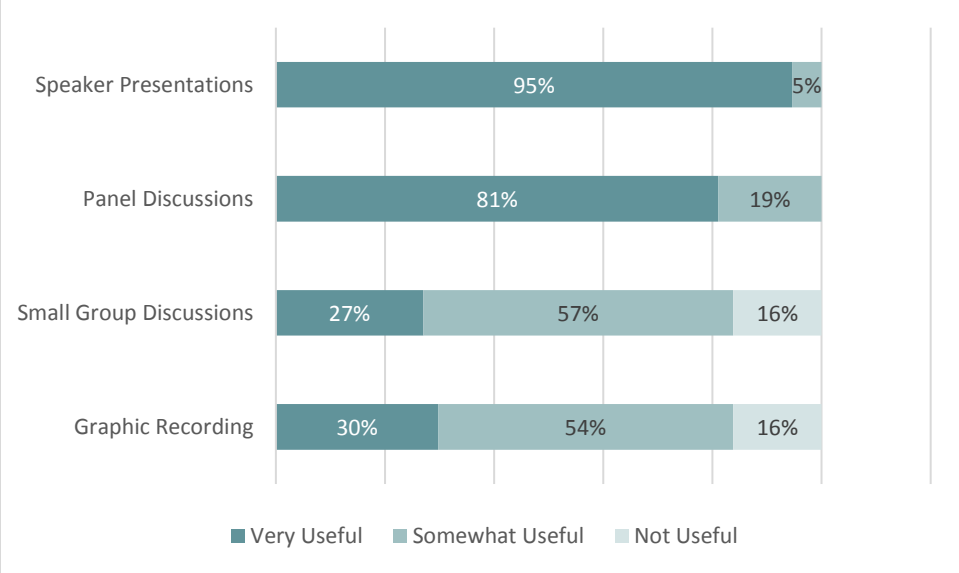
Please share additional comments.

7. Please indicate one or two topics you would be interested in covering in a future symposium like this one.

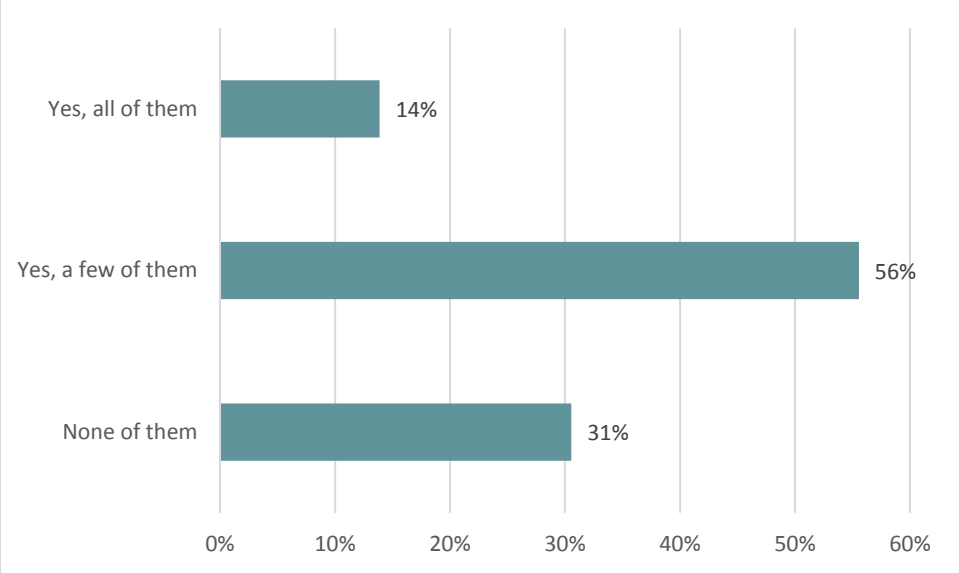
Q1. Overall, how would you rate the symposium?



Q2. How useful or engaging did you find each of the below portions of the day?



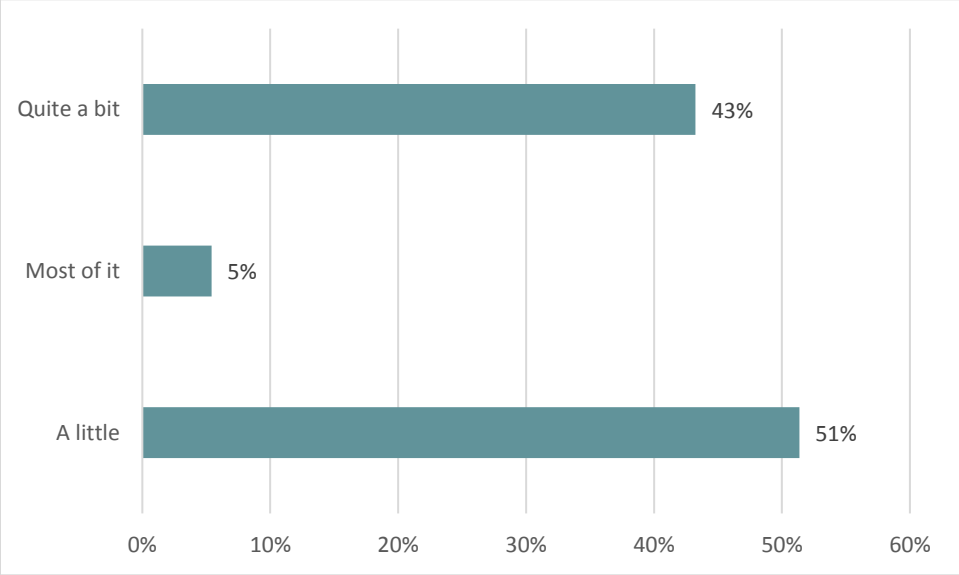
Q3. Did you read any of the suggested readings that were provided beforehand?



Q3. If yes, please comment on how useful you found [the suggested readings] in preparing you for the symposium.
Very helpful.
I found them useful but had read them before announcement of the symposium. I did not have time to read them when they were provided due to short time period.
It was great context setting so I understood some background before the speakers presented their topics around them.
None, because none came to me, even though I'd signed up well in advance. Sounds like it was a MailChimp error. :(
I have a fair amount of knowledge in the arena. Still, the readings helped bring it all together.
They provided good context and overview, especially for those new to the issue.
It was great to get all this information. I will read them going forward...
good background info. I had read most of the reports already.
Useful in presenting a new perspective on waste measurement.
Very useful! I'm so glad you sent this and with plenty of time ahead to read. I plan to read the articles I didn't yet get to.
I had read some of them already, and nothing was really too groundbreaking in them.
I really didn't have the time to read much of the materials. In the big scheme of things, I don't think the advance materials added value. All I needed was a synopsis of SMM and what to be considering.
My spam quarantined them and didn't release until later.
The core suggested readings gave a great primer for the day's discussions and presentations.
It was helpful background but I knew most of it.
Informative.

Q3. If yes, please comment on how useful you found [the suggested readings] in preparing you for the symposium.
Core readings, not so useful. Other relevant documents, most useful. National and state framework documents, somewhat useful (although I was already very familiar with them before the symposium).
I missed the information on recommended reading.
Very helpful.

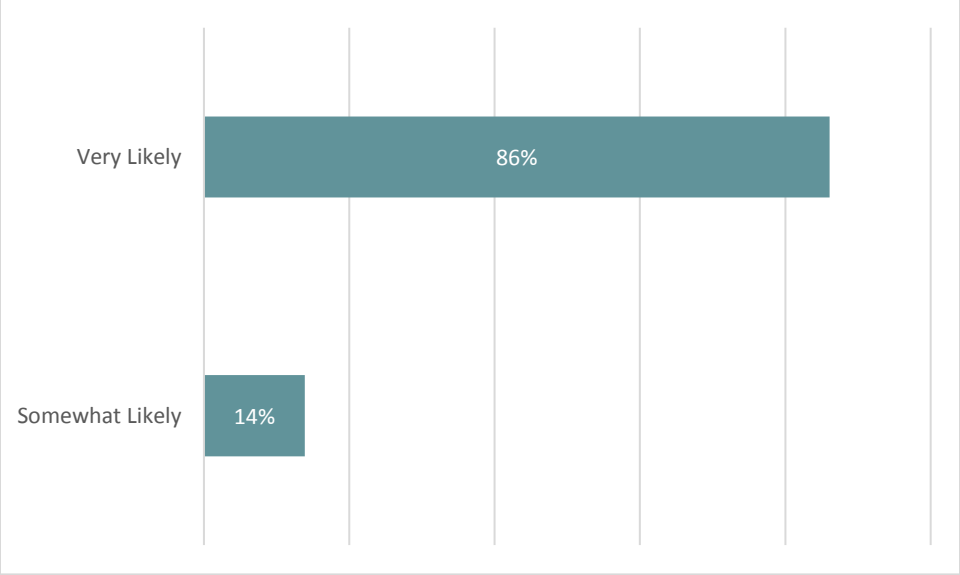
Q4. How much of the symposium content was new to you?



What content or perspectives were new to you?
I gained an understanding of the Sustainable Materials Management proponents perspectives are- and how different they are from Zero waste and source reduction efforts.
I am privileged in being engaged in the subjects and perspectives covered fairly often.
Oregon's sustainability plan.
The closing remarks by Cheryl about having to let a person/entity decide for themselves that they are in the wrong was refreshing/new. The group discussion was new, too, and interesting to see how people approached it.
I'm still in the learning phase of looking at new measures for recycling rates, and am very excited about the ideas presented about looking at the environmental impact of recycling as key over a simple percentage by volume number.
David Allaway's. I really appreciated his candor and bold perspective. His LCA approach (albeit uncomfortable) really made sense to me. It was an A Ha moment.
Loved to hear about Oregon DEQ efforts and Waste Management's efforts.
Scrapping recycling rates as an indication of success; redefining goals; using new measurement tools.
Details on Seattle's program evolution. The ongoing work of Oregon DEQ.

What content or perspectives were new to you?
David Allaway's presented information. I would like to dig into that more to understand it more thoroughly, both the general ideas and the backing information. I would love to have access to a pdf of the PowerPoints.
Hearing from the EPA was quite informative.
I'm rally somewhere between 'a little' and 'quite a bit'. I'm familiar with SMM generally. What was new is the approach to metrics and the better explanation provided between traditional weight-based measurements and looking at impact.
A good deal of what DEQ had to say was information I had heard before but always from a financially biased perspective. Hearing it from someone who may not have as many special interests gave it a very useful angle.
I really enjoyed the philosophical conversation on measurement and how it helps or conflicts with our goals.
Circular economy indicators (not the concept).
City of Seattle history of goals, DEQ measurement tools.

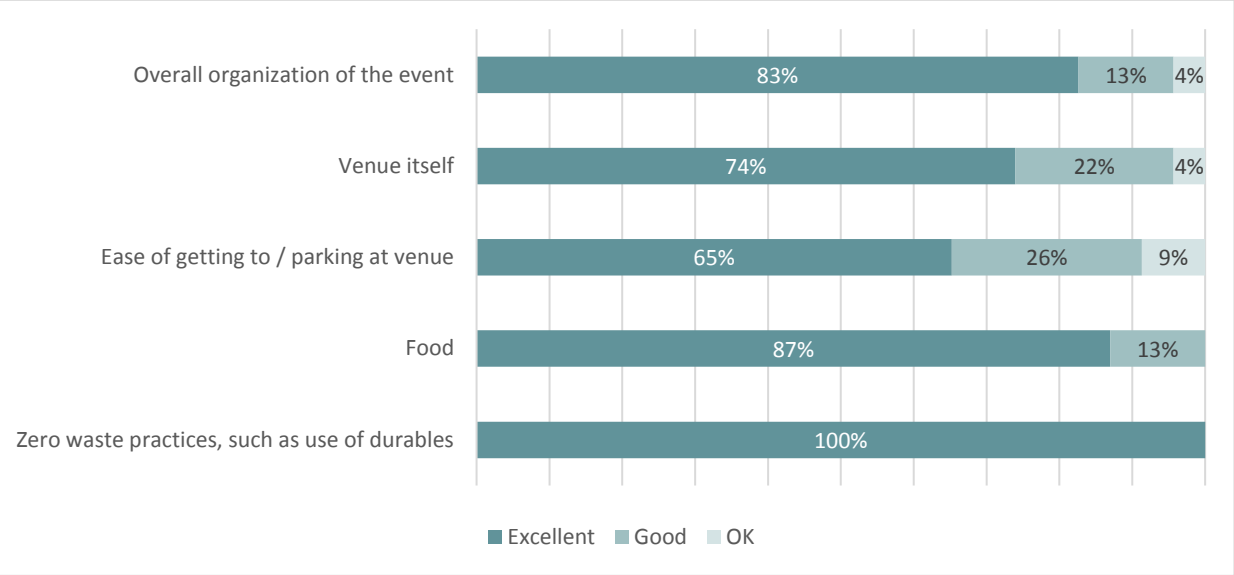
Q5. How likely are you to share what you learned?



Q5 Responses: What are you most likely to share and with whom?
Colleagues working on packaging reduction and marine debris. California regulators and advocates.
Internally, SMM.
I've already shared with my fellow Ecology planners that this may (hopefully) be the wave of the future (measuring in ways that reflect the true reasons we do this, rather than just tons), even if the specific metrics are not pounded out yet.

Q5 Responses: What are you most likely to share and with whom?
I have staff who review local Comprehensive Solid Waste Management plans. We will all be looking at new ideas for measurement. Also, this is something my management team is looking at and discussing.
The need to rethink the goals we have established.
King County has completed its draft Comprehensive Solid Waste Management Plan. We will be able to use the information gained in this symposium to continue our discussions with our stakeholders. We will be able to apply these ideas going forward.
My zero-waste cohort.
I already have been sharing. I had some side conversations with attendees that I've been able to share with colleagues that might lead to potential collaborations. The perspectives from the presenters were fantastic and valuable. What I believe would've been even more useful would be time to interact in small groups about the information presented, and to engage on how to change course or problem solve specifics.
General synopsis of the conversation with my colleagues in my organization.
The concept of measuring impact versus the traditional method of weight-based collection and diversion. And how we have a propensity to use surrogate metrics, which are simple, for complex problems. Body weight and health being the example.
Thinking differently about goals.
I'm a lot more concerned with waste reduction now and how we measure it/take credit for it.
The conversation about zero waste for landfill reduction matched up against reconsidering things outside of a lens of zero waste to reach a larger sustainable goal.
I have shared with my team and it has motivated me to write an article.
Work colleagues and industry associates.
Emphasis on waste reduction measures (moving away from recycling rates), life cycle measures, keep in mind the objective is not recycling, but conservation of resources and reduction of environmental impacts (e.g., pollution). Sharing: with coworkers in staff meeting
City of Seattle history of goals, DEQ measurement tools.

Q6. How would you rate the…



Please share additional comments.
I thought the food was really good and the zero waste practices were exemplary!
The venue/food/durables/notetaker all added to the "Wow" factor of this meeting, and are not to be overlooked. Also the all-star attendees and presenters. It helped add to the seriousness, too, as one could kind of go "uh, huh, yeah, Ok" to a new/challenging idea and brush it off. In this case, the energy in the room was to "roll up your sleeves." It was like a party of sorts, and I feel really blessed to have gotten to be a part of it. Thank you!
I took the bus, and not the fault of the organizers, but METRO's webpage wasn't as clear as it could have been about where to get the best bus that went by the facility. I love the eclectic mix of plates. Another waste saving practice could be to let participants know in advance that there might be leftover to take home, and we could bring our own containers. Of course, who doesn't need an extra reusable container as provided! So maybe this cancels out my comment!
At my table, in particular I sensed frustration as to how planned the event was to the point it limited Q&A in the moment and forced people to ask questions at the end.
SPU should be commended for bringing this diverse and well-versed group together!
Loved the walk from light rail to the facility.
I love that you walked the talk.
Your survey doesn't provide an opportunity for me to share my biggest disappointment, which was that the panels were very one-sided in terms of representing a Sustainable Materials Management perspective, they were very anti-waste prevention, and there wasn't much diversity in perspectives about how to approach solid waste. Furthermore, I felt like we were being talked at a lot rather than providing input. The first small break-out session was awful- the question posed to my group was unclear and VERY poorly facilitated- our facilitator didn't understand what the question was asking and she had no facilitation skills. But the fact that I only got to participate in one small group discussion, addressing a topic that I had no background in or understanding of, meant that I had no

Please share additional comments.
real opportunity to provide input on substantive issues. I traveled a long way, read all the materials in advance, and was prepared to have good discussions about policies aimed at preventing or reducing the generation of solid waste and how to incentivize it and measure progress. The SMM folks basically dis'd this as a goal and so there was no valuable exchange of ideas about this. I hope SPU doesn't toss waste prevention out as a valuable goal, just because EPA and Oregon don't value it.

Q7. Please indicate one or two topics you would be interested in covering in a future symposium like this one.

Q7 Responses re: Future Discussion Topics
- Strategies to move upstream in solid waste management. - How do we make equity and racial justice at the center of solid waste management policies and practices? How do we factor these in the metrics in the current political climate?
How to achieve overall reductions in waste prevention- how to measure prevention- and whether light-weighting the waste stream is a good outcome when focusing on source reduction.
How commercial offices and businesses are thinking about SMM and strategies to implement in the private sector
How can we really know if our recyclables (by specific material type) are actually making it to end users? What kind of chain of custody possibilities exist? Who currently has them in place, and what are the cost(s)? For too long, we've blithely tossed items into the blue bin, trusting they'll get carefully shepherded to end users. In reality, it's all a dollars game. We need to protect our good intentions by checking in on how and where items are going, and have balances ready to implement if things go astray. We shouldn't have to wait for China to finally put us in the "time out" corner for bad behavior. I'd want to know the status at that time of OR's IMFO, and of WA's Materials Matrix. I'd also want further discussion of metrics already in use out there, and which ones (existing, under development, or not yet developed) that would be best to use, and which are good for using across various states/entities for some amount of comparison. I'm referring to new metrics that attempt to capture the essence of what we're after, such as pollution reduction and resource conservation.
Continuing to dig deeper into all the topics presented at the workshop. Maybe some detailed looks at specific materials that are in the recycle stream and where they rank as collectable, recyclable, and best bang for the (environmental) dollar.
demonstrating private/public partnerships (uncovering barriers, working together on specific challenges/solutions, metrics used)
Affordability versus Landfilling. Disposal is often the cheapest method of material management.
Let's continue a regional discussion of how we can move these discussions forward.
Build on the MMS framework - to review best future practices for categories of materials with low LCA benefit.
More in-depth discussion of just what is involved in calculating environmental (including public health, ecosystem and other impacts in addition to climate) footprints.
Recycling market development, finding sustainability in recycling contracts
costs

Q7 Responses re: Future Discussion Topics
Specific focus on tools to measure waste prevention.
There's always something emerging, so whatever is relevant at the moment.
Distill down how a local government can begin looking at SMM in a more practical sense. I really get the feeling that SMM, as presented, is really the work of Federal and State Govt. We at the local level don't have the full understanding, resources, or time.
Analyzing actual options for improved measurement. Follow-up on Oregon's implementation of new metrics. Speakers from other communities leading this charge.
EPR
Explore options for increasing planning and policy coordination across gov sectors (climate change, air quality, economic development, solid and haz waste, water quality, etc.)
Actual case studies of how a sustainable materials management prospective has been used to prioritize staffing and dollar resources.
Flexible Packaging - How to collect and recover for circularity.
How SMM management will change the way solid waste contracting might be done, and how to make contracts more fluid so that changes can be implemented more effectively when better options develop that may not be traditional.
Extended Producer Responsibility - is it realistic in WA
More detailed look at SPU's data collection work (garbage, recycling, organics, market prices) and SPU's econometric model; life cycle analysis;
Life Cycle Analysis and GHG's.
- How or where to find the data that would allow us to look at comprehensive environmental impact of different behaviors. -As a government agency, how can we remove the silos that exists in our programs so that we can focus on the full environmental aspect of different behaviors
First off, I was hoping this survey would be asking people for their further thoughts and input as a result of the symposium. It doesn't really do that so I think it might be useful to do a follow up question to those attending asking specifically for that input, now that they've had a month to reflect. And I am going to do use the survey to do that myself. The next symposium should be related to this one and build on it. There was not adequate time for discussion to actually tease out ideas and evolve thoughts. Also, as the symposium was framed as sustainable materials management, there was not a discussion around zero waste and circular economy (and cradle to cradle) approaches and the pros and cons of each, or how to integrate those approaches at the local level to provide benefit to rate payers, the economy, society, and the environment. While it might seem academic, various approaches lead different directions. I was just in a meeting with Amazon yesterday and watched various approaches lead different directions for Amazon even as we spoke. My personal opinion is that what is needed is an integrated approach that draws from each to inform actions so that they are most effective. With that in mind, the next symposium should be something like: Integrating zero waste, circular economy and sustainable materials management at the local level. It would involve hearing more about these other approaches and a review of SMM, maybe a couple of case studies presented or examples to discuss, and would be discussion heavy. Another and related subject would address what it means to be a community based sw utility. One of the potential issues with SMM as it was presented is the potential of viewing things as technocrats. Basing approaches only on what the numbers show (which is part of the problem that

Q7 Responses re: Future Discussion Topics
we didn't really get to - what do different forms of measurement show us and direct us to do) and not being responsive to political, consumer or public concerns. I think a purely technocratic approach will not ultimately work nor is in keeping with the idea of a community based utility - but an integrated approach can also be data driven, strategic, and respond to the community.