Climate Action Plan 2.0

Appendix 8

Community Climate Action: Materials Management Planning

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Eugene's Triple Bottom Line Vision

As we work to implement the City of Eugene's Climate Recovery Ordinance and to increase our community's resiliency towards climate change, we will be using the City Council's vision to guide our work. The vision describes the three legs of the Triple Bottom Line framework.

Social Equity
Value all people, encouraging respect and appreciation for diversity, equity, justice, and social well-being. We recognize and appreciate our differences and embrace our common humanity as the source of our strength

Environmental Stewardship
Be responsible stewards of our physical assets and natural resources. We will sustain our clean air and water, beautiful parks and open spaces, and livable and safe neighborhoods; and foster a vibrant downtown, including a stable infrastructure

Economic Prosperity
Encourage a strong, sustainable and vibrant economy, fully utilizing our educational and cultural assets, so that every person has an opportunity to achieve financial security.

Climate Action Plan 2.0 (CAP2.0) Social Equity Lens

The project team has identified the need to pay special attention to social equity throughout the CAP2.0 update. The following guiding questions were used during the section meetings to support the project work in deepening the integration of social equity principles through the process and outcomes of the work.

Guiding Questions:

1. Who are the most vulnerable and underserved groups impacted by this decision? How will our decision impact these groups?
2. Does the decision being made ignore or worsen existing disparities or produce other unintended consequences?
3. If there is an investment or resource allocation, how does that advance the social equity leg of the Triple Bottom Line?
4. What are the opportunities and barriers to more equitable outcomes? (e.g. mandated, political, emotional, financial, programmatic or managerial)
5. How have we intentionally involved stakeholders, impacted communities, technical experts, and other community members affected by this decision? Who else do we need to invite?
6. What's the mechanism for including more voices throughout the process?
7. How will we modify or enhance our strategies to ensure impacted and vulnerable communities' individual and cultural needs are met?
8. Do we have the data we need to understand which communities might be impacted? Can we effectively collect data on impacted or vulnerable communities for this decision or investment?

1. Project Description

The City of Eugene is leading a process to update Eugene's 2010 Community Climate Action Plan (Eugene CAP). Eugene's CAP2.0 revision process began in January 2018 and will run through mid-2019. To support the update to Eugene's CAP2.0 Chapter 5 – Materials Management: *Reduce, Reuse, Recycle*, the City received a grant from Oregon Department of Environmental Quality (ODEQ). The purpose of the grant is to align actions included in Eugene's CAP with the overlapping actions and goals included in Oregon's 2050 Materials Management Plan. Specifically - identifying community actions that reduce lifecycle greenhouse gas emissions (GHG) of imported material goods and food consumed in Eugene.

ODEQ conducted a consumption-based greenhouse gas inventory for the Eugene community. The results show that emissions generated during production of goods and food represent a significant share (about 50%) of the community carbon footprint. And while our community cannot regulate how products are produced in other cities and countries – there are local actions that can have a mitigating benefit. This project sought to identify those actions and to identify appropriate metrics and available data to track progress over time.

The grant project plan included 6 tasks:

- Task 1 – Convene Mayor's Ad Hoc Committee
- Task 2 – Convene Eugene CAP Update Planning Committee
- Task 3 – Convene Grant Technical Advisory Committee (TAC)
- Task 4 – Host Local Stakeholder Workgroups
- Task 5 – Provide Content to Update Eugene CAP – Consumption and Waste Chapter
- Task 6 – Provide "How To" Guidance for other Cities

City of Eugene staff worked to convene the Task 1 - Mayor's Ad Hoc Committee and Task 2 - Eugene CAP Update Planning Committee, a team that included City staff and consultants on the CAP project team. City of Eugene staff, ODEQ staff, and Good Company worked together to convene the Task 3 - Grant TAC and Task 4 – Host Local Stakeholder Workgroups. The process of selecting the focus for the 4 Workgroups and selections of the stakeholders is described in the following sections of this report. Good Company prepared the Task 5 and Task 6 Deliverables, which are included in this report.

The intent of this report is to provide a resource to other communities about current research and best practices around community actions that address life-cycle emissions. This report provides a suggested "How-To Guide" on the process approach and shares the details of what was learned in Eugene's experience.

2. How-To Planning Process Overview

For other communities in Oregon planning to align their community climate action plan with Oregon's 2050 Materials Management Plan, we suggest the steps listed to the right.

1. Work with ODEQ to complete a Consumption-Based Community Greenhouse Gas Inventory (CBEI)
2. Use the CBEI results to determine workgroup topics for greatest emission reduction potential
3. Convene community stakeholders for workshops to discuss existing community actions and other best practices for focused topic areas (e.g. food waste).
4. Stakeholders select actions to include in the Climate Action Plan. Actions selected should have a clear lead organization and a defined progress metric.

The first step is to conduct a consumption-based emissions inventory for your community. Inventory results will highlight the largest sources of upstream (imported) material-related emissions in your community. These results can be used in conjunction with community context to select appropriate workgroups that include existing community programs that address the sources of emissions and to consider new actions.

Prior to convening the workgroups – a staff member or consultant should identify a list of best management practice recommendations by trusted authorities, such as Oregon Department of Environmental Quality or West Coast Climate and Materials Management Forum, or actions that have been successful in similar peer communities. One or multiple workshops should be organized to bring together appropriate local experts to prioritize and discuss existing and potential climate actions for opportunities, barriers, other community co-benefits beyond climate impact reductions, appropriate tracking metrics and available data.

Eugene convened a single 2-hour workshop for each topic area and found that more time was required. In retrospect, we recommend either a single, longer workshop, or convening two sessions to ensure consensus on the actions; assign a lead organization; and define an appropriate progress tracking metric based on an available data stream. An example of a meeting agenda used for one of Eugene's workshops is included in Appendix A.

The following sections of this report detail Eugene's experience using this process and the outcomes. In addition to this report – all meeting agendas and PowerPoints are available upon request to support similar efforts in other communities.

2. Eugene's Consumption-Based Emissions Inventory

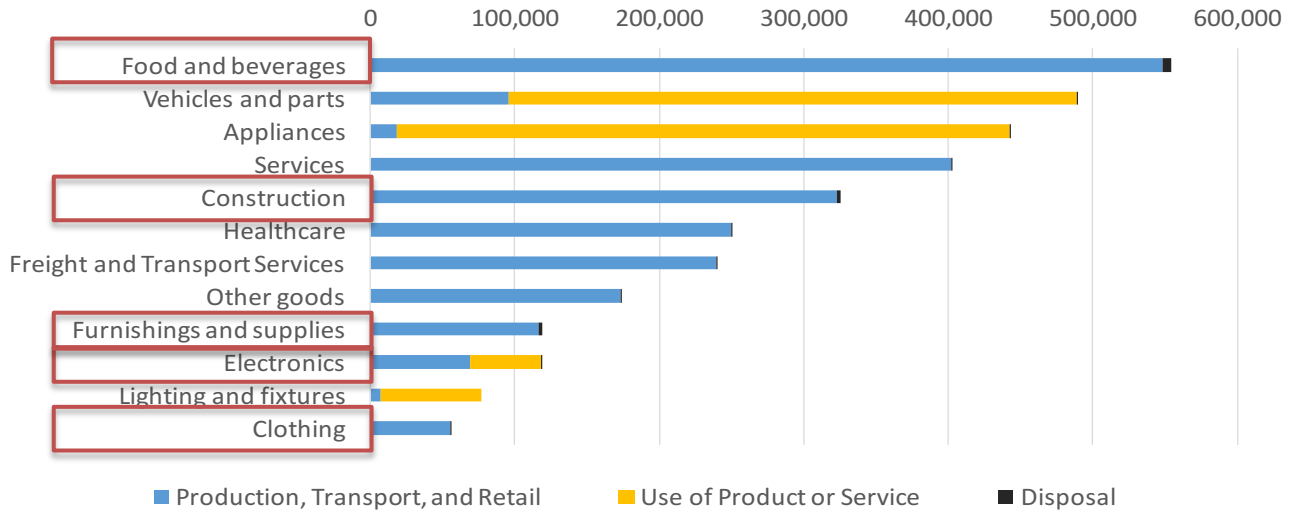
To better understand Eugene's community carbon emissions, the City of Eugene regularly conducts a community greenhouse gas (GHG) inventory. By conducting inventories at regular intervals, community stakeholders can understand trends and manage emissions from specific sources and activities in a Community Climate Action Plan. Eugene's community inventory results are presented using two types of inventory methodologies – Sector-Based and Consumption-Based.

- ***Sector-based emissions inventories*** (in-geographic boundary inventories) include local emissions from energy use by homes, businesses, and vehicles as well as emissions from landfilling solid waste and wastewater treatment.
- ***Consumption-based emissions inventories*** include local, sector-based emissions, *but also include* emissions that are generated during production and delivery of *imported* goods, energy and food consumed within the Eugene community, and exclude sector-based emissions from local production that are exported.

Inventory Results and Selection of Workgroups

Community Climate Action Plans and commonly referenced climate goals (e.g. 80% reduction of 1990 by 2050) typically focus on Sector-based emissions – represented by the yellow and black stacks in the figure below. This approach is reasonable considering that these emissions are local, and communities have greater control over these sources and better data to track progress. However, there is significant scale in the emissions of imported goods and services.

The blue stacks on the figure below represent emissions from the production and transport of imported goods and services consumed by our communities. The purpose of this project is to identify the actions that will mitigate emissions – regardless of where the emissions are being generated around the globe. Based on the inventory results, this project selected workgroups for food, concrete and asphalt, general construction materials, and consumer goods.



3. Findings from Climate Action Workgroups

Workshop 1: Food - Institutional Purchasing and Waste Avoidance

INTRODUCTION

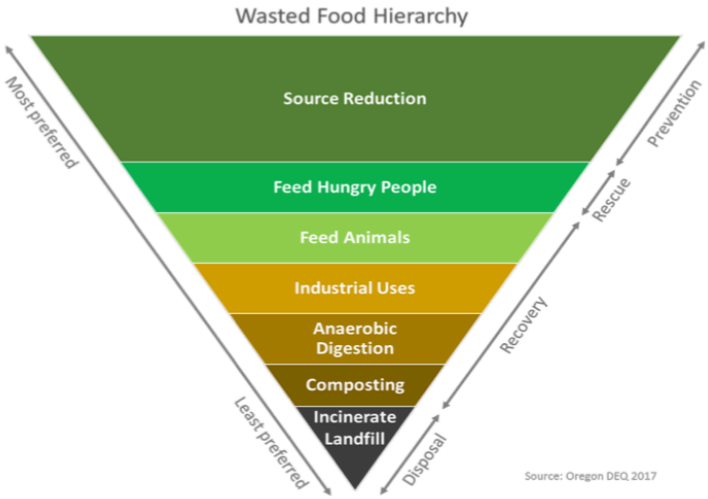
The food and beverages consumed in Eugene represent the largest source (16%) of community consumption-based greenhouse gas emissions. The overwhelming majority of these emissions are generated during food production, processing, transport, and retail – *not in the disposal of food waste*. Upstream emissions from imported food - during production, transport and retail – can seem like they are largely outside of the community's direct control, but there are several high-leverage intervention points to significantly reduce food-related emissions. Specifically, preventing the wasting of food and shifting from high-carbon to low-carbon food types. These action areas were the focus of the food workshop discussion.

GUIDANCE AND RESOURCES

ODEQ's work to date on food includes development of a Strategy for Preventing the Wasting of Food[1] and conducting in-depth research to better understand the causes of waste, collect reliable data on wasted edible food, and assess shifts in waste prevention behaviors or levels of awareness. DEQ's work also includes completing environmental footprints for a variety of food types.

Food Waste Prevention

ODEQ's Waste Food Hierarchy is shown to the right. As can been seen – the most preferred options are reducing waste at the source and capturing edible food to feed the hungry. By avoiding waste and capturing edible food, the community will reduce the total quantity of food it needs to purchase and reduce upstream food-related emissions.

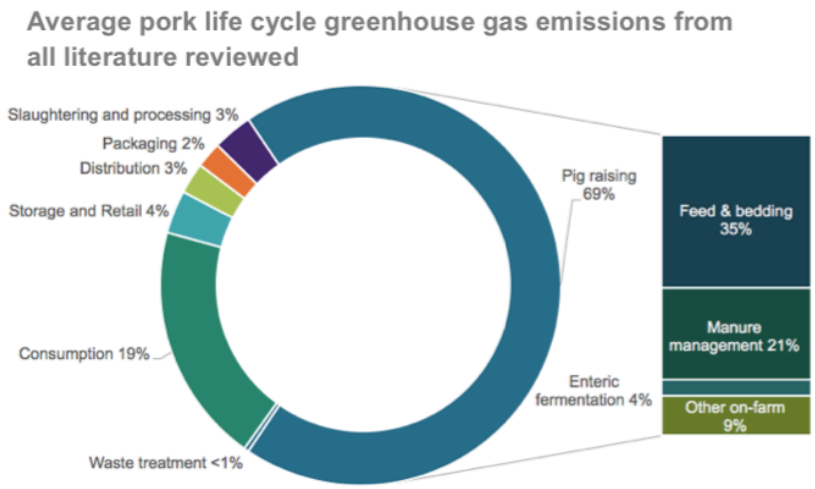


Food Purchasing

Environmental footprints from ODEQ are available for tomatoes, wine, pork, land-based aquaculture, beer, coffee, and citrus fruit and juices. For organizations producing or purchasing these food types – these studies offer details on where, in the product lifecycle, to intervene to reduce emissions. For example, the graphic below shows the sources of lifecycle emissions from the production of pork.

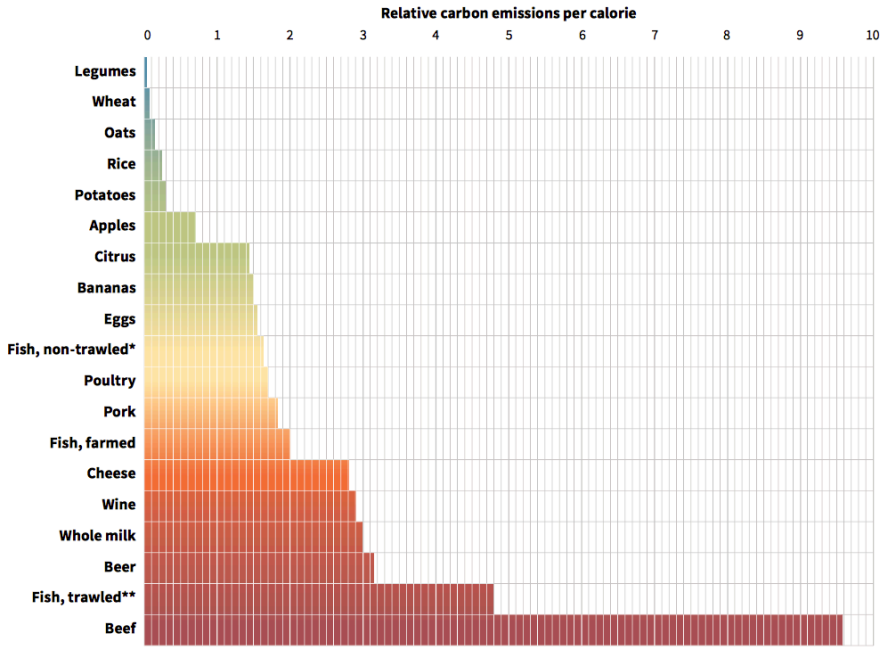
[1] More information at http://www.oregon.gov/deq/mm/food/Pages/foodwastestrategy.aspx

As can be seen, the majority of emissions occur during the pig raising. A potential intervention point could be customers inquiring about manure management practices of pork in their supply chain. Manure management represents a large source of emissions that can be managed in a way to not only reduce emissions, but also generate a renewable form of natural gas.



The larger opportunity related to food is shifting calories from high-carbon food types to low-carbon food types. ODEQ does NOT offer direct guidance on this front and therefore this project sought information from other sources. One of the more compelling and detailed resources identified during this work is *Menus of Change*[2] by The Culinary Institute of America and Harvard's School of Public Health, which seeks to realize a long-term, practical vision integrating optimal nutrition and public health, environmental stewardship and restoration, and social responsibility concerns within the foodservice industry and the culinary profession.

A second example is the City of Portland and Multnomah County's Climate Action Plan, which includes the graphic below that compares emissions from various types of foods. This type of presentation supports the general public's understanding of the impacts associated with food choices and actions that can be taken at the individual level to lower household carbon footprints.



COMMUNITY STAKEHOLDERS

Every one of us interacts with food multiple times every day in buying, cooking, eating, storing, and disposing. Therefore, choosing stakeholders for this workshop was difficult. There are a large number of food-related businesses and institutions involved in a community's food supply chain including farmers, food processors, restaurants, grocery stores, government institutions, and waste

[2] More information at http://www.menusofchange.org

management professionals. Because this project was limited to 1, 2-hour workshop – the project's Technical Advisory Committee decided to focus on the prevention of wasted food and food purchasing for local institutional purchasers including k-12 school districts, University of Oregon's Dormitories, the City of Eugene, and Lane County.

Stakeholder engagement for the workshop and follow-up included:

- Holly Langan, 4J School District, Purchasing and Nutrition Services
- Jennie Kolpak, Bethel School District, Nutrition Services Director
- Becky Wheeler, City of Eugene, Purchasing Manager
- Alexandra Breyer, Deveron Musgrave, City of Eugene, Waste Prevention and Green Building
- Jeff Orlandini and Sarah Grimm, Lane County Waste Management
- Elaine Blatt, Oregon Department of Environmental Quality, Senior Policy Analyst
- Tom Driscoll, University of Oregon, Director of Dining Services
- Carolyn Stein, BRING Recycling, Executive Director

EXISTING STAKEHOLDER ACTIVITY

- **4J School District (4J SD)** includes 33 unique sites. The Love Food Not Waste is implemented at 11 sites. On-site composting is dependent on teacher and kid teams. Some schools have recess before lunch to avoid distractions, increase appetites and reduce waste.

- **Bethel School District (Bethel SD)** includes 11 sites. The district has a goal of less than 5% food production waste. Bethel schools measure, record, and analyze waste data continually. If the waste exceeds the 5% threshold, appropriate adjustments are made to menus and food preparation. All schools use accurate, standardized recipes to reduce waste. The district partnered with local farms (commercial compost system) and participate in the Love Food Not Waste Program (all schools). Some schools have recess before lunch. The schools all use reusable trays.

- **BRING** educators provide programming for all local school districts. BRING's ReThink Business program collaborates with the Love Food Not Waste program. BRING services include waste assessment services and provides Zero Waste advisors for technical assistance.

- **City of Eugene (COE)** runs food waste prevention outreach and education programs, such as Love Food Not Waste and is responsible for implementation of residential and commercial food waste collection. The City also provides funding to support related community organizations. City of Eugene Waste Prevention is helping to fund a 2-year LeanPath study at University of Oregon Housing and UO Office of Sustainability.

- **Lane County Waste Management (LCWM)** promotes LeanPath[3], a company that helps organizations reduce food waste. The County's Master Recycling Program includes education on home composting.

[3] More information at https://www.leanpath.com

- **Oregon Department of Environmental Quality (ODEQ)** – Led the development of Oregon's 2050 Materials Management Vision which considers the full life-cycle of materials – the production and transport states in addition to disposal options. Developed a Strategic Plan for Preventing the Wasting of Food that lays out ODEQ's planned projects over a 5-year period. ODEQ is currently conducting a foundational study to determine the amount and types of food that are wasted in Oregon and why, through state-wide surveys, kitchen diaries and waste bin sorts. The study also includes 15 case studies to identify and test best practices for preventing the wasting of food in commercial kitchens. ODEQ is also studying food rescue channels to identify the most effective strategies. This research will inform ODEQ's future efforts, including planned development of a residential wasted food prevention campaign.

CLIMATE ACTIONS REVIEWED DURING THE WORKSHOP

The following actions were offered to Eugene's food workshop for discussion. These actions are based on ODEQ's research and findings to date as well as other best practices to reduce emissions from food. This list is not comprehensive, but were chosen to begin an ongoing discussion on how to reduce food-related emissions. The actions in bold are those prioritized for discussion by stakeholders during the workgroup.

Prevention of Wasted Food
1. **Conduct a waste audit**
2. Local school participation in ODEQ's "demonstration" on implementing best practices for food waste.
3. SB 263 implementation of household food waste education campaign by City and County governments.
a. Continue Eugene's Food Too Good to Waste campaign
b. Continue / Include food waste avoidance in the Master Recycler curriculum.
4. SB 263 implementation of commercial food waste education campaign by City and County governments.
5. Follow ODEQ research and recommendations for community food waste messaging.
6. Coordinate with ODEQ and partners to share available data to develop more refined recommendations.

Food Purchasing
1. **Shift calories from high carbon to low carbon food types (as appropriate for dietary requirements)**
2. **Engage with supply chain about manure management lagoon practices of beef, dairy, and pork suppliers**

ACTIONS FOR FURTHER CONSIDERATION IN EUGENE'S CAP

- Conduct a waste audit and track waste at local elementary schools.
- Eugene schools to apply for and participate in ODEQ's demonstration projects.

- City of Eugene continues food waste prevention community outreach events.
- Use and build on ODEQ research and recommendations for community food waste messaging and outreach to commercial food service businesses.

METRICS AND DATA TRACKING

GHGs associated with the production and transport of the food consumed in Eugene is the community's largest source of consumption-based emissions. Two ways to address those emissions were discussed during the workshop – prevention of edible food waste and food purchasing. The outcomes of the workshop indicate that focusing on avoiding food waste is the preferred approach as institutional food purchases have a number of barriers that would make it difficult to pursue this type of action.

Therefore, the following metrics and measures focus on avoided food waste. That said, ODEQ's *Purchaser Price Model* and EPA's *USEEIO* model provide emissions coefficients per dollar that could support the calculation of GHG emissions associated with $ spend on various food categories. This may be useful in the future should local institutions choose to pursue this climate action related to food purchasing.

Potential Metrics

- Community edible food waste generated / discarded (short tons / year)
- Elementary school food waste generated / discarded (short tons / year)
- GHG emissions from landfilled food waste – community and elementary schools

GHG Measurement

To calculate GHG emissions, two primary pieces of information are required – 1) Activity data (units) and 2) Emissions Coefficients (GHGs / unit). These are multiplied together to estimate GHG emissions. To calculate a GHG reduction – GHG emissions are calculated for a Baseline and an Action Scenario and the difference between the two calculations is equal to the emissions reduction potential.

The following sections describe publicly available sources of Activity Data and Emissions Coefficients to track GHG from food waste and related climate actions.

Activity Data

- Oregon Department of Environmental Quality *Oregon Solid Waste Characterization and Composition Study*. This study is conducted approximately every 6 years, and contains details about the fraction of food waste for cities or counties that pay to have a composition study done on their area. This data provides a means of monitoring the weight of edible food waste being landfilled.
- City of Eugene program data for Love Food Not Waste

GHG Coefficients

- Environmental Protection Agency's Waste Reduction Model (WARM). WARM provides emissions coefficients (kg CO2e / short ton) for a number of disposal pathways including landfilling, source reduction, composting, and anaerobic digestion.

Calculating GHG Emissions

Food-related GHG emissions for disposal and avoidance scenarios may be calculated using the EPA's WARM model. These emissions can be calculated for the community over time using ODEQ data, or other more local data sets may utilize WARM to calculate the emissions benefits for specific programs.

Calculation Option 1 (Weight-Based Method)

Use EPA's WARM Model to perform the following calculations.

$$\textbf{Baseline Emissions} = Weight\ of\ Material\ Type\ (short\ tons) \times Baseline\ Coefficient\left(\frac{kg\ CO2e}{short\ ton}\right)$$

$$\textbf{Action Scenario Emissions} = Weight\ of\ Material\ Type\ (short\ tons) \times Source\ Redution\ Coefficient\left(\frac{kg\ CO2e}{short\ ton}\right)$$

Note: kg CO_2e = kilograms of carbon dioxide equivalent

Workshop 2: Concrete and Asphalt – Materials and Processes

INTRODUCTION

The construction materials consumed in Eugene represents about 10% of Eugene's community consumption-based emissions. Building materials, as a group, are one of the largest materials categories to flow through Oregon's economy and communities. The overwhelming majority of these emissions are generated during the production of Portland cement and asphalt binder (bitumen). These materials are energy intensive to produce and release process GHGs during production. Action areas discussed during the workshop were focused on lowering the climate impact of materials used in road and sidewalk construction. Actions discussed included lower GHG substitutes for concrete and asphalt; reduced energy processes; and documenting those benefits in environmental product disclosures by the producers of the materials.

GUIDANCE AND RESOURCES

The West Coast Climate and Materials Management Forum's *Climate Friendly Purchasing Toolkit*[4] - provides specific guidance on Concrete and Asphalt. This guidance details best practices for asphalt including: warm-mix asphalt and reclaimed asphalt pavement and asphalt

[4] Available at https://westcoastclimateforum.com/cfpt.

made from shingles. The Guide's concrete best practices include: use of Supplementary Cementitious Materials (SCM); environmental product disclosures (EPD); and recycled aggregate for concrete mixes.

The City of Eugene, Oregon and its vendor partners have a long history of using the asphalt strategies and have recently begun specifying the use of SCMs in appropriate concrete applications. Eugene has been able to reduce its asphalt and concrete emissions by 19% using these strategies. The West Coast Climate Forum has documented Eugene's program in a case study[5] and webinar[6] on their website.

The Oregon Concrete EPD Program is a partnership between Oregon Concrete and Asphalt Paving Association (OCAPA) and the Oregon Department of Environmental Quality (DEQ). It features free environmental product disclosure (EPD) tool access and cost reimbursement incentives for Oregon concrete producers to develop labels for their products.

EPD "Nutrition" Label

Your Building Product

Amount per Unit

LCA IMACT MEASURES	TOTAL
Primary Energy (MJ)	12.4
Global Warming Potential (kg CO^2 eq)	0.96
Ozone Depletion (kg CFC- 11 eq)	1.80E-08
Acidification Potential (mol H^+ eq)	0.93
Eutrophication Potential (kg N^- eq)	6.43E-04
Photo-Oxidant Creation Potential (kg 03 eq)	0.121

Your Product's Ingredients: Listed Here

EPD "nutrition label" for concrete mixes

EPDs are standardized ways of reporting the life-cycle environmental impacts of a wide array of products including concrete and asphalt. EPDs are like a "nutrition label" for products that report a selection of environmental impacts, one of which is global warming potential (i.e. quantity of climate pollution). The disclosures are developed by product vendors upon customer request to certify environmental benefits and impacts and to help the customer choose the materials that best fit their performance objectives.

EPDs provide a means of documenting and verifying the environmental benefits for specific products – for climate impacts as well as other environmental impacts. Within the context of Eugene's CAP, EPDs represent a means to assess and compare different concrete mixes with the goal of lowering the carbon footprint of public and private construction projects. EPDs can be requested from Oregon concrete vendors. If vendors do not have EPDs available or for an example visit the National Ready Mix Concrete Association's (NRMCA) EPD website to view existing concrete EPDs (http://www.nrmca.org/sustainability/EPDProgram/Index.asp).

COMMUNITY STAKEHOLDERS

Stakeholders invited to the workshop or contacted during outreach included representatives from local organizations involved in the design, specifications and construction of roads, curbs, and sidewalks. City of Eugene Public Works has been a leader in the use of low carbon materials and practices and this group was assembled to identify opportunities to scale up the

[5] Case study available at https://westcoastclimateforum.com/cfpt/asphalt/casestudy/eugene.
[6] Climate Friendly Purchasing Toolkit: Asphalt & Concrete webinar available at https://westcoastclimateforum.com/2015-16-annual-forum-webinar-series

City's practices elsewhere in the community. In the future, the community may also want to convene a group of local architects, engineers, material vendors, and structural code experts to identify additional opportunities in the residential and commercial building sectors.

Stakeholder invited to the workshop included:

- Andrew Beattie, City of Eugene, Structural Plans Examiner
- Kelly Hoell, Lane Transit District (LTD), Transit Development Planner
- Jeremiah Legrue, City of Eugene, Structural Plans Examiner
- Jordan Palmeri, Oregon Dept. of Environmental Quality
- Matt Rodrigues, City of Eugene, Traffic Engineer
- Kelly Staines, LTD Maintenance, Facilities Maintenance Supervisor
- Jenifer Willer, City of Eugene, Principal Civil Engineer

City Staff also met with the following participants outside the workshop:

- Tami Canaday, Knife River, Eugene and Florence Division Manager
- Orin Schumacher, Lane County Public Works

EXISTING STAKEHOLDER ACTIVITY

- City of Eugene requires that warm-mix asphalt is required for mainline paving projects and allows for optional use for small and irregular areas. 30% binder replacement with reclaimed asphalt pavement has been used in Eugene for over 30 years. When applicable, higher percentages (35% and 40%) of binder replacement are allowed. Use of reclaimed asphalt pavement and/or shingles to replace virgin asphalt binder is allowed. The City roadway in-place recycling projects require a 50% Portland Cement substitution with SCMs. Substitute materials can be blast furnace slag or fly ash.
- Knife River upgraded its equipment to produce warm-mix asphalt. They produce asphalt concrete mixes with 30% substitution of RAP and are testing a new plant with a 40% substitution. Knife River offers concrete mixes with SCM substitutions upon request.

CLIMATE ACTIONS REVIEWED DURING WORKSHOP

The following actions were offered to Eugene's Concrete and Asphalt workshops for discussion. These actions are based on ODEQ's research and findings to date as well as other best practices from West Coast Climate and Materials Management forum. The actions in bold are those prioritized for discussion by stakeholders during the workgroup.

Request environmental product disclosures (EPD) from concrete vendors to inform selection of concrete mix design
Substitute supplementary cementitious materials (SCM) for Portland cement
Substitute reclaimed asphalt pavement (RAP) and shingles (RAS) for virgin materials

Substitute warm-mix asphalt for hot-mix asphalt

ACTIONS FOR FURTHER CONSIDERATION IN EUGENE'S CAP

- City staff to assess Climate Impact for use of SCMs on in-place recycling to identify project types and circumstances where SCMs would provide an emissions reduction.
- City staff to advocate for minimum SCM percentage in Oregon Department of Transportation Standards in appropriate applications, such as sidewalks where cure time is less of a concern
- City to create maximum SCM limits, by use, through local construction specifications
- City engineering to consider asking for EPDs as part of project bids
- City to convene a working group of local architects and engineers to identify opportunities to incorporate SCMs into projects that don't require early high-strength

METRICS AND CALCULATING GHG EMISSIONS

This section focuses on tracking for *City operations*. No community-scale tracking system was identified that would allow community use of EPDs to comprehensively track environmental impacts related to concrete and asphalt. It may be possible to track material use through data from local vendors, but that information is not publicly available at present.

The City of Eugene Public Works currently tracks use of warm-mix asphalt, reclaimed asphalt, and SCMs. This data is used to estimate annual emissions and calculate reductions compared to conventional products.

Potential Metrics

- % of RAP/RAS substitution for conventional binder
- % of SCM substation for Portland cement
- GHG reduction from baseline

GHG Measurement

To calculate GHG emissions, two primary pieces of information are required – 1) Activity data (units) and 2) Emissions Coefficients (GHGs / unit). These are multiplied together to estimate GHG emissions. To calculate a GHG reduction – GHG emissions are calculated for a Baseline and Action Scenario and the difference between the two calculations is equal to the emissions reduction potential.

The following sections describe publicly available sources of Activity Data and Emissions Coefficients to track GHG from food waste and related climate actions.

Activity Data

- City of Eugene – Weight data (short tons) is available for asphalt materials. Volume (cubic yards) and expense ($) data is available for concrete mixes and cement.

GHG Coefficients

- National Ready Mixed Concrete Association – Industry-Wide EPD for Ready Mixed Concrete[7]
- Concrete Vendors – Product-specific EPDs. May be available upon request from vendor.
- Inventory of Carbon and Energy Database (V2.0)[8]

Calculating GHG Emissions

Calculation Option 1 (Weight-Based Method)

$$\textbf{Baseline Emissions} = Material\ Type\ (activity\ unit) \times Baseline\ Material\ Coefficient\left(\frac{kg\ CO2e}{activity\ unit}\right)$$

$$\textbf{Action Scenario Emissions} = Weight\ of\ Material\ Type\ (activity\ unit) \times\ Action\ Material\ Coefficient\left(\frac{kg\ CO2e}{activity\ unit}\right)$$

Note: kg CO_2e = kilograms of carbon dioxide equivalent

Workshop 3: Building Materials – Recovery and Reuse

INTRODUCTION

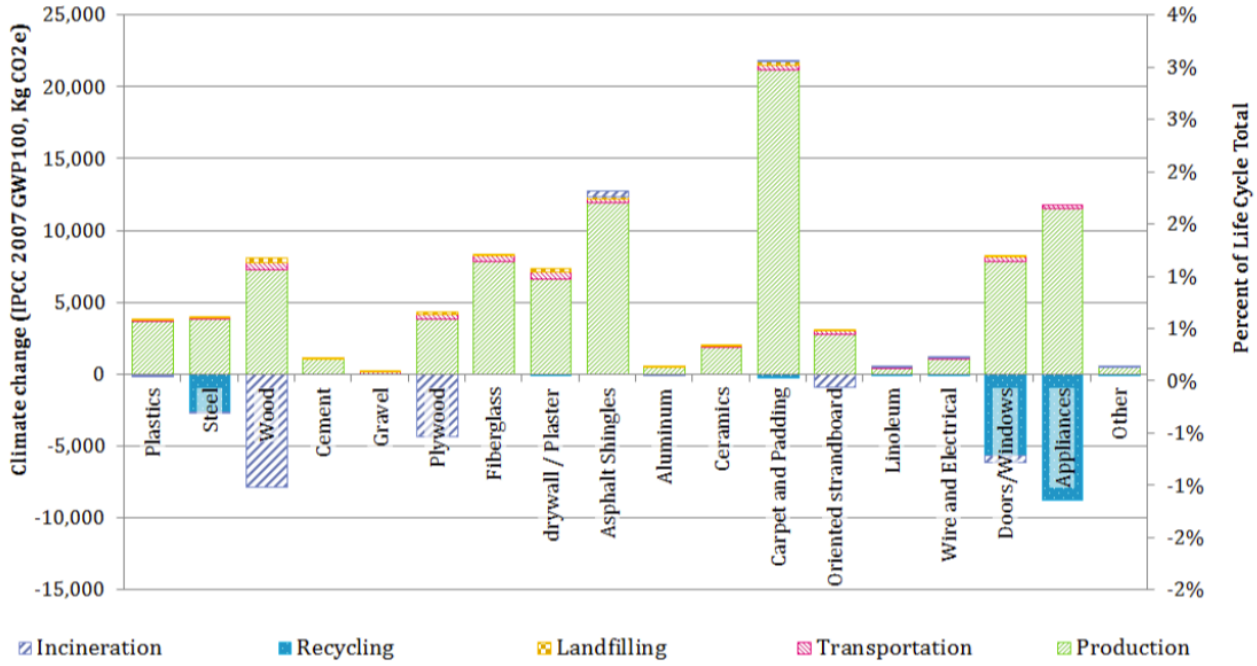
The construction materials consumed in Eugene represents about 10% of Eugene's community consumption-based emissions. Building materials, as a group, are one of the largest materials categories to flow through Oregon's economy. The overwhelming majority of these emissions are generated during production, transport, and retail – and not in the disposal of the materials. While this project is focused on climate impacts, it's important to note that building materials, because of their high volume, also pose significant potential for human health impact (e.g. lead pollution during demolition). Action areas discussed during the workshop included whole building reuse; whole building deconstruction; developing systems to identify high grade materials for recovery prior to demolition; and local infrastructure needs to increase the quality and supply of used building materials.

[7] Available online at https://www.nrmca.org/sustainability/EPDProgram/Downloads/EPD10080.pdf
[8] Available online at http://www.circularecology.com/news/the-ice-embodied-carbon-database-is-now-hosted-for-download-by-circular-ecology

It's important to acknowledge the connection between building materials – such as insulation and appliances – and the energy use over a building's lifecycle. Different makes and models of building materials may have similar production emissions, but very different effects on building energy use. The stakeholders and workgroup convened for this project focused on production-related emissions. Building energy use and its relationship to materials will be covered during the larger Eugene CAP update process. Likewise, the relationship between the size of a structure, its energy use, and effect on other material consumption and GHG emissions will also be covered during the Eugene CAP process.

GUIDANCE AND RESOURCES

ODEQ's research on reducing the lifecycle environmental impacts of building materials has a long history. In 2010, ODEQ released *A Life Cycle Approach to Prioritizing Methods of Preventing Waste from the Residential Construction Sector in the State of Oregon*.[9] This paper provides a bounty of information related to reducing environmental impacts and waste in the residential building sector. Recently, ODEQ refined its guidance with the release of its *Strategic Plan for Reuse, Repair, and Extending the Lifespan of Products in Oregon*.[10] This plan covers the period of 2016 – 2021. To develop the Plan, ODEQ's conducted a year-long evaluation of materials, infrastructure, economics, businesses and nongovernmental organizations, policies, challenges, and opportunities. DEQ research identified three focus product categories – which includes building materials. The following graphic is from their *Background Paper - Appendix B: Building Materials, Figure 2*[11] for Oregon's Strategic Plan.



[9] Details at http://www.oregon.gov/deq/FilterDocs/ADU-ResBldgLCA-Report.pdf
[10] Details at http://www.oregon.gov/deq/mm/Pages/Product-Lifespan-Extension.aspx
[11] Details at http://www.oregon.gov/deq/FilterDocs/wprBackgroundPaperF.pdf

This graphic presents the lifecycle material climate impacts for an average Oregon home over a 70-year lifespan. The materials with the greatest climate impacts (bar above the x-axis) are those that are replaced multiple times - such as carpet, asphalt shingles and appliances. Other materials with relatively large climate impacts include wood, fiberglass and drywall. Some materials are recycled (see blue bars below the x-axis) which negates a portion of its climate impacts. Energy can be recovered from some materials, such as wood (hashed bars below the x-axis) which also negates a portion of climate impacts from power generation.

The *Strategic Plan for Reuse, Repair, and Extending the Lifespan of Products in Oregon* includes the following Strategies and Actions related to building materials. These served as a foundation for items discussed in the Stakeholders Workshop.

- Research whole building reuse
- Evaluate the "price gap" between deconstruction and demolition through addressing environmental and health impacts and associated social costs.
- Grant support for infrastructure and capacity and market development
- Support reuse, repair and durability considerations in public procurement
- Support community-scale education about reuse, repair and product lifespan extension.

COMMUNITY STAKEHOLDERS

Stakeholders invited to the workshop or contacted during outreach included representatives from local organizations involved in the design, construction, permitting, waste management, and retail sale of reused building materials. The stakeholders included:

- Andrew Beattie, City of Eugene, Structural Plans Examiner
- Jeremiah Legrue, City of Eugene, Structural Plans Examiner
- Sarah Grimm, Lane County, Waste Reduction Specialist
- Simon Love, ODEQ, Reuse, Repair and Product Lifespan Extension Specialist
- Ed McMahan, Lane County Home Builders Association, Executive Vice President
- Ethan Nelson, City of Eugene, Intergovernmental Relations
- Jeff Orlandini, Waste Program Supervisor
- Susan Palmer, St. Vincent DePaul, Economic Development
- Stephanie Scafa, City of Eugene, Waste Prevention and Green Building Manager
- Carolyn Stein, BRING Recycling, Executive Director
- Michael Wisth, City of Eugene, Waste Prevention and Green Building Manager

There are many other stakeholders in our community involved in construction that are or could be partners in climate action. Their exclusion from this workshop was not intentional, only a function of available outreach and coordination time available for the project. The City and local partners will continue to engage with those looking to identify and implement effective climate solutions in the future.

EXISTING COMMUNITY ACTIONS

- **BRING** Recycling has been Eugene's local leader on changing attitudes and behaviors regarding waste and as a collection and retail source for used building materials. BRING processes 1.5 million pounds of building materials annually. In addition, BRING provides community education and local environmental certification programs. BRING is currently piloting the concept of providing onsite technical assistance to incorporate reused materials into new construction projects.
- **City of Eugene** provides community education by directly supporting events like BRING's Sustainable Home and Garden Tour and the Cascadia Green Building Council; supporting and assisting development of BRING's Construction Materials Recovery & Reuse pilot; evaluating deconstruction opportunities; and is working on educational opportunities for building codes. The City of Eugene has also begun digitally storing building plans which will make whole building reuse easier in the future.
- **Lane County** offers depot drop off options for metals, wood, brush concrete, cardboard, appliances, and they regularly refer solid waste customers to private recyclers in the community. The County has long provided the funding and facilitation for community education on waste prevention and reuse – most visibly through the Master Recycler program, which has trained hundreds of local residents to manage materials effectively. Lane County provides foundational funding for BRING's Business waste prevention certification program and more recent/y a construction recycling technical assistance program. Lane County supports/promotes a variety of local programs and organizations including St. Vincent de Paul, BRING tour of homes, MECCA, and other projects as available. Lane County also ensures there are options for material recovery from mixed loads of construction waste through disposal rate incentive for the two Eugene facilities that receive and sort mixed construction waste. Lane County recently implemented and is promoting an easy to use online look-up tool and app to find available disposal and recycle options for all materials. In addition, beginning July 1, 2018, Lane County's Glenwood transfer station and the Landfill will implement a construction and demolition recycling requirement per OAR 340-090-0040(3)(L). In short, construction and demolition loads over 6CY must be sorted for recycling by the generator, or be delivered to a material recovery sorting facility.
- **Lane Home Builders Association** has long hosted the annual Builders Garage Sale, which ended last year. Materials that have been sold in the past at the Garage Sale will now be donated to BRING and Habitat for Humanity.
- **St. Vincent De Paul** of Lane County regularly salvages whole homes to provide affordable community housing; refurbishes mobile homes to current energy code; upcycles old window glass into new architectural glass; repairs and resells appliances (removing and properly disposing of refrigerants with high climate impacts); and builds community repair and reuse skills while creating jobs and career paths.

CLIMATE ACTIONS REVIEWED DURING WORKSHOP

The following actions were offered to Eugene's Building Materials workshops for discussion. These actions are based on ODEQ's research and findings to date as well as other best practices to reduce emissions from building materials. This list is not comprehensive, but these were chosen to begin an ongoing discussion on how to reduce emissions. The actions in bold are those prioritized for discussion by stakeholders during the workgroup.

Potential Actions
Define infrastructure needs for additional reused building material extended life and recovery and compete for ODEQ grants as appropriate
Develop outreach / education focused on expanding building material lifespans*2010 CEAP
Skills / apprenticeships / job development in repair, reuse and lifespan extension related businesses
Encourage whole building reuse, as appropriate
Support changes to state building codes to allow for greater use of reused materials
Require that all construction and demolition waste materials to be sorted for reusable or recyclable materials*2010 CEAP
Increase community deconstruction activity
Increase in use of recovered dimensional lumber (related to recent changes in State building codes)
Carpet recovery actions / plans per SB 263

Other action areas suggested by stakeholders:

- Remanufacturing materials into other products
- Upstream actions at manufacturing level

ACTIONS FOR FURTHER CONSIDERATION IN EUGENE'S CAP

- Lane County to implement, monitor, and improve as available, a construction and demolition waste sorting requirement to recover building materials.
- Conduct feasibility study to identify the means to capture high grade materials prior to demolition and related infrastructure needs relative to the value of those materials. See City of Portland deconstruction study as an example and for guidance.
- City of Eugene to conduct feasibility study and scale opportunity for whole commercial building reuse. Develop proactive approach to identifying community opportunities.
- BRING's CMMT program is implemented permanently. This program provides support to new Commercial projects to provide real-time, onsite technical assistance reuse materials. Program funding will need to be identified.

METRICS AND CALCULATING GHG EMISSIONS

Metrics for climate actions related to building materials focus on tracking the amount and types of materials being recovered from the waste stream and the quantity of that material being reused. Available data sources include ODEQ's Waste Composition Survey; Lane County and City of Eugene data; and point of sales data from local non-profits that sell used items. In additional point of sale (POS) data can also be used to estimate weights for certain types of materials – including metal goods and dimensional lumber.

Potential Metrics

- Recovered material weight for reuse, by material type (short tons). This tracking could focus on a couple materials categories – such as metal goods and wood – as a starting place and be built up to support climate action efforts and reporting.
- Point of Sales Data from Local Businesses. This tracking could focus on a couple materials categories – such as metal goods and wood – as a starting place and be built up to support climate action efforts and reporting.
- GHG's reduced from 2013 baseline

GHG Measurement

To calculate GHG emissions two primary pieces of information are required – 1) Activity data (units) and 2) Emissions Coefficients (GHGs / unit). These are multiplied together to estimate GHG emissions. To calculate a GHG reduction – GHG emissions are calculated for a Baseline and Action Scenario and the difference between the two calculations is equal to the emissions reduction potential.

The following sections describe publicly available sources of Activity Data and Emissions Coefficients to track GHG from food waste and related climate actions.

Activity Data

- BRING – Point of sale data ($ / year / material category). Material categories include lumber, fasteners, furniture, plumbing, lighting, etc. For metals and lumber POS data can be used to estimate weights (kg / year / material category). Note that this data many also be available from other local thrift retailers, but that has not been confirmed.
- Lane County – Material recovery facility reports (short tons / year / material category). Lane County receives reports for pass-through to ODEQ. Reports describe number of tons collected from several distinct collection categories by material type (e.g., food waste; wood waste, comingled, metal). Lane County receives monthly reports from the Construction and Demolition sorting facilities describing the materials processed and quantities recovered.

GHG Coefficients

- Weight-Based: Environmental Protection Agency's *Waste Reduction Model* (WARM)

- Dollar-Based: Oregon Department of Environmental Quality's *Purchaser Price Model* was used to derive simple factors that may be used to estimate emissions reductions from sales of used materials.

Calculating GHG Emissions

Readily available data from BRING is POS data in ($). Unfortunately, emissions coefficients (GHGs / $) are not readily available for retail of used building materials. Therefore, in order to calculate emissions reductions, the POS data needs to be converted to a weight equivalent. BRING has the ability to convert the data for specific product categories – specifically metal goods and dimensional lumber. Weight activity data may be used in EPA's WARM to calculate baseline and action scenario emissions using the method described in the following text box.

Lane County collects weight data from reporting by local material recovery facilities. This data does exist but is not publicly available and only captures a fraction of the materials recovered.

Calculation Option 1 (Weight-Based Method)

Use EPA's WARM Model to perform the following calculations.

$$\boldsymbol{Baseline\ Emissions}\ (MT\ CO_2e) = Weight\ of\ Material\ Type\ (short\ tons) \times Baseline\ Coefficient\left(\frac{kg\ CO2e}{short\ ton}\right)$$

$$\boldsymbol{Action\ Scenario\ Emissions}\ (MT\ CO_2e) = Weight\ of\ Material\ Type\ (short\ tons) \times Source\ Redution\ Coefficient\left(\frac{kg\ CO2e}{short\ ton}\right)$$

Workshop 4: Consumer Goods – Repair, Reuse, and Lifespan Extension

INTRODUCTION

Consumption of consumer goods in Eugene represents about 13% of Eugene's community consumption-based emissions. Consumer goods include product categories such as furniture, clothing, electronics, appliances, and a variety of other goods. The overwhelming majority of these emissions are generated during production, transport, and retail – and not in the disposal of consumer goods. Upstream emissions from imported consumer goods - during production, transport and retail – can seem like they are largely outside of the community's direct control, but there are high-leverage intervention points to significantly reduce related emissions – community education around the benefits of repair and reuse of consumer goods, hosting Fix-It Fair events, supporting lending libraries like the ToolBox Project, and supporting local thrift businesses.

ODEQ, United Sutainability Directors Network, and City of Eugene are collectively funding an in-progress research project in Eugene to study the effectiveness of these types of actions. Results will be available in 2019. These results may be used by Eugene and others to inform climate action strategy related to consumer goods.

AVAILABLE GUIDANCE AND RESOURCES

In 2016, Oregon Department of Environmental Quality released its Strategic Plan for Reuse, Repair, and Extending the Lifespan of Products in Oregon.[12] This resource provides detailed background research, strategies and actions as well as a discussion of challenges and barriers. Material areas of focus included in the strategy includes textiles and building materials. ODEQ's strategy also provides grant funding to support specific repair and reuse activities and business.

COMMUNITY STAKEHOLDERS

The stakeholders selected for this workgroup by the Technical Advisory Committee include local experts involved in repair, reuse, and lifespan extension of consumer goods. This includes City and County staff who are experienced with education and outreach and local non-profits that focus on providing recovery, repair and resale services while providing local jobs and training.

Stakeholder organizations invited to the workshop included:

- Anya Dobrowolski, ToolBox Project, Founder, and Fix-It Fairs, Event Manager
- Greg Evans, Lane Community College, Chief Diversity Officer
- Sarah Grimm, Lane County, Waste Reduction Specialist
- Simon Love, Reuse, Repair and Product Lifespan Extension Specialist
- Susan Palmer, St. Vincent DePaul, Economic Development
- Stephanie Scafa, City of Eugene, Waste Prevention and Green Building Manager
- Allie Breyer, Waste Prevention and Green Building
- Carolyn Stein, BRING Recycling, Executive Director

EXISTING COMMUNITY ACTIONS

- **St. Vincent DePaul of Lane County** (SVDP) serves 840,000 people each year through its retail locations and other programming. Retail locations sell repaired, used and recycled items and in the process create local jobs and career paths. SVDP of Lane County collects materials along the I-5 corridor as far south as San Francisco. SVDP has had notable success locally through upcycling used clothing. They employ a fashion designer and 3 additional staff that upcycle clothing for sale at their retail locations and on Etsy. A second notable category is SVDP's work on furniture. They contract with the county to recycle used mattresses into dog beds. They also repair donated wood

[12] Available for download at http://www.oregon.gov/deq/mm/Pages/Product-Lifespan-Extension.aspx.

furniture for retail and reupholster sturdy furniture needing new covers. SVDP is also involved in a variety of other innovative used material related businesses in the community.

- **City of Eugene** Waste Prevention is currently developing a repair and reuse strategy. In 2017, the City hosted three well-attended Fix-It Fairs and supports the ToolBox Project. The 2017 Fix-It Fairs served over 400 people and is planning future events. The City is experimenting with supporting small-scale community repair events and is working with a group of local repair professionals to develop skill-building and hands-on learning programs, and develop an apprenticeship program to develop the pool of skilled repair and reuse professionals in our community with a focus on the younger generation.
- **Lane County Waste Management** provides a unique funding source to support reuse of household goods: a disposal discount of 33% is offered to registered charitable organizations that operate reuse thrift stores. Currently Goodwill, St. Vincent de Paul and Salvation Army are in this program. Lane County also contracts with SVDP's to reuse, refurbish and recycle mattresses and appliances. The County runs the Master Recycler program that is focused on developing local experts on a variety of recycling, repair and reuse topics. The program has trained over 800 people since 2000. The County supports advertising for Materials Exchange Center for The Community Arts (MECCA) and NextStep and also maintains the Repair2Reuse.org website that provides a local database of repair service providers.
- **The ToolBox Project** is a volunteer driven community tool library with over 500 members and 900 tools. The nonprofit focuses on helping community members repair their homes and possessions, and decreases the need to purchase new goods.

CLIMATE ACTIONS REVIEWED DURING WORKSHOP

The following actions were offered to Eugene's Consumer Goods workshops for discussion. These actions are based on ODEQ's research and findings to date as well as other best management practices (BMP) to reduce emissions from building materials. This list is not comprehensive, but these were chosen to begin an ongoing discussion on how to reduce emissions. The actions in bold are those that were prioritized for discussion by stakeholders during the workgroup.

Potential Actions for BMP Research
City and County will continue to pursue grants for local, priority projects in reuse, repair, and lifespan extension, including innovative reuse-oriented solutions in schools
City and County to implement, locally appropriate education and outreach programs to support reuse, repair, and lifespan extension to support the requirements of SB 263 – community-at-large and in-school
Host Fix-It Fairs to provide community access and education on local repair services and vendors
Support ToolBox Project, and similar innovative community reuse solutions, to expand shared resources

Focus on textiles and clothing (data collection and foundational research, increase collection of reusable textiles, shift consumption to durables, support clothing repair business, develop consumer skills)
Focus on furniture (data collection and foundational understanding, increase salvage events, shift consumption to durables, support furniture repair, reuse, and remanufacturing businesses)
Develop skills / job development / apprenticeships to support the repair, reuse, remanufacturing and lifespan extension
City and County to publicly support "Right to Repair" legislation.

Stakeholder Suggested Actions
Identify national campaigns that could be used to build awareness of customers to influence manufacturers.
Conduct feasibility analysis to identify infrastructure needs
Develop a web platform that would include a Repair event calendar
Career and technical education programs in high schools (related to repair and reuse)
Additional community flea markets and swap meets
City / County to host a repair hub incubator

ACTIONS FOR FURTHER CONSIDERATION FOR EUGENE CAP

The actions prioritized for discussion were reviewed by the group for opportunities, barriers, and social equity benefits.

- City and County to implement locally appropriate education and outreach programs to support reuse, repair, and lifespan extension.
- City to continue hosting repair events that provide community access and education on local repair services and vendors. These events will be informed by ODEQ, USDN, and City of Eugene's related research on the long-term effectiveness of this action.
- City and County to regularly convene a workgroup focused on expanding the success of community partners' innovative repair and reuse opportunities - including a focus on textiles. ODEQ microgrants to be sought as appropriate.
- City to create a centralized web platform to allow community to easily access information about local repair businesses, upcoming Fix-It events, and how-to videos.
- County marketing programs to profile local repair organizations.
- As part of CAP2.0, Phase Two, evaluate the feasibility and impact of expanding existing or creating new community education programs on buy less, reused, and durable.

METRICS AND DATA TRACKING

Metrics for climate actions related to building materials focus on tracking the amount and types of materials being recovered from the waste stream and the quantity of that material

being reused. Available data sources include ODEQ's *Waste Composition Survey*: City and County programmatic data; and point of sales data from local non-profits that sell used items.

Potential Metrics

- Point of Sales Data from Local Businesses. This tracking could focus specific materials categories of interest – such as clothing/textiles – as a starting place and be built up to support climate action efforts and reporting.
- Customers served / items repaired at local City repair events
- GHG's reduced from 2013 baseline

GHG Measurement

To calculate GHG emissions, two primary pieces of information are required – 1) Activity data (units) and 2) Emissions Coefficients (GHGs / unit). These are multiplied together to estimate GHG emissions. Emissions can be calculated to represent an annual emissions total for an emissions source, or to estimate a GHG reduction. To calculate a GHG reduction – GHG emissions are calculated for a Baseline and Action Scenario and the difference between the two calculations is equal to the emissions reduction potential.

The following sections describe publicly available sources of Activity Data and Emissions Coefficients to track GHG from food waste and related climate actions.

Activity Data

- SVDP – Point of sale data ($ / year / product category). Note that this data many also be available from other local thrift retailers, but that has not been confirmed.

GHG Coefficients

- Weight-Based: Environmental Protection Agency's *Waste Reduction Model* (WARM)
- Dollar-Based: Oregon Department of Environmental Quality's *Purchaser Price Model* was used to derive simple factors that may be used to estimate emissions reductions from sales of used materials.

Calculating GHG Emissions

As of this writing, there isn't a clear methodology available to calculate GHG emissions / reduction benefit for used and repaired consumer goods. Available activity data and emissions coefficients are incongruent with one another. The only known source for activity data is POS data for businesses. Unfortunately, appropriate emissions coefficients (GHGs / $) are not available to calculate emissions reductions for used consumer goods. Weight-based coefficients are readily available, but activity data by weight are not. Additional work would need to be done to either modify existing dollar-based coefficients for sale of reused goods; develop a dollar to weight conversion factor; or establish a system where the weight of resold materials is tracked.

4. Additional Opportunities in City Operational Procurement

There are two other sources of upstream material emissions in City operations that can be measured with readily available data and managed in climate action planning. These include upstream emissions from purchased energy and production emissions for IT equipment. The City of Eugene is considering these sources in its operation climate action plan and has developed means of measuring and tracking emissions over time. This section describes the City's measurement approach for these two purchasing categories.

There were no workshops held for these purchasing categories, as they are City of Eugene internal actions. They are included to provide a description of the City's approach to these sources of operational emissions and the associated GHG tracking systems.

Purchased Energy – Upstream Production Emissions

Scope 1 and Scope 2 emissions from consumption of energy in buildings and vehicles typically represent a significant source of emissions for most City governments and are commonly accounted for in operational GHG inventories. Scope 1 emissions are "tailpipe" emissions from owned vehicles and equipment. And Scope 2 emissions are "tailpipe" emissions from electricity generation equipment that serves an organizations electricity load.

Scope 1 and Scope 2 emissions represent the majority of emissions associated with combusting fossil fuels. However, there are also Scope 3 emissions associated with the consumption of energy products, or the emissions that happen upstream during the production and transport of fuels. For example, energy is used and there are process methane emissions that occur during the extraction of natural gas that are not accounted for in Scope 1 or Scope 2. Likewise, biogenic carbon dioxide emissions from biofuels (such as biodiesel and ethanol) are excluded from GHG inventory results. For biofuels, the majority of emissions are in Scope 3.

Oregon is unique in many ways, but in this case, Oregon is unique in that that State provides the technical resources that make calculation of Scope 3 energy emissions possible through documentation that support's Oregon's Clean Fuel Standard. When organizations are making decisions about energy purchases, considering life-cycle emissions instead of only tailpipe emissions will lead to more effective decisions on energy purchases and impact on climate action.

Potential Action Metrics

- Annual energy purchases, by type (fuel specific consumption unit / year). Examples of units include gallons, kilowatt-hours, or cubic feet.
- Annual GHG emissions, annual total and by energy type

Available Activity Data

- City annual purchasing records, by fuel type (gallons, kWh, terms)

GHG Emissions Coefficients

- Scope 1 or Scope 2 coefficients
  - Reputable sources of these emissions factors include EPA[13] and The Climate Registry[14].
- Life-cycle carbon intensity (CI) coefficients
  - Request purchased fuel-specific carbon intensity (CI) values from fuel vendors or electric utility (g CO_2e / megajoule)
  - If the above coefficient source is not an option, Oregon Department of Environmental Quality's fuel-specific, life-cycle carbon intensities that support Oregon's Clean Fuels Program.[15]

See next section for details on use of these factors in an operational GHG inventory.

GHG Emissions Tracking

Following operational greenhouse gas protocol – lifecycle fuel emissions are split between Scope 1 (tailpipe emissions) and Scope 3 (upstream, fuel production emissions) for liquid and gaseous fuels. For electricity, lifecycle fuel emissions are split between Scope 2 (tailpipe emissions for electricity generation) and Scope 3 (upstream, fuel production emissions).

This can be done by calculating Scope 1 or 2 emissions using GHG emissions coefficients common to Scope 1 and Scope 2 protocols. Reputable sources of these emissions coefficients include EPA[16] and The Climate Registry[17]. Than calculating life-cycle emissions using ODEQ CI values. Subtract Scope 1 or 2 emissions from life-cycle emissions to calculate Scope 3 emissions. Note that ODEQ values do not include biogenic CO_2 from biofuels; therefore, calculation of Scope 1 emissions for biofuels should also exclude biogenic CO2 to use the method described here. If your organization has completed an operational GHG inventory – it is likely Scope 3 emissions for energy purchases are not being included. Therefore, an organization will need to calculate Scope 3 emissions for the organization's Baseline inventory in order to compare subsequent years' reporting.

[13] Downloaded April 2018 at https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors_mar_2018_0.pdf
[14] Downloaded April 2018 at https://www.theclimateregistry.org/tools-resources/reporting-protocols/general-reporting-protocol/. Requires creation of a free TCR account.
[15] Downloaded April 2018 at http://www.oregon.gov/deq/FilterDocs/cfp-All-CIs.pdf
[16] Downloaded April 2018 at https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors_mar_2018_0.pdf
[17] Downloaded April 2018 at https://www.theclimateregistry.org/tools-resources/reporting-protocols/general-reporting-protocol/. Requires creation of a free TCR account.

Calculation Option 1

Develop an Excel spreadsheet to calculate emissions or use an existing tool like Good Company's Carbon Calculator (G3C).

$$\textbf{Baseline Scope 1 or 2 Emissions } (MT\ CO_2e) = Quantity\ of\ Fuel\ Type\ (megajoule) \times Fuel\ Type\ Scope\ 1\ or 2\ \ Coefficient \left(\frac{MT\ CO2e}{MJ}\right)$$

$$\textbf{Baseline Scope 3 Emissions } (MT\ CO_2e) = Quantity\ of\ Fuel\ Type\ (megajoule) \times Fuel\ Type\ Scope\ 3\ Coefficient \left(\frac{MT\ CO2e}{MJ}\right)$$

$$\textbf{Action Scenario Scope 1 or 2 Emissions } (MT\ CO_2e) = Weight\ of\ Material\ Type\ (short\ tons) \times Source\ Redution\ Coefficient \left(\frac{MT\ CO2e}{MJ}\right)$$

$$\textbf{Action Scenario Scope 3 Emissions } (MT\ CO_2e) = Weight\ of\ Material\ Type\ (short\ tons) \times Source\ Redution\ Coefficient \left(\frac{MT\ CO2e}{\ldots}\right)$$

IT Equipment - Upstream Production Emissions

A large number of City governments in Oregon have completed a supply chain GHG analysis as part of the Local Government Operational GHG Inventory. This analysis estimate Scope 3 emissions associated with the production of goods, food, and services purchased in the course of City operations.

A supply chain analysis is typically conducted using economic input-output models, such as Oregon Department of Environmental Quality's *Purchaser Price Model*[18], EPA's EEIO Model[19], and Carnegie Mellon Green Design Institute's EIOLCA.net[20]. All of these resources provide emissions coefficients for the production of goods and services for a number of economic sectors in the form of kg CO2e / $. These coefficients can be used with an organization's accounting data to calculate Scope 3 supply chain emissions.

The West Coast Climate and Materials Management Forum produced a step-by-step, *How To Guide on Supply Chain Analysis*.[21] The West Coast Climate Forum also produced a *Trends* Analysis that summarizes results for supply chain inventories for a variety of organization types

[18] Available upon request from ODEQ materials management department.
[19] USEEIO available for download at https://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=336332. Note that model can only be opened with LCA software. OpenLCA is a free download that supports use of the USEEIO model. It may be downloaded at http://www.openlca.org
[20] Carnegie Mellon tool available at http://www.eiolca.net
[21] How To Guide available at https://westcoastclimateforum.com/cfpt/HowTo.

and sizes.[22] This resource can be used by organizations to see what purchasing categories commonly generate the greatest quantities of emissions for local governments.

A supply chain analysis provides comprehensive results that allow organizations to compare and highlight various types of purchasing categories in terms or annual total emissions and also the carbon intensity of different product types (CO2e / $). Supply chain inventories are an excellent means of identifying emissions "hot spots" in the supply chain – they do not provide a means to accurately track emissions over time. This is because the analysis relies on models that represent U.S. average emissions instead of vendor-specific emissions. The models can estimate emissions from the purchase of $1 million of computer hardware but cannot accurately account for production emissions for $1 million of HP computers versus $1 million of Apple computers.

In order to accurately manage and track GHG emissions from specific categories of purchases – additional information is required. IT equipment is typically a small source of supply chain emissions for public organizations. However, IT equipment is somewhat unique in that the electronics industry has been on the forefront of conducting life-cycle analysis on their products, which can be used to track organizational emissions for IT equipment purchases.

It's important to note that the life-cycle energy use by IT equipment is not considered in the supply chain analysis but is another important factor to be used in purchasing decisions. The following information is specific to tracking emissions for the production of IT equipment.

Potential Metrics

- Annual GHG emissions from IT purchases

Available Activity Data

- Organizational IT equipment inventory and planned purchases. Data on equipment types; number of units; and vendors for specific types of IT hardware

GHG Emissions Coefficients

- Dell, *Carbon Footprints of Dell Desktops, Laptops, Mobile Devices, and Servers*[23]
- Apple, *Product Environmental Reports*[24]
- The above are examples – look to your preferred vendor for similar reports

GHG Emissions Tracking

Emissions from computer purchases may be tracked on an annual basis or for purchasing decisions using the following formula.

[22] Trends Analysis available at https://westcoastclimateforum.com/cfpt/trendsanalysisintro.
[23] Available online at http://www.dell.com/learn/us/en/vn/corp-comm/environment_carbon_footprint_products
[24] Available online at https://www.apple.com/environment/reports/

Calculation Option 1 (Unit-Based Method)

Use EPA's WARM Model to perform the following calculations.

$$\boldsymbol{Annual\ Emissions}\ (MT\ CO_2e)\ = \#\ of\ Product\ Units \times Emissions\ Coefficient\left(\frac{kg\ CO2e}{unit}\right)$$

Appendix A: Example Workshop Agenda

Eugene Sustainability Office

good COMPANY

Subject: Eugene Community Climate and Energy Actions Plan – Materials Management Chapter Update (CEAP-MM) – Building Materials – Recovery, Reuse and Lifespan Extension Workgroup

Implementation Partners: Andrew Beattie, Jeremiah Legrue, and Mark Whitmill, City of Eugene; Dan Bryant, Square One Villages; Simon Love, Oregon Dept. of Environmental Quality; Ed McMahan, Lane County Home Builders Association; Carolyn Stein, BRING Recycling

Technical Advisory Committee: Carolyn Stein, BRING Recycling, Dan Hurley, Lane County Solid Waste; David Allaway, Oregon Dept. of Environmental Quality; Susan Palmer, St. Vincent de Paul Society of Lane County; Chelsea Clinton, Ethan Nelson, Stephanie Scafa, and Michael Wisth, City of Eugene; Josh Proudfoot and Aaron Toneys, Good Company

Meeting Date: Janurary 9th, 2018

Meeting Agenda

- Welcome, Introductions, and Agenda – 5 minutes – Chelsea
- Project Overview – 5 minutes – Josh
  - Implementation Partner - Participation and Process
    - *Attend today's workshop*
    - *Review Deliverables (CEAP-MM Chapter content and How to Guide)*
- Workshop Context – 15 minutes – Chelsea / Aaron
  - *Social Equity and Eugene's Triple Bottom Line Vision (page 2)*
  - *Community Greenhouse Gas Emissions and Tracking*
- Round Robin on Current Activities – 10 minutes - Group
- Discuss Ideas for New Actions – 80 minutes – Group
  - Review list of Ideas for New Actions
  - Add new actions from group
  - Review the following for each:
    - *Opportunities*
    - *Barriers*
    - *Social Equity Considerations*
    - *Metrics and Available Data*
- Thank you and Next Steps – 5 minutes – Chelsea / Josh
  - *Review of Deliverables – Spring 2018*

Appendix B: Workshop 1: Food – Institutional Purchasing and Waste Avoidance

OPPORTUNITIES, BARRIERS, AND CO-BENEFITS FOR ACTIONS DISCUSSED

Action 1: Conduct a waste audit

Opportunities:

- Participation in "Oregon Green Schools" requires a waste audit.
- UO moved away from trays, which took about two weeks for the students to adjust to, immediately saw decreased food waste.
- Huge amount of food from tray waste in K-12 school setting. Amount of food put on trays is mainly dictated by USDA. Bethel SD utilizes a "no thank you table" for items like fruit, but that approach doesn't work with many main dishes.
- 4J SD looking into providing bulk milk in lieu of cartons so that students can take only what they want.
- By Middle school, only 40% of students are buying lunch at school. By high school, its 8-20%. It makes sense to focus at the elementary level.
- Food for Lane County picks up extra food from UO kitchen.
- BRING and Partners for Sustainable Schools provide waste audit services.
- LCWM provides a $500 grant to schools for waste audits. Audits are used to identify potential actions and set goals.
- 4J SD and Bethel SD have not completed waste audits.
- Bethel schools and UO are tracking internal waste weights.

Barriers:

- Elementary students don't have enough time to eat.
- The amount of time at the table to eat is often small and competing with recess which leads to food waste.
- Kids have choices but have to take required units by USDA requirement.
- Increasing quality helps decrease waste - entrees can't go to the no thank you bin.
- Cost - sampling of schools. Oregon Green Schools is free.

Action 2: Shift calories from high carbon to low carbon food types

Opportunities:

- Offer meat alternatives at schools as a choice.
- 4J SD does meatless Monday once a month.
- UO students willing to eat vegetarian or vegan much of the time.
- UO provides what's in demand.
- UO – adopted many practices from "Menus of change"

Barriers:

- US Government provides subsidy to buy different items on a commodities list. Commodities have a huge impact on what's offered on the menu.
- Multiple food options lead to students eating more, but also may increase overall food waste.

Social Equity:

- For some segment of the community, avoiding meat is not a cultural norm/ this doesn't reflect their values.

Action 3: Engage with supply chain about manure management lagoon practices of beef, dairy, and pork suppliers *Opportunities:*

Barriers:

- Workshop participants did not believe they had the ability to ask these questions of their vendors.

Appendix C: Workshop 2: Concrete and Asphalt – Materials and Processes

OPPORTUNITIES, BARRIERS, AND CO-BENEFITS FOR ACTIONS DISCUSSED

Action 1: Request environmental product disclosures (EPD) from concrete vendors to inform selection concrete mix design

Opportunities:

- LEED Certification points available for EPDs
- Increased customer requests for EPDs will increase of Oregon EPD availability
- OCAPA and DEQ will issue a partial reimbursement for verification costs. Each plant is eligible for up to a $2,500 reimbursement or 75% of their verification costs – whichever is less. Companies that own more than one plant may not qualify for reimbursements for more than 8 plants[25]
- EPDs from local concrete vendors would allow the concrete consumer to make informed choices based on verified information
- City Permitting Department currently has database infrastructure to track EPDs at a project level, but would need directive from City decision-makers to implement
- City Public Works could include a voluntary EPD submittal to accompany project bids

Barriers:

- EPDs from Oregon concrete vendors are not readily available *due to lack of requests from public and private developers.*
- Staff work time and calendar time required to collect data and calculate EPDs for the material producers. Typical calendar time is 3 months. Once verified, EPDs are valid for 5 years.
- Cost to verify EPDs. Typical cost is $5,000 to verify 100 mix designs
- Concrete manufacturers are reluctant to use them until they are required or until there is more certainty about standards. EPDs are viewed as a risk at this point and increased risk leads to increased cost.

Social Equity:

- Ensure small batch plants, with fewer resources to document and verify EPDs, are not negatively affected by onerous requirements

ACTION 2: Substitute SCM for Portland cement

Opportunities:

- SCMs are being utilized on main arterial projects, but not in local street projects.
- Local architects and structural engineers to revise templated specs to allow for greater use of SCMs.

[25] Additional information at http://www.ocapa.net/oregon-concrete-epds

- Concrete vendors to support 56-day strength tests to allow for longer cure times that result in more durable material.
- SCM concrete is often lighter in color and could reduce "heat island effect".
- Local producers could participate in the NRMCA survey and use standardized EPDs for their product offerings.
- Blast furnace slag results in a higher strength product than fly ash.
- Blast furnace slag is readily available in the region and is 20-30% less expensive than Portland cement.

Barriers:

- Learning curve on how to use SCMs can be challenging. For those who create and maintain buildings and infrastructure the perceived risk associated with "experimentation" with unfamiliar mix designs is too great.
- Limited technical resources available to support early use.
- SCMs result in lower 7-day strength than Portland cement, but have the same 28-day strength. This strength issue results in construction delays – particularly for multi-story buildings. Concrete vendors do not recommend using SCMs for concrete mixes that require high, early strength mixes.
- Incorrect use can lead to cracking problems.
- Oregon Department of Transportation standard specification limits maximum SCM substitution to 30%.
- Fly ash supply in the northwest U.S. is an issue and quality varies significantly.

ACTION 3: Substitute RAP or RAS for virgin materials

Opportunities:

- Widely used and proven technique
- Existing AASHTO and ODOT specifications
- Reduces costs, energy use, and GHGs
- Can be used in a variety of asphalt mixes
- Improves strength and durability
- Reduces consumption of virgin natural resources

Barriers:

- RAP / RAS mixes can result in very stiff and difficult to apply mixture
- Variability among reclaimed material stockpiles
- High percentage substitution can lead to quality issues
- Reclaimed aggregate reduces in size as it is reground – this material becomes appropriate for lower speed roadways. The higher the speed, the larger the size of rock.

ACTION 4: Substitute warm-mix asphalt for hot-mix asphalt

Opportunities:

- Eugene vendors all have the equipment necessary to produce warm mix

Barriers:

- ODOT standard specification require that a certain quantity of hot mix asphalt be used prior to use of warm mix
- Lane County follows ODOT specs
- Asphalt vendors, depending on location, may not have the capital equipment needed to produce warm-mix products.
- Local plants may be limited based on local air permit limits

Social Equity:

- Reduction in criteria air pollutants for workers and pedestrians near application site

Appendix D: Workshop 3: Building Materials – Recovery and Reuse

OPPORTUNITIES, BARRIERS, AND CO-BENEFITS FOR ACTIONS DISCUSSED

Action 1: Define Infrastructure Needs

Note: The discussion made clear that the group is not ready to define specific infrastructure needs. The workshop served as a discussion about what actions to take to define community infrastructure / skills needs and assess the feasibility of such actions.

Opportunities:

- Conduct study to identify infrastructure and system deficiencies and assess feasibility
- Infrastructure should support contractor-scale sale of reused materials
- BRING staff can offer real time technical assistance during construction to identify reused material options and availability
- Transfer stations staff could be used to recover high grade materials in real time
- Create separate reuse education materials for commercial versus DIY homeowner
- Host a local contractor inventory swap site
- IT upgrades for inventory management at reused building centers

Barriers:

- Reused material quality and consistent availability
- Time and cost issues associated with reused materials compared to virgin materials
- Contractor liability concerns with reused materials
- Direct salvage not allowed at transfer stations
- Contractor experience in ordering and receiving materials. At conventional building supply centers, a contractor can bring in plans and have material delivered in specific quantities, on specific dates, with consistent quality. In order to be competitive – reused material centers would need to operate in a similar way.

Social Equity:

- Safety and reliability issue related to reused materials
- Development of new services and infrastructure should consider: who will operate it; where it is sited; and what jobs and skills will it provide.

Action 2: Whole Building Reuse

Opportunities:

- Commercial buildings should be the focus
- MUPTE tax incentives could be used to encourage reuse

- Develop a proactive approach to identifying whole building reuse opportunities. This might involve an analysis of Eugene's building stock to identify building types, ages, materials types, etc. that lend themselves to whole building reuse.
- City of Eugene started archiving building plans which will make reuse easier in the future.

Barriers:

- Difficult or expensive to make needed seismic upgrades
- Zoning and code issues associated with changing the building from original to new use
- Premanufactured components are common and can be difficult to modify
- Incomplete building plans and uncertainty about what specific components will perform the structural function when seeking salvaged components

Social Equity:

- Whole building reuse allows community to maintain architectural character
- Issues related to gentrification

Action 3: Increase Building Deconstruction

Opportunities:

- Convene group to develop system to identify deconstruction opportunities
- Include a moment in the permitting process that requires demo contractor, or a similar service provider reviews the building for high-value materials

Barriers:

- BRING used to provide deconstruction services for the community but gave it up because it isn't financially viable. Labor costs are more than the value of the materials.
- Most construction in Eugene is post-1950; therefore, material quality is low.

Social Equity:

- Avoided air emissions of mechanical demolition for nearby residences

Action 4: Require C&D Waste Sorting for Reuse and Recycling

Opportunities:

- Lane County is in the process of developing a C&D waste sorting requirement

Barriers:

- Any sorting requirement will need an extended implementation period to ensure all service providers understand the compliance requirements

Social Equity:

- Compliance may be more difficult for small contractors if it requires significant investment in equipment

Appendix E: Workshop 4: Consumer Goods – Repair, Reuse, and Lifespan Extension

OPPORTUNITIES, BARRIERS, AND CO-BENEFITS FOR ACTIONS DISCUSSED

Action 1: City and County to implement, locally appropriate education and outreach programs to support reuse, repair, and lifespan extension to support the requirements of SB 263 – community-at-large and in-school solutions

Opportunities:

- Educate on buy less, reused, and durable and develop a local buyers guide
- Education about what it actually means to recycling things. Buying Smart.
- Targeting advertising via social media.
- Regularly scheduled event to coordinate local reuse industry representatives.

Social Equity Considerations:

- Affordability of goods
- Time cost of researching repair and durable goods options
- Cultural sensitivity for education and outreach materials

Action 2: Host Fix-It Fairs to provide community access and education on local repair services and vendors

Opportunities:

- Develop smaller-scale Fix-It Fair events (e.g. neighborhood associations, church events, etc.). In the past year, the City has hosted 3 City-wide Fix-It Fairs and 5 repair cafes. Learning and vendor network from these events can support development efforts.
- Use events to promote local repair businesses.
- Develop stock materials that could be used to support smaller scale events
- SVDP community rooms could be used for events
- BRING current hosts 12 repair events per year.
- BRING: 12 events. Absorbing costs. Volunteers have access to BRING bucks.
- Repair of small electric appliances and clothing have been the most popular goods categories during recent events.

Barriers:

- Expense - $5,000 per event to host one City-wide Fix-It Fair.

Social Equity Considerations:

- Location and timing of events
- Cultural sensitivity for education and outreach materials

Action 3: Support ToolBox Project, and similar innovative community reuse solutions, to expand shared resources

Opportunities:

- ToolBox Project concept could be expanded to create lending libraries for other product categories (e.g. kitchen equipment, toys, wedding event items).

Barriers:

- Identifying long-term funding for paid staff
- Increasing and messaging about membership fees.

Action 4: Focus on textiles and clothing (data collection and foundational research, increase collection of reusable textiles, shift consumption to durables, support clothing repair business, develop consumer skills)

Opportunities:

- SVDP: There is a market for all fabric - reuse in wiping rags. Opportunity for fashion.
- Action: Opportunity for growth in fashion and one-off. COE has micro loan program - maybe an opportunity to work with SVD on job/business development.
- Action: Focus on collection of clothing and textiles.
- Action: City-wide summer swap fest
- Action: Event to gather more textiles - SVD would be willing to deal with the materials

Barriers:

- Sustainable consumption - Changing attitudes around

Action 5: Focus on furniture (data collection and foundational understanding, increase salvage events, shift consumption to durables, support furniture repair, reuse, and remanufacturing businesses)

Opportunities:

- Wood furniture good
- Foam furniture bad
- Workshops to repair and refurbish furniture
- Collaboration across the community
- Action: Promote Campbell Center, Makers Space, others from Anya (?)

Barriers:

- Moving furniture to Fix-It Fair. Only what you can carry
- SVDP won't take problem furniture
- BRING takes wood furniture, but not press board as it falls apart

Social Equity Considerations:

- Affordability
- Pick up vs. drop off