



Construction and Demolition Waste Recovery and Reuse Project

Real World Eugene-Winter Term 2023

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Meet the Team



Quinn Doherty is a senior in Planning, Public Policy, and Management from Pendleton, Oregon. Post-graduation he will be entering the construction industry as a construction project manager, which heavily influenced his interest upon joining this project. With this project, he hopes to translate proper C&D waste recycling onto future construction projects that he is a part of, and also to positively influence future waste recycling within Lane County and the State of Oregon.



Finley Hungerford is a senior in Planning, Public Policy and Management and Environmental Studies minor from San Luis Obispo, California. He is interested in transportation and environmental policy. Post-graduation he hopes to travel abroad before moving to a bigger city and working for a planning office.



Libby Darlington is a junior in Planning, Public Policy, and Management from Humboldt County, California. Post-graduation she is interested in working in the government sector on policy that will reduce the impact of climate change on the environment. Her future career plans inspired her to participate in this project because the project findings will have a direct impact on the condition of the local environment.



Anna Heironimus is a junior in Planning, Public Policy, and Management and Food Studies minor from Sherwood, Oregon. Her academic interests include sustainable planning and policy, which is why she was interested in joining this project. Post-graduation she hopes to continue working on projects for local governments that focus on food justice and environmental planning.

Acknowledgements

Our team would like to thoroughly thank those who were involved in our project research. With this project, we reached out to those in many different sectors ranging from: nonprofits, public works, wood processing centers, recycling centers, and policy makers. Everyone listed below contributed to our project through informational interviews, tours, project coordination, and outreach, and we appreciate their time and contributions.

Maya Buelow

Deveron Musgrave

Dan Hurley

Olivia Cashman

Shawn Wood

Lane Forest Products

Rexius

Matt Mueller-Curson - BRING

Urban Gypsum

Executive Summary

Lane County, Oregon seeks recommendations for identifying markets, policies, and incentives for the reuse and recycling of construction and demolition (C&D) materials. This research project will identify solutions to reduce the current C&D waste production occurring in Lane County. Working towards eliminating this waste maximizes the potential environmental, social, and economic benefits from practicing reuse and recycling, thus achieving a circular economy that utilizes materials to their fullest potential.

Through the University of Oregon Real World Eugene course, four undergraduate students were tasked with drafting recommendations for how Lane County should implement C&D reuse and recycling. This project includes research on specific case studies and reuse and recycling reports to understand all potential barriers and solutions. Based off of this research, the team conducted informational interviews with appropriate non-profit, for-profit, and government officials to receive valuable insight on potential recommendations. This report synthesizes all the information into feasible recommendations that could be implemented.

After considering all potential solutions, the project team created a final set of recommendations that includes:

Market Opportunities:

- EIHCs- Emergency Interim Housing Communities for the unhoused.
- Basketball courts in low-income neighborhoods
- GLB engineered wood products made from recycled materials.
- Additional non-profit partnerships for donating recycled wood.
- Continued manufacturing of hog fuel, mulch, wood chips, and wood pellets
- Soil conditioner for garden and farming practices.

Policy Recommendations:

- Site signage
- Jobsite material sorting bins
- Deconstruction training
- Community engagement
- Deconstruction ordinance
- “Building for future deconstruction” ordinance

Incentives:

- Grants
- Streamlined permit process
- Lowered hauling fees
- Utilizing outside funding

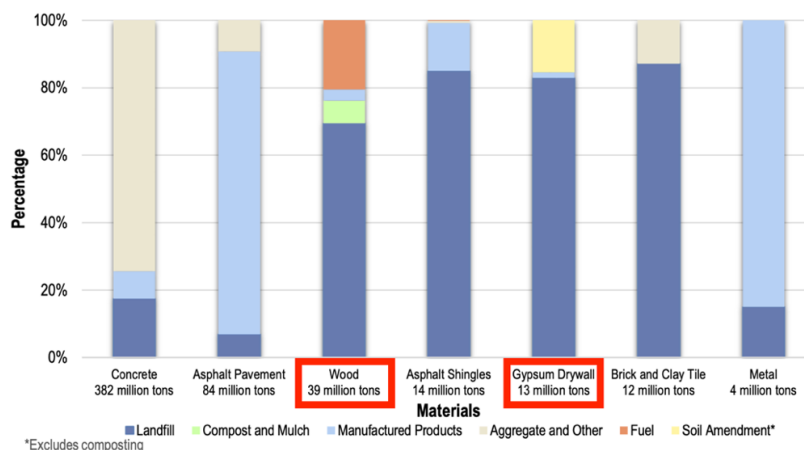
Background

In 2018, “600 million tons” of construction and demolition (C&D) waste was produced in the United States with more than “90 percent” coming from demolition projects (EPA). Specifically in Lane County, C&D waste from building projects comprises 31 percent of the materials headed to landfills. The materials that constitute these waste streams include wood and gypsum, which create extra costs beyond the fees of landfill disposal. Wood products decompose slower than most other organic materials, remaining in landfills for longer periods of time (Gosline). Additionally, gypsum can pose a serious threat in traditional disposal methods, leading to “hydrogen sulfide gas emissions” when mixed with other biodegradable waste (Hamid et al.). Thus, composing a plan to address the growing C&D waste in Lane County is of critical importance.

There are opportunities for reuse and recycling of wood and gypsum materials in a variety of industries rather than spending years degrading in landfills, but with little incentive and presence of markets in the area, combating this growing problem is difficult. Achieving a circular economy where materials continuously move from creation to reuse leads to a more efficient and effective process. Furthermore, there is potential for reducing the environmental impacts of the excessive waste in landfills and spur economic growth locally if reuse solutions are utilized more commonly. Exploring the possibilities for reuse and recycling markets in Lane County is a crucial step to combating the C&D waste crisis.

Lane County tasked the Real-World Eugene student team to investigate current or potential markets for the reuse and recycling of construction materials like wood and gypsum. Our research process involved analyzing best practices for the recovery of materials, conducting a market analysis for wood and gypsum, examining case studies of similar projects, and organizing key person interviews with appropriate stakeholders. In addition to the exploration of markets, evaluating different incentives like subsidies and microgrants that could be used to encourage reuse and recycling practices is also a priority. The final deliverable will capture the research findings and will serve as a resource for county officials in their efforts to reduce C&D waste.

Figure ES-3. 2015 C&D Debris Management by Activity (percent of total generation amount for the material)



The graph above shows the percentage of C&D waste that is heading to landfills or is used to create another product. The red boxes indicate the data that represents wood and gypsum materials. (*Construction and Demolition Debris Management in the United States*).

Research Objective

What kinds of market opportunities are available or have potential for reusing and repurposing wood and gypsum from construction and demolition projects?

What policies and incentives would support the increased recovery of wood and gypsum?

Our group researched, compiled, and analyzed best practices to recover wood and gypsum for recycling within a 100-mile radius of Eugene/Springfield. The project included conducting a market analysis for wood and gypsum and identifying markets where these materials could serve as feedstock. Potential opportunities that our group investigated includes non-profit partnerships, establishing additional recycling centers in Lane County, microgrants for de-constructing, and incentives for contractors and small-scale home renovators. Our final report includes recommendations about the best market opportunities and regulations that could be executed in Lane County.

Project Team Division

To accomplish both aspects of our scope for this project, our team was split into two groups. The purpose of this division was to allow our team to equally split the research topics to focus on; recycled material market opportunities and C&D recycling policy implementation.

Team 1 (Finley and Anna)- Policy and Incentives Research (Offering microgrants, city-based waste recovery methods, mandatory recycling agreement for demolition, material sorting bin requirements at job sites, etc.)

Team 2 (Quinn and Libby)- C&D recycling market opportunities, county and non-profit partnership opportunities, future wood engineered products, (Informational interviews with non-profit and limited liability company leaders and contractors, market research)

Project Goals

- Identify existing or potential market opportunities for recycling and reusing wood and gypsum in Lane County, ranging from non-profit and for-profit partnerships, additional recycling centers, and markets in need of recycled wood or gypsum.
- Identify applicable policies and incentives that could complement market opportunities, including microgrants, subsidies, ordinances, and on-site requirements.
- Utilize case study research, informational interviews, and data to analyze and evaluate different opportunities.

- Recommend multiple market opportunities and incentives based on feasibility and effectiveness.



Methodology for Research

To accomplish our project goals, our team used several mediums to gain insight into potential secondary markets and policy implementations for C&D materials. These mediums included: past C&D project evaluations, researching case studies related to the handling and disposal of C&D waste, a recycling center facility tour, and informational interviews with wood recycling facilities, non-profit recycling organizations, and city and government officials.

Use of Deliverables

The C&D Project Team met with our community partner to share a visual presentation and written report as our final deliverables. These materials included examples of existing and new market opportunities that do not currently exist in Lane County. The Lane County Waste Reduction Team and Project Pivot can expect to use our final deliverables to examine market opportunities and policy incentives for repurposing and reusing deconstructed wood material as well as a market opportunity for recycling gypsum waste. The research and insight provided by our final deliverables outlines potential opportunities for Lane County to improve their C&D waste recovery rate to move closer to their defined waste reduction goal.

Project Limitations

After completing background research on limitations to C&D reuse and recycling practices, our team identified potential barriers that would exist in Lane County. These limiting factors included: cost and convenience, time, space, climate, lack of recyclable markets, safety, and regulation (Seattle C&D waste Project). This was apparent in several of our informational interviews and initial discussions with Maya Buelow. While crafting our final recommendations, we kept these limitations in mind.

Another limitation that we experienced was project work time. The University of Oregon's term schedule is set to 10-weeks with the final week being for tests and presentations. With the Real-World course, we were operating on a nine-week schedule due to the loss of the first week for syllabus review and team groupings. Despite that, we are confident with our research and recommendations. We strongly encourage Lane County to use our research as a steppingstone, and to invest further time and materials into this research to fully encompass the economic and social possibilities for increasing C&D recycling.

Survey Construction

A mock Qualtrics survey was created and sent out to several contractors within Lane County by the student team during Week 6. The purpose of this survey was to learn more about contractors' knowledge of Lane County recycling outlets, potential incentives to increase C&D recycling, job site material waste sorting, and C&D waste hauling mileage. While our survey did not receive as many responses as we hoped, the two responses provided valuable information on C&D recycling from a contractor's perspective. Creating a similar survey to send to contractors would be beneficial for Lane County to determine what practices would be most effective for improving C&D reuse and recycling practices in the area.

The questions that were included on the survey asked about their prior knowledge about C&D waste reduction in Lane County, if they were currently utilizing any reuse or recycling practices on their job sites, and which incentives would encourage more waste reduction practices.

The biggest takeaways from our survey were:

- Contractors were already recycling and bringing C&D materials to facilities like BRING, St. Vincent de Paul, Rexus, and Lane Forest Products.
- The incentives for promoting deconstruction that contractors want include tax breaks, grants, and reduced recycling and dumping fees.

For more information about survey questions and responses, please refer to Appendix F.

Recommendations

Market Opportunities	Policy Implementations	Incentives
<ul style="list-style-type: none"> • Emergency interim housing communities for the unhoused population • Basketball courts in low-income neighborhoods • GLB engineered wood products • Additional non-profit partnerships • Hog fuel, mulch, wood chips, and wood pellets • Soil conditioner 	<ul style="list-style-type: none"> • Site signage • Sorting bins • Deconstruction training • Community engagement • Deconstruction ordinance • “Building for future deconstruction” ordinance 	<ul style="list-style-type: none"> • Grants • Streamlined permit process • Lowered hauling fees • Utilizing outside funding

Market Opportunities Recommendations

We compiled ten market opportunities for reusing and recycling wood and gypsum material waste in Lane County. These recommendations are based on the information we gathered from background documents and informational interviews with nonprofits, a limited liability company, and wood recycler employees. We listed and explained each of our recommendations to include our basis for the recommendation, time frame, resources needed, and overall impact on the community.

Emergency interim housing communities for the unhoused population

Emergency interim housing communities would provide an outlet for deconstructed wood material waste in Lane County. This recommendation is based on our research of the nonprofit BRING and background documents such as *Treasure in the Walls: Reclaiming Value Through Material Reuse in San Antonio* published by PlaceEconomics. Through our research, we discovered that local nonprofits such as Habitat for Humanity ReStore and Square One Villages could use deconstructed wood to build shelters for the homeless population. A considerable barrier to this potential project between Lane County Government and the nonprofits Habitat

for Humanity ReStore and Square One Villages would be identifying transportation for deconstructed wood material from construction job sites to housing community locations. An additional barrier would be collecting large amounts of high-quality deconstructed wood that can be used to build structures; however, salvaged wood materials that could not be used for the actual homes could be utilized for other projects within the community area like fences, doors, and planter boxes. This recommendation addresses the redirection of wood materials while also considering the needs of the community, thus making it valuable to consider and further research.



This picture showcases a tiny home village made in Madison, WI (Giles Bruce for KHN).

Basketball courts in low-income neighborhoods

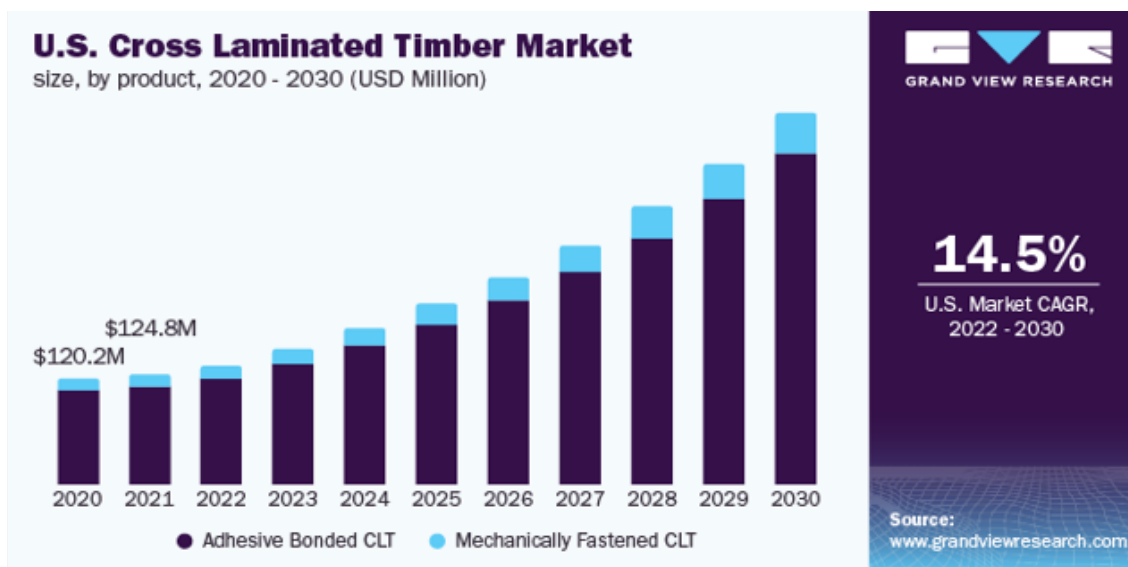
Creating basketball courts in low-income neighborhoods is another market opportunity for deconstructed wood in Lane County. This recommendation is based on the article *This Nike Basketball Court is Made from 20,000 Pairs of Used Sneakers* written by Sarah Osei. This article discusses a basketball court with a surface built from 20,000 pairs of recycled sneakers through Nike's Grind initiative. In Lane County, this project could be recreated by utilizing recycled wood or other construction materials for the court, hoops, and fences within the outdoor space. This recommendation could also be taken indoors, where salvaged wood could be utilized in basketball courts for the YMCA, Boys and Girls Club, or other community spaces. There are some unknown factors like the feasibility of a Nike Grind partnership because we were unable to interview anyone from Nike, so this recommendation requires further exploration and research. Finding opportunities to utilize wood that provides a direct benefit to the citizens within the community is a market opportunity would be extremely valuable and has the potential to provide new life to a sizable share of the wood recovered in Lane County.



This picture depicts the Shek Lei Grind outdoor basketball court in Hong Kong that was created through the Nike Grind program (Nike).

GLB Engineered Wood Products

An additional recommendation is transforming recycled wood into engineered wood, a market that currently growing within the United States. Engineered wood or “mass wood” is the process of layering wood and compressing the layers to form high strength wooden beams for construction. This practice is becoming more widely used by architects and designers due to the durability, longevity, earthquake resistance, and limited carbon emissions in comparison to concrete and steel construction. In Portland, engineered wood is starting to be mass produced and become a highly popular topic among affordable housing developers, some saying that it “allows them to move quicker to rebuild after crisis like wildfires and to address systematic issues like the housing shortage” (Rush). Within Lane County, a similar process could take place by establishing partnerships with other wood developing companies. For instance, this year Sierra Pacific will be opening a new wood mill in Lane County that will be the most technologically advanced timber mill in the nation. The complex will also be one of the largest in the nation, with a maximum production capacity of “650 million board feet” (Griesel). Establishing a partnership with Sierra Pacific or another related company to produce engineered wood products in their facilities would be beneficial and has the potential to create more jobs in the local economy. Identifying avenues to take advantage of the growing engineered wood market has the potential to address multiple issues while finding an opportunity to utilize salvaged wood in Lane County.



The graph above illustrates the increasing market demand for cross laminated timber over the next 10 years (Grandview Research market outlook for engineered wood products).

Hog fuel, mulch, wood chips, wood pellets, and biomass

Continuing current recycling methods with Lane Forest Products and Rexius like producing hog fuel is a valuable market opportunity for utilizing salvaged wood in Lane County. The 2015 C&D Management in the United States document identified that hog fuel is the most widely used option for recycling wood from C&D projects, so expanding this current market opportunity would help recycle a significant amount of wood waste in Lane County. Lane County has already established partnerships with these two companies, but based on our interview with them they emphasized that they would be able to accept additional wood materials such as pallets, decking, and construction waste. Further connecting with them to identify the specific availability within their space and their potential for growth would be a beneficial market opportunity to continue.

While talking with Rexius and Lane Forest Products, they also discussed how they could utilize additional wood for the creation of wood chips, mulch, and wood pellets. Directing more C&D wood waste to these companies could be used for their own selling of these materials, but they could also be made for specific projects within Lane County. In particular, these companies could produce mulch and wood chips and either sell them at a discount or donate them to Lane County to be used in communities gardens, parks, and other public spaces. They could also be sold to larger entities such as the University of Oregon to spread around their campus. This opportunity would provide a guaranteed end use for salvaged wood materials and provide an opportunity for those who utilize the recycled wood chips or mulch to promote their environmentally friendly choice. An example sign that could be placed within the areas that use these recycled materials is shown below.

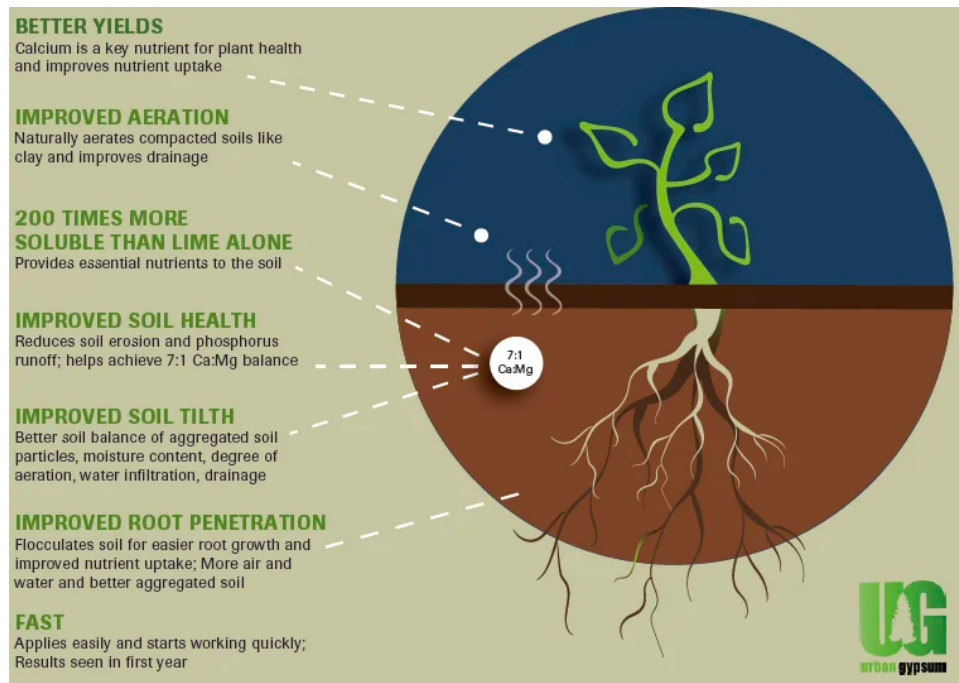
Towards the end of our project, we also discovered some research about biomass as a potential market opportunity for wood salvaged from C&D building projects. However, we were not able to spend substantial time researching biomass due to our project's time constraint. Therefore, it is difficult to determine aspects of this recommendation such as time frame and resources needed, so more research is required.



The picture above is a mock plaque created by our team to showcase gardens in Lane County that use fully sustainable wood materials.

Soil Conditioner

After researching market opportunities for gypsum material waste, we concluded that soil conditioner would be the most feasible in Lane County. While researching markets that recycle and reuse gypsum material waste we discovered Urban Gypsum, a limited liability company located in Portland, Oregon that recycles drywall from construction and demolition job sites into soil conditioner. Their company utilizes all the gypsum material waste they collect and they accept materials across the entire West Coast. Establishing a partnership with them for Lane County's gypsum waste would be an extremely beneficial way to significantly extend gypsums lifespan as well as utilizing the benefits it brings to soil that is described in the infographic below. However, a potential barrier to recycling gypsum with Urban Gypsum is transportation, since it is located in Portland. A potential solution to this barrier is establishing group hauling of gypsum, where individuals bring all their gypsum to one location to be taken to Portland. This solution is discussed further in the "Lowered hauling fees" incentive recommendation.



This infographic shows the benefits of soil conditioner derived from gypsum (Urban Gypsum).

Policy Implementations

After completing case study analysis and informational interviews with city and county officials, we compiled multiple policy solutions for Lane County to consider. Within this section there are six different recommendations that are organized by feasibility, with the most feasible listed at the top.

Site Signage

A common requirement among the different grant and ordinance projects was the establishment of a site signage requirement at deconstruction sites. The signs included information about how the structure was being deconstructed instead of demolished and had a website that shared more detailed information. While talking with Shawn Wood at the City of Portland, he described how this requirement helped educate the neighbors and spread information about the process of deconstruction because it started conversations between the citizens and the workers. This requirement helped educate the community about the deconstruction process, leading to an overall positive response and support from the community. Increased awareness also led to more individuals utilizing the deconstruction grant program and eventually led to the deconstruction ordinance that was passed by the city. Implementing this recommendation in Lane County is a simple and an effective way to support deconstruction in the area.



The above picture is an example sign that the City of Portland utilizes in deconstruction projects (Wood).

Sorting bins

Another key element of the reuse and recycling implementations executed by cities and counties was the careful organization and separation of materials on site. Having bins on site that separate materials from their type and final location is a crucial step that helps identify and organize all materials that have potential to be salvaged and simplifies the final hauling of the materials to their reuse or recycling location. This recommendation also follows Oregon State Law 340-090-0030, that outlines recycled materials must have separate bins. Including provisions that outline this step will be critical to the success of a C&D reuse and recycling plan in Lane County.



This picture is an example of material specific sorting bins on a jobsite (“Optimize Building Space and Material Use”).

Deconstruction training

To maximize the potential for reuse and recycling in Lane County, training services need to be provided for the community. Establishing a partnership with deconstruction companies or contractors in the state or across the nation could help Lane County create a training program to prepare the workforce in the area. Build Reuse is a nonprofit that would be a beneficial resource for establishing a deconstruction program since the City of Portland worked with this organization when they held their national deconstruction conference in 2017 (City of Portland Bureau of Planning and Sustainability). This annual conference and nonprofit organization provides the opportunity discuss solutions, barriers, and outcomes with other cities, providing valuable partnerships and expertise for Lane County as they establish similar programs. Utilizing knowledge from others who have created deconstruction programs in their areas would be beneficial for creating a well-rounded program.

A deconstruction training program in Lane County would need to include on-site training and classroom testing to ensure that all deconstruction contractors are practicing efficiently and effectively. Making the training process quick and offered at a free or reduced cost will eliminate potential barriers that prevent current contractors from receiving the training. The City of Portland has held similar free deconstruction training programs that have created a positive benefit in the community and helped expand the practice in the area. One individual in particular, Rebecca Hoefer, who works for Lovett Deconstruction in Portland illustrates the potential value of encouraging more to be trained in deconstruction saying, “I can honestly say that changing [my] career path to deconstruction was the best decision I’ve ever made” (City of Portland Bureau of Planning and Sustainability). Encouraging this practice through the establishment of county-led programs is a vital step that needs to be implemented.



The picture above is of a group of students who participated in a no-cost deconstruction training program in Portland, OR in 2017. This was provided by the city staff, Oregon

Department of Environmental Quality, and Metro (City of Portland Bureau of Planning and Sustainability).

Community engagement

Community engagement and feedback are crucial to the success of establishing deconstruction or other C&D reuse and recycling practices in Lane County. Utilizing public surveys and community forums will provide opportunities for the community to share feedback, input, and ask questions about potential programs. When talking with Shawn Wood from the City of Portland and Olivia Cashman from Hennepin County, Minnesota, both individuals stressed the importance of reaching out to the community. Establishing and growing public support for the reuse and recycling of construction materials was essential for their programs to be successful. Without engaging the community, the programs would be unknown or missing critical considerations.

In addition to receiving input, they described how community engagement also involves proper advertising of the C&D reuse and recycling programs. One way Hennepin County, Minnesota achieved this was through targeted advertising for different stakeholders. They utilized a wide variety of advertising avenues like social media, newspapers, and their website to reach out to as many people as possible. Another tactic that was utilized by the City of Portland was reaching out to community members through the creation of infographics that included relevant information. For instance, the infographic below includes information about who to contact and where to apply for the deconstruction grant program in Portland. Creating easily digestible information for the public is a critical aspect of a program's success.

Removing a house?

Salvage valuable material for reuse through deconstruction

Grant funds are available for deconstruction projects

- Applications accepted beginning Sept. 8, 2015.
- Visit www.ExploreDecon.com for application instructions.

Deconstruction benefits:

- Our community.
- Our environment.
- Our economy.

www.ExploreDecon.com

Bureau of Planning and Sustainability
Innovative Collaborations. Practical Solutions.
 City of Portland, Oregon
 Chad Staley, Mayor | Anne Anderson, Director

To apply for grant funds:

- The project must include the complete removal of a house or duplex, regardless of zoning.
- Anyone associated with the project may apply (owner, builder, contractor).
- Historic properties may apply, however additional criteria will need to be addressed.

In addition:

- Applications are reviewed and selected within approximately seven days from application date.
- Partnerships between demolition contractors and deconstruction contractors are encouraged.
- A licensed/bonded/insured contractor must perform the salvage work.

www.ExploreDecon.com

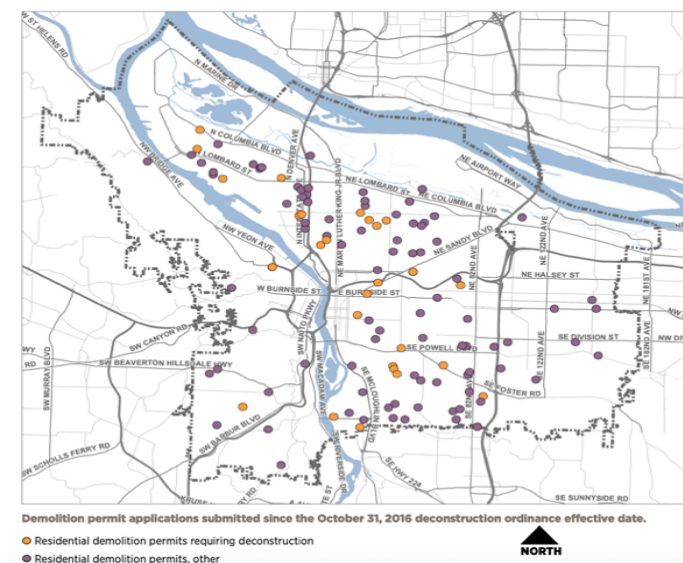
The infographic above was shared by the City of Portland to educate citizens about the deconstruction process and their grant program eligibility (Wood).

Deconstruction ordinance

A positive addition to other deconstruction programs in Lane County would be the establishment of a deconstruction ordinance for residential and commercial buildings. To fully define and determine each element of a deconstruction ordinance, Lane County would first need to successfully implement other deconstruction related programs like grants and training. In Portland, the establishment of their deconstruction ordinance and its overall success is due to the hard work they put into other related programs first. They built up demand by educating citizens, establishing incentive programs, and educating the workforce, so the implementation of the ordinance in 2016 showed positive results.

A deconstruction ordinance that would be beneficial to further examine and emulate in Lane County is from the City of Portland. Currently, Portland's deconstruction ordinance requires all single-dwelling structures constructed in or before 1940 to be deconstructed rather than demolished. They determined this age restriction based on their current housing stock and on the materials they were hoping to salvage. As seen by the map below, the age requirement they selected led to appropriate structures to be identified and required to be deconstructed. Since the age and quality of housing stock differs across the state, Lane County would need to complete their own housing stock inventory to determine what age requirement would be applicable.

Additionally, before establishing a complete deconstruction ordinance, Lane County could create a partial deconstruction ordinance. This type of ordinance could identify that residential and commercial properties must salvage a smaller percentage or a specific material (like doors for instance) from their property rather than requiring the entire building to be deconstructed. Using this smaller-scale ordinance as a steppingstone to establishing a full-scale ordinance would be beneficial in capturing easily recyclable and reusable materials from projects that may otherwise be demolished due to other barriers. Establishing either a partial or full deconstruction ordinance will be a long-term project that provides numerous benefits to the C&D reuse and recycling market in Lane County.



This map identifies structures across Portland that now require deconstruction practices instead of demolition (City of Portland Bureau of Planning and Sustainability).

“Building for future deconstruction” ordinance

To ensure that future deconstruction projects are possible, we are also proposing a “building for future deconstruction” ordinance. One of the reasons why we are proposing this is because of the change in construction techniques over the 20th century, where there was a shift to cheaper construction processes that resulted in creating homes with less valuable materials for reuse. Establishing construction techniques like more utilization of engineered wood and less glue will provide more potential for more reusing materials and will work towards eliminating this barrier from the future deconstruction market. While this will be costly for developers, we feel this is the best way to prepare and maximize the future of deconstruction in Lane County. Rethinking the way we build new structures will create a major impact in our ability to reuse materials and reduce waste in the future.

Incentives

After completing case study analysis and informational interviews with city and county officials, we compiled with multiple incentive solutions for Lane County to consider. Within this section there are four different recommendations that are organized by feasibility, with the most feasible listed at the top.

Grants

A critical incentive that would significantly encourage deconstruction, reuse, and recycling practices in Lane County is the creation of grant programs. The City of Portland created a deconstruction grant which provided funding for deconstruction activities, offering \$2,500-3,000 for each grantee to help cover the additional costs in time, labor, and training. Since the start of their program, they have had over 20 grant deconstruction projects in Portland. It has also helped encourage and promote the process in the city, eventually leading to their ordinance in 2016. Offering money to subsidize the deconstruction process for homeowners or contractors will help reduce some of the financial burdens that could be preventing this activity.

Another grant system used in Hennepin County was reuse and recycling grants. Here they provided between \$5,000-15,000 and required that materials be donated or recycled to one of their partner facilities. Within their grant program, they identify specific materials and percentages that must be reused or recycled in order to obtain the grant. Their grant program was also able to save an entire house with a house move project shown below. This style of grant would be most successful if Lane County established a partnership with local reuse and recycling organizations like BRING so materials will be able to easily be tracked. By providing financial incentives and other resources for the entire process, it is easier for more individuals to choose reuse and recycling over dumping in the landfill.



The picture above is of a house-move project in Hennepin County, MN that was made possible by grant money (“Salvaging and Reusing Building Materials to Combat Climate Change”).



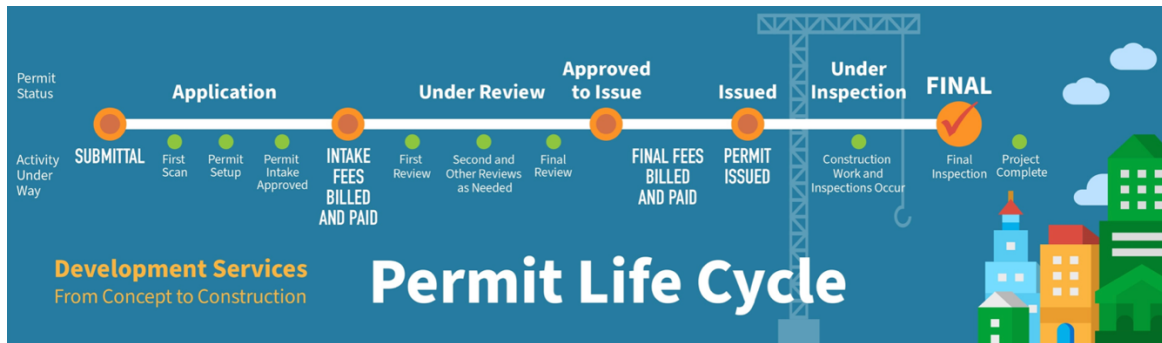
Deconstruction workforce training at a grant-funded site

This picture above depicts some of the deconstruction work that was done on a grant recipient house in Portland, OR (Wood).

Streamlined permit process

During the informational interview with City of Portland’s Shawn Wood, one of the main points he stressed was making the deconstruction process easier than demolition. One way this could be adopted in Lane County is through the establishment of a streamlined permit process. Currently, the City of Portland requires that deconstruction projects apply for a demolition permit and pay the same fixed demolition permit fee, which disincentivizes the deconstruction process unless they can obtain a grant (“Deconstruction Requirements | Portland.gov”). Instead, Lane County should work with cities to create a separate deconstruction permit process that utilizes non-monetary incentives like time and additional support to encourage deconstruction. For instance, outlining rules that create a significantly shorter wait period for deconstruction permits versus demolition permits would be beneficial for utilizing time as an incentive. Additionally, reducing or eliminating application costs for applying for deconstruction permits and providing additional support to homeowners through the creation of an

established network of deconstruction contractors as well as reuse and recycling facilities that materials can be taken to will help promote and incentivize the deconstruction process. Making the process simplified will encourage deconstruction that will lead to more reuse and recycling of C&D materials.



The infographic above represents the current permit life cycle for the City of Portland. Replicating similar steps as this model while also finding ways to differentiate a deconstruction permit from demolition will be beneficial for incentivization (“Permit Metric Dashboard | City of Portland”).

Lowered hauling fees

Hauling fees are a major barrier to the success of deconstruction projects in Lane County since locating and determining the requirements of reuse and recycling facilities can be difficult and sometimes requires individuals to travel farther than desired. For instance, the closest recycling facility for gypsum materials is in Portland OR, so it requires people to drive at least two hours one way. This leads to additional costs in gas and time, thus disincentivizing the choice to recycle. Wood recycling is easier to locate with BRING, Lane Forest Products, and Rexus as options for the community; however, each comes with its own requirements surrounding type of wood and cost for donation or disposal. When these additional barriers exist it makes the ease of dumping materials in the landfill become the preferred choice.

One way Lane County could combat this barrier to reuse and recycling is through efforts to lower the actual and hidden costs that are associated with hauling materials. For instance, to reduce the costs of time and gas that are associated with gypsum recycling, Lane County could establish a collective effort to recycle by setting up bins at the Glenwood Transfer Station and creating a contract with a trucking company to take those materials up to Portland. This service could be provided at a lower cost than the gas and time it takes for individuals to transfer materials themselves or could be subsidized by an increase in dumping fees at landfills. Increasing the fees at landfills will also simultaneously increase incentive for wood recycling by making the cost difference between dumping and recycling larger. The more expensive the cost of landfilling debris becomes, the more incentivized individuals will be to salvage materials for reuse and recycling.

Utilizing outside funding

A potential source of funding to cover program costs for reuse and recycling of C&D materials comes from federal grants. Federal agencies like the U.S. Department of Agriculture (USDA) Forestry Service offers many different grant programs to fund city or county initiatives that promote reuse and recycling. One example that is applicable to Lane County is the USDA grant program known as the Community Wood Energy and Wood Innovation Program. This grant supports the “installation of thermally led community wood energy systems” and “the expansion of innovative wood product facilities” (2023 Community Wood Energy and Wood Innovation Program | GRANTS.gov). Projects by local governments that will stimulate the local economy and will not require additional funding after the award period are eligible to apply for this grant. The maximum awards are \$1 million or up to 35% of the total capital costs. Additional information about this grant program is available in the Appendix D tables.

An additional USDA program is the Wood Utilization Assistance grant which supports local governments that would like to expand wood energy and product markets in their area. Projects that focus on “markets for wood restoration, showcase environmental and economic benefits, and overcome market barriers for wood energy” can apply for this federal funding (“Wood Utilization Assistance | GRANTS.GOV.”). Additional information on this grant program is available in the Appendix D tables.

Other available funding for Lane County can come from the Oregon Department of Environmental Quality (DEQ) within their Materials Management Grant Program. In 2020, the City of Portland received this grant which helped them support more deconstruction projects within the city. The goals of the DEQ grant program is to prevent and reduce waste within the state, which fits in nicely with Lane County’s C&D waste reduction goals. Currently, the grant program is on pause until Summer 2024, but when it reopens it would be applicable to apply for. Utilizing these or other federal grant programs will help boost the potential for Lane County’s reuse and recycling projects in the future.

Conclusion

Addressing the 31% of Lane County’s waste stream that is made of construction debris and in particular the presence of wood and gypsum waste in landfills is of critical importance. By allowing these materials to continue being landfilled, we are ignoring their threat to our environment, health, safety, and the potential value that comes from achieving a circular economy. Lane County will be able to overcome the persistent barriers to the reuse and recycling of these materials if action is taken to make the process cheaper, easier, and more accessible. Attaining this desired reality is possible if the outlined recommendations for market opportunities, policy implementations, and incentives are considered and utilized. The ideas described above are the strongest options that were identified after completing research and informational interviews with different stakeholders across all sectors. While potential

opportunities for reuse and recycling is not limited to just the programs stated above, the ones listed are great starting points for changing the C&D waste norm in Lane County.



Appendix

Appendix A: Terminology

C&D- Construction and Demolition

Circular economy- System where materials and products are continuously reused and repurposed.

CLT- Cross Laminated Timber

Deconstruction- The systematic and careful dismantling of a structure

Demolition- The partial or complete tearing down of a building or structure.

Feedstock- Raw material used to supply another product.

GLB- Glulam Beam

Gypsum- Construction building material made of calcium sulfate dihydrate. It is often found in drywall used for interior walls and ceilings.

LEED- Leadership in Energy and Environmental Design

Linear Economy- System where materials are manufactured, used, and discarded.

Reuse- Further or repeated use of materials or items, including sale or donation of items.

Salvage- The controlled removal of construction or demolition debris/material from a building, construction, or demolition site for the purpose of on- or off-site reuse, or storage for later reuse

Selective Deconstruction- Disassembly of part of a building or attached structure.

Stakeholder- A person or business with interest or concern in a something that involves them.

Strip-out- Harvesting a building's most valuable and easily removable components.

Virgin Material- Freshly made material that has not been used.

Appendix B: Case Study Research

Grant Case Studies

Location	Hennepin County, MN	Portland, OR
Amount of funding given to each grant recipient	Commercial grant: \$10,000 maximum (\$2 per square foot)	\$50,000 total budget \$2,500-3,000 per project

	<p>Residential grant: \$5,000 maximum (\$2 per square foot)</p> <p>Structural move grant: \$15,000 maximum (\$5 per square foot)</p>	<p>Received \$50,000 from Oregon DEQ (Department of Environmental Quality) after original establishment</p>
Requirements	<p>At least five materials in category A (cabinets, windows, solid wood door, etc.)</p> <p>At least 1,000 pounds of lumber were deconstructed for reuse.</p> <p>All non-reusable materials are sent to an approved recycling facility.</p> <p>Residential properties must be built prior to 1970.</p> <p>Record receipts of materials reused/recycled for tracking.</p>	<p>Applicant is anyone related to the project (homeowner, deconstruction contractor, etc.)</p> <p>Data about the project (asbestos, timeline)</p> <p>Site signage</p> <p>Record receipts of materials reused/recycled for tracking.</p>
Specific grant related projects	<p>Ad Godfrey House:</p> <ul style="list-style-type: none"> - Prioritized the use of salvaged materials. - Worked with programs that train clients in employable skills. - Wood materials for siding came from a reuse warehouse. <p>Victorian house relocation:</p> <ul style="list-style-type: none"> - Utilized structural moves grant. 	<p>NE 60th:</p> <ul style="list-style-type: none"> - 80% of materials recovered. - Deconstruction cost \$16,070 for 1,562 square feet. - Efficient use of tools and equipment <p>NE 28th:</p> <ul style="list-style-type: none"> - 50% of materials recovered. - Deconstruction costs \$8,500 for 1,100 square feet. - Separate bins for materials were essential for saving time.

		<ul style="list-style-type: none"> - Strong relationships with contractors were important. <p>N Van Houten:</p> <ul style="list-style-type: none"> - 70% of materials recovered. - Deconstruction costs \$7,825 for 660 square feet. - Need to slow down to minimize loss
Takeaways	<p>Year built requirement helps secure high quality materials, but also restricts the amount of deconstruction.</p> <p>Ongoing challenge to get the word out.</p> <p>Timing and cost have been a barrier.</p>	<p>Increased deconstruction by reducing the financial burden.</p> <p>Promoted awareness of deconstruction in area</p> <p>Helped inform eventual elements of the ordinance.</p> <p>Tied to availability of deconstruction contractors in the area</p>

Ordinance Case Studies

Location	Palo Alto, CA	Portland, OR	King County, WA	Pitkin County, CO
Population	66,680	641,162	2.2 million	17,348
Date established	2020	2016	2022	2020
Requirements	<p>No demolition for projects that are being completely removed.</p> <p>Must utilize GreenWaste for collection of materials or send to an</p>	<p>Buildings built in 1916 or earlier must be deconstructed.</p> <p>Must use a certified deconstruction contractor.</p>	<p>Diversion rates of C&D reach minimum of 80%.</p> <p>All C&D waste was delivered to a designated C&D receiving facility.</p>	<p>Sign a recoverable materials diversion acknowledgment form.</p> <p>Pay a refundable diversion compliance deposit.</p>

	<p>approved facility.</p> <p>Must conduct a survey of materials salvaged.</p>	<p>Site signage must be present.</p> <p>Must maintain receipts for all reuse and recycling of materials.</p> <p>Proper pre and post application forms completed.</p>	<p>Separate recycling bins on all job sites.</p>	<p>A minimum of 25% of total project waste is to be diverted away from trash.</p> <p>Tiered fee pricing will be used in the recycling process.</p>
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Reuse and Recycling Feasibility Research Reports

Title	Published in	Successes of reuse/recycling	Barriers to reuse/recycling
C&D Debris Recycling for Environmental Protection and Economic Development SE Region	2004	<p>Minimizes and eliminates pollution from linear economy.</p> <p>Creates green jobs.</p> <p>Supports economic development.</p> <p>Reduces landfill expansion.</p>	<p>Increased time, material costs, and labor.</p> <p>Lack of technical expertise.</p>
Overcoming the Barriers to Deconstruction and Materials Reuse in New Zealand	2005	<p>Increased employment opportunities</p> <p>It has support of central government; key for reaching their climate goals.</p> <p>Benefits are long term and collective</p>	<p>More labor intensive</p> <p>Need legislation to back up the practices.</p> <p>High cost of transport and storage of materials</p> <p>Need collaboration within the market</p>

			<p>from owners, contractors, builders, and government.</p> <p>Need a skilled workforce.</p> <p>Need minimum quotas for the materials that are reused and recycled.</p>
UO Community Planning Workshop C&D Market Analysis Report	2010	<p>Conserves landfill space</p> <p>Reduces environmental impact; reduced greenhouse gas emissions.</p> <p>Creates jobs.</p> <p>Reduces overall building costs.</p>	<p>Cheaper to take materials to landfill.</p> <p>Must separate materials and transport.</p> <p>Presence of hazardous materials.</p>
Oregon Material Recovery and Waste Generation Rate Report –Oregon DEQ (Department of Environmental Quality)	2018	Better use of emissions versus creating new products	Recovery activities still create environmental impacts from transportation
Google Accelerating the Circular Economy Through Commercial Deconstruction and Reuse Report	2019	<p>Double carbon benefits from deconstruction.</p> <p>Job creation</p> <p>New markets</p> <p>Many materials have opportunities for reuse and recycling.</p>	<p>Buildings are not designed for deconstruction.</p> <p>Possibility of hazardous materials</p> <p>Time and cost constraints</p>

		Preserves building character and styles.	Lack of deconstruction contractors Lack of reuse and recycling services
Treasure in the Walls	2021	Achieving a circular economy. Produces 300 jobs per 10,000 tons of waste versus 1-6 jobs in landfilling process. Reduces hazardous material particles released from demolition. Maximizes use of expensive, scarce materials.	Need materials to be sorted. Need resale/recycling businesses.

Reuse and Recycling Solutions Research

Title	Published in	Solutions
Seattle Options for Increasing C&D Debris Processing Capacity Report	2008	Monitoring of transfer and sorting of C&D materials Financial programs for reuse, recycling, and deconstruction Supporting the growth of the reuse and recycling market System that rewards the increase of materials salvaged with lower fees. Move from voluntary to mandatory.
C&D Management in the U.S.	2015	Biofuel- most widely used.

		Compost/mulch
Lane County Solid Waste Management Plan	2019	Resale of materials: BRING, Habitat for Humanity, St. Vincent De Paul
Google Accelerating the Circular Economy Through Commercial Deconstruction and Reuse Report	2019	<p>Regulations about use of healthy materials in projects</p> <p>Requiring salvage assessment for permits</p> <p>Requirements about the number of reused materials in new projects</p> <p>Incentives for reuse and recycling</p> <p>Support for workforce training</p> <p>Grants for deconstruction</p> <p>Reduced permit fees for deconstruction.</p>
Reclaimed lumber market size	2020	Reclaimed wood products: framing, casework, paneling, flooring, trim, cabinets, and interior design components
Treasure in the Walls	2021	<p>Reselling C&D materials on or near construction sites to eliminate transportation.</p> <p>Doors have great resale opportunity.</p>
Bags to Benches: Recycled Benches Placed Around County	2023	500 pounds of plastic bags used to create one outdoor bench; could be made from reclaimed wood
Sierra Pacific to Build New Mills in Western Oregon	2023	Two new mills in Lane County that will process Douglas fir logs
OR Boosting Housing Jobs with Mass Timber	2023	Creating prototype housing units using mass timber

Appendix C: Background Document Research

Report	Method (Policy, Regulation, or Incentive)	Key Takeaways
City of Eugene Building Demolition Handout	Requirements form	<ul style="list-style-type: none"> Includes how to apply for the permit, what to show on the site plan, what to include in the demolition plan, things to consider, and a reminder for no explosives. Includes a phone number if you have additional questions
City of Eugene Demolition Best Practices	Policy and recommendations	This is a “best practices” guide for demolition sites in Eugene, including: roles, responsibilities, and legal requirements for local projects. <ul style="list-style-type: none"> Safe and successful demolition requires careful planning. List of materials that pose risks and descriptions for them included in guide are asbestos and lead. For lead removal: The EPA's Lead Renovation, Repair and Painting Rule (RRP Rule) requires that firms performing renovation, repair, and painting projects that disturb lead-based paint in homes, childcare facilities and pre-schools built before 1978 have their firm certified by EPA (or an EPA authorized state), use certified renovators who are trained by EPA-approved training providers and follow lead-safe work practices. To prevent dust, apply water during debris removal. Written notice must be given to adjacent properties across the street at least 48 hours before work starts. There is a demolition permit requirement. Recycling demolition materials: “materials can be recycled by separating them onsite and taking them to recycling facilities or commingling them and hauling them to a materials recovery facility”
Portland Building Materials Reuse Association	Program	Title of Paper: City of Portland Mandatory Reuse and Recycling Program Summary: Since 1995 Portland has made multiple modifications to their recycling regulations for construction and demolition waste. Starting in 1995, Portland issued an ordinance that required building projects with a value of \$25,000 or more to recycle a minimum of 50% of the construction debris created on job sites.

At the time that this paper was published, Portland required a 75% recycling rate for CR&D materials. Additionally, Portland required recycling of at least 85% of all construction, remodeling, and demolition waste for new construction and major renovations of City-owned facilities. Portland’s CR&D waste goals were supported by Metro Portland’s Enhanced Dry Waste Recovery Program. Through this program CR&D waste was required to be processed at approved material recovery facilities before disposal. This document discusses the results of Portland’s most recent Mandatory Reuse and Recycling Program.

Key Findings:

2011: Portland created a website (recyclingnutsandbolts.com) and this website allowed city staff to have more time to observe jobsites, ensure that their requirements were being met, and answer contractors’ questions.

All building projects in Portland must meet the following requirements to maximize reuse and recycling of C&D debris. Failure to meet these requirements will result in responsible persons being subject to a \$500 fine for the first violation (City Code 17.102.090 Assessments and Infractions): (1) Provide a trash bin for food waste (lunch waste) to prevent contamination of recyclables. (2) Clearly label all recycling containers on the job site regarding acceptable materials. (3) Submit a Construction and Demolition Debris Management Form within one week of permit application for all building projects worth \$50,000 or more (including both demolition and construction phrases).

Cons of Program:

Limited Staff- “1 staff member (30 hours per week) to oversee CR&D communications and education, policy updates and support salvage and reuse on demolition projects.”

Shawn Wood Report

Grant program

- \$50,000 funds; \$47,000 for grant recipients and \$3,000 for administration costs

Goals accomplished:

Increase deconstruction as alternative to demolition:

- Grants helped fund deconstruction projects, making it possible for more people to pick this option.

		<ul style="list-style-type: none"> • 24 houses total within program. <p>Build capacity within industry:</p> <ul style="list-style-type: none"> • New contractors can now enter the field. • Two new companies formed in response to ordinance and grant program. • More training opportunities available in the field <p>Promote awareness of deconstruction:</p> <ul style="list-style-type: none"> • Signs informed neighbors of deconstruction project; instigated conversations between neighbors. • More positive response from increased awareness <p>Collect and share project data and case studies:</p> <ul style="list-style-type: none"> • Grant program enabled the collection of information about reuse/recycling practices. • Information like project costs, labor, hazmat encounters, etc. <p>Takeaways:</p> <ul style="list-style-type: none"> • Grant funds are instrumental in promoting deconstruction.
<p>2018 Oregon Material Recovery and Waste Generation Rate Report – Oregon DEQ</p>	<p>Oregon State data review</p>	<ul style="list-style-type: none"> • Material recovery: includes all materials collected for recycling or composting, and for a subset of materials, incineration with energy recovery. • Waste generation = the amount of waste recovered + the amount of waste disposed • Landfills, local recycling collectors, private recycling collection companies and depots, transfer stations, material recovery facilities, composters, local governments, and any other operation that handles post-consumer recoverable materials all are required to turn in a Materials Recovery Survey form. • Recovery activities also create impacts. For example, recycling trucks produce GHG emissions. • However, it can be assumed that these emissions impacts may be better for the environment than creating new products. For example, aerobic composting leads to CO2 emissions, but it may represent a savings compared to methane emissions from materials disposed of in landfills. • In 2018, Oregon recovered 40.8% of the total municipal post-consumer waste stream
<p>2015 C&D Management in the United States</p>	<p>Policy and Regulation</p>	<ul style="list-style-type: none"> • Asphalt and concrete are most easily recyclable. • Concrete takes up most of the percentage of tonnage regarding C&D waste within landfill due to the density of the material. (97% or 285 tons in 2015) • About 415 million tons were directed for next use and 132 million tons of C&D debris were sent to landfills • “Aggregate” was the main EOL next use for C&D materials.

		<ul style="list-style-type: none"> • There are seven building materials that the EPA included in the C&D Debris Generation 2015 report; steel, wood products, drywall and plaster, brick and clay tile, asphalt shingles, concrete, asphalt concrete. • Plastic, glass, cardboard, carpet, and organics are excluded from this memo. • Potential markets for wood in this report include; biofuel, manufactured products, and compost/mulch. • (Put in graphs after this section)
<p>2019 Lane County Solid Waste Management Plan</p>	<p>County Plan</p>	<p>Description: Lane County Government is the state-designated Solid Waste Authority for the Lane County Watershed. Lane County created this Solid Waste Management Plan (SWMP), "...to align with state recovery goals and priorities and to coordinate solid waste management efforts between the County, municipalities, industry stakeholders, and other community partners." (...). As of 2019, Lane County was recorded to have sent over 275,000 tons of waste to the landfill annually. According to the Oregon DEQ waste composition study analysis, two-thirds of this waste could be composted, recycled, or recovered for energy. The Lane County Government acknowledged that they could therefore do more to reduce the amount of waste that was being sent to the landfill. The SWMP was designed to provide direction for the management and improvement of solid waste management systems in Lane County.</p> <p>Terms:</p> <p>Watershed- "A 'watershed' is defined in Oregon law as being an area of the state that shares a common solid waste disposal system, or an appropriate area in which to develop a common recycling system. In all but two cases, individual Oregon counties are designated as watersheds. Lane County is a single-county watershed."</p> <p>Municipalities: A city or town that has corporate status and local government.</p> <p>The governing body of a municipality.</p> <p>Stakeholder: A person with an interest or concern in something, especially a business.</p>

Oregon State Department of Environmental Quality (DEQ): A state of Oregon agency with the mission to be a leader in restoring, maintaining, and enhancing the quality of Oregon's air, land, and water.

WMD: Lane County Public Works Department Waste Management Division.

Key Takeaways:

In 2015, Lane County chose 63% as their 2025 materials recovery goal after the Oregon State Legislature passed new legislation to update the Opportunity to Recycle Act (Oregon Revised Statute 459A).

Since 2017, Lane County had the highest waste recovery rate in Oregon at 52.8%.

WMD owns and operates one sanitary landfill that handles most of the waste disposed in Lane County, the Short Mountain Landfill. The Short Mountain Landfill is comprised of approximately 67% of waste from commercial haulers, 22% from Lane County transfer stations, and 11% from private vehicles and account holders (large businesses and construction contractors). The Short Mountain Landfill is estimated to have over 100 years of disposal capacity.

Delta Sand & Gravel C&D Landfill: Delta Sand and Gravel Company controls a privately-owned construction and demolition reclamation landfill that accepts a variety of materials including building demolition and roofing as backfill for their gravel mine.

Lane County can recycle roughly 250,000 tons of materials each year due to the help of local private and nonprofit providers that collect goods from residents and businesses through drop sites or pick-up services. BRING Recycling and Habitat for Humanity specialize in the resale of building supplies. Habitat for Humanity operates locations in Florence, Cottage Grove, and Eugene.

St. Vincent De Paul operates several waste-based businesses that recycle, resell, or repair several different materials including wood products.

		<p>In Lane County, there are two material recovery facilities and one privately operated C&D landfill for processing and recovery of C&D waste.</p>
<p>Oregon State Law ORS 340-090-0030 (3)</p>	<p>Oregon state law</p>	<ul style="list-style-type: none"> • Each disposal site must have separate bins for each material. • Each city with 4,000 or more citizens must have on route collection services at least once a month. • Have proper signage for disposal and recycling practices. • The city or county responsible for disposal must carry out public education that. <ul style="list-style-type: none"> - Explains purpose of recycling - Recycling opportunities - Materials and preparation for recycling - Subsection of contact information for recycling haulers - Opportunities for citizen input on materials recycling
<p>Lane Code 9.060 (2)(b) UGB (Urban Growth Boundary) Area Recycling Regulations</p>	<p>Policy</p>	<p>Lane Code 9.060 (2) (b) states: Deliver all loads of construction and demolition debris containing recyclables and 10 cubic yards or greater in size to a material handling facility for sorting,</p>
<p>2004 C&D Debris Recycling for Environmental Protection and Economic Development SE Region</p>	<p>Incentive</p>	<p>Description: The Construction & Demolition Debris Recycling for Environmental Protection and Economic Development document has the purpose of serving as a template and information resource for local governments and community groups interested in developing a thorough construction and demolition recycling program.</p> <p>The First Cost Perspective: “The way goods are valued is primarily by the initial investment. This perspective does not consider lifecycle costs, environmental impacts, and social and human capital investments.”</p> <p>When evaluating whether it is more cost effective to dispose of C&D debris in the landfill or recycle, it is important to consider the costs of sending it to the landfill. Typically, this decision is based on the cost of tipping fees for recycling the C&D waste, but when lifestyle, environmental, social, and human capital investment are not considered, the tipping fee is not an accurate reflection of the true cost of disposing of C&D waste.</p> <p>Social Costs</p>

- Missed opportunities for job training and employment. (Green collar jobs: separation of materials, disassembly of buildings, and remanufacturing of recycled materials).
- Community involvement in reshaping local built environments and neighborhood stability.

“...using new materials and discarding scrap from them means developers pay for materials twice-first for the purchase and then again for disposal. Case studies indicate that 80 percent of building materials could be reused or recycled. Communities requiring C&D waste management plans that utilize recycling can help to reduce development costs of new and rehabilitated projects. These savings can, in turn, stimulate additional development and improve the bottom line for construction firms.”

Project disposal costs can range from 5-30% of a project.

Community-level Benefits of Recycling and Reuse of C&D Debris

- Supports economic development and the improvement of communities.
- Recycling and reuse industries create jobs and revenue.
- Provide small business development opportunities and job training outlets.
- Reduce Landfill expansion needs.

Cons that dissuade industries from choosing to recycle their C&D waste materials:

- Increased labor, material costs, and time.
- Lack of technical expertise; knowledge of recycling practices; and awareness of and access to market opportunities for C&D waste materials.
- Complications in organizing a system for recycling C&D material waste: securing a trained workforce, coordinating construction schedules, meeting space requirements for sporting goods, and having timely availability of goods.

Cons of disposing of C&D debris in the landfill instead of recycling it:

Environmental Cons:

- Loss of habitat when unused land is converted into new landfills or expanded to accommodate existing landfills.
- Removal of raw materials for new construction products.
- Leaching from landfilled items into soil and groundwater.
- Poor air quality.

Social Cons:

Missed opportunities for job training and employment (green collar jobs: separation of materials, disassembly of buildings, and remanufacturing of recycled materials).

Minnesota Economy Growth

Policy &
Regulation

Overview:

- An analysis of Minnesota’s reuse and recycling practices
- The reuse economy in Minnesota is worth over \$5 billion, creates 45,000 jobs, and takes the equivalent of 100,000 gas-powered vehicles off the road.
- The reuse economy should be considered more as a circular economy. It shows the environmental, social, and economical benefits of the transition to a reuse economy. Practicing reuse limits the production of new products and allows for more sustainable practices. Take-make-waste is a very inefficient model, and further promotes harsh climate practices.

Department of Agriculture – Forest Service - 2023 Community Wood Energy and Wood Innovation Program (CWEWIP)

Federal grant
program

Overview:

- USDA Forest Service delivering CWEWIP.
- Supports the installation of thermally led community wood energy systems of development and expansion of innovative wood product facilities.

Eligibility:

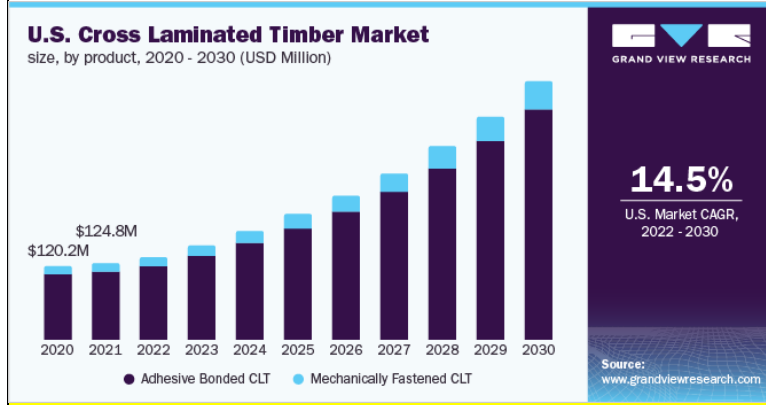
- Non-profits, local, state, and tribal governments, businesses, companies, corporations, institutions of higher education, and special purpose districts
- Projects that will:
 - Expand thermally led community wood energy or innovative wood product opportunities

		<ul style="list-style-type: none"> - Improve forest health - Stimulate local economies • Intended for read projects that will not require additional funding or time to complete after award period. <p>EX: for purchasing/installing equipment for new facility</p> <p>Amount:</p> <ul style="list-style-type: none"> • Forest Service plans to award \$17 million total. <ul style="list-style-type: none"> - Maximum awards of \$1 million to pay up to 35% of total capital costs • Applicants must contribute remaining funds to complete project beyond the grant (leveraged funds) <ul style="list-style-type: none"> - Must come from non-federal sources and be committed within grant timeframe <p>Contact: Julie Tucker- National Lead for Renewable Wood Energy (202) 253-6483</p>
<p>Department of Agriculture – Forest Service - Wood Utilization Assistance</p>	<p>Federal grant program</p>	<p>Overview:</p> <ul style="list-style-type: none"> • USDA Forest Service • Proposals to expand wood energy and wood product market to support forest management. <p>Eligibility:</p> <ul style="list-style-type: none"> • For-profits, state and local governments, Indian Tribes, school districts, community, not-for-profit organizations, institutions of higher education, and special purpose districts • Focuses on: <ul style="list-style-type: none"> - Reducing hazardous fuels and improve forest health - Reduce costs of forest management - Promote economic and environmental health of communities • Projects including: <ul style="list-style-type: none"> - Cost analyzes in later stages of commercial construction projects and later stages of wood energy project development - Develop manufacturing capacity and markets for wood restoration - Showcasing environmental and economic benefits of wood as sustainable building material

		<ul style="list-style-type: none"> - Establishing statewide wood utilization teams - Develop cluster of wood energy projects in geographic areas - Overcoming market barriers and stimulating expansion of wood energy in commercial sector <p>Amount:</p> <ul style="list-style-type: none"> • Total program funding of \$24 million • Award ceiling of \$300,000; floor of \$10,000 <p>Contact: Kevin Naranjo- Wood Innovations Lead (404) 673-3482</p>
OR Timber Harvest Levels	Market research	<ul style="list-style-type: none"> • Timber harvest remained consistent until the decline with the housing recession in 2008-2009 • Harvest is expected to decline by 100-250 million board feet annually from 2026-2065 due to 2020 wildfires
Reclaimed lumber market size	Market research	<ul style="list-style-type: none"> • The global reclaimed lumber market size was valued at USD 49.27 billion in 2020 and is expected to grow at a compound annual growth rate (CAGR) of 4.6% from 2021 to 2028. • “China is projected to have significant product demand owing to increasing awareness for reducing Greenhouse Gas (GHG) emissions and the presence of vast wood-based construction industry in the country. China has seen increased growth in wooden construction in recent years, as it offers excellent seismic performance and energy conservation and conserves the Chinese tradition.” • The use of these products in construction results in a reduction in the percentage of materials being sent to landfills, facilitating a significant reduction in environmental pollution. The rising cost of landfill spaces and state mandates to reduce the waste have encouraged the wood waste recovery strategies, leading to growth in recovered wood from deconstruction activities. • Reclaimed wood products offer an ideal choice for many residential applications, such as framing, casework, paneling, flooring, trim, cabinets, and interior design components.
Cross Laminated Timber	Market research	<ul style="list-style-type: none"> • The global cross laminated timber market size was estimated at USD 944.9 million in 2021 and is expected to register a CAGR of 13.8% from 2022 to 2030. This growth is

attributed to the growing demand for lightweight, durable, and sustainable construction materials in residential, institutional, and commercial applications.

- Cross laminated timber is widely used in various applications in residential, commercial, institutional, and other segments owing to its intrinsic properties such as high thermal performance, sound insulation, earthquake resistance, fire resistance, lightweight, durability, and low manufacturing costs.
- Adhesive bonded cross laminated timber is produced by stacking and gluing three or more layers of wood in a perpendicular cross-section. The layered wooden planks are then pressed in large vacuum or hydraulic systems to form a high strength interlocked assembly.
- In addition, the adhesive bonded CLT (Cross Laminated Timber) panels can be converted to biofuel pellets at the end of their life cycle.



What Google thinks about deconstruction

Barriers to deconstruction

Deconstruction- buildings are systematically dismantled from the outside in.

- Building components are kept intact to create a circular system.
- Increases recyclability of materials
- Buildings should be thought of as resources vs disposal.
- Construction and demolition activities account for two-thirds of all waste generated annually in the U.S.
- Expand green job opportunities — within both the construction industry and salvaged and refurbished materials market.

Google's Efforts:

- Salvaged materials from small-scale interior refreshes since 2012; diverted over 1,000 tons of materials from landfills in the Bay Area

- In 2019, we partnered with the Ellen MacArthur Foundation, Building Product Ecosystems, and Ackerstein Sustainability to publish a whitepaper on commercial deconstruction and reuse
- At the Caribbean office development in Sunnyvale, California, we salvaged 35 tons of material to donate to California charities and nonprofits.
- Charleston East development project in Mountain View, California we are incorporating over 30 types of salvaged materials.

Barriers:

- Buildings were built between 1960-2000, an era that relied on adhesives and composite materials.
- Structures challenging to dismantle.
- Hazardous materials that should not be reintroduced into new construction.
- Regulatory hurdles
- A limited deconstruction workforce
- An under-developed reuse marketplace

Cost of deconstruction and demolition in MA

Economic analysis of C&D

Introduction:

- “The comparative cost analysis is developed by systematically analyzing two separate residential deconstruction projects.”
- approximately 136 million tons of building-related C&D debris was generated in the United States in 1996

Benefits of deconstruction:

- The economic benefits come from the salvage materials sold/reused.
- disposal fees avoided.
- reduced waste generation.

Cost analysis:

- labor cost (either productivity or hourly rate)
- disposal cost (tipping fee and transportation)
- resale value of deconstructed materials
- in Massachusetts, deconstruction costs could be 17–25% higher than demolition costs.

		<ul style="list-style-type: none"> Massachusetts's net deconstruction costs may vary between \$10.21/SF and \$15.53/SF, while demolition costs are estimated at between \$8.15/SF and \$13.25/SF. <p>Duration and labor:</p> <ul style="list-style-type: none"> Deconstruction time includes the time to remove all materials and clean the site.
Cornell C&D study	Deconstruction vs demolition	<ul style="list-style-type: none"> Demolition is the faster, cheaper route. Deconstruction can be cheaper than demolition when accounting for: <ul style="list-style-type: none"> Landfill diversion Reduced carbon dioxide emissions Fewer natural resources extracted Making deconstruction cheaper is a matter of scale and repetition.
CMRR Program analysis w/ BRING.	Program	<p>Description: The Construction Materials Recovery and Reuse (CMRR) pilot program launched in 2018 as a partnership between BRING, the City of Eugene, and Lane County to fulfill state law ORS340-090-0030(3). Law ORS340-090-0030(3) requires construction firms who produce a minimum of six cubic yards of “self-hauled” or ten cubic yards of “arranged collection service” of C&D material to separate the source of these materials. The goal of this program was to assist developers, project managers, contractors, architects, and residential homeowners with building projects. This program aimed to provide education to reduce waste during pre-construction, building construction, renovation, and demolition phases; resources for material reuse; and outlets for material recovery facilities for recycling. The time for this final report is from January 2021-August 2022. This report's purpose is to analyze the CMRR pilot program, and the different methods used to reduce the amount of reusable construction materials sent to the landfill.</p> <ul style="list-style-type: none"> Between January 2021-August 2022 BRING donated over \$4,200 worth of used materials that were collected through the CMRR program to local nonprofits including Community Supported Shelters and Carry It Forward. CMRR Staff conducted outreach with 65 different entities involved in the construction and building sector through email, telephone, project-site walk-ons, and presentations. They found that the most effective outreach method was building relationships with contractors, which resulted in additional jobs for the CMRR staff to work with repeat clientele.

		<ul style="list-style-type: none"> • One of the CMRR Program goals was to work with at least 10 active construction projects per fiscal year, or 30 projects. Between January 2021 and August 2022, the CMRR Program worked with 26 projects. • August 21, 2022, marked the conclusion of the CMRR Pilot Program at BRING. • This program found that new construction projects offered less opportunity for reuse materials than projects that were slated towards demolition and remodeling. • Deconstruction is significantly more expensive to implement than demolition because of time and labor cost.
<p>2008 Seattle Options for Increasing C&D Debris Processing Capacity Report</p>	<p>All</p>	<ul style="list-style-type: none"> • City or third-party processing certifications (solid waste transfer/sorting) with heightened monitor of recovery effectiveness. • Financial programs (tax credits and reductions on equipment) to enhance facility effectiveness at removing recyclable material from disposed waste stream. • Placing heavy emphasis on financial development assistance and incentives to encourage specialty sorting. • Intermodal containers deliver C&D waste instead of being separated out into differing bins. Potentially adding a transfer tax to these bins could promote recycling. • Create a market with King County and other local governments to develop markets for recycled C&D waste. • Contractors understand that the more C&D materials that they recycle, the less they must pay for trucking and disposal. • Materials typically salvaged include; old growth timbers, bricks, architectural features; windows, doors, flooring, plumbing fixtures, lighting fixtures, appliances and heating, ventilation, and HVAC (Heating, Ventilating, & Air Conditioning) components (44) • Concrete, asphalt, and metal are the most easily recycled materials. <p>Conclusions</p> <ul style="list-style-type: none"> • Voluntary salvage, reuse, and recycling permit with waste diversion plan • C&D recycling deposit program for all building and demolition projects • Mandatory recycling requirements for contractors • An on certain materials from landfill disposal

Palo Alto Case Study of Commercial Deconstruction	Deconstruction case study	<p>Background:</p> <ul style="list-style-type: none"> • 2,580 sq ft commercial building; 1950s • Crew of four people over 14 days • Project cost \$92,468; \$35.84/ sq ft • April 2019 <p>Steps:</p> <ul style="list-style-type: none"> • Salvage material identification <p>Reuse organization representative identified materials for reuse.</p> <ul style="list-style-type: none"> • Hazardous materials inspection <p>Asbestos and lead</p> <ul style="list-style-type: none"> • Request for quotation (RFQ) <p>Requirements for deconstruction, reuse, sorting, etc.</p> <ul style="list-style-type: none"> • Pre-construction meeting (RFQ) <p>Planned steps and final location for material reuse/recycling.</p> <ul style="list-style-type: none"> • Materials deconstructed. <p>Organized into bins by categories.</p> <ul style="list-style-type: none"> • Transport materials to approved facilities. <p>Outcomes:</p> <p>Materials recycled, salvaged, or landfilled; 184.6 tons.</p> <ul style="list-style-type: none"> • Recycled- 171.62 tons (93%) • Salvaged- 7.28 tons (4%) • Landfilled- 5.16 tons (3%) <p>Lessons learned:</p> <ul style="list-style-type: none"> • Experience matters. • Prepare for additional salvageable materials. • Plan for logistics and materials management • Organize jobsite
Collegetown deconstruction case study	Deconstruction case study/article	<p>Project:</p> <ul style="list-style-type: none"> • five days • crew of up to eight workers • 4,500-square foot • buildings over their life cycle are responsible for about 40% of greenhouse gas emissions. • “Design for disassembly”

		<ul style="list-style-type: none"> • “develop “green” job skills – including for union apprentices – and created more jobs benefiting the community than the adjacent demolition site.” • 18,000 pounds of structural members saved from the one home translate to 29,000 pounds of embodied (and sequestered) carbon dioxide kept out of a landfill
National organization that connects deconstruction resources	Potential contact for deconstruct program	<ul style="list-style-type: none"> • Build Reuse is a registered 501(c)3 nonprofit established in 1994. • encouraging the recovery, reuse, and recycling of building materials in the United States • Construction and demolition waste is the largest single-stream source of refuse in the United States - more than double the amount thrown into household trash bins. <p>Reuse businesses in Eugene/Springfield:</p> <ul style="list-style-type: none"> • The Timber Recycler <p>541 687 0817 Email: ttrzirg@aol.com 188 HWY99 N Eugene, Oregon 97405 Springfield-Eugene Restore HFH Accepts: Board lumber, composite decking, consumer goods, dimensional lumber, engineered flooring/lumber, glulam, hardwood, medium density fiberboard, millwork, plywood, sheet goods, board lumber, siding, wood doors/windows, salvage, fiberboard, softwood, barnwood. Email: info@habitatlane.org 5832 Avalon St, Eugene, OR 97402</p> <ul style="list-style-type: none"> • Holds conference to discuss C&D strategies and actions. • Register in fall.
San Antonio, TX Reuse	Ideas for reuse and recycling	<p>Circular economy- reduces material use, redesigns materials to be less resource intensive, and recaptures “waste” as a resource to manufacture new materials and products.</p> <ul style="list-style-type: none"> • Materials from end move to beginning. <p>Linear economy- that mines raw materials to process into products that are thrown away after a single use.</p> <ul style="list-style-type: none"> • Only 9% of materials worldwide are recovered for reuse.

		<p>Reuse workforce:</p> <ul style="list-style-type: none"> • Need deconstruction contractors. • People clean the materials for reuse sale. • Operating the stores of reuse businesses • Deconstruction creates 6 jobs for every one structure. <p>Salvage fair:</p> <ul style="list-style-type: none"> • Encourage reuse/recycling of materials. • Community event • Established a community Facebook group for sharing reused materials.
House move project in Hennepin County, MN	Examples of grant projects	<ul style="list-style-type: none"> • A 1900 house in Minneapolis was stopped from being demolished. • Funded its relocation through a structural moves grant. • About 85% of the materials in a typical demolition project could be salvaged for reuse and kept out of the landfills • Work with Better Futures Minnesota; nonprofit dedicated to reintegrating high-risk adults back into society. • divert about 700 tons of building materials a year from area landfills and provide revenue to help support the nonprofit's outreach and supportive services.
Seneca biofuel in Lane County	Link about recommendations	<ul style="list-style-type: none"> • 2017 Department of Environmental Quality Facility Emissions Report for Lane County, Seneca Biomass electric power generation emitted 198,398 metric tons of carbon dioxide. • one of Lane County's largest greenhouse gas emitters • EWEB pays Seneca three times the megawatt rate it pays its regular supplier. • The EWEB contract with Seneca sunsets in 2026, which should end an inefficient and polluting source of energy
Seneca biofuel	Link about recommendations	<ul style="list-style-type: none"> • A California forest products company has bought Eugene-based Seneca Sawmill Co. • Sierra Pacific Industries is based in Anderson, California. It owns and manages timberland in California, Oregon and Washington and is one of the largest U.S. lumber manufacturers. • Seneca was founded in Eugene in 1953. Seneca owned 131,000 acres of land in Douglas County.

Seneca biofuel power plant	Link about recommendations	<ul style="list-style-type: none"> • 18.8MW biopower project • The project supplies enough clean energy to power 13,000 households. • The project cost is \$45m. • Wood waste, which is a kind of wood by-product, is used as a feedstock to power the project. <ul style="list-style-type: none"> • Commissioned in 2011 <ul style="list-style-type: none"> • The power generated from the project is sold to Eugene Water & Electric Board
Square-one villages	Link about recommendations	<ul style="list-style-type: none"> • Opportunity Village Eugene (OVE) is a transitional micro-housing community located in Eugene, Oregon. • project on city-owned land in August of 2013, • served more than 100 otherwise unhoused individuals and couples. • The 30 micro-homes range from 60-80 square feet in size. • common cooking, gathering, restroom, and laundry facilities. • The village is self-managed by its residents with oversight and support provided by our non-profit, Square One Villages. <p>Commonly needed items include:</p> <ul style="list-style-type: none"> • lumber and plywood • pellets for wood stove • refrigerator / freezer
Wood Chips	Link about recommendations	<ul style="list-style-type: none"> • Charge \$32/yd. • Made from Douglas fir. • For playgrounds, garden, etc.
Wood Chips	Link about recommendations	<p>Local gardening resources:</p> <p>FOOD for Lane County:</p> <ul style="list-style-type: none"> • “The GrassRoots Garden and the Youth Farm grow fresh nutritious food for distribution through the FFLC network while providing opportunities for youth and adults to grow, learn and contribute to their community.”

- foodforlanecounty.org/go-learn-more/other-programs/gardens.

River Road Community Organization
 - Working to protect, maintain and enhance the ecological, historical, social, and cultural elements of the River and Garden District

- riverroadna.org.

Eugene Community Gardens

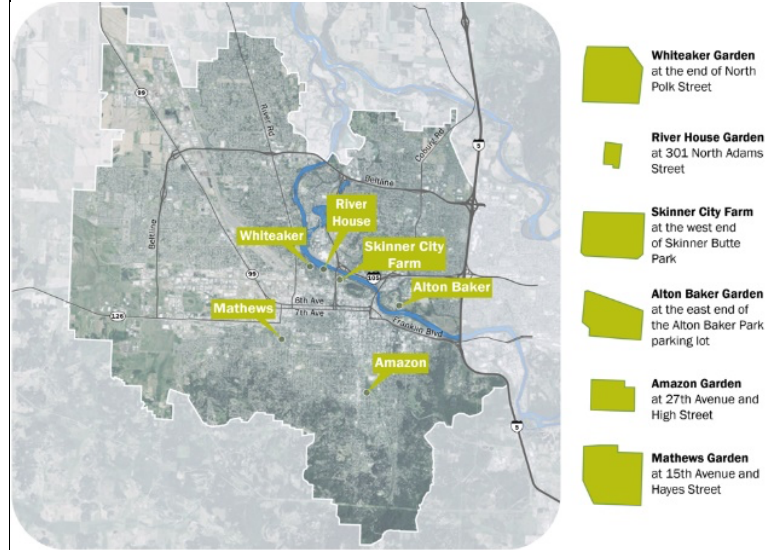
Recommendations resources

- Six community gardens throughout the City of Eugene
- Eugene has over 340 plots.

There are three plot sizes:

1. Approx. 300 square-feet for \$60 per year
2. Approx. 600 square-feet for \$100 per year
3. Raised bed at Alton Baker for \$25 per year.

- The cost includes access to garden tools and water.
- Each garden has a site coordinator who can help answer questions, share expertise and assist with problems or concerns that arise.



EPA C&D Facts

Background resources

- 600 million tons of C&D debris were generated in the United States in 2018, which is more than twice the amount of generated municipal solid waste.
- Demolition represents more than 90 percent of total C&D debris generation, while construction represents less than 10 percent.

		<ul style="list-style-type: none"> • just over 455 million tons of C&D debris were directed to next use and just under 145 million tons were sent to landfills.
New England Forestry wood information	Background resources	<ul style="list-style-type: none"> • Anaerobic decomposition of solid wood and some wood products is known to progress more slowly than decomposition of most other organic materials because of the high lignin content in wood. • Carbon from all the lignin and some cellulose and hemicellulose from wood products remains in permanent storage in landfills. • The best approach is to keep wood products in service through the cascading uses as long-lived wood products that can be recycled for maximum life spans, and then either dispose of the products in a well-managed landfill or use it for biofuel when it can be burned efficiently and cleanly.
Science direct lifecycle of gypsum	Background resources	<ul style="list-style-type: none"> • Gypsum is a versatile construction material that can effectively close the material loop, being fully and eternally recyclable. • A circular economy system keeps the added value in products for as long as possible and reduces waste.
NCBI facts about gypsum	Background documents	<ul style="list-style-type: none"> • Gypsum waste becomes a very serious environmental issue as the common disposal methods applied involve landfilling and burning in the incinerator. • normal landfill as it was mixed with other biodegradable waste which led to hydrogen sulfide gas emission. • hydrogen sulfide is toxic, colorless, and flammable and has distinct foul odor of rotten eggs that could cause breathing difficulties, discoloration of the skin and eye irritation

<p>The ReUse People</p>	<p>Demolition versus deconstruction costs</p>	<table border="1"> <thead> <tr> <th></th> <th style="text-align: center;">Deconstruction</th> <th style="text-align: center;">Demolition</th> </tr> </thead> <tbody> <tr> <td>Physical lowering of house</td> <td style="text-align: right;">\$37,700</td> <td style="text-align: right;">\$15,700</td> </tr> <tr> <td>Disposal of trash & debris</td> <td style="text-align: right;">4,100</td> <td style="text-align: right;">4,100</td> </tr> <tr> <td>Appraisal of salvaged materials</td> <td style="text-align: right;">2,500</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Total Costs</td> <td style="text-align: right;">44,300</td> <td style="text-align: right;">19,800</td> </tr> <tr> <td>Donation Value*</td> <td style="text-align: right;">92,400</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Tax Savings** (After-tax value of donated materials)</td> <td style="text-align: right;">32,340</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Total Costs (from above)</td> <td style="text-align: right;">44,300</td> <td style="text-align: right;">19,800</td> </tr> <tr> <td>After-tax net costs</td> <td style="text-align: right;">\$11,960</td> <td style="text-align: right;">\$19,900</td> </tr> <tr> <td>Net cash savings of \$7,940. (a savings of 39.6%)</td> <td></td> <td></td> </tr> </tbody> </table>		Deconstruction	Demolition	Physical lowering of house	\$37,700	\$15,700	Disposal of trash & debris	4,100	4,100	Appraisal of salvaged materials	2,500	0	Total Costs	44,300	19,800	Donation Value*	92,400	0	Tax Savings** (After-tax value of donated materials)	32,340	0	Total Costs (from above)	44,300	19,800	After-tax net costs	\$11,960	\$19,900	Net cash savings of \$7,940. (a savings of 39.6%)		
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<p>Oregon Biogas Facility Permitting Guide</p>	<p>Background resource</p>	<ul style="list-style-type: none"> • Biogas makes up a small portion of the Oregon energy sector, but it is growing • According to a survey from the Oregon Department of Energy, there are more than 75 existing bioenergy plants in Oregon, including three biogas facilities and 29 more in the planning or construction stages (2010) • “Anaerobic digestion is a biochemical process in which bacteria break down organic waste in an oxygen free environment” (pp. 3) <p>Challenges to permitting include:</p> <ul style="list-style-type: none"> • Permitting can be confusing process for facility developers 																														

- | | | |
|--|--|---|
| | | <ul style="list-style-type: none">• The length of time it takes to acquire a permit hinders the phases of development. A recommendation is to apply for Land Use Compatibility Statement with local city government before applying for DEQ permits• Biogas facility development is not defined within existing regulations such as land use codes |
|--|--|---|

Appendix D: Informational Interviews

Wood Recyclers

Lane Forest Products and Rexus

- Currently, both wood manufacturers have a partnership with Lane County.
- Both manufacturers take in wood materials such as pallets, decking, and construction waste.
- They do not accept treated wood (Stained Wood, Kresol Logs, etc.) since it can be hazardous to recycle.
- Both manufacturers have additional capacities at their facilities. Nails and screws in the wood are not a major concern to the recyclers.
- Nails and screws do limit the possibility of wood being recycled into mulch and compost.
- The primary export of recycled wood is used for biofuel.
- Neither pursue wood to recycle, but rather their intake relies on donations.
- Both recyclers would need additional markets before they would pursue C&D wood to recycle.

City Officials

City of Portland Construction Waste Specialist

- Public support is critical for deconstruction practices to be implemented.
- The homeowner's interest in deconstruction helped gain city council support to start the deconstruction grant program.
- Advertising and public information are important. Site signage helped inform community members, community forums got different people involved, the more information they shared with contractors and homeowners led to more grant applicants.
- Supporting the deconstruction market through faster permit processes, subsidies, grants, and training helped expand the presence in Portland, which in turn made it easier for deconstruction versus demolition.
- Connect with other resources like federal grants and existing businesses to help support the program's growth.

Waste Prevention Manager- City of Eugene

- Recycling wood in the Eugene area is a challenge for multiple reasons. One reason is the age of the housing stock, since homes built after the 1950s were not built to be deconstructed (Construction techniques were different from older buildings, which have better quality wood and construction styles).
- Another barrier to deconstructing buildings for material reuse in Eugene is there is no city ordinance requiring buildings to be deconstructed. Demolishing buildings is much cheaper and less time consuming.
- One idea for what to do with deconstruction materials is tiny homes for the unhoused, or even a partnership with Habitat for Humanity. However, there would likely need to be a deconstruction requirement for this to happen.
- The limitations for non-profits like BRING and construction materials intake is capacity, staffing, transportation ability, training, and lot space are all capacity to large scale deconstruction projects.
- There is low resale value for deconstructed wood. When there is low resale value for an item, there will not be much of a market for it, especially when the deconstruction process is more time consuming and costs more than demolition.

Hennepin County, Minnesota C&D Waste Specialist

- Target advertising towards the community you are trying to reach is crucial. This can be achieved through a wide range of resources like community forums, social media, etc.
- Focus the program's requirements to cover the different types of materials that can be reused, the amount, and other acceptable recycling options if reuse is not possible.
- Compile resources into one accessible area and build partnerships with the local businesses and nonprofits to make it easier for the grantee.
- County contracts with the main nonprofits have helped subsidize costs to make deconstruction cheaper and have led to most of the projects utilizing those groups specifically.
- Building relationships with all stakeholders is important. A great way to reach out to the demolition contractors has been through their pre-inspection requirements.
- Success is determined by how much you can build market demand to support the supply side of deconstruction. So far, sharing information with the public about deconstruction and the grant program has helped build demand.

Non-Profit

BRING

- BRING expects to have additional capacity for deconstructed wood material because of the high demand for their wood.
- An issue with reusing deconstructed wood materials is collecting enough high-quality desired woods. (Hardwoods)
- There are limited amounts of hardwood, therefore, most projects that use C&D wood materials are smaller projects such as garden projects, concrete framing, and patios.
- There is a stigma associated with using reused materials for buildings. Some contractors are unwilling to use reused materials in their building projects because they are responsible for the quality of their work and do not want to build projects with what they consider to be unreliable materials.
- Currently, there is a lack of people that are trained in deconstructing buildings because deconstruction is more time consuming and expensive than demolition.
- BRING has donated deconstructed wood material to local nonprofits such as Square One Villages in the past.
- Local nonprofits such as Square One Villages and The ToolBox Project may be able to take in additional deconstructed wood materials in the future.

LLC

Urban Gypsum

- There is no limit to the amount of gypsum material waste Urban Gypsum could process.
- Urban Gypsum sells 100% of the soil amendment products that they manufacture.
- Urban Gypsum is in Portland but receives materials from all over the West Coast including Idaho, Washington, and the Oregon Coast. They also receive material from outside of the United States in Canada.

Appendix E: BRING Facility Tour

On February 17th, the team met Matt Mueller-Curson at the BRING recycling center in Springfield, Oregon. BRING is a local 501(c)(3) nonprofit organization that focuses on repurposing and recycling several materials such as: wood, plumbing fixtures, tools, furniture, office furniture, garden supplies, paint, windows, and doors. BRING states their mission as: “Since 1971, BRING has worked to change attitudes and behaviors regarding waste. Today, we focus on the urgent issues of consumption, climate change, and community resiliency. Through our reuse store and community education programs, we fulfill our mission to provide vision, leadership, and tools for living well on the planet that we share.”

In the past, BRING has partnered with Lane County to promote proper reuse of C&D waste through product diversion and recycling. Matt was able to provide our team with insight into the recycling programs that BRING has offered to local businesses, contractors, and demolition contractors. They offer educational courses and certification programs to help educate local businesses and schools towards green practice and green thinking. The two certification programs are called ReThink and EcoBiz which are both free programs offered to Lane County businesses. BRING will work with these clients to educate and coordinate with them to achieve sustainable practices, and receive recommendations, tools, and support to becoming more environmentally consciousness. Businesses that complete one of the two programs receive certification through the following categories: energy, pollution prevention, solid waste, transportation, wastewater, water, JEDI (Justice, Equity, Diversity, and Inclusion), and resilience.

While we were with Matt, he gave us a full tour of the BRING facility and shared with us their operation. Our team’s main objective for this tour was to learn about the wood recycling process and opportunities within Lane County. The process for contractors or private individuals to recycle wood materials to BRING is reliant on the amount of material that is being donated. BRING does not necessarily have a hauling service, but they are willing to haul wood or other recycled materials if it is worthwhile for them. Additionally, it is expected that all C&D materials will be sorted upon arrival. If materials are not sorted, sorting companies like EcoSort will sort out materials for a fee. Also, wood and nails in the wood are not a concern as BRING has volunteers are assigned to help them prepare the recycled wood for sale. We were informed that the wood recycled from homes in Eugene and Lane County is not of the best due to lesser quality wood materials used to construct homes in the early 1960s. Unlike in Portland, the quality of wood does not translate well into repurposing. Also, the wet environment that Eugene has often leads to wood rot and limited drying opportunities for the recycled wood. The main success that BRING has had for recycling wood has come from outsourcing material from sawmills or selling recycled wood for projects that are not required to be structurally sound (Garden boxes, concrete forms, and other small-scale projects). The tour of the BRING facility helped our group learn more about the specifics of reuse and recycling in the Lane County community and overall helped guide the final recommendations we outlined above.



Matt showed Finley and Libby BRING's community garden that incorporates donated outdoor artwork, coastal bridge sections, wind chimes, and benches.



Several wood products are made by BRING from recycled wood. The recycled products that they make include bird houses, picture frames, coasters, coat hooks, and jewelry.



This picture depicts a stack of wood that BRING attained from a local sawmill. Each of these 2x4s are milled yet are aesthetically not appealing enough to sell to consumers. Rather than throwing them away, these 2x4s are bought by repurposing centers like BRING who resell them to consumers for low-cost wood for projects. (This wood is not suitable for home construction, but rather a small shed, concrete pour setup, or any other small project).



Additional recycled wood that BRING has on hand.

Appendix F: Survey Results and Outline

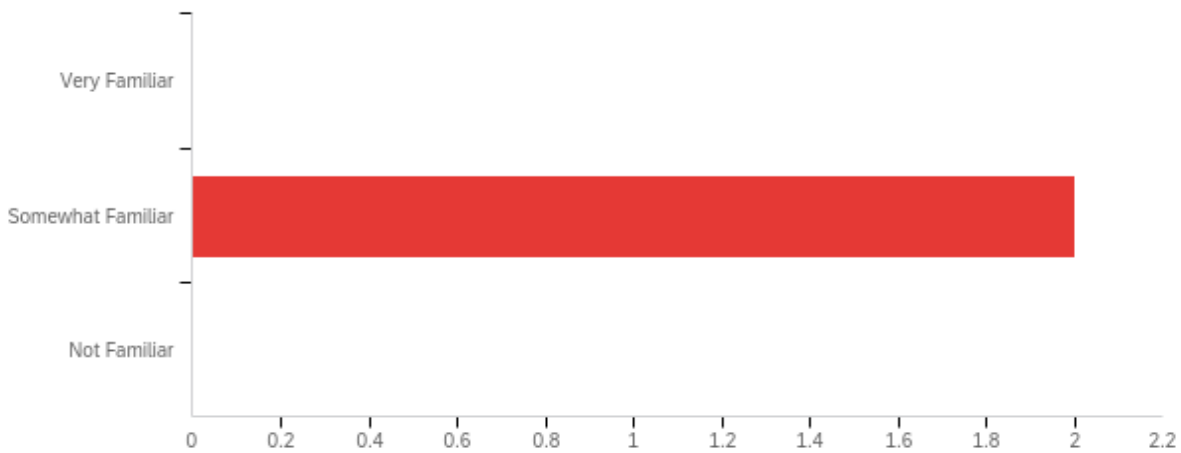
1 - What position do you hold with your company?

What position do you hold with your company?

Office Manager

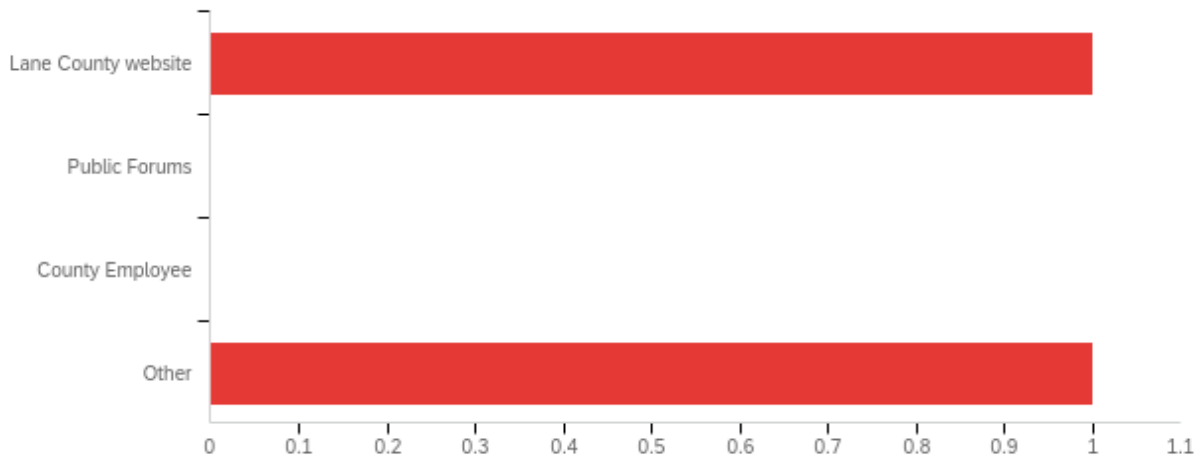
Senior Partner

2 - How familiar are you with Lane County's C&D landfill waste reduction goal?



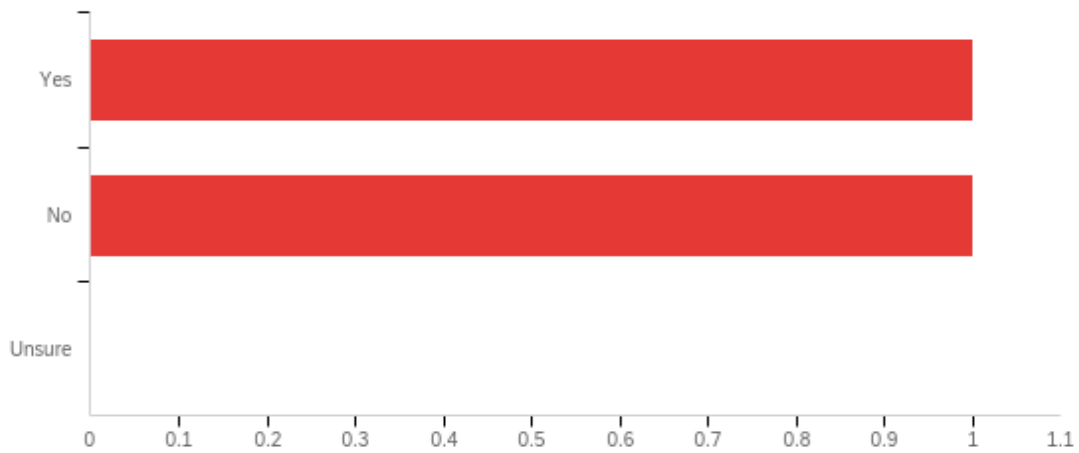
#	Answer	%	Count
1	Very Familiar	0.00%	0
2	Somewhat Familiar	100.00%	2
3	Not Familiar	0.00%	0
	Total	100%	2

3 - How did you learn about Lane County's C&D waste reduction goals?



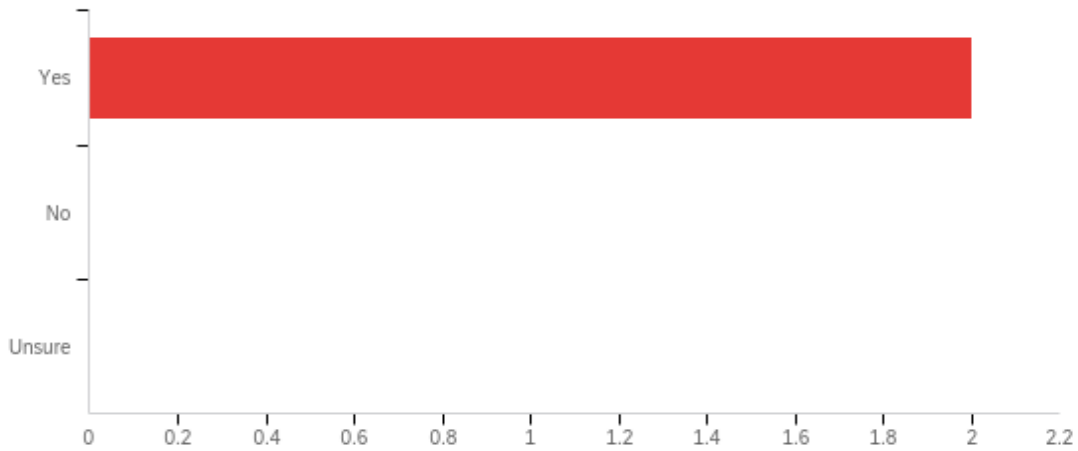
#	Answer	%	Count
1	Lane County website	50.00%	1
2	Public Forums	0.00%	0
3	County Employee	0.00%	0
4	Other	50.00%	1
	Total	100%	2

4 - Has your company been trained on job site recycling methods? (Separating waste materials, certifications, etc.)



#	Answer	%	Count
1	Yes	50.00%	1
2	No	50.00%	1
3	Unsure	0.00%	0
	Total	100%	2

5 - Has your company ever recycled C&D materials with a non-profit? (Ex- ToolBox Project, St. Vincent DePaul, BRING, American Gypsum)



#	Answer	%	Count
1	Yes	100.00%	2
2	No	0.00%	0
3	Unsure	0.00%	0
	Total	100%	2

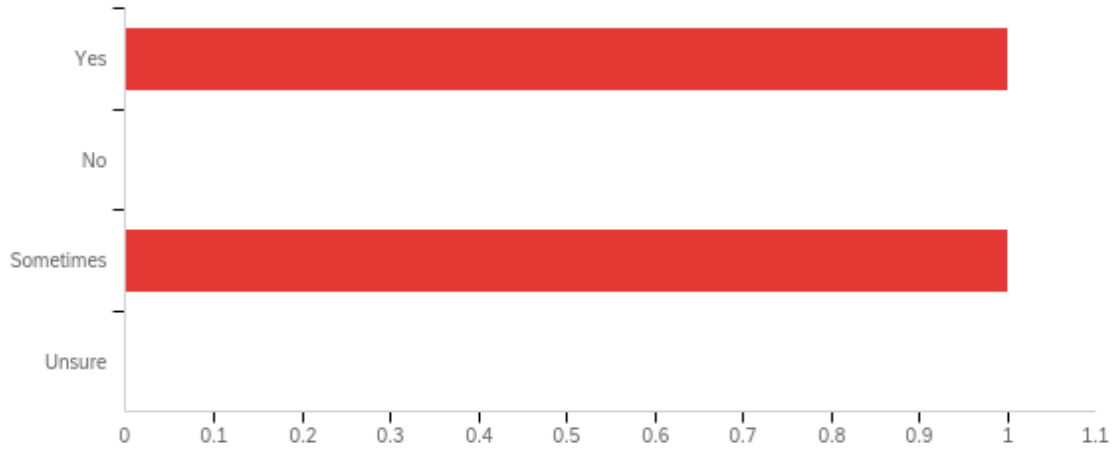
6 - Which non-profit/program do you collaborate with?

Which non-profit/program do you collaborate with?

Bring, Schnitzer (scrap metal), Lane Forest

Habitat for Humanity, BRING, St Vincent De Paul, Goodwill

7 - Do your job sites have separate bins specifically for recycling wood, metal, gypsum, rubber, etc.?



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Do your job sites have separate bins specifically for recycling wood, metal, gypsum, rubber, etc?	1.00	3.00	2.00	1.00	1.00	2

8 - If yes, how often?

#	Answer	%	Count
1	Yes	50.00%	1
2	No	0.00%	0
3	Sometimes	50.00%	1
4	Unsure	0.00%	0
	Total	100%	2

9 - You marked unsure; please explain why you are unsure.

We typically separate materials when brought back to shop

10 - What is your average tonnage of waste from each job? (Please estimate)

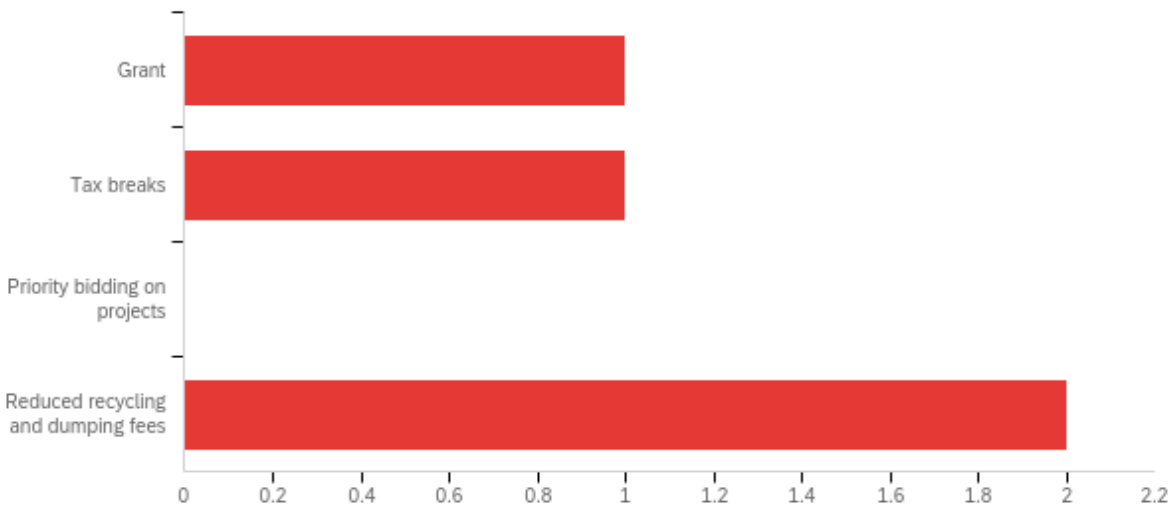
#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Tons	0.00	0.00	0.00	0.00	0.00	1

11 - Please estimate the amount of financial assistance you would need to fully deconstruct and recycle all C&D materials rather than demolishing?

#	Answer	%	Count
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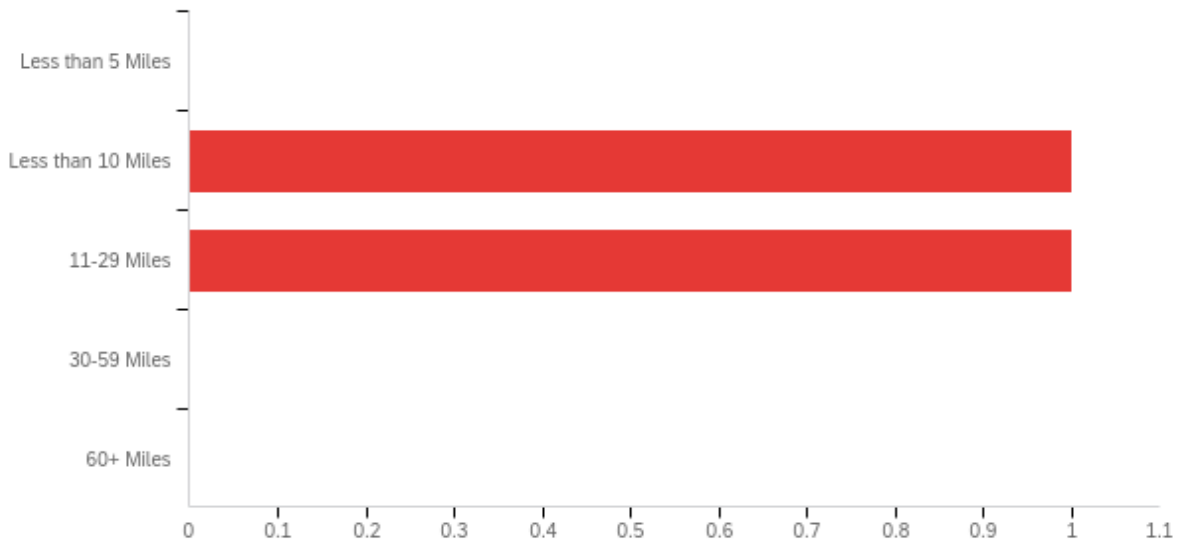
1	Less than \$5,000	100.00%	1
2	\$5,000-\$10,000	0.00%	0
3	More than \$10,000	0.00%	0
	Total	100%	1

12 - Please select the two best options below for incentivizing deconstruction practices instead of demolition.



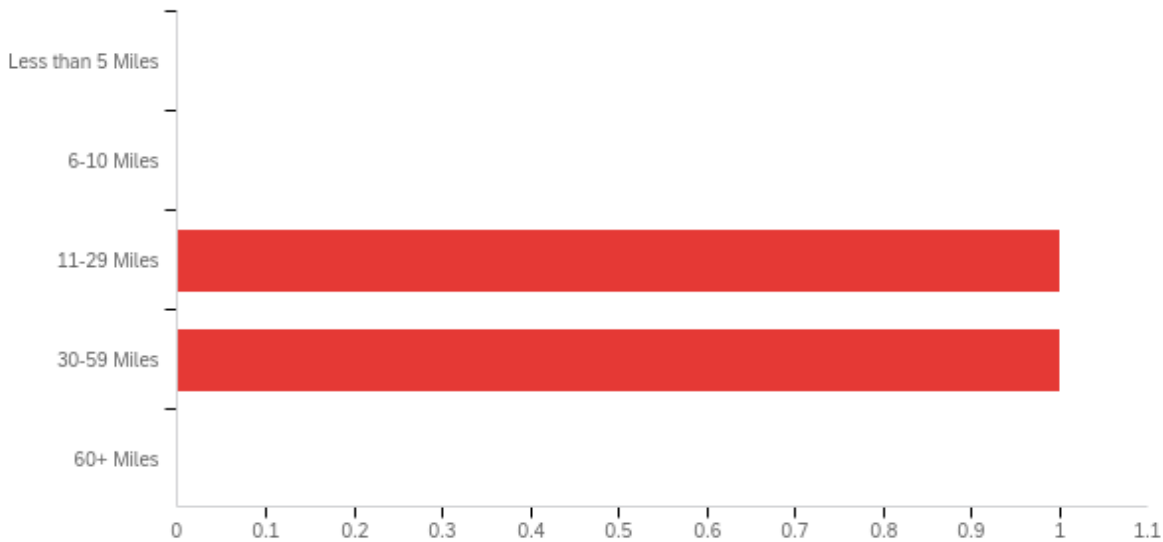
#	Answer	%	Count
1	Grant	25.00%	1
2	Tax breaks	25.00%	1
3	Priority bidding on projects	0.00%	0
4	Reduced recycling and dumping fees	50.00%	2
	Total	100%	4

13 - How many miles do you typically drive per day to haul construction waste?



#	Answer	%	Count
1	Less than 5 Miles	0.00%	0
2	Less than 10 Miles	50.00%	1
3	11-29 Miles	50.00%	1
4	30-59 Miles	0.00%	0
5	60+ Miles	0.00%	0
	Total	100%	2

14 - What is the furthest distance you would drive to a recycling center?



#	Answer	%	Count
1	Less than 5 Miles	0.00%	0
2	6-10 Miles	0.00%	0
3	11-29 Miles	50.00%	1
4	30-59 Miles	50.00%	1
5	60+ Miles	0.00%	0
	Total	100%	2

15 - Do you have any additional comments or recommendations for recycling or repurposing C&D materials?

This is a challenging form for us because we have a large company with a culture, systems and a staff person who take care of our C and D. The challenge of this work is how to make dumping cost prohibitive and recycling the easier and cheaper option for the small outfits. I run enough jobs, and have bought enough buckets, and maintain a collection point in our yard that allows for the slower developing waste to be periodically taken to the various recycling. It really boils down to enough buckets at some level.

Appendix G: Additional Resources

In the table below are contacts we received from informational interviews, but did not have time to talk with. They were recommended as useful resources to connect with for planning a C&D waste project in Lane County.

Name	Title	City/State	Contact Information
Melissa Wenzel	Minnesota Pollution Control Agency	Minneapolis, Minnesota	(651) 757-2251 melissa.wenzel@state.mn.us
Stephanie Phillips	Deconstruction and Circular Economy Program Manager	San Antonio, TX	stephanie@sapreservation.com
Build Reuse	National deconstruction organization	Nationwide	https://www.buildreuse.org
Katie Kennedy	Seattle deconstruction grant program	Seattle, WA	katie.kennedy@seattle.gov

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