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Enhancing Community Engagement Using Q-Methodology

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Executive Summary

The purpose of this document is to demonstrate the use and application of the social science technique Q-Methodology as a means of enhancing the public engagement process. This report describes the results and findings from a set of outreach workshops organized by the Oregon Department of Environmental Quality following the 2021 Sustainable Oregon Conference hosted by the Association of Oregon Recyclers. The objective of the workshops was to pilot a structured engagement approach to explore patterns of stakeholder agreement and disagreement regarding the various trade-offs within the vast framework of Sustainable Materials Management. Sustainable Materials Management (SMM) takes a holistic view of environmental impacts across the full life cycle of materials, as well as actions that can be taken to reduce those impacts. The 2050 Vision and Framework for Action describes a desired future where people in Oregon produce and consume materials responsibly – conserving resources, protecting the environment and enhancing well-being.

Responses were gathered from 31 participants across four separately facilitated sessions using Zoom and Q Method Software. Within each session, participants were presented a set of 40 statements that outlined trade-offs throughout the entire life cycle of materials. For example, "*Consistent and reliable collection service for solid waste and recycling for all,*" or *"Tracking rates of natural resource demand and consumption in relation to global resource availability."* Participants were then asked to individually rank-order the 40 statements in matter of importance to them. Following the completion of the virtual Q-Sort, participants engaged in a facilitated group discussion on how their experiences in materials management inform their priorities and decisions regarding multiple trade-offs.

During the four sessions, both quantitative and qualitative data was collected. The findings of the multivariate statistical analysis of the 31 Q-Sorts submitted revealed two shared patterns of response. Those two perspectives are summarized as: 1) The Social Systems Perspective, and 2) The Material Systems Perspective.

Separately those perspectives reported different priorities within the life cycle of materials, however, together there was shared agreement on the importance of the following SMM elements.

Area 1: Chemical Infrastructure and Toxics Reduction

AOR members who engaged in this exercise expressed a high importance for persistent chemicals (i.e., PFAS) to be properly managed throughout their full life cycle. Participants reported that resource extractors and/or producers should demonstrate accountability by planning and implementing enhanced management infrastructure. Participants also reported that the reduction, prevention and elimination of toxic substances within product design is highly important.

Area 2: Product Stewardship

Strong support was expressed for the framework of Product Stewardship. Participants collectively agreed that manufacturers should have integrated responsibility for their products throughout the entire material life cycle, with an emphasis on front-end processing and extraction. Additionally, there was broad support for Extended Producer Responsibility (EPR) models (e.g. E-Cylces, PaintCare).

Area 3: Fair Labor

Fair labor was also an area of consensus. Participants reported that enforceable fair labor agreements, which ensure the health and safety of workers throughout all stages of the material life cycle, as a top priority within SMM.

The successful completion of this project demonstrates how a scientifically rigorous engagement method can facilitate public dialog around the qualitative features of environmental protection. Q-Method provides a structured, yet flexible tool to bring stakeholder voices together and better acknowledge varying interests, priorities and values within SMM. Such an approach can greatly enhance the public process by uncovering hidden viewpoints and identifying areas of shared interest within planning and decision-making efforts.

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Introduction

"Enhancing well-being"

The 2050 Vision and Framework for Action describes a desired future where people in Oregon produce and consume materials responsibly – conserving resources, protecting the environment and enhancing well-being. DEQ has researched, communicated and implemented the best available approaches toward conserving resources and protecting the environment. However, a systematic investigation into the directive of *enhancing well-being* has been slow to develop. Part of the difficulty in researching well-being exists within the diversity of subjective features which shape the concept, making a universal definition hard to establish. Existing quantitative models used to monitor resource consumption and environmental impacts are not easily transferable into the research space of well-being. Based on the conceptual complexity of well-being, and the vast spectrum of values and attitudes which need to be better understood, a novel research agenda is warranted. Therefore, a qualitative approach is required to better recognize the varied futures we might all envision. Additionally, the directive of *enhancing well-being* offers a broader framing of materials management which may help uncover the societal and economic conditions that have been previously left out of the conversation.

By introducing qualitative inquiry to the life-cycle of both materials and the people managing them, there is increased opportunity to better understand the challenging trade-offs stakeholders and practitioners encounter within their lived-experience. Incorporating the well-being of people and places in the conversation about environmental protection helps create a framing which reveals the complex connections between a person, their immediate and broader community, and global society. It further allows the influences of the material life cycle to be viewed through the lens of populations with varied environmental conditions.

Stakeholder Voice and Well-Being

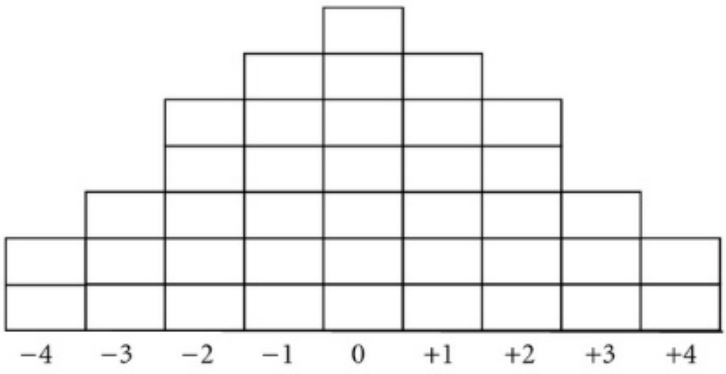
DEQ identified Q-Methodology as a means of getting to an open conversation about the lived-world of materials management. Also referred to as Q-Method or Q-Sort, the approach is a scientifically rigorous public engagement approach that explores the multitude of relationships people have with a particular topic or issue (Armatas et al., 2021). The application of Q-Method within this project aims to explore the different priorities and influences stakeholders experience within the SMM framework. By seeking such feedback DEQ hopes to better understand what is most important to stakeholders and learn more about their unique needs, as a means to consider which conditions may engender well-being. Such an approach also provides the opportunity to clarify the scope of SMM and build new conversations that equitably promote stakeholder voice.

Methods

Q-Methodology

Q-Methodology was developed in the 1930's by British psychologist and physicist William Stephenson. The research technique is designed to analyze first-person perspectives about a given topic or issue (Stephenson, 1953). Q-Method typically employs a convenience sampling technique and presents study participants with a menu of statements that aim to representatively convey the specific topic or issue being examined. Q-Method allows each participant to generate a unique set of answers through a rank-ordering of the statements they are presented. Below is an example of the Q-Sort board that participants use. The statements are individually written on cards to be placed throughout the board in order of importance – the column on the far right of the board (+4) is where a participant's two most important statements will be placed, followed by descending importance across the board to the far-left column (-4). The horizontal rows have no influence on the ranking, just the vertical columns.

Figure 1: Q-Sort Board



Using Q-Method to examine complex topics within environmental protection can provide a systematic and inclusive way of exploring stakeholder perspectives. It can also serve to uncover additional viewpoints, which may fall outside the realm of traditional paradigms. Q-Method has the ability to reveal patterns of subjective agreement and disagreement within topics of concern. DEQ is interested in employing such an approach in order to generate a more holistic understanding of stakeholder priorities and interests based around their reported needs. This understanding will also help provide greater nuance to inform the planning and decision-making process.

Model Design

The SMM model was designed over the course of six months by a DEQ workgroup of nine individuals, with two members joining as external partners. The task of designing and implementing the model provided an opportunity to build internal capacity regarding the application of Q-Method, as well as a chance to demonstrate the technique as an engagement approach used with stakeholders. In designing the model, the workgroup started by categorizing SMM into three primary dimensions:

1) Resource Extraction and Processing
2) Product Design and Consumption
3) Material Recovery and Discard

The workgroup then developed a list of 40 statements as a representation of SMM within those dimensions. The list was created through the guidance the 2050 Vision and Framework for Action, the EPA's 2009 publication The Road Ahead, as well as an informal peer-review process to ensure the language and concepts were clear and relatable. After pre-testing the model internally with DEQ staff, the workshops were organized following the completion of the 2021 Sustainable Oregon Conference hosted by the Association of Oregon Recyclers.

The following three tables provide the contents of the SMM model.

Resource Extraction and Processing
1. Landscape assessments which map the scale of resource extraction practices in the United States and abroad
2. Tracking rates of natural resource demand and consumption in relation to global resource availability (e.g., depletion rates)
3. Research into the inter-generation impacts of the material life cycle on people and communities
4. Harvest management frameworks which promote long-term stewardship of renewable resources
5. Extractor and/or producer responsibility for the full life cycle of persistent chemicals (e.g., PFAS)
6. Investment into technologies which reduce carbon intensive practices within the extraction of raw resources
7. Resource extraction stewardship models which reduce negative impacts on people and ecosystems
8. Enforceable fair labor agreements which ensure the health and safety of workers throughout all stages of the material life cycle
9. Baseline transparency within global supply chains of societal and environmental impacts
10. Product stewardship programs where manufactures have integrated responsibility for their products throughout the entire life cycle

Product Design and Consumption
11. Reduction, prevention and elimination of toxic substances within product design to protect public health (e.g., green chemistry, pollution prevention)
12. Public policy that supports product life extension programs at the community level (e.g., right to repair, thrift, tool libraries)
13. Readily available information, toolkits, and resources for consumers to make informed purchasing choices (e.g., safe cleaning products, food waste prevention)
14. Product labeling with truthful information about the life cycle impacts of a product and proper discard management
15. Business leadership initiatives that promote greater transparency about the sourcing of materials for products and services
16. Coordination between producers and suppliers to promote inter-industry use of secondary feedstock
17. Youth apprenticeship programs which provide education and training regarding job opportunities within materials management
18. Extended producer responsibility programs where manufactures have integrated responsibility for end-of-life management of their products (e.g., E-Cycles, PaintCare, Drug Take-Back)
19. Science supported procurement programs for public and private organizations which incentivize purchasing products and services with low life cycle impacts
20. Aligning the design and construction of the built environment to not cause disproportionate community burdens
21. Physical and social infrastructure that provides equitable access to housing
22. Physical and social infrastructure that provides equitable access to nutritional food
23. Emissions profiles and/or footprints for high volume goods and services which factor in consumption and demand
24. Systematic data profiles for high impact products and services consumed in Oregon to inform public policy

Material Recovery and Disposal
25. Food recovery and redistribution programs that directly support communities (e.g., foodbanks, share kitchens)
26. Commercial collection of food scraps (e.g., grocery stores, restaurants)
27. Curbside collection of food scraps and yard debris
28. Curbside collection of solid waste for disposal
29. Curbside collection of recycling

30.	Commercial collection of solid waste for disposal
31.	Commercial collection of recycling
32.	Composting facility operations which reduce negative impacts (e.g., clean feedstock, nuisance odor strategies, leachate management)
33.	State of the art management of hazardous waste (e.g., personal safety training, proper handling and disposal)
34.	Scientifically informed material use and management polices (e.g., Recycling Modernization Act, Cap and Trade)
35.	Transfer station and landfill operations which reduce negative impacts (e.g., material screening, leachate management, emissions management)
36.	Consistent and reliable collection services of solid waste and recycling for all
37.	Programs which properly manage hard to process materials (e.g., bulky waste, medical waste, refrigerant recycling)
38.	Recycling decals and instructions to help reduce contamination
39.	Guidelines which ensure recycled material exported to foreign destinations does not pollute or harm communities
40.	State of the art energy recovery technologies (e.g., waste to energy, chemical recycling)

Data Collection

Data was collected during the four workshop sessions in December 2021. The quantitative data was gathered through the completed Q-Sort submitted by participants. The qualitative data was gathered during facilitated group discussions. The workshops provided an opportunity to introduce Q-Method and receive feedback from participants on the methodology's application and use. Participation was voluntary, and to maintain consistency each session began with a short introduction and description of the methodology and how the software functions. Participants were given 30-40 minutes to familiarize themselves with the list of 40 statements and rank-order their importance in relation to one another using the Q-Sort board. Participants were encouraged to ask clarifying questions during the sorting activity. Following the completion of the sorting process a facilitated group discussion took place.

By designing the data collection process as a group activity, the workshops provided stakeholders the opportunity to collectively familiarize themselves with SMM and build on conceptual clarity in certain framework areas. The 40 statements provided a uniform description of SMM while the Q-sort process allowed subjective opinions of the framework to become better known. As a result, the quantitative findings uncovered areas of consensus and divergence around SMM priorities within this specific audience. While the group discussions offered further detail into the particular considerations participants are regularly confronted with – those qualitative findings are offered in Appendix A.

Data Analysis and Results

Principal Components Analysis

One of the primary goals of this study was to determine the underlying structure of participant perspectives on Sustainable Materials Management. For this reason, exploratory factor analysis was performed on the dataset through the technique of principal components analysis (PCA). PCA allows a large number of Q-sorts to be distilled into a concise number of typified Q-sorts or "archetypes" that represent the range of opinions reported by participants. These archetypes provide a summarized visualization of the shared patterns of response across all 40 statements by the sample population. The archetypes are meant to represent shared perspectives that are defined by multiple people. As such, a participant from this effort might review the archetypes and note: "This one is not exactly how I feel, but it is close in certain areas" (Armatas et al., 2019).

Interpreting the Results

Based on the results of the factor analysis, two perspectives have been identified within the sample population. The two resulting factors (*perspectives*) uncovered through PCA are:

1) The Social Systems Perspective
2) The Material Systems Perspective

Both perspectives offer insight into the different ways participants prioritized trade-offs within SMM. Appendix B provides a table outlining how the two archetypal perspectives ranked each statement. However, before going into detail about how the two underlying perspectives differ, it is helpful to identify the areas of interest within SMM where broad support is exhibited across both perspectives.

Area 1: Chemical Infrastructure and Toxics Reduction

AOR members who engaged in this exercise expressed a high importance for persistent chemicals (e.g., PFAS) to be properly managed throughout their full life cycle. Participants reported that resource extractors and/or producers should demonstrate accountability by planning and implementing enhanced management infrastructure. Participants also reported that the reduction, prevention and elimination of toxic substances within product design is highly important.

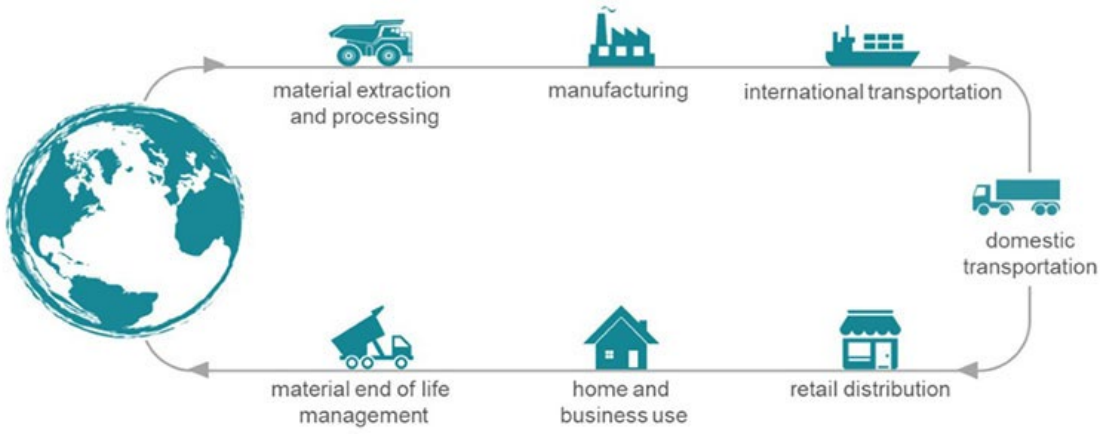
Area 2: Product Stewardship

Strong support was expressed for the framework of Product Stewardship. Participants collectively agreed that manufacturers should have integrated responsibility for their products throughout the entire material life cycle, with an emphasis on front-end processing and extraction. Additionally, there was broad support for Extended Producer Responsibility (EPR) models (e.g. E-Cylces, PaintCare). These findings support the assertion that the AOR community may support stronger Product Stewardship and EPR initiatives to improve material sustainability. And, that Product Stewardship and EPR may be avenues that support the stewardship desires identified in Area 1.

Area 3: Fair Labor

The final area of shared support was the topic of fair labor. Participants prioritized enforceable fair labor agreements which ensure the health and safety of workers throughout all stages of the material life cycle as a top priority within SMM. Which offers an addition consensus area for further elaboration and future program development.

The below diagram offers a generic systems level view of the material life cycle. Considering the three areas of broad support identified through the Q-Sorts, such a diagram may better include stewardship features that address the cross-cutting issues and priorities at each of the life cycle stages, particularly in production and consumption flows.



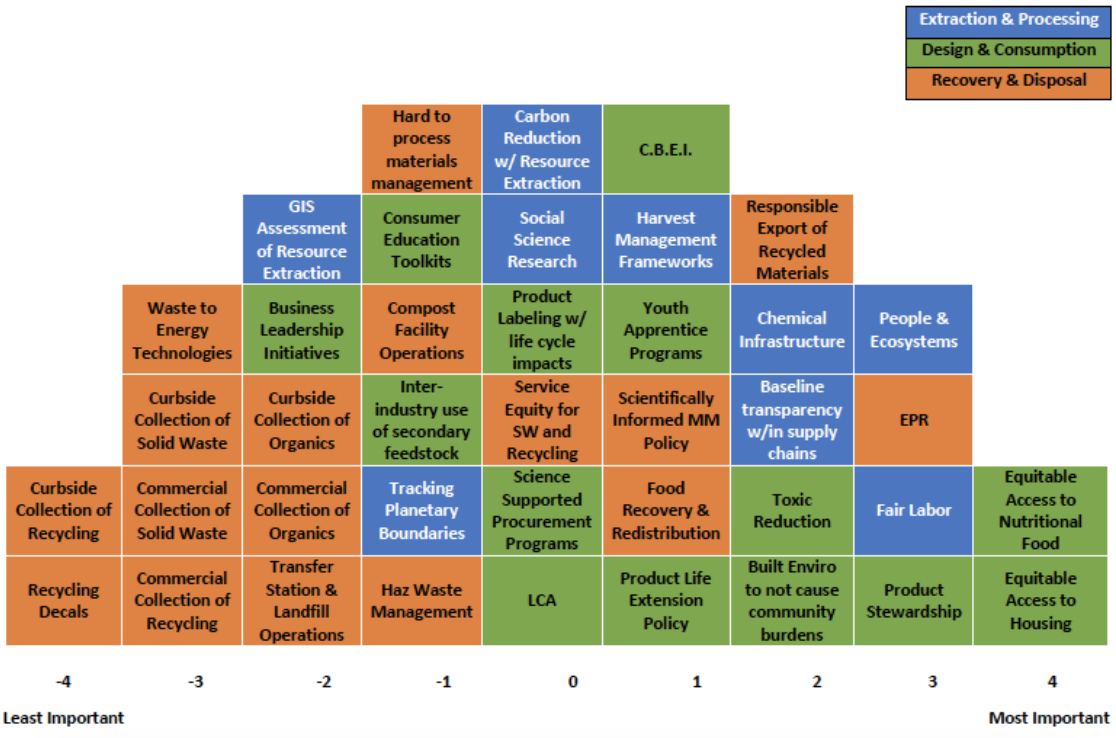
The following sections provide a detailed outline of the characteristics which make up both the *Social Systems Perspective* and *Material Systems Perspective* uncovered by the data analysis.

Factor 1: Social Systems Perspective

The *Social Systems Perspective* was the most commonly held perspective within the sample population (n=18). This perspective expressed the importance of:

- Equitable access to housing and nutritional foods
- Resource extraction stewardship models which reduce negative impacts on people and ecosystems while ensuring the health and safety of workers throughout the entire material life cycle
- The integrated responsibility of manufactures for their products throughout the entire life cycle of materials

Below is the archetypal Q-Sort board for the *Social Systems Perspective* which resulted from PCA. When looking at the board, the numbers on the bottom represent the ranking score of the statements via the vertical columns, the horizontally stacked rows have no influence on rank.



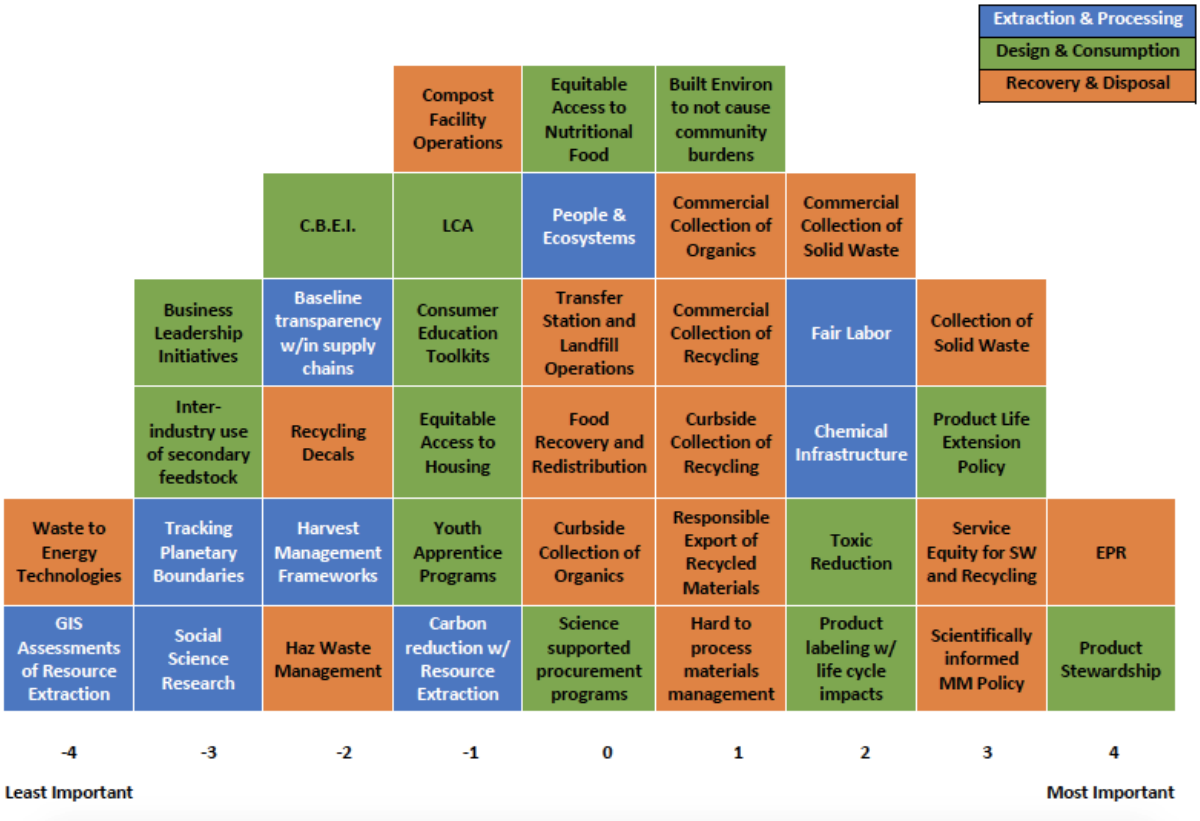
This archetype has been labeled the *Social Systems Perspective* because of the emphasis placed on access to basic human needs. Equitable access to shelter and nutrition, as well as the reported importance of stewardship models that consider the social impacts of material extraction and consumption. Additional areas of importance for this perspective were: responsible export of recycled materials; baseline transparency in global supply chains; and preventing disproportionate community burdens from the design of the built environment.

Factor 2: Material Systems Perspective

The *Material Systems Perspective* was the second perspective within the sample (n=13). This perspective expressed the importance of:

- The integrated responsibility of manufacturers for their products throughout the entire life cycle of materials
- Materials Management policy that is scientifically informed and focused on matters of product life extension
- Service equity for the collection of solid waste and recycling

Below is the archetypal Q-Sort board for the *Material Systems Perspective* resulting from PCA:



This archetype has been labeled the *Material Systems Perspective* because of the emphasis placed on product stewardship and EPR systems. Solid waste management services and materials management policy were also highly important. Additional areas of importance for this perspective were: product labeling that explains life cycle impacts; service equity for recycling and solid waste collection.

Low Priority and Divergent Statements

Among the two perspectives there was also consensus of agreement regarding low priority items within SMM. Participants reported low importance on energy recovery technologies, as well as recycling decals. There was also a low importance reported toward business leadership initiatives within the private sector. Finally, spatial mapping approaches (e.g. GIS) received a low ranking. The below table shows those statements with the archetypal ranking on the right.

Consensus Statements – LOW IMPORTANCE	Social	Materials
State of the art energy recovery technologies (e.g., waste to energy, chemical recycling)	-3	-4
Recycling decals and instructions to help reduce contamination	-4	-2
Business leadership initiatives that promote greater transparency about the sourcing of materials for products and services	-2	-3
Landscape assessments which map the scale of resource extraction practices in the United States and abroad	-2	-4

As for divergent priorities across the two perspectives, a few were identified. Physical and social infrastructure was viewed by the *Social Systems Perspective* as a top priority, while the *Material Systems Perspective* reported those statements to be of neutral importance. Conversely, solid waste management statements were ranked with high importance by the *Material Systems Perspective* and low importance by the *Social Systems Perspective*.

Divergent Statements	Social	Materials
Physical and social infrastructure that provides equitable access to housing	4	-1
Physical and social infrastructure that provides equitable access to nutritional food	4	0
Baseline transparency within global supply chains of societal and environmental impacts	2	-2
Curbside collection of solid waste for disposal	-3	3
Curbside collection of recycling	-4	1
Commercial collection of solid waste for disposal	-3	2
Curbside collection of recycling	-4	1

Limitations

There are a number of study limitations to address. The first being the virtual setting in which the engagement sessions were held based on COVID-19 precautions. Typically, Q-Method functions as an in-person event where participants have the opportunity to directly engage with each other throughout the entire process, including being able to view other's completed Q-Sort board and talk informally about differences and similarities. Although we are grateful to have hosted this event virtually, some of those interpersonal features were lost based on the format itself. Also, because the web-based sort boards were not able to be viewed by others, the group discussion section of the workshop may have been limited based on participants inability to put forth those observations. Additionally, the virtual format may have prevented some potential participants from joining in the workshops, either due to technological constraints or based on work schedules. To note, two of the four sessions were hosted in the evening.

Conclusion

The successful completion of this project demonstrates how a scientifically rigorous engagement method can facilitate public dialogue around the qualitative features of environmental protection. Q-Method provides a structured, yet flexible tool which effectively communicates technical information to a broad audience in a shared setting. For this project, the prioritization exercise brought stakeholder voices together and acknowledged varying interests, priorities and values within SMM. Such an approach enhances the public process through the formation of new discussions on environmental issues, and also by uncovering hidden viewpoints and areas of mutual interest. By identifying collective interests, stakeholders gain the opportunity to collaborate across technical disciplines and jurisdictions, while a more nuanced understanding of the different needs reported by other individuals and communities builds. Additionally, this process presents an approach to governance that works to enhance the well-being of people and the environment by ensuring stakeholder needs and interests are formally identified and included into agency planning and decision-making.

Acknowledgements

Thank you to the DEQ personnel who contributed to the design and implementation of this project: Alex Bertolucci, Martin Brown, Shannon Davis, Marie Diodati, Lydia Emer, Amanda Ingmire, Audrey O'Brien, Minal Mistry and Sanne Stienstra. Thank you to Alejandra Cuesta Monrroy and Carlos Banks of BanksCuesta Translations for their support and guidance. Thank you to Amy Roth of the Association of Oregon Recyclers for helping organize the workshop forums. Thank you to Chris Armatas of the Aldo Leopold Wilderness Research Institute. And lastly, thank you to the participants who made this project possible.

Appendix A

This appendix provides a summary of the specific SMM topics discussed during the four hours of facilitated group discussion.

Two Major Categories of Interest

1) Policy and Research
2) System Access and Upkeep

Policy and Research

Discussion Themes:

- Emissions Reduction
- Implementation
- Research
- Stewardship Models
- Re-use and Repair
- Scale of SMM

Emissions Reduction

Stakeholders expressed a desire to know more about supply chain emissions cycles and how they can be more explicitly addressed. On the topic of policy, stakeholders agreed that carbon is important, but inquired how people might be better included into the conversation. There was also an observation expressing concern that within emissions reduction efforts it seems policy gains often outpace infrastructure availability – citing the specific example of Hempcrete.

Implementation

Participants reported that DEQ's implementation processes are a grey area. Especially when it comes to understanding the steps taken from initiating projects, to developing policy, and to comprehensive program management. Stakeholders stated that grey area makes it harder for them to understand the short and long-term direction of the program. Also, stakeholders noted that the "intent" of a proposed and agreed upon project/policy/program can often differ from the end results of implementation years down the road – which can negatively impact confidence levels.

Stakeholders' suggestions to address these issues:

- Build more confidence through greater transparency in the process
- Inform stakeholder groups of implementation plans
- Ask stakeholders, "what information are you missing?"
- Build more engagement into the process

Research

Participants acknowledged that SMM naturally builds on its research, but some stakeholders reported still feeling left behind – primarily in an informational sense. Similar to *Implementation*, stakeholders mentioned that when they are not able to follow the progression of the MM program's research they have less to understand, and less to support. This suggests DEQ must translate scientific research to multiple audiences in a more effective manner to create advocates.

Re-use and Repair

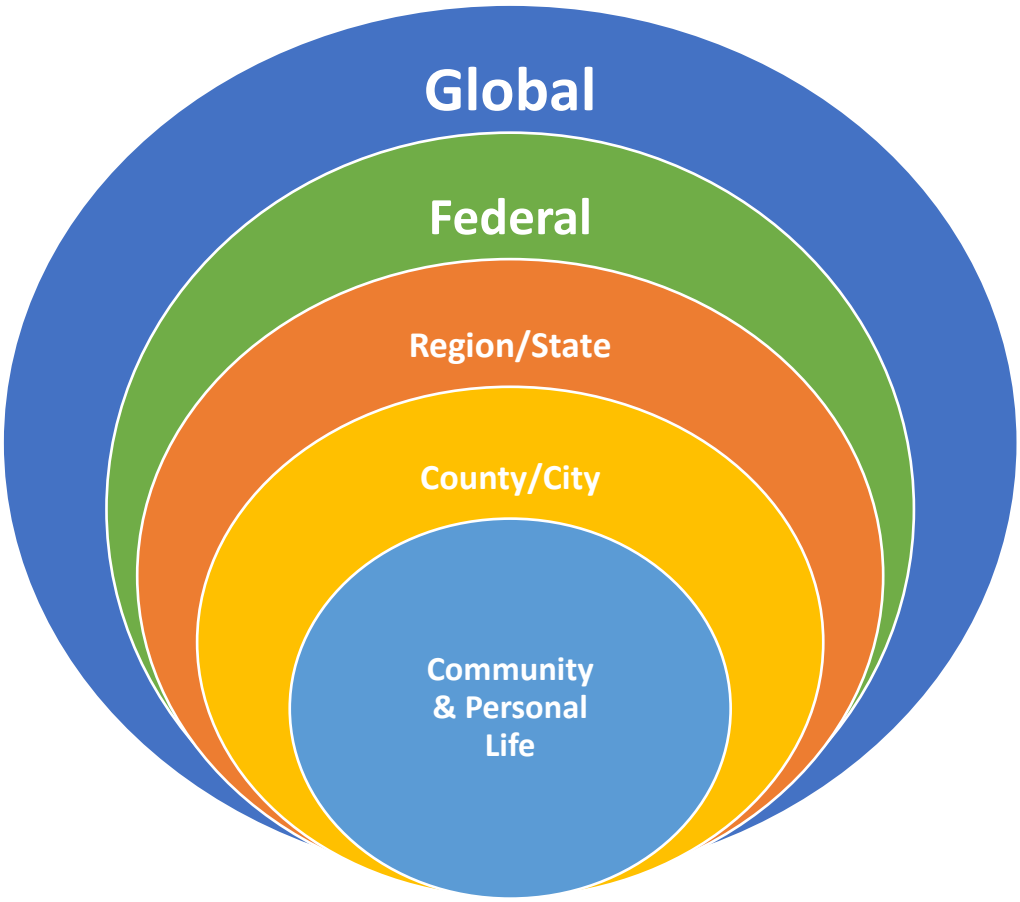
Stakeholders expressed agreement that re-use and repair efforts are an effective way of re-distributing useful materials to more people. Also, acknowledging the consumer benefits of tool libraries and thrift. However, there was notable interest in expanding the focus around re-use and repair to go beyond "consumer choice" within an individual and/or residential sense. Specifically, there were two areas identified by stakeholders in which more information about the status of re-use and repair in Oregon was expressed: 1) The commercial possibilities of re-use and repair (e.g., remanufacturing engines), and 2) The social and economic benefits of small business and job creation. These suggestions highlight that stakeholders are curious to find new ways of scaling up the efforts of re-use and repair, and therefore present new opportunities for research and planning.

When stakeholders discussed the traditional view of re-use and repair via "consumer choice," they expressed the need to provide the public with more practical incentives to purchase secondhand goods, as well as the opportunity to address the topic of "durability" within the conversation, which could potentially function as a way link to product stewardship into the conversation.

Scale of SMM

Stakeholders reported that the scale of SMM can be disorienting. Maintaining that because different SMM directives and programs vary so much in size and scope, working to understand the management trade-offs that are most important is made difficult based on changing comparisons (i.e. rarely apples to apples). There was also discussion of the emotional scale of SMM, which is often overlooked. The emotional scale centered on the notion that some actions are a high priority to people despite the small positive impact they make on system and social levels (e.g., banning plastic straws) – which highlights how the figurative impacts of certain actions are emphasized over the actual aggregate impacts.

There was also discussion about how the large-scale data DEQ often references to explain high impact actions has little emotional impact because it does not provide human context. Which led to the suggestion that DEQ should make high impact data more relatable and interesting to people so that they might form emotional responses to large scale carbon reduction actions. Below is a diagram which outlines the different scales of SMM mentioned by stakeholders:



System Access and Upkeep

Discussion Themes

- Access
- Human Health Topics
- Centralized vs Regionalized Mindset
- Food and Nutrition
- Physical and Social Infrastructure

Access

On multiple occasions stakeholders mentioned the importance of universal access to solid waste and recycling services. Some stakeholders emphasized that fundamental system access is just as important as upstream policy initiatives. If a community or individual lacks access to these services, participants expressed that it's near impossible for upstream programs to be important or relevant to them.

One thought expressed was that those who ***have*** reliable access to recycling and solid waste service often overlook the "have not" perspective – suggesting that these services are easily taken for granted. Moving upstream within SMM requires everyone, so access to such system services ought to be monitored and addressed.

Human Health Topics

Human health was a common interest within all four group discussions. The suggestion of developing new inter-agency programs was brought up a number of times (e.g., Oregon Health Authority, Occupational Safety and Health Administration). Despite the agreed upon importance of human health within SMM, many participants expressed frustration regarding the difficulty of including social/health considerations into policy. Participants stated that it's important to address what's causing harmful exposures rather than focusing so much on addressing the problem post hoc. Stakeholders continually expressed that SMM policy tends to focus on system and infrastructure considerations and should do more to address public health.

Centralized vs Regionalized Mindset

One observation regarding the "mindset" of SMM noted that a centralized mindset dominates the planning and decision-making context. Whether the system of interest is recycling, composting, or solid waste management the concern raised by stakeholders was the overemphasis of system design and upkeep that favors a centralized system, as opposed to many regionalized systems. The reported benefits of regionalized systems were: local job creation and increased networking across cities and regions of the state. These are features that participants believe large catch-all systems fail to offer.

One example mentioned was bottle washing stations:

> *"Do we want one bottle washing station in the Metro region, or do we want 40? 40 would create more jobs and allow more people to interface with the system, while one centralized station operates in the background."*

In terms of different scales of governance, stakeholders stated that DEQ seems best at changing systems, while local government programs seem best at changing social access and service.

Another example offered:

> *"The Cully glass plant reduces carbon by recycling glass, but it comes at the social cost of those who live around the plant … which in this sense, the trade-off being prioritized is the system-level need of reducing carbon, which is taking precedent over the community specific need of pollutant free air, (i.e., system needs over environmental justice). That's how a centralized mindset overlooks people."*

Food and Nutrition

Some stakeholders mentioned that access to food is just as important as food waste prevention efforts. There was also interest in hearing about food in more of an upstream manner (harvest practices, renewable resources, local vs global, supply chain emissions – climate impacts of it all, not only landfill outputs). Using the traditional SMM lens, some participants found it hard to see how access to food and nutrition itself are part of SMM.

There was also discussion about poverty and lack of access to food. It was stated that often the cheapest foods made available to underserved communities are associated with high levels of environmental degradation, which isn't talked about enough. Again, the theme of basic needs was addressed, and the notion that people who don't have their basic needs met, have no way

of benefiting (or accessing) nutritious and organic products which have a lower impact on the planet. Instead, low impact products within the food space are usually only available to higher income groups. Cheap and affordable foods have high social and environmental costs, which means poverty and lack of access to food is detrimental to the environment and has deeply imbedded social costs. Stakeholders expressed wanting to talk more about this topic.

Physical and Social Infrastructure

Stakeholders all agreed that housing is important, but many questioned whether this fell within the scope of SMM, suggesting that more conversations around the Built Environment might provide some nuance and clarity.

In terms of consumption, stakeholders acknowledged that affordable ("cheap") products and services are imported to communities who have no other option than to consume high impact, low quality goods that are not tested for exposure, break easily, and are not regulated within early life cycle stages. One stakeholder stated, "It's hard for low-income populations to access low impact products and services, and it's also hard for these populations to access local products and services because of the barriers to entry."

Appendix B

	SMM Statement	Social System Rank	Material System Rank
1	Landscape assessments which map the scale of resource extraction practices in the United States and abroad	-2	-4
2	Tracking rates of natural resource demand and consumption in relation to global resource availability (e.g., depletion rates)	-1	-3
3	Research into the inter-generation impacts of the material life cycle on people and communities	0	-3
4	Harvest management frameworks which promote long-term stewardship of renewable resources	1	-2
5	Extractor and/or producer responsibility for the full life cycle of persistent chemicals (e.g., PFAS)	2	2
6	Investment into technologies which reduce carbon intensive practices within the extraction of raw resources	0	-1
7	Resource extraction stewardship models which reduce negative impacts on people and ecosystems	3	0
8	Enforceable fair labor agreements which ensure the health and safety of workers throughout all stages of the material life cycle	3	2
9	Baseline transparency within global supply chains of societal and environmental impacts	2	-2
10	Reduction, prevention and elimination of toxic substances within product design to protect public health (e.g., green chemistry, pollution prevention)	2	2
11	Public policy that supports product life extension programs at the community level (e.g. right to repair, thrift, tool libraries)	1	3
12	Readily available information, toolkits, and resources for consumers to make informed purchasing choices (e.g., safe cleaning products, food waste prevention)	-1	-1
13	Product labeling with truthful information about the life cycle impacts of a product and proper discard management	0	2
14	Business leadership initiatives that promote greater transparency about the sourcing of materials for products and services	-2	-3
15	Coordination between producers and suppliers to promote inter-industry use of secondary feedstock	-1	-3
16	Youth apprenticeship programs which provide education and training regarding job opportunities within materials management	1	-1
17	Extended producer responsibility programs where manufactures have integrated responsibility for end of life management of their products (e.g., E-Cycles, PaintCare, Drug Take Back)	3	4

18	Science supported procurement programs for public and private organizations which incentivize purchasing products and services with low life cycle impacts	0	0
19	Aligning the design and construction of the built environment to not cause disproportionate community burdens	2	1
20	Physical and social infrastructure that provides equitable access to housing	4	-1
21	Physical and social infrastructure that provides equitable access to nutritional food	4	0
22	Emissions profiles and/or footprints for high volume goods and services which factor in consumption and demand	1	-2
23	Systematic data profiles for high impact products and services consumed in Oregon to inform public policy	0	-1
24	Food recovery and redistribution programs that directly support communities (e.g., foodbanks, share kitchens)	1	0
25	Commercial collection of food scraps (e.g., grocery stores, restaurants)	-2	1
26	Curbside collection of food scraps and yard debris	-2	0
27	Curbside collection of solid waste for disposal	-3	3
28	Curbside collection of recycling	-4	1
29	Commercial collection of solid waste for disposal	-3	2
30	Commercial collection of recycling	-3	1
31	Composting facility operations which reduce negative impacts (e.g., clean feedstock, nuisance odor strategies, leachate management)	-1	-1
32	State of the art management of hazardous waste (e.g., personal safety training, proper handling and disposal)	-1	-2
33	Scientifically informed material use and management polices (e.g., Recycling Modernization Act, Cap and Trade)	1	3
34	Transfer station and landfill operations which reduce negative impacts (e.g., material screening, leachate management, emissions management)	-2	0
35	Consistent and reliable collection services of solid waste and recycling for all	0	3
36	Programs which properly manage hard to process materials (e.g., bulky waste, medical waste, refrigerant recycling)	-1	1
37	Recycling decals and instructions to help reduce contamination	-4	-2
38	Guidelines which ensure recycled material exported to foreign destinations does not pollute or harm communities	2	1
39	State of the art energy recovery technologies (e.g., waste to energy, chemical recycling)	-3	-4
40	Product stewardship programs where manufactures have integrated responsibility for their products throughout the entire life cycle	3	4