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Executive Summary
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Executive Summary

A materials management strategic planning document would help Benton County help achieve organizational goals, meet regulatory requirements, and provide valuable community services while developing Solid Waste Program priorities and allocate program resources effectively. The primary goal of this internship project was to start developing a sustainable materials management plan for Benton County.

The plan development began in April 2021, and the development process for the plan consisted of the following general elements: research, data analysis, strategy development, drafting, public and stakeholder feedback, local government approval, and implementation. The scope of this project includes research, data analysis and initial strategy development.

Vision and Overarching Objective

Ensure high environmental quality by minimizing the full lifecycle impact of materials through safe, equitable, resilient, and measurable management strategies.

Benton County Information

Benton County consists of an area of 697 square miles, with a 2021 population estimate of 93,976 (Sykes, 2021). Unincorporated areas of Benton County house approximately 21% of the county's population, while over 63% of the population lives within Corvallis, and the remaining population within North Albany, Philomath, Adair Village, and Monroe (Sykes, 2021). Benton County's population is forecasted to increase steadily through 2070 (Population Research Center, Portland State University, 2021).

Increasing population will increase total waste generation in the county unless per capita waste generation decreases, increasing solid waste collection needs. Adair Village is expected to grow faster than any other area of Benton County, followed by North Albany, Monroe, Philomath, Corvallis, and unincorporated areas, respectively. Benton County's collection franchise will likely be less impacted by population growth than other collection franchises. Corvallis is expected to contain a large majority of the county's population through 2070, making the materials management practices of the city particularly important for the entire Wasteshed.

Current Challenges

Improper Solid Waste Disposal

Roadside litter and debris, Illegal dumping, and outdoor burning of solid waste materials can cause pollution issues in the air, as well as terrestrial and aquatic environments.

Equity and Accessibility in Waste Collection Services and Materials Management Resources

Addition resources beyond collection services are concentrated in the Corvallis area, and there is a wide geographic distribution of the county residents outside of Corvallis.

Participation in Waste Recovery Collection Services

Approximately 62% of residential customers under the Benton County solid waste collection franchise subscribe to mixed organics collection service (Republic Services, 2021), and not all mixed organics customers place food waste in their carts.

Comingled recycling service is also available to all Benton County residences and commercial accounts. Approximately 75% of residential customers subscribe to comingled recycling service (Republic Services, 2021).

Contamination

Contamination is challenging to monitor and address at the point of collection. Oregon's recycling stream is currently comprised of about 8-13 percent contamination (Oregon Department of Environmental Quality, n.d.-b).

Participation in waste prevention activities

The disposal of some materials in Benton County's Wasteshed is preventable. The State of Oregon set a goal of reducing waste generation to 15% below 2012 levels by 2025 (Oregon Department of Environmental Quality, 2021a), and by 2019 Benton County has increased waste generation to 11% over 2012 levels.

Lack of sustainable products for consumption

Many product choices for consumers are not sustainable due to the use of high-impact materials in the product itself or the product's packaging, and the life cycle of the product. The majority of emissions associated with a product can be attributed to lifecycle stages prior to consumer purchase (Oregon Department of Environmental Quality, n.d.-c).

Shifting from Solid Waste Management to Sustainable Materials Managements

Conventional solid waste management focuses on the end of a material's life, primarily though the collection and transportation of wasted materials to landfills, recycling processing facilities, and compost facilities. A sustainable materials management framework uses a more holistic approach by considering the material's full life cycle impacts in addition to recovery and disposal (Oregon Department of Environmental Quality, 2012). A relatively small portion of greenhouse gas emissions can be attributed a material's end-of-life, as compared to the material's full life cycle.

Solid Waste and Recovery Facilities and Services

Coffin Butte Landfill

The landfill is currently operated by Republic Services, and Benton County has a twenty-year host franchise agreement with the landfill from 2021-2040. The average amount of waste accepted at Coffin Butte Landfill from 2016-2020 is 880,686 tons/year. There is a reported estimate lifespan of 18.8-21.85 years from 2020 (2038-2041), depending density and annual accepted tonnage (Republic Services, 2020). More than half of Benton County's waste disposed at Coffin Butte Landfill come from private vehicles, including special waste, asbestos, and public self-haulers. The remaining material disposed is MSW (38%), and C & D (10%) (Republic Services, 2020).

Waste Generation Trends

Per capita waste disposal and recovery have each increased over the five, ten, and twenty years periods prior to 2019. Waste disposal has increased faster than recovery in the five and

ten year periods prior to 2019, and from 2015-2019 per-capita waste disposal increased by an average of 1.9% per year. Total waste disposal and recovery has also increased faster than per-capita, with a 2015-2019 average annual growth rate of 3.0% (Oregon Department of Environmental Quality, n.d.-a). The county's population had an average annual growth rate of 0.9% from 2000-2010, and 1.0% from 2010-2020 (Population Research Center, Portland State University, 2021). Based on current trends, waste generation is likely to increase into the future.

Recovery Rate

Benton County has a voluntary recovery rate goal of 44% by 2025 (State of Oregon, 2021). The county's 2019 recovery rate was 35.4%, which was short of the goal by 8.6% or 8,807 tons (Figure 17). Benton County's highest recovery rate was 43% in 2004 (Oregon Department of Environmental Quality, n.d.-a). To meet the goal, the county will need to recover more material through recycling and composting, generate less disposal material, or a combination of the two.

Waste Characterization

Recovered Materials

Yard debris, cardboard, scrap metal, paper fiber, and glass had the largest recovery tonnage in 2019, respectively (Oregon Department of Environmental Quality, 2021b).

Disposed Materials

Food waste is the largest category of landfilled material, at over 15%, followed by wood, other inorganics (like rock, dirt, litter, gypsum wallboard, etc.), paper, and plastic. Food is also the largest category of disposed materials that are currently recoverable, followed by paper, wood, metal, and yard debris respectively (Oregon Department of Environmental Quality, 2018).

Construction and Demolition (C & D) Materials

Coffin Butte Landfill accepted 10,279 tons of material from Benton County labeled as C & D material in 2020, which is about 16% of disposed materials from the county (Republic Services, 2020). Another estimate shows Benton County's C & D materials disposed is 20% of all disposed material in the county (Oregon Department of Environmental Quality, 2018), or 13,127 tons. C & D materials make up an even larger portion of landfilled waste than food waste.

Residential vs. Commercial vs. Self-Haul Waste Characterization

The most notable comparisons between the relative percentage of waste in the between residential, commercial, and self-haul waste characterization sub-streams (Oregon Department of Environmental Quality, 2018) are:

- Self-hauled materials include less food waste, paper, and yard debris, and more C & D (most sub-categories) than other sub-streams.
- Commercial materials include slightly more carpet, rugs, fiber pads than self-hauled loads, and more non-recyclable glass than other sub-streams.
- Residential materials include more recyclable glass and yard debris than other sub-streams.

Lifecycle Impacts of Materials

Greenhouse Gas Emissions

Emissions associated with production of materials is much larger than emissions associated with end-of-life waste management processes like recycling, composting, and landfilling. The cumulative net emissions from paper are the highest of the material categories, followed by food waste, C & D materials, mixed plastics, and cumulative metals (figure 1).

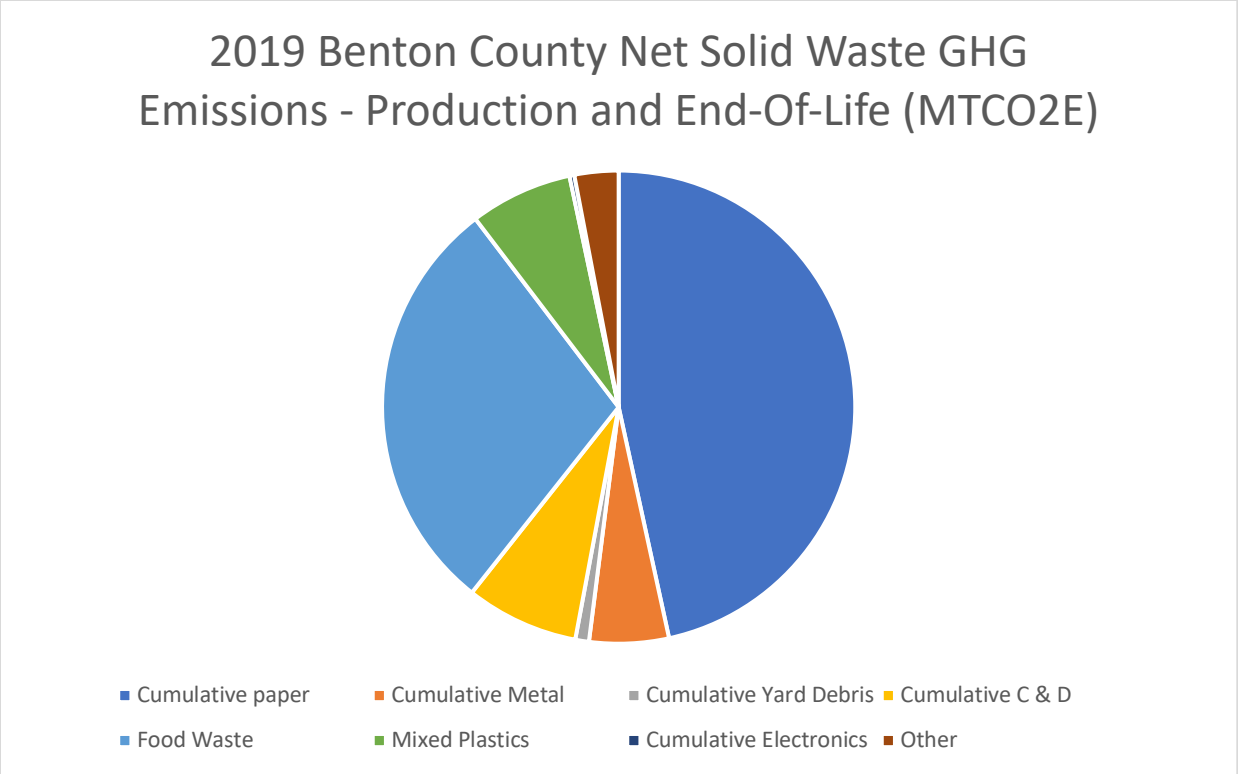

Figure 1. Relative net emissions of the full lifecycle of solid waste materials in Benton County in 2019.

The results of Oregon DEQ's Waste Impact Calculator for the GWP 100 impact calculation show that the most impactful waste materials for global warming potential in Benton County aside from the "other" category is cumulative paper, followed by food waste, textiles, cumulative plastics, and electronics, respectively (Brown & Canepa, n.d.).

The most waste materials with the largest global warming potential difference between "optimal" and "actual" management scenarios aside from the "other" category is cumulative plastics, cumulative cardboard and paper-related materials, food waste, textiles, and cumulative metals, respectively.

Preliminary Management Strategies

Reducing Waste Generation

Targeted materials for reduced waste generation include those with the largest greenhouse gas emissions and those with the largest generated and disposed tonnage. Targeted materials for waste reduction and prevention include:

1. Cumulative cardboard and paper
2. C & D materials
3. Food waste
4. Plastics
5. Textiles
6. Electronics
7. Metals

Increasing Waste Recovery

Certain materials are well-suited for increasing waste recovery through recycling or composting. This is due to the relatively high amount of recoverable materials in the disposal stream, as well as large potential reduction greenhouse gas emissions by increasing recovery. These materials include:

1. Plastics
2. Cumulative cardboard and paper
3. Food Waste
4. Textiles
5. Wood
6. Metal
7. Yard debris

Recommendations

1. Large industries and organizations should be considered as important partners in reducing waste across the county.
2. Benton County should share formal agreements with incorporated cities to combine efforts to meet materials management goals outlined in future Sustainable Materials Management Plans.
3. Benton County Wasteshed may decrease waste generation, increase waste recovery, reduce contamination, and increase public awareness by implementing the additional Opportunity to Recycle Act elements throughout the county.
4. The plan should include information about how many households are not subscribing to any solid waste collection service.
5. Some survey information that would help inform some critical details include management of Household Hazardous Waste (HHW), equity of services, specific disposal and recovery methods (especially for those not subscribing to some collection services), community perception of resources and services, knowledge about waste prevention and recovery best-practices, and barriers to participating in waste prevention and recovery.
6. A detailed contamination study would help the county understand the levels of contamination, provide the opportunity to connect with waste generators about contamination best-practices using targeted outreach, and learn how outreach is impacting contamination levels and waste generator behavior.
7. The landfill in Benton County has a limited lifespan, and further research is required to plan for future disposal of materials at the end of their useful life. Additional planning will also be required for future remediation and use of the landfill site post closure.
8. Another landfill study regarding the impacts to nearby residents would also be important for future research, to help limit impacts to those residents.

9. Oregon DEQ should integrate material categories between the various data sets and analytical tools. The resulting data would be more useful to local governments in developing accurate sustainable materials management plans.

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