2025 Community Climate Action Plan Update

CITY OF BEND

Community Climate Action Plan

Table of Contents

Introduction and Background

The Bend Community Climate Action Plan (CCAP), first adopted in 2019, outlines a comprehensive framework of strategies and actions designed to help the City of Bend meet its climate goals. These goals, established in **Resolution 3044** in 2016, aim to:

Achieve a 40% reduction in community-wide greenhouse gas emissions by 2030

Achieve a 70% reduction in community-wide greenhouse gas emissions by 2050

Progress toward these goals is measured against a baseline set by the 2016 Bend Community Greenhouse Gas Emissions (GHG) Inventory. The City is committed to measuring progress on emissions reductions and updating the CCAP every three to five years to ensure that the City is on track to achieves its climate goals. This is the first update since the Plan's adoption in 2019.

Since 2019, the City has been dedicated to implementing the CCAP. The initial years focused on establishing and refining internal City systems and processes to advance the CCAP. A key development was the creation of the Environment and Climate Committee (ECC), a permanent Council-advisory committee tasked with overseeing and guiding the CCAP's implementation. The ECC comprises 11 volunteer community members with expertise or experience in areas related to the CCAP and environmental sustainability, such as renewable energy, energy efficiency in buildings, alternative transportation, energy policy, and water resources.

The ECC was tasked with creating this update as part of its CCAP oversight role. The initial CCAP was developed with extensive community input, engaging hundreds of subject matter experts and thousands of community members through feedback surveys and workshops. Because the original plan incorporated a significant amount of community feedback and was comprehensive in its approach, this update focuses on revising and adding strategies and actions rather than a complete overhaul. The aim for this update is to maintain the structure, goals, and principles of the original CCAP while aligning strategies and actions with best practices and current conditions. By keeping the process streamlined, the ECC and staff could continue implementing the Plan's strategies without being overwhelmed by a full-scale update. It was crucial that the Committee and staff had the capacity to deliver projects while engaging in the update process.

CCAP Update Process

The process update the CCAP included the following steps:

- **May – June 2024:** Document progress to date and revise existing strategy and action language.
- **July – August 2024:** ECC led workshops for each focus area to propose, discuss, and recommend new/ revised strategies and actions.
- **September – December 2024:** Evaluate proposed strategies for emissions reduction potential, cost, and co-benefits.
- **November – December 2024:** Conduct community-wide survey **(Appendix B)**.
- **January – February 2025:** Refine, discuss, and prioritize proposed strategies actions for the 2025-2027 biennium.
- **March 2025:** ECC vote to recommend the proposed strategies and actions to City Council.
- **April 2025:** Deliver CCAP update recommendation to City Council for consideration and adoption.

Bend's Climate Impact: How Are We Doing?

CCAP Implementation Progress

The 2019 Community Climate Action Plan included 20 strategies and 42 actions. Between adoption at the end of 2019 and the end of calendar year 2024, the City made significant strides in advancing key climate action projects. The table below illustrates the total number of actions in each sector area, along with the number of actions completed, in progress, and yet to be started by the end of 2024. Many of the actions that are labeled "in progress" are actions that are ongoing, even though specific initiatives have already been complete that fulfill the action in part. **69% of our CCAP actions are either in progress or complete, while the remaining 31% are yet to be initiated.**

Focus Area	# of Actions Not Yet Started	# of Actions in Progress	# of Actions Completed	Total # of Actions
Energy Supply	2	7	3	12
Energy in Buildings	3	7	2	12
Transportation	3	4	1	8
Waste and Materials	5	4	1	10
Total (# & %)	**13 (31%)**	**22 (52%)**	**7 (17%)**	**42**

The four sector-specific tables below provide additional detail about the status of each of the 42 specific CCAP actions. For narrative information about the specific projects that have been completed, see the CCAP 2020-2024 Progress Report in **Appendix A.**

Energy Supply

As of the end of 2024, 10 out of the 12 actions in the Energy Supply focus area have been completed or are in progress. The remaining 2 actions have not yet started.

Energy Supply Actions	Project Status
ES1 – Provide 100% renewable electricity supply to the community	
ES1A – Achieve a 100% renewable electricity supply	
ES2 – Contract for a natural gas offset program for community gas use	
ES2A – Develop a program that allows residential and commercial customers to offset their natural gas use	
ES3 – Expand distributed commercial and residential solar photovoltaics (PV)	
ES3A – Increase community education on renewable energy and available incentives	
ES3B – Promote renewable energy incentives offered by utilities	
ES3C – Create new incentive packages that increase the installation of renewable energy systems on residential and commercial buildings	
ES3D – Create revolving loan funds to finance renewable energy projects	
ES3E – Develop community solar projects that residents can subscribe to for access to offsite solar energy	
ES3F – Pilot microgrid and battery storage projects	
ES3G – Support and expand workforce development programs in renewable energy trades	
ES3H – Create a commercial, property-assessed clean energy program	
ES4 – Build/explore a biodigester at the wastewater treatment facility	
ES4A – Build a biodigester at the wastewater treatment facility	
ES5 – Install solar panels on public buildings	
ES5A – Install solar panels on public buildings to demonstrate public sector leadership	

Energy in Buildings

As of the end of 2024, 9 out of the 12 actions in the Energy in Buildings focus area have been completed or are in progress. The remaining 3 actions have not yet started.

Energy in Buildings Actions	Project Status
EB1 – Support policies that increase energy efficiency of buildings	

EB1A – Participate in code update processes and vote for advancing energy efficiency in codes	
EB1B – Develop and deliver outreach and education campaigns to promote net zero ready building standards	
EB2 – Improve uptake of voluntary energy efficiency projects in buildings	
EB2A – Increase community education on energy efficiency and available energy efficiency incentives	
EB2B – Promote energy efficiency incentives offered by utilities	
EB2C – Create new incentives and programs to expand energy efficiency projects in residential and commercial buildings	
EB2D – Create revolving loan funds to finance energy efficiency projects	
EB2E – Support workforce development programs in energy efficiency trades	
EB2F – Explore options for demand response programs	
EB3 – Implement benchmarking and disclosure programs for energy performance	
EB3A – Develop a home energy score program	
EB3B – Develop voluntary disclosure and benchmarking programs for public and commercial buildings	
EB3C – Support and expand low-cost energy audit programs	
EB4 – Promote smaller homes and denser housing options through incentives	
EB4A – Develop incentives that encourage private developers to build smaller housing options	

Transportation

As of the end of 2024, 5 out of the 8 actions in the Transportation focus area have been completed or are in progress. The remaining 3 actions have not yet started.

Transportation Actions	Project Status
T1 – Support the transition to electric vehicles (EVs) with an EV Readiness Plan	
T1A – Develop a plan that anticipates EV growth, determines necessary charging infrastructure to accommodate this growth, and defines mechanisms to encourage the expansion of public and private charging infrastructure	
T2 – Increase bike and pedestrian trips	
T2A – Prioritize Bend's Bike, Pedestrian, and Complete Streets Policies in the Transportation System Plan	
T3 – Increase transit ridership	
T3A – Create a Mobility Hub program to improve access to a wide range of travel options and support multimodal lifestyles	

T3B – Create high-capacity transit corridors	✗
T3C – Expand transit service coverage consistent with the regional transportation master plan	◷
T3D – Coordinate with school district to encourage use of public transit for getting to school	✗
T4 – Promote ride sharing	
T4A – Encourage the use of carpooling, vanpooling, and other modes of ride sharing	✗
T5 – Convert City and other public agency fleets to electric vehicles and alternative fuels	
T5A – Public agencies will convert fleets to electric and alternative fuel vehicles as total cost of ownership allows	◷

Waste and Materials

As of the end of 2024, 5 out of the 10 actions in the Materials and Waste focus area have been completed or are in progress. The remaining 5 actions have not yet started.

Waste and Materials Actions	Project Status
W1 – Improve non-food waste recovery	
W1A – Improve recycling at multifamily residences	✗
W1B – Develop a recycling and waste reduction program targeting tourists	✗
W1C – Investigate and invest in facility and infrastructure upgrades to meet long term needs of solid waste system	◷
W2 – Expand use of low-carbon concrete in City projects and new development	
W2A – Utilize low-carbon concrete mixes in City projects and create incentives to encourage developers to utilize low-carbon concrete	✗
W3 – Improve food waste recovery	
W3A – Expand curbside composting program	✓
W3B – Develop and deliver educational programs that teach and encourage residents to compost their food waste	◷
W4 – Improve construction and demolition waste recovery	
W4A – Expand and develop new programs to increase recovery of construction and demolition materials	✗
W5 – Develop outreach and education materials for upstream consumption reduction	
W5A – Conduct outreach campaigns that promote waste prevention and reducing consumption	◷
W5B – Implement training programs for specific industries to prevent waste	✗

W6 – Develop programs that encourage food waste prevention	
W6A – Conduct outreach campaigns that promote food waste prevention	

Tracking Bend's Greenhouse Gas Emissions

The City completed a baseline emissions inventory in 2016 and an updated inventory in 2021. A breakdown of 2021 emissions are shown in Figure 1, and the full report can be found in **Appendix A**. The 2021 emissions inventory showed a 13% increase in overall community emissions, rising from 1,163,771 MT CO_2e in 2016 to 1,310,817 MT CO_2e in 2021. While per capita emissions decreased by 8% (from 13.9 MT CO_2e to 12.8 MT CO_2e), this reduction was insufficient to offset the emissions increase due to population growth.

Local emissions, or sector-based emissions, are emissions generated within the City's boundaries, including emissions from grid-supplied electricity consumed within the City. Emissions that occur outside of the City's boundaries but are driven by activity within the City are considered imported, or consumption-based emissions. The City of Bend's climate goals, like those of most cities, focus on local emissions and exclude consumption-based emissions because of the City's limited control over them. However, imported emissions are still measured and reported because they are a significant source of emissions (more than double Bend's community emissions), making it essential for the City to take action to mitigate them.

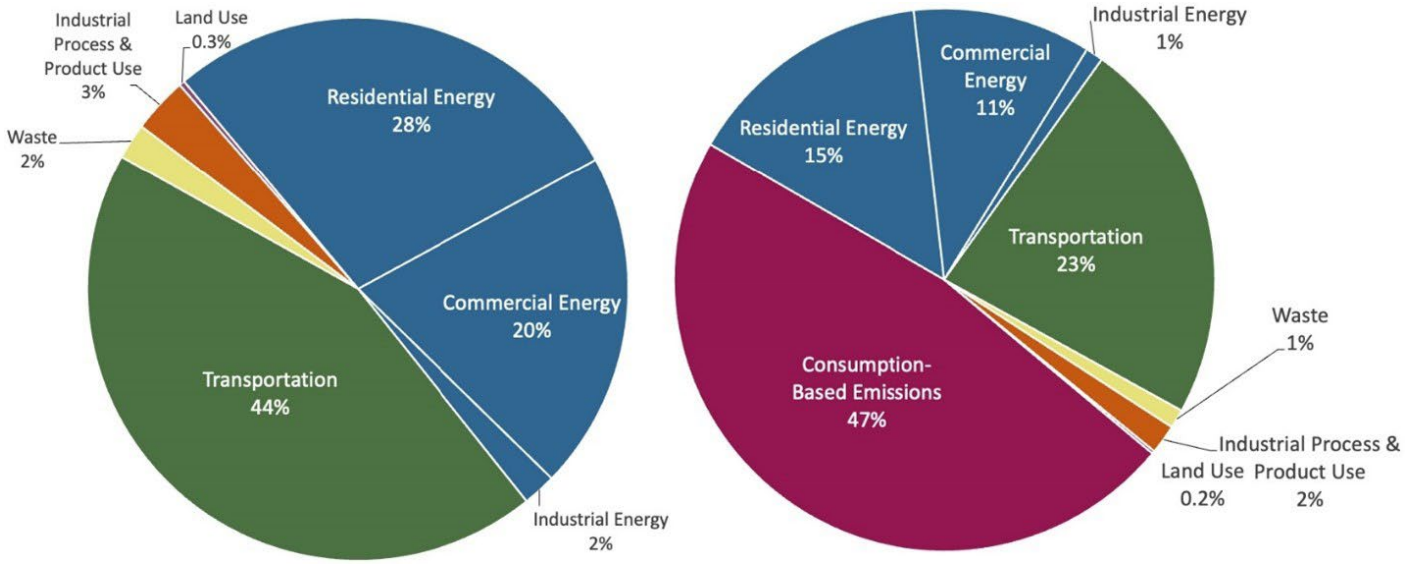


Figure 1. Bend's 2021 Local GHG Emissions (left) and Local + Imported GHG Emissions (right)

Imported emissions are generated during the production of goods, food, energy, and services consumed by Bend residents. **In 2021, these imported emissions totaled an additional 1.2 MT CO_2e, almost equivalent to local emissions.**

Energy-related emissions are the largest contributor to Bend's local emissions, accounting for 50% of local emissions. Residential buildings are responsible for 28%, and commercial buildings contribute 20%. Electricity use accounts for 73% of building energy emissions, and natural gas accounts 24%. Between 2016 and 2021, energy-related emissions in Bend decreased by 1.5% from 680,000 MT CO_2e in 2016 to 670,000 MT of CO_2e in 2021. This slight decline reflects improvements in energy efficiency and the growing share of renewable energy in the electricity grid. However, population and economic growth are putting upward pressure on overall energy consumption, highlighting the need for continued investment in energy efficiency measures and clean energy sources.

Transportation is the second-largest source of emissions in Bend, accounting for 44% of local emissions, primarily from passenger vehicles. Between 2016 and 2021, transportation-related emissions increased by 28%, due to higher vehicle

usage and population growth. Reducing transportation emissions will require strategies to decrease the number of miles driven by Bend residents (known as vehicle miles traveled, or VMT) and promote the use of vehicles that do not generate emissions.

Bend's waste related emissions remained relatively stable between 2016 and 2021 at around 2% of local emissions, but imported emissions from consumption increased significantly, by 10%.

The overall increase in Bend's emissions between 2016 and 2021 highlights the significant effort required to achieve the City's climate goals. Meeting these goals was challenging when set in 2016 and has become even more difficult as emissions have risen over the years. The Bend community must continue to address the additional emissions from a growing population. Meaningful, effective, and substantial actions are necessary to reduce emissions to levels that will mitigate Bend's climate impact.

Projected Emissions Reductions

By 2030

Based on the 2021 inventory and population growth, Bend is expected to emit 1,437,364 MT CO_2e in 2030 if no action is taken. To achieve the 40% reduction from 2016 levels, Bend must emit 655,000 MT CO_2e or less in 2030. If this CCAP update is fully implemented and achieves the expected uptake, Bend will reduce emissions to 744,000 MT CO_2e, representing a roughly 32% reduction from the 2016 baseline. **This would fall 89,000 MT CO_2e short of achieving the City's 2030 goal** (see Figure 2).

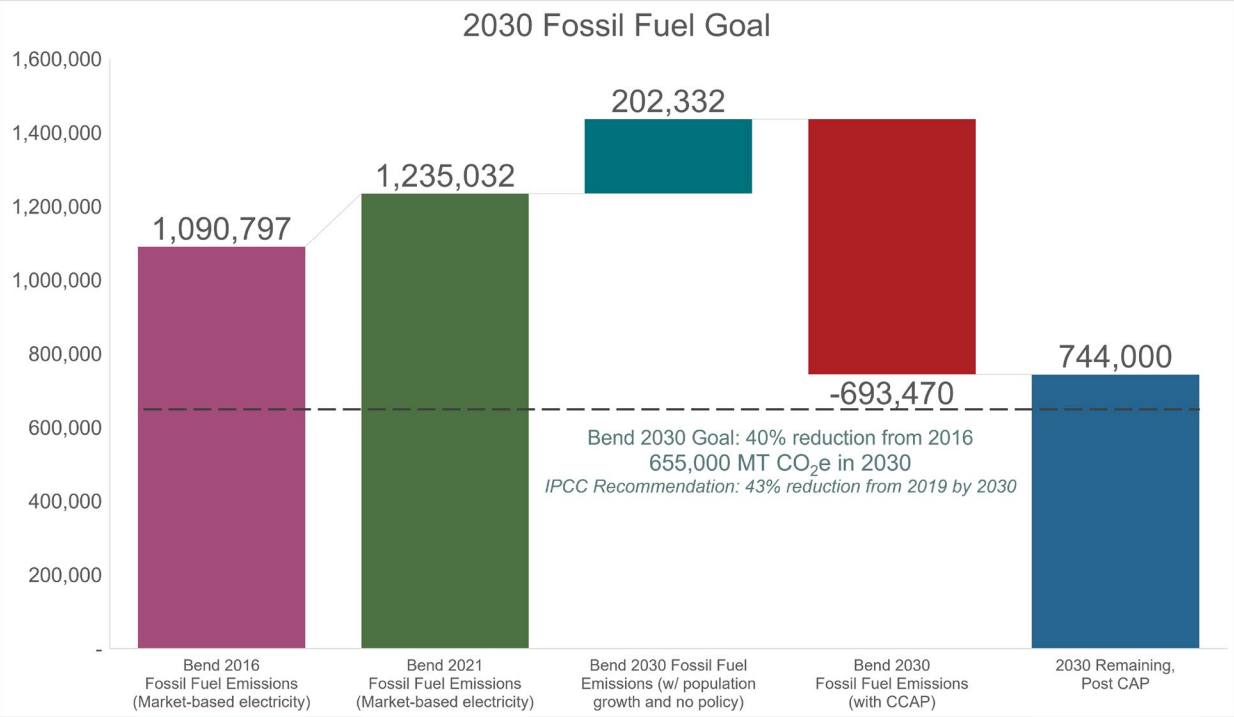


Figure 2. Emission reductions projected by 2030 from the Bend CCAP

By 2050

By 2050, without action, Bend is forecast to emit 1,995,891 MT CO_2e, factoring in population growth. Bend's 2050 goal sets a target of 330,000 MT CO_2e. If this CCAP update is implemented as planned and achieves intended outcomes, along with existing state policies, Bend will reduce emissions by 1,336,333 MT CO_2e by 2050. Remaining emissions would be 660,000 MT CO_2e, representing a 39% reduction from the 2016 baseline (see Figure 3). **Unfortunately, this falls short of the 70% reduction goal.**

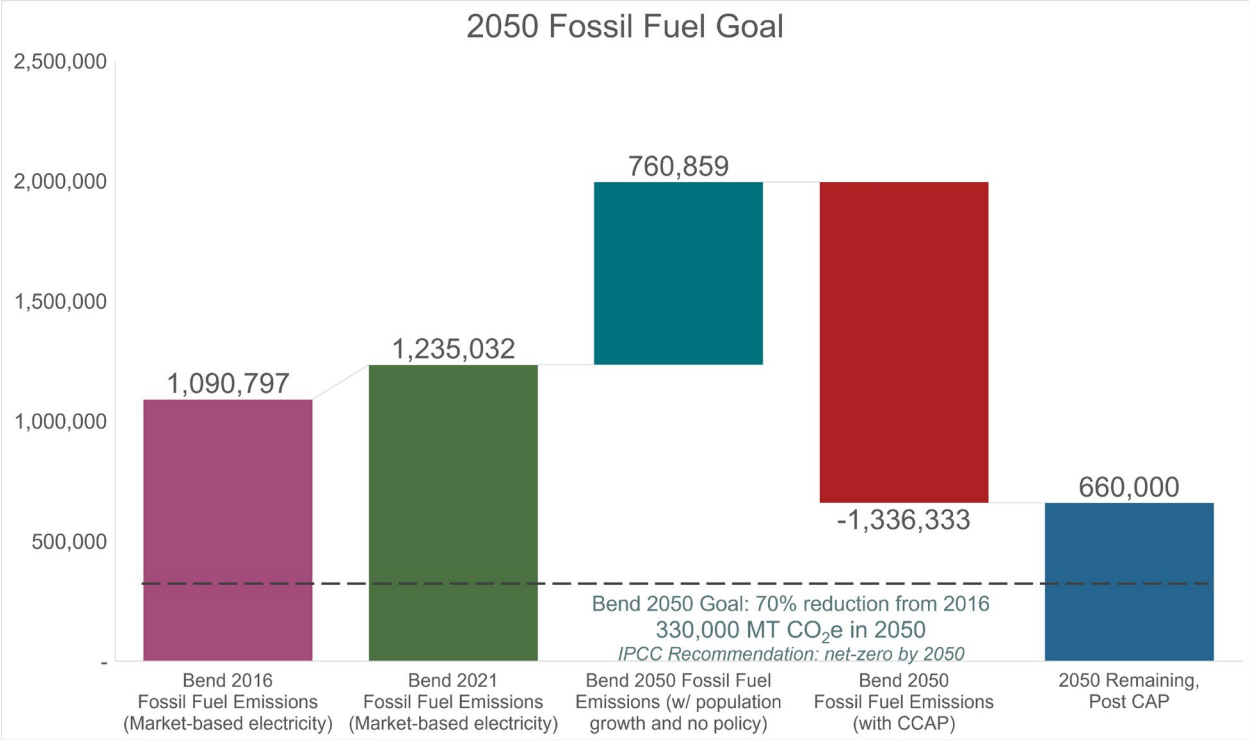


Figure 3. Emissions reductions projected by 2050 from the Bend CCAP

Bend's climate action strategies proposed in this plan will significantly reduce greenhouse gas emissions through 2050, but **the pace of reduction is insufficient to offset the projected increase of emissions.** This underscores the need for the City of Bend to remain committed to climate action to achieve greater reductions than current projections. This can be achieved by exceeding model assumptions and identifying new strategies and actions.

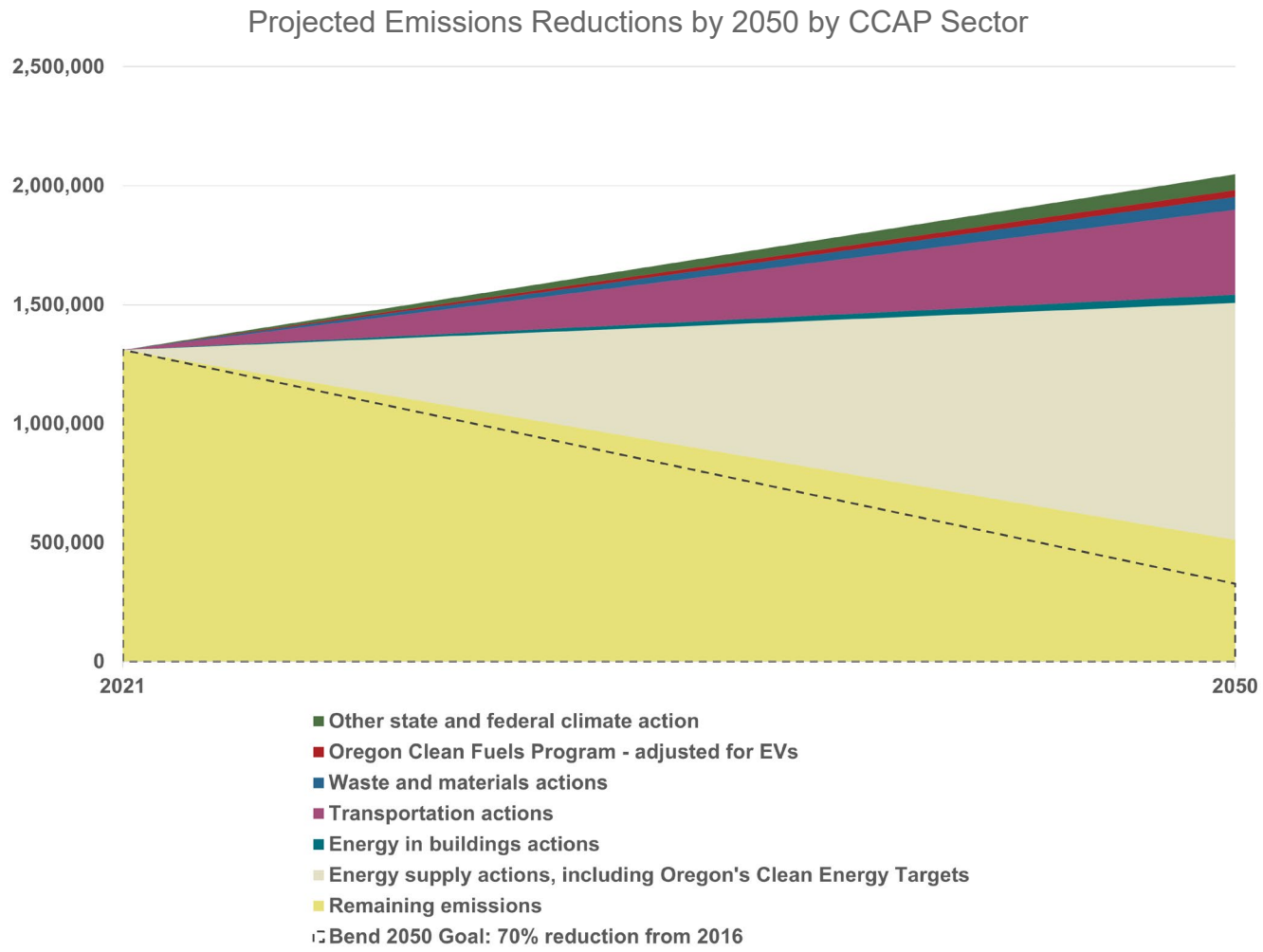


Figure 4.Projected emissions reductions by 2050 from each CCAP sector

Energy Supply & Buildings

Across all sectors, **decarbonizing the energy supply will result in the largest emissions reductions.** The energy supply sector alone accounts for 65% of the projected reductions, largely due to Oregon's Clean Energy Targets, which mandate that Pacific Power and other investor-owned utilities provide 100% clean energy through the electric grid by 2040. The energy supply sector also assumes most buildings in Bend will switch from natural gas to clean electricity for space and water heating, cooking, and other uses. Additional efficiency improvements in buildings will contribute an additional 2% of emissions reductions, in addition to those from phasing out natural gas.

Transportation

Transportation actions contribute to roughly 23% of emissions reductions by promoting the adoption and use of electric vehicles and alternative transportation modes like transit, walking, biking, and carpooling. The Oregon Clean Fuels program drives an additional 2% of reductions.

Materials and Waste

The the materials and waste sector contributes to about 4% of total projected emissions reductions. While this sector presents modest opportunity to reduce total local emissions, many actions in this sector significantly reduce consumption-based emissions, which are emissions from upstream activities (e.g., production and

transport) of goods and services consumed in Bend. These emissions are not included in our graphs showing projected emissions reductions, as they focus on local emissions only. Consumption-based emissions occur outside Bend and are beyond the City's direct influence and control, so they are not included in Bend's climate action goals. Nevertheless, mitigating these emissions is crucial. The strategy and action tables in the next section calculate both local and consumption-based (imported) emissions to highlight the positive impact of many strategies on reducing emissions outside the local area.

2025 Community Climate Action Plan Strategies and Actions

The ECC defined the strategies and actions in this update through a committee-led process. The Community Climate Action Plan maintains the same four CCAP sectors from the original CCAP:

Energy Supply

Energy in Buildings

Transportation

Materials and Waste*

**The "Waste and Materials" focus area has been changed to "Materials and Waste" to better reflect the City's commitment to prioritizing the reuse of materials over the disposal of waste.*

How to Read the Strategy and Action Tables

Each proposed strategy was evaluated using the same methodology as the 2019 Community Climate Action Plan, ensuring consistency. This methodology included a triple bottom line analysis, considering social, economic, and environmental criteria:

GHG Emissions Reduction Potential: Projected emissions reductions were calculated annually and totaled for cumulative impact. The tables in the following section include the cumulative emissions reduction impact for an overall summary of the long-term impact of the strategies. Data was gathered from existing reports and data sets, either specific to Bend or adapted from state and national data sets. Further details of the data and assumptions behind each strategy can be found in **Appendix C.** Emissions are categorized as local or imported (consumption emissions) next to the emissions value.

Cost to Mitigate Emissions: Measured in dollars per metric ton, the cost or savings varies by strategy. In some cases, the City or the leading entity bears the cost, while in others, it is distributed throughout the community. **Appendix C** provides more information about the cost assumptions.

- **Co-benefits:** These are the positive impacts beyond reducing greenhouse gas emissions. The co-benefits were originally defined by the ECC (formerly the Climate Action Steering Committee) for the 2019 CCAP and are maintained for the 2025 update. The six co-benefits evaluated include:

Economic Vitality: Measured in job creation.

Affordability: Measured in the relative cost and benefit to the person or entity bearing the cost

Supports the Natural Environment: Measured in the degree to which the strategy conserves or restores natural resources.

Social Equity: Measured in the degree to which the strategy equitably distributes benefits to historically underserved community members.

Community Health and Safety: Measured in the degree to which the strategy provides health and safety benefits to the community.

Adaptation and Resilience: Measured in the degree to which the strategy helps the community prepare for and recover from stressors such as drought and wildfire.

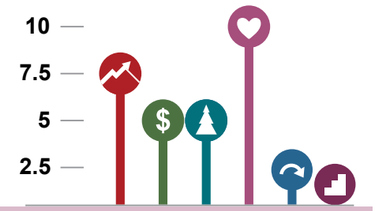
The following tables include columns identifying the lead implementation partner and modeling assumptions. The lead implementation partner indicates which entity will lead the action. The City is the lead partner for most actions, and many actions also list “community organizations” as additional lead partners, as the City intends to partner with these organizations due to limited capacity. Other implementation partners include public agencies, utilities, and waste haulers.

The modeling assumptions column includes the key assumptions used to calculate cumulative greenhouse gas emissions. To achieve the projected emissions reductions, the City must meet the values included in the modeling assumptions. In the 2019 CCAP, these were listed as “targets,” but in the 2025 CCAP update, they are referred to as “modeling assumptions”, as the City may set different targets.

2025 CCAP Update Strategy and Action Tables

Energy Supply

Table 1. Energy Supply - Climate Action Strategies

Strategy/Action	Lead Implementation Partner	2020-2050 Cumulative GHG Reductions (each circle below represents 200,000 metric tons of emissions)	Modeling Assumptions	Cost per 1 MT CO2e of Reduction (Parentheses indicate a cost savings per metric ton of emissions reduced)	Co-benefits
STRATEGY: *ES1 - Provide 100% renewable electricity supply to the community*					
ES1A – Ensure compliance with clean energy targets established for investor-owned utilities in House Bill 2021 by following utilities progress and advocating as opportunities occur if progress is not on track.	Lead:	12,120,000 (Local)	80% renewable grid energy by 2030, 100% renewable grid energy by 2040	$0	
ES1B – Engage with Central Electric Cooperative to better understand their resource planning and identify opportunities to encourage clean energy supply.					
STRATEGY: *ES2 - Reduce emissions associated with reliance on and usage of natural gas and other fossil fuels*					
ES2A – Develop policies to limit fossil fuel use in new construction.	Lead:	3,394,000 (Local)	1,236,526 therms annual reduction	Not estimated	
ES2B – Develop policies to phase out gas appliances and transition to electric alternatives in residential and commercial buildings.					
ES2C – Develop policies to phase out gas lawn equipment and transition to electric alternatives.					
STRATEGY*: ES3 - Encourage solar and other renewable energy generation on residential and commercial buildings*					
ES3A – Increase community education about renewable energy and available incentives.	Lead: Partners:	640,000 (Local)	858 MW new solar rooftop capacity by 2050	($140)	
ES3B – Develop and deliver education programs targeted at builders, developers, and contractors focused on renewable energy, energy storage, and available incentives.					
ES3C – Support and expand local workforce development programs in renewable energy trades.	Lead:				

City of Bend · Public Agencies · Community Partners · Utility · Waste Haulers

Savings · Expenditures · Economic Vitality · Affordability · Supports the Natural Environment · Community Health and Safety · Adaptation and Resilience · Social Equity

**Emissions reduction potential assumes stated strategy target is achieved. For more details on methodology and calculations, see Appendix D.*

Energy Supply

Table 1. Energy Supply - Climate Action Strategies

Strategy/Action	Lead Implementation Partner	2020-2050 Cumulative GHG Reductions (each circle below represents 200,000 metric tons of emissions)	Modeling Assumptions	Cost per 1 MT CO2e of Reduction (Parentheses indicate a cost savings per metric ton of emissions reduced)	Co-benefits
STRATEGY*: ES3 (cont.) - Encourage solar and other renewable energy generation on residential and commercial buildings*					
ES3D – Develop programs that encourage residents and businesses to pursue renewable energy and energy storage projects, including leveraging existing federal and state programs.	Lead: City of Bend Partners: Community Partners	640,000 (Local)	858 MW new solar rooftop capacity by 2050	($140)	10 / 7.5 / 5 / 2.5
ES3E – Develop new incentives to promote renewable energy projects, including financing options, streamlined permitting processes, and both financial and non-financial incentives.	Lead: City of Bend				

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Energy Supply

Table 1. Energy Supply - Climate Action Strategies

Strategy/Action	Lead Implementation Partner	2020-2050 Cumulative GHG Reductions (each circle below represents 200,000 metric tons of emissions)	Modeling Assumptions	Cost per 1 MT CO2e of Reduction (Parentheses indicate a cost savings per metric ton of emissions reduced)	Co-benefits
STRATEGY*: ES4 - Pursue local renewable energy generation*					
ES4A – Investigate and pursue opportunities for renewable energy generation at the water reclamation facility, the water filtration facility, and other areas of the water distribution system.	Lead: City of Bend				
ES4B – Support the development of local community solar projects that residents can subscribe to for access to offsite renewable energy.	Lead: City of Bend Partners: Community Partners				
ES4C – Pilot microgrid and battery storage projects powered by renewable energy that can operate independently of the energy grid.	Lead: City of Bend	77,000 (Local)	Install 1400 kW in-conduit capacity by 2030; 2200 kW of community solar by 2027; 650,000 therms annually of Renewable Natural Gas (RNG) from wastewater biodigester by 2028	($250-0)	
ES4D – Explore the potential for district energy projects.	Lead: City of Bend Partners: Utility				
ES4E – Participate in advocacy to reduce regulatory barriers for local renewable energy development.	Lead: City of Bend				
STRATEGY*: ES5 - Lead by example by decarbonizing City facilities*					
ES5A – Install solar panels on public buildings to demonstrate public sector leadership and meet the buildings' energy demand.	Lead: City of Bend	21,000 (Local)	1,200 kW added capacity of solar on Juniper Ridge Public Works Building and new City Hall	($1,300)	
ES5B – Build and retrofit City facilities to be all electric or otherwise avoid fossil fuel use.					

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Savings · Expenditures · Economic Vitality · Affordability · Supports the Natural Environment · Community Health and Safety · Adaptation and Resilience · Social Equity

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Energy in Buildings

Table 2. Energy in Buildings - Climate Action Strategies

Strategy/Action	Lead Implementation Partner	2020-2050 Cumulative GHG Reductions (each circle below represents 200,000 metric tons of emissions)	Modeling Assumptions	Cost per 1 MT CO2e of Reduction (Parentheses indicate a cost savings per metric ton of emissions reduced)	Co-benefits
STRATEGY: ***EB1 - Support policies that reduce greenhouse gas emissions of buildings***					
EB1A – Participate in code update processes and vote to advance energy efficiency standards.	Lead:	Not Scaled Separately - Aligned with ES2		Not estimated	
EB1B – Support state legislation and local implementation of state-wide laws and programs that align with CCAP goals and actions.					
STRATEGY: ***EB2 - Encourage upgrades in residential and commercial buildings that promote energy efficiency and reduce greenhouse gas emissions***					
EB2A – Increase community education on energy efficiency topics and available incentives.	Lead:	506,000 (Local)	5.4% annual reduction in energy use through 2032, then 5.3% annual reduction in energy use through 2050	($50) - $0	
EB2B – Develop and deliver targeted outreach and education to builders, developers, and contractors on high performance building topics and incentives.	Partners:				
EB2C – Support and expand local workforce development programs in energy trades (i.e., renewable energy, electricity generation and distribution, energy efficiency, and HVAC systems.)	Lead:				

City of Bend · Public Agencies · Community Partners · Utility · Waste Haulers

Savings · Expenditures · Economic Vitality · Affordability · Supports the Natural Environment · Community Health and Safety · Adaptation and Resilience · Social Equity

**Emissions reduction potential assumes stated strategy target is achieved. For more details on methodology and calculations, see Appendix D.*

Energy in Buildings

Table 2. Energy in Buildings - Climate Action Strategies

Strategy/Action	Lead Implementation Partner	2020-2050 Cumulative GHG Reductions (each circle below represents 200,000 metric tons of emissions)	Modeling Assumptions	Cost per 1 MT CO2e of Reduction (Parentheses indicate a cost savings per metric ton of emissions reduced)	Co-benefits
STRATEGY: ***EB2 (cont.) - Encourage upgrades in residential and commercial buildings that promote energy efficiency and reduce greenhouse gas emissions***					
EB2D – Develop programs that encourage residents and businesses to pursue energy efficiency, electrification, and other emissions reductions upgrades.	Lead: City of Bend Partners: Community Partners				
EB2E – Identify barriers to expanding energy efficiency and electrification projects in residential and commercial buildings and create incentives to address those barriers, including financing options, permitting processes, and other financial and non-financial incentives.	Lead: City of Bend	506,000 (Local) ●●◐○○	5.4% annual reduction in energy use through 2032, then 5.3% annual reduction in energy use through 2050	($50) - $0	
EB2F – Promote energy efficiency and load management through smart controls and demand response participation.	Lead: City of Bend Partners: Community Partners, Utility				

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Savings · Expenditures · Economic Vitality · Affordability · Supports the Natural Environment · Community Health and Safety · Adaptation and Resilience · Social Equity

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Energy in Buildings

Table 2. Energy in Buildings - Climate Action Strategies

Strategy/Action	Lead Implementation Partner	2020-2050 Cumulative GHG Reductions (each circle below represents 200,000 metric tons of emissions)	Modeling Assumptions	Cost per 1 MT CO2e of Reduction (Parentheses indicate a cost savings per metric ton of emissions reduced)	Co-benefits
STRATEGY: ***EB3 - "Implement benchmarking and disclosure programs along with building performance standards***					
EB3A – Explore the creation of a city-specific building standard that exceeds statewide building performance standards.	Lead: City of Bend	190,000 (Local) ●○○○○	5% additional achievable efficiency gains developed each year from 2025-2034	$0 - $150	
EB3B – Support and expand low cost energy audit programs.	Lead: City of Bend Partners: Community Partners				
STRATEGY*: EB4 - Promote smaller homes and denser housing options through incentives*					
EB4A – Develop incentives that encourage private developers to build smaller housing options.	Lead: City of Bend	211,000 (Local) ●○○○○	Average size of homes is 1,600 sq. ft.	($730)	

City of Bend · Public Agencies · Community Partners · Utility · Waste Haulers

Savings · Expenditures · Economic Vitality · Affordability · Supports the Natural Environment · Community Health and Safety · Adaptation and Resilience · Social Equity

**Emissions reduction potential assumes stated strategy target is achieved. For more details on methodology and calculations, see Appendix D.*

Transportation

Table 3. Transportation - Climate Action Strategies

Strategy/Action	Lead Implementation Partner	2020-2050 Cumulative GHG Reductions (each circle below represents 200,000 metric tons of emissions)	Modeling Assumptions	Cost per 1 MT CO2e of Reduction (Parentheses indicate a cost savings per metric ton of emissions reduced)	Co-benefits
STRATEGY: *T1 - Encourage community-wide electric vehicle (EV) adoption*					
T1A – Expand access to community-wide public EV charging. **T1B** – Expand access to multi-family EV charging. **T1C** – Expand workplace EV charging. **T1D** – Conduct outreach and education to promote to promote EV adoption.	Lead: City of Bend Partners: Community Partners	3,740,000 (Local) ●●●●●	19% of all household vehicles are EVs by 2035; 95% of all household vehicles are EVs by 2050	($50) - $75	
STRATEGY: *T2 - Encourage bike and pedestrian travel in the Transportation System Plan (TSP)*					
T2A – Prioritize Bend's Bike, Pedestrian, and Complete Streets policies in the Transportation System Plan. These policies include expanding bike and pedestrian infrastructure. **T2B** – Prioritize TSP projects and programs that develop safe alternate routes to schools. **T2C** – Use crash analysis data to improve safety by implementing projects and programs from the Transportation Safety Action Plan. **T2D** – Expand bicycle parking at mobility hubs and other key destinations.	Lead: City of Bend	560,000 (Local) ●●◐○○	25% of all household trips are bike/ped by 2050	($35)	
STRATEGY: *T3 - Increase transit ridership*					
T3A – Work with partners to create a Mobility Hub program to improve access to a wide range of travel options and support multi-modal lifestyles. **T3B** – Support future high-capacity transit corridors and transit use by preserving existing rights-of-way on city roadways and rezoning for higher land use density.	Lead: City of Bend Partners: Public Agencies	19,000 (Local) ◐○○○○	Increase transit service by 50% and increase ridership by 2% by 2040	$40	

City of Bend · Public Agencies · Community Partners · Utility · Waste Haulers

Savings · Expenditures · Economic Vitality · Affordability · Supports the Natural Environment · Community Health and Safety · Adaptation and Resilience · Social Equity

**Emissions reduction potential assumes stated strategy target is achieved. For more details on methodology and calculations, see Appendix D.*

Transportation

Table 3. Transportation - Climate Action Strategies

Strategy/Action	Lead Implementation Partner	2020-2050 Cumulative GHG Reductions (each circle below represents 200,000 metric tons of emissions)	Modeling Assumptions	Cost per 1 MT CO2e of Reduction (Parentheses indicate a cost savings per metric ton of emissions reduced)	Co-benefits
STRATEGY: *T3 (cont.) - Increase transit ridership*					
T3C – Support the expansion of transit coverage consistent with the regional transit master plan. **T3D** – Actively collaborate with Cascades East Transit to promote transit use by providing new infrastructure for transit stops, promoting transit through City channels, and aligning planning efforts. **T3E** – Support use of transit to recreational destinations, such as the ski resort.	Lead: City of Bend Partners: Public Agencies	19,000 (Local)	Increase transit service by 50% and increase ridership by 2% by 2040	$40	
STRATEGY: *T4 - Promote the use of carpooling and vanpooling*					
T4A – Encourage carpooling to City and community events. **T4B** – Partner with large employers to promote carpooling and vanpooling for daily commutes.	Lead: City of Bend Partners: Community Partners	51,000 (Local)	Double the rate of car/vanpooling to 20% of work-related trips by 2030, and further increase car/vanpooling by 10% annually from 2030 to 2040.	($500)	
STRATEGY: *T5 - Lead by example by converting fleet vehicles to electric and alternative fuel vehicles*					
T5A – Convert the City fleet to electric and alternative fuels whenever technically feasible alternatives are available.	Lead: City of Bend	11,000 (Local)	All gas powered city fleet vehicles are converted to EV and all fossil diesel is replaced by R99 diesel by 2030	($200) - $75	

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Transportation

Table 3. Transportation - Climate Action Strategies

Strategy/Action	Lead Implementation Partner	2020-2050 Cumulative GHG Reductions (each circle below represents 200,000 metric tons of emissions)	Modeling Assumptions	Cost per 1 MT CO2e of Reduction (Parentheses indicate a cost savings per metric ton of emissions reduced)	Co-benefits
STRATEGY: T6 - Use land use policy and transportation planning to to encourage the reduction of vehicle miles traveled (VMT)					
T6A – When creating and amending land use plans (i.e., the Comprehensive Plan, Transportation System Plan, Refinement Area Plans), develop policies and strategies that promote walking, biking, and transit use. **T6B** – Implement land use changes that promote walking, biking, and transit use by adopting policies from land use plans to create complete communities. **T6C** – When the City designates Climate Friendly Areas, identify and pursue additional opportunities to increase housing and enhance multimodal transportation and connectivity options. **T6D** – When amending the Transportation System Plan, avoid prioritizing projects that increase VMT.	Lead: City of Bend	246,000 (Local)	Accommodate all forecasted population growth within the current Urban Growth Boundary (including planned expansions).	Not estimated	
STRATEGY: *T7 - Establish financial incentives to drive behavior change in transportation*					
T7A – Identify and implement additional paid parking districts. **T7B** – Expand the use of Transportation Demand Management (TDM) programs for large employers through incentives. **T7C** – Continue evaluating a gas tax as a funding mechanism.	Lead: City of Bend	Not Estimated	Not Estimated	Not Estimated	

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Materials and Waste

Table 4. Materials and Waste - Climate Action Strategies

Strategy/Action	Lead Implementation Partner	2020-2050 Cumulative GHG Reductions (each circle below represents 200,000 metric tons of emissions)	Modeling Assumptions	Cost per 1 MT CO2e of Reduction (Parentheses indicate a cost savings per metric ton of emissions reduced)	Co-benefits
STRATEGY*: MW1 - Improve waste recovery through recycling*					
MW1A – Enhance recycling at multi-family residences by ensuring developments provide provide adequate recycling services and infrastructure.	Lead:				
MW1B – Improve multi-family recycling by expanding and improving outreach and education at multi-family buildings.	Lead: Partners:				
MW1C – Create a recycling and waste reduction program aimed at tourists, including hotels and resort communities.	Lead:	844,000 (Local and downstream)	Increase recovery rate to 45%	Not estimated	
MW1D – Work with Deschutes County and waste haulers to reduce recycling contamination through targeted outreach and education.	Partners:				
MW1E – Develop new programs to recover materials that make up the largest portion of the waste stream.	Lead:				
MW1F – Support the expansion of solid waste infrastructure and facilities to increase waste recovery and meet long-term needs, in partnership with Deschutes County and private waste companies.	Partners:				
STRATEGY*: MW2 - Expand use of low-carbon concrete in City projects and new development*					
MW2A – Track concrete use in City projects and increase the use of low-carbon concrete in City projects.	Lead:	320,000 (Imported)	Emissions intensity of concrete mixes are 26% lower by 2050	($250) - $200	
MW2B – Develop incentives to promote the use of low-carbon concrete in private development.					

City of Bend · Public Agencies · Community Partners · Utility · Waste Haulers

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Materials and Waste

Table 4. Materials and Waste - Climate Action Strategies

Strategy/Action	Lead Implementation Partner	2020-2050 Cumulative GHG Reductions (each circle below represents 200,000 metric tons of emissions)	Modeling Assumptions	Cost per 1 MT CO2e of Reduction (Parentheses indicate a cost savings per metric ton of emissions reduced)	Co-benefits
STRATEGY*: MW3 - Improve food waste recovery*					
MW3A – Increase participation in and access to food waste collection services, particularly in multi-family and commercial sectors.	Lead: City of Bend Partners: Community Partners, Waste Haulers	206,000 (Local)	Increase food waste recovery to 50% recovery rate	$0 - $10	
MW3B – Develop and deliver educational programs that teach and encourage residents to compost their food waste.	Lead: City of Bend Partners: Community Partners				
STRATEGY*: MW4 - Improve recovery of construction and demolition (C&D) waste*					
MW4A – Expand and develop new programs and increase the recovery of C&D materials.	Lead: City of Bend Partners: Community Partners, Waste Haulers	174,000 (Local and downstream)	Divert an additional 2,305 tons of C&D waste from landfill annually	Not estimated	
MW4B – Encourage reuse of C&D materials.	Lead: City of Bend Partners: Community Partners				
STRATEGY*: MW5 - Encourage waste prevention and reduced consumption*					
MW5A – Conduct outreach campaigns to promote waste prevention and reduced consumption by connecting residents and businesses to local resources, such as repair cafes.	Lead: City of Bend Partners: Community Partners	406,000 (Imported)	3% reduction in consumption of clothing, furniture, appliances and construction materials	($270)	
MW5B – Implement industry-specific training programs to prevent waste, targeting sectors like building and construction, and food and restaurants.	Lead: City of Bend Partners: Community Partners, Public Agencies				
MW5C – Promote and support the use of reusable service ware in food services.					

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Materials and Waste

Table 4. Materials and Waste - Climate Action Strategies

Strategy/Action	Lead Implementation Partner	2020-2050 Cumulative GHG Reductions (each circle below represents 200,000 metric tons of emissions)	Modeling Assumptions	Cost per 1 MT CO2e of Reduction (Parentheses indicate a cost savings per metric ton of emissions reduced)	Co-benefits
STRATEGY: MW5 (cont.) - Encourage waste prevention and reduced consumption					
MW5D – Promote reuse by supporting gear swap events, community garage sales, and neighborhood repair cafes.	Lead: City of Bend Partners: Community Partners, Public Agencies	406,000 (Imported)	3% reduction in consumption of clothing, furniture, appliances and construction materials	($270)	
MW5E – Demonstrate City leadership in promoting reuse by shifting from single-use to reusable items in City operations and events.	Lead: City of Bend				
MW5F – Research models of and support the development of centralized materials exchange forums.	Lead: City of Bend Partners: Community Partners, Public Agencies				
STRATEGY*: MW6 - Encourage food waste prevention through outreach and education*					
MW6A – Conduct outreach campaigns that promote food waste prevention.	Lead: City of Bend Partners: Community Partners, Public Agencies	88,000 (Imported)	5% reduction in food waste generated from 2021 estimate	($1,300)	
STRATEGY*: MW7 - Promote low-carbon food choices*					
MW7A – Prioritize and promote low-carbon food options for City government events and meetings.	Lead: City of Bend	3,000,000 (Imported)	24% reduction in emissions from food	Not estimated	
MW7B – Conduct outreach campaigns that promote low-carbon food choices.	Lead: City of Bend Partners: Community Partners				

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Implementation Recommendations

The key to achieving the City's climate goals will be in the actual implementation of this Plan. Appropriate staffing and resources will be required to execute and maintain programs that can deliver meaningful emissions reductions. Furthermore, the City must create a mechanism through which to partner with community organizations and other potential partners to advance climate actions. The lack of such a mechanism has been a significant barrier in the first phase of the CCAP implementation. Implementation recommendations to ensure the CCAP is as successful as possible include:

1. **Establish a Permanent and Sustainable Funding Source:** Create a permanent and sustainable funding source to support implementation of CCAP projects and programs. This may involve creating a new revenue source. The funds would be used for programmatic expenses for outreach and education, new financial incentive programs, additional staff as needed, and funds for contracting out programs or initiatives. Multiple funding sources will be necessary for the CCAP, and different funding sources may be more appropriate for certain actions over others. City staff will continue to pursue a variety of funding sources for specific actions as appropriate including grants, public-private partnerships, and other public financing mechanisms, but a dedicated baseline funding source to support developing and maintaining programs will be essential to having success meeting climate goals.
2. **Create a Climate Action Partner Grant Program:** Develop a grant program to facilitate community partner-led CCAP action implementation. This program would provide grants to community-based organizations running programs that help achieve CCAP actions. This is an important aspect of implementing the CCAP because many of the actions are actions that the City does not have the expertise or the capacity to deliver to the community. The City must work with partners to deliver all CCAP programs and projects to the community and a Climate Action Partner Grant Program can allow the City to provide capacity-building support for partners implementing programs that meet CCAP objectives.

The 2025 Bend Community Climate Action Plan Update highlights the City's continued effort to address climate change through thoughtful strategies and collaboration. By refining actions to align with best practices and current conditions, this update ensures the CCAP remains effective and focused on meeting its goals. This ongoing work underscores Bend's commitment to advancing sustainability and supporting a resilient community for the future.

Appendix A. CCAP 2020-2024 Progress Report

Our Progress Since 2019

The original Community Climate Action Plan (CCAP), adopted in December 2019, outlined 20 strategies and 42 actions, setting ambitious goals for 2020 and beyond. This section highlights some of the major initiatives undertaken to implement the plan from its adoption through the end of 2024.

Snapshot of Progress

The table below illustrates the total number of actions in each focus area, along with the number of actions completed, in progress, and yet to be completed as of mid-2024. The City is dedicated to updating our progress every 3-5 years, as specified in the original CCAP. **69% of our CCAP actions are either in progress or completed,** while the remaining 31% are yet to be initiated.

Focus Area	# of Actions Not Yet Started	# of Actions in Progress	# of Actions Completed	Total # of Actions
Energy Supply	2	7	3	12
Energy in Buildings	3	7	2	12
Transportation	3	4	1	8
Waste and Materials	5	4	1	10
Total (# & %)	**13 (31%)**	**22 (52%)**	**7 (17%)**	**42**

Energy Supply

As of the end of 2024, 10 out of the 12 actions in the Energy Supply focus area have been completed or are in progress. The remaining 2 actions have not yet started.

Energy Supply Actions	Project Status
ES1 – Provide 100% renewable electricity supply to the community	
ES1A – Achieve a 100% renewable electricity supply	
ES2 – Contract for a natural gas offset program for community gas use	

ES2A – Develop a program that allows residential and commercial customers to offset their natural gas use	✓
ES3 – Expand distributed commercial and residential solar photovoltaics (PV)	
ES3A – Increase community education on renewable energy and available incentives	🕒
ES3B – Promote renewable energy incentives offered by utilities	🕒
ES3C – Create new incentive packages that increase the installation of renewable energy systems on residential and commercial buildings	✓
ES3D – Create revolving loan funds to finance renewable energy projects	✗
ES3E – Develop community solar projects that residents can subscribe to for access to offsite solar energy	🕒
ES3F – Pilot microgrid and battery storage projects	🕒
ES3G – Support and expand workforce development programs in renewable energy trades	✗
ES3H – Create a commercial, property-assessed clean energy program	✓
ES4 – Build/explore a biodigester at the wastewater treatment facility	
ES4A – Build a biodigester at the wastewater treatment facility	🕒
ES5 – Install solar panels on public buildings	
ES5A – Install solar panels on public buildings to demonstrate public sector leadership	🕒

Achieve a 100% renewable electricity supply (ES1A)

The City played a pivotal role in supporting the passage of **House Bill 2021** during the 2021 Oregon State Legislature session. This landmark bill significantly bolsters the City's climate action initiatives by establishing a **100% renewable electricity standard for investor-owned utilities by 2040.** Additionally, it mandates utilities to offer a **community green tariff,** enabling our community to voluntarily opt-in to a 100% renewable electricity supply ahead of the 2040 deadline. The bill also incorporates **crucial energy justice and equity measures,** enhancing statewide community engagement in energy planning.

The City will inherently benefit from the new **2040 renewable standard**, positioning us more favorably to meet our climate action objectives. The City also actively worked to promote the development of the **community green tariff program** across the state and are assessing its potential local implementation in Bend.

Natural Gas Offset Program (ES2A)

Due in part to City of Bend and Cascade Natural Gas collaboration on the development of the Bend CCAP, Cascade Natural Gas launched a natural gas offset program in early 2025 that would allow residential and commercial customers to voluntarily purchase gas offsets on their bill.

Regional Resource Recovery Alternatives Analysis (ES4A)

As a first step to explore the feasibility of using biogas at the City's water reclamation facility, The City of Bend conducted a **Regional Resource Recovery Alternatives Analysis**, focusing on extracting energy from hauled wastes such as fats, oils, and grease (FOG), septic waste, and brewery waste. A stakeholder committee was formed to collaborate on a project beneficial to other cities and regional partners. The study identified **three**

feasible and economically attractive alternatives, including two at the Bend Water Reclamation Facility and one at the County-owned Knott Landfill. These projects will be further explored in the **2025 Water Reclamation Facility master planning process.**

City-installed Solar Projects

The City has installed **four major solar arrays** on its facilities, with more projects in the pipeline. The existing projects include:

- **129 KW ground-mount system** at the Outback Water Filtration Facility (2020)
- **110 KW roof-mount system** at the Outback Water Filtration Facility (2020)
- **78.2 KW ground-mount system** at the Awbrey Butte Utility Site (2022)

The City is currently constructing a 600 KW solar system at the **Juniper Ridge Public Works Campus**, with construction wrapping up in late 2025. Solar installations will also be prioritized for any new City-owned buildings.

City Commitment to Electrification Facilities

In October 2024, the City adopted a resolution to construct **all new facilities as all-electric**, showcasing leadership in building decarbonization and establishing best practices. The first facility to meet this new standard will be the **Juniper Ridge Public Works Campus**, set for construction in 2025. A future City Hall is also planned to adhere to this standard.

Commercial Property Assessed Clean Energy (CPACE)Program (ES3H)

In 2022, Deschutes County established a CPACE program, which allows owners of eligible commercial property to obtain long-term, low-interest financing from private capital providers for certain qualified projects. Qualified projects include projects for energy efficiency, renewable energy, water conservation, and seismic rehabilitation improvements. This allows for a unique and compelling financing opportunity to encourage energy efficiency and renewable energy projects throughout Deschutes County.

Energy in Buildings

As of the end of 2024, 9 out of the 12 actions in the Energy in Buildings focus area have been completed or are in progress. The remaining 3 actions have not yet started.

Energy in Buildings Actions	Project Status
EB1 – Support policies that increase energy efficiency of buildings	
EB1A – Participate in code update processes and vote for advancing energy efficiency in codes	
EB1B – Develop and deliver outreach and education campaigns to promote net zero ready building standards	
EB2 – Improve uptake of voluntary energy efficiency projects in buildings	
EB2A – Increase community education on energy efficiency and available energy efficiency incentives	
EB2B – Promote energy efficiency incentives offered by utilities	
EB2C – Create new incentives and programs to expand energy efficiency projects in residential and commercial buildings	

EB2D – Create revolving loan funds to finance energy efficiency projects	✗
EB2E – Support workforce development programs in energy efficiency trades	✗
EB2F – Explore options for demand response programs	🕒
EB3 – Implement benchmarking and disclosure programs for energy performance	
EB3A – Develop a home energy score program	✓
EB3B – Develop voluntary disclosure and benchmarking programs for public and commercial buildings	✗
EB3C – Support and expand low-cost energy audit programs	🕒
EB4 – Promote smaller homes and denser housing options through incentives	
EB4A – Develop incentives that encourage private developers to build smaller housing options	✓

Home Energy Score (EB3A)

The **Home Energy Score Program,** adopted in December 2022 and effective from **July 1, 2023**, requires a Home Energy Score for any home sold in Bend. This score, similar to a vehicle's miles per gallon rating, assesses a home's energy efficiency using a standardized tool. The Environment and Climate Committee prioritized this program for the FY21-23 biennium, with a working group developing the policy and engaging the community from December 2021 to December 2022.

As of **July 1, 2023**, all publicly listed homes for sale in Bend must include a Home Energy Score report, helping buyers compare home efficiency and identify cost-effective upgrades. The data obtained through this program will help the City identify common energy efficiency needs and tailor programs effectively.

Statewide Advocacy (EB1)

The City supports various **energy efficiency and building code legislation** annually. In 2023, The City Council backed a bill to allow local adoption of the **Reach Code** as the minimum building code . Although the bill failed, the City remains engaged in related policy discussions and has supported various energy efficiency and building decarbonization bills in each legislative session.

Encourage Smaller Housing Development (EB4A)

The City has been working to promote diverse housing types, including **smaller and denser dwelling**, to meet housing and climate goals. On October 21, 2020, the City **updated housing codes to enable micro-unit and small lot developments**. Key updates include:

- **Micro-units**, defined as a one-room living space designed to include seating, a bed, bathroom, storage and a food preparation area, in several different zoning areas (medium density residential zone and higher densities)
- Permitting **small dwelling unit developments**, including single family detached units, ADU's, and duplexes in standard and medium density residential zones on lot sizes as small as 1,500 square feet in RS, RM and RM-10 districts
- **Zero lot line developments,** which allow single-family detached dwelling units, duplexes and accessory dwelling units to be constructed with a zero side setback while maintain a 10 foot setback on the other side

The code changes also expanded duplex permissions to comply with 2019 Oregon legislation (HB 2001). Recently, the City introduced a **free pre-approved ADU plan** to encourage ADU development.

Tax Increment Assistance Incentives (EB2C)

In 2024, the City established a Tax Increment Assistance for Housing Affordability Program, which provides multi-unit residential rental projects financial assistance from the Bend Urban Renewal Agency. To qualify for the incentive, eligible projects have minimum affordability requirements. Energy efficiency is incentivized through this program by creating a larger incentive for projects that meet both the affordability requirements and are also certified under an energy efficiency program, such as through Energy Trust of Oregon, LEED, Earth Advantage or something similar.

Transportation

As of the end of 2024, 5 out of the 8 actions in the Transportation focus area have been completed or are in progress. The remaining 3 actions have not yet started.

Transportation Actions	Project Status
T1 – Support the transition to electric vehicles (EVs) with an EV Readiness Plan	
T1A – Develop a plan that anticipates EV growth, determines necessary charging infrastructure to accommodate this growth, and defines mechanisms to encourage the expansion of public and private charging infrastructure	✓
T2 – Increase bike and pedestrian trips	
T2A – Prioritize Bend's Bike, Pedestrian, and Complete Streets Policies in the Transportation System Plan	◷
T3 – Increase transit ridership	
T3A – Create a Mobility Hub program to improve access to a wide range of travel options and support multimodal lifestyles	◷
T3B – Create high-capacity transit corridors	✕
T3C – Expand transit service coverage consistent with the regional transportation master plan	◷
T3D – Coordinate with school district to encourage use of public transit for getting to school	✕
T4 – Promote ride sharing	
T4A – Encourage the use of carpooling, vanpooling, and other modes of ride sharing	✕
T5 – Convert City and other public agency fleets to electric vehicles and alternative fuels	
T5A – Public agencies will convert fleets to electric and alternative fuel vehicles as total cost of ownership allows	◷

Bend Electric Vehicles Readiness Plan (T1A)

In 2022, the City created our **Electric Vehicle (EV) Readiness Plan**, providing a roadmap for widespread electrified transportation in Bend. The plan focuses on making sure everyone, particularly underrepresented and vulnerable communities, has access to charging stations. It includes a needs assessment to determine how many more charging stations are needed and outlines strategies to promote EV use. These strategies include public outreach and education, updating policies to encourage EV-friendly development, and adding more public EV charging

stations for residents and visitors.

City Fleet Conversion to Electric and Alternative Fuels (T5A)

The City has been making strides in converting its fleet to electric and alternative fuels. In 2018, the City had 0 hybrid or fully electric vehicles. Today, **16%** of the City's light and medium-duty fleet is hybrid (36 vehicles) or **fully electric** (eight vehicles), with an additional 20 electric vehicles planned by 2028.

The City started buying r**enewable diesel (R99) and biodiesel** to replace conventional diesel. R99 cuts greenhouse gas emissions by two-thirds compared to biodiesel and costs about the same. As of Spring 2024, 64% of the Water Services Department's diesel fuel needs and 7.5% of the Transportation and Mobility Department's fuel needs were met with R99, significantly reducing fleet emissions.

Encouraging Bicycle and Pedestrian Trips (T2A)

The City has been working to improve and expand bicycle and pedestrian infrastructure throughout the community in order to encourage community members to drive single occupancy vehicles less and bike or walk to their destinations more. The City has several specific bicycle and pedestrian projects underway and is also committed to improving bike and pedestrian safety on new roadway projects through Complete Streets designs.

Key Routes

The Bend **Transportation System Plan** includes a system of 12 Key Routes which are designed to be "low stress" for pedestrians and bicyclists, to provide safe and appealing connections to schools, parks, and other destinations as well as for cross-City travel. Examples include off street multi-use paths, buffered, separated, raised and/or painted bike lanes and widened sidewalks. Creating Key Routes is one of the projects supported by the $190 million voter approved general obligation (GO) bond voters passed in November 2020. The **Wilson Avenue Corridor Project** was the first GO bond project under construction and is the first Key Route being built. The Wilson project features Bend's first protected bike lanes and its first roundabout with protected bike lanes. The remaining 12 Key Routes will be built over time and will continually improve the safety for multimodal transportation in Bend.

Bend Bikeway Project

The **Bend Bikeway Project** creates one connected and protected North-South and one East-West key route by building upon and enhancing the existing transportation system to construct bike and pedestrian improvements that are continuous, easy to navigate, and as separated from traffic as feasible. The City has begun analysis and design of this project, which will rely on existing infrastructure as well as infrastructure that will be completed by other projects. The goal is to complete the portions of these routes by June 2025.

Midtown Connections and Streetscaping Project

The **Midtown Connections project** will make travel safer for all users on four key corridors and has a primary goal of improving bicycle and pedestrian safety and comfort between east and west Bend. A premier feature of the Midtown Connections project is a multimodal bridge on Hawthorne Avenue, called the **Hawthorne Bridge**. The bridge which will provide a key connection for bicycles and pedestrians across US97 and the BNSF rail line. The conceptual design for this bridge is underway. The Midtown Connections Project also includes bicycle and pedestrian improvements on three additional corridors: Greenwood Avenue, Franklin Avenue, and Second Street.

Mobility Hub Program (T3A)

Transit service is the responsibility of Cascades East Transit (CET), our local transit agency. In 2020, **CET completed its 2040 Transit Master Plan**, which identifies conceptual transit service throughout Central Oregon over the next 20 years. A major component of the Transit Master Plan is the development of a mobility hub system. Mobility

hubs are places designed to facilitate convenient, safe, and accessible connections to and between multimodal mobility services like public transportation. The plan for Bend local services is to transition the hub-and-spoke fixed route system to a more multi-central model, supported by various mobility hubs.

In 2021, a team of Cascades East Transit, the Bend Metropolitan Planning Organization, and the City of Bend received a grant to conduct a Mobility Hub Feasibility Study. The Feasibility Study took place though 2022 and resulted in the launch of a pilot program.

In addition, the City of Bend has formally adopted mobility hub language into their Development Code. Currently, the City of Bend leased its property to CET near Troy Field as the first Mobility Hub pilot site. This location will include a transit stop, signage, a shelter, lighting, and other potential modes of transportation such as bike-share.

CET is also working with partner agencies on a larger mobility hub site and has secured funding for design and construction for the site. There are two potential locations being considered for a larger mobility hub on both the north and south sides of town, one near US-97 and Ponderosa and the other near Cooley Road. CET is currently conducting outreach to determine if these sites should be developed as a larger Mobility Hub.

CET is also reconstructing Hawthorne Station to include more mobility hub elements.

Materials and Waste

As of the end of 2024, 5 out of the 10 actions in the Materials and Waste focus area have been completed or are in progress. The remaining 5 actions have not yet started.

Waste and Materials Actions	Project Status
W1 – Improve non-food waste recovery	
W1A – Improve recycling at multifamily residences	✗
W1B – Develop a recycling and waste reduction program targeting tourists	✗
W1C – Investigate and invest in facility and infrastructure upgrades to meet long term needs of solid waste system	🕒
W2 – Expand use of low-carbon concrete in City projects and new development	
W2A – Utilize low-carbon concrete mixes in City projects and create incentives to encourage developers to utilize low-carbon concrete	✗
W3 – Improve food waste recovery	
W3A – Expand curbside composting program	✓
W3B – Develop and deliver educational programs that teach and encourage residents to compost their food waste	🕒
W4 – Improve construction and demolition waste recovery	
W4A – Expand and develop new programs to increase recovery of construction and demolition materials	✗
W5 – Develop outreach and education materials for upstream consumption reduction	

W5A – Conduct outreach campaigns that promote waste prevention and reducing consumption	
W5B – Implement training programs for specific industries to prevent waste	
W6 – Develop programs that encourage food waste prevention	
W6A – Conduct outreach campaigns that promote food waste prevention	

Expansion of Curbside Compost (W3A)

In 2018, Bend's waste companies – Republic Services (then Bend Garbage), and Cascade Disposal – expanded curbside compost collection by allowing **all food waste** to be put in the organics bin. Prior to this, only vegetative food waste was accepted. This change has made it much easier for residents to compost and has reduced confusion about what can be composted, decreasing the amount of food waste being sent to the landfill. Both waste companies promote the food scraps collection program through their websites and occasional mailers.

- Republic Services:
  - **Residential and Commercial**
- Cascade Disposal:
  - **Residential**
  - **Commercial**

Community Innovation Fund (W5 and W6)

In 2023, the City supported an expansion of the **Community Innovation Fund**, a local grant program that empowers residents and businesses to develop creative waste reduction solutions. This program provides grants of up to **$5,000** for projects that promote waste reduction, reuse, recycling, and composting throughout Deschutes County. The City allocated approximately **$42,000** for both project support and administration, prioritizing initiatives that target f**ood waste reduction and multifamily recycling**—key strategies in the **Community Climate Action Plan.** The Community Innovation Fund is part of the **Rethink Waste Project**, a program of the Environmental Center.

Recycling Modernization Act (W1)

The **Recycling Modernization Act** (RMA), passed by the Oregon legislature in 2021, aims to update the recycling system, making it easier for the public to use, expanding access to services, upgrading sorting facilities, and creating environmental benefits. The Act introduces a new funding stream for local governments, funded by producers and manufacturers of packaged items, paper products, and food service ware.

The RMA requires cities to improve waste prevention and reduction outreach, expand recycling infrastructure, and align with the City's CCAP strategies. While most RMA requirements take effect in mid-2025, the **City of Bend is proactively updating its programs to comply**, accelerating the implementation of relevant CCAP strategies.

RecyclePlus (W1)

Cascade Disposal and Republic Services recently launched **RecyclePlus**, a new doorstep recycling service to collect recyclable items that cannot go in the blue commingled recycle cart (i.e., batteries, light bulbs, textiles, plastic film, Styrofoam/block foam and plastic clamshell). This program keeps more materials out of the landfill, supporting Bend's waste reduction goals. However, challenges remain—**in 2021, Bend's recycling diversion rate was 29%, a decrease from 33% in 2020.** There is room for improvement, and the City continues to develop policies and programs to enhance recycling participation and effectiveness.

Appendix B. 2021 Greenhouse Gas Emissions Inventory

CITY OF BEND

2021 COMMUNITY GREENHOUSE GAS INVENTORY

December 2022

Prepared by Good Company

TABLE OF CONTENTS

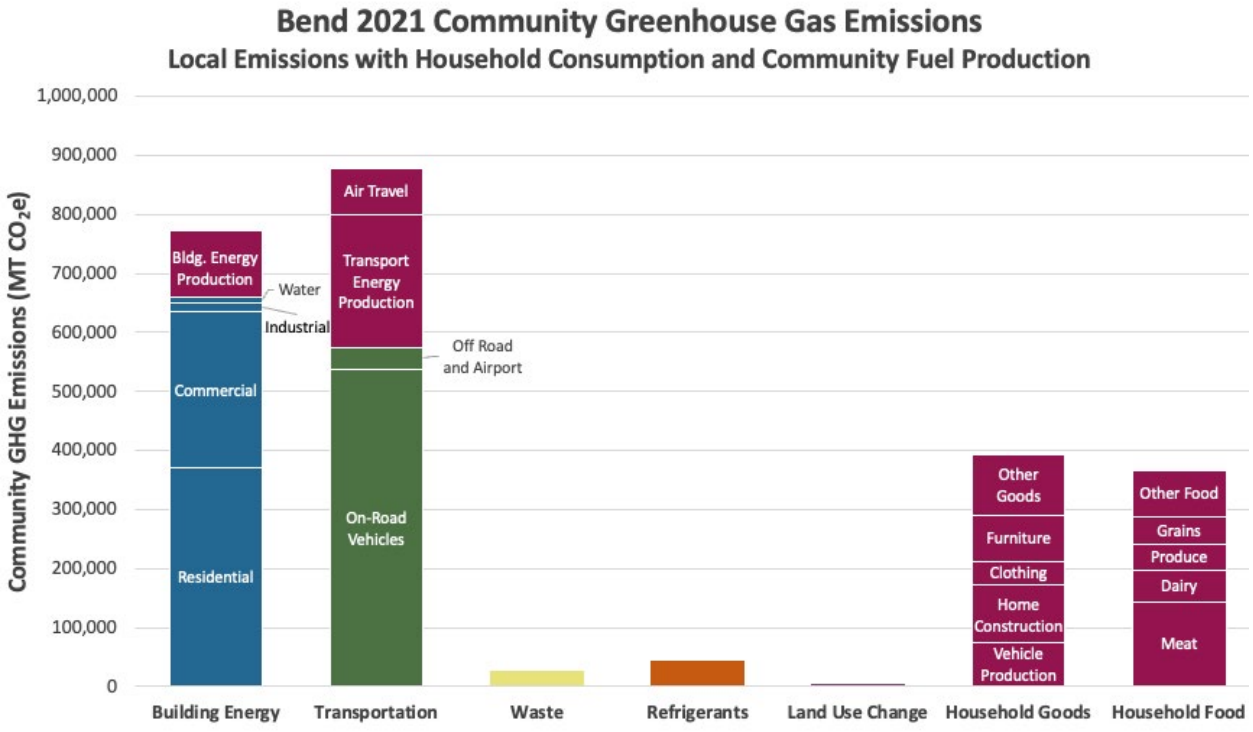
I. EXECUTIVE SUMMARY

This Greenhouse Gas (GHG) Inventory provides an update to the previous 2016 GHG Inventory as part of Bend's community emissions tracking system to measure progress toward the Community Climate Action Plan (C-CAP). As part of the climate action work, Bend has implemented two **climate targets: 40% GHG emissions reduction from 2016 by 2030** and **70% reduction from 2016 by 2050**.

The inventory follows internationally recognized community GHG inventory protocol and accounts for all significant sources of GHG emissions driven by activities taking place within the City's geographic boundaries.

- Bend's largest sources of **local (sector-based) emissions** include **building energy use (50%)** and **transportation (44%)**. For buildings, electricity is the largest source of emissions (73%); followed by natural gas (24%); and other fuels (3%). Smaller local sources of emissions include **refrigerant loss from buildings and vehicles (3%)** and **waste disposal (2%).** Lastly, **land use development emissions (<.5%)** were included – a newly available emissions source since 2016. See Figure 1.
- Beyond local emissions, the inventory also considers imported emissions from the production and **consumption of imported goods, food, and energy products**. When included, these emissions more than double Bend's community emissions. The largest sources include consumption of meat, clothing, furniture, construction materials, air travel, and upstream energy production.
- This report also forecasts Bend's future community emissions through 2050 based on existing climate policy. These policies are **expected to reduce local emissions by 64% in 2050 compared to 2016 – below the target of 70% reduction.**

Figure 1: Bend's 2021 Community GHG Emissions. Local emissions (primary colors) with imported emissions (magenta) *Note: this report uses market-based accounting for electricity.*



II. INTRODUCTION

The Intergovernmental Panel on Climate Change (IPCC), the United Nations body that regularly convenes climate scientists, has identified human activity as the primary cause of the global climate changes that have occurred over the past few decades and quickened in recent years. Consensus statements from the IPCC suggest that human-caused greenhouse gas emissions (GHG) must be reduced significantly to avoid the worst potential climate impacts on human communities and economies. According to IPCC, we need a decrease of around 45% in net emissions (compared to 2010) by 2040 and to reach net-zero by 2050 or sooner. The commonly referenced international goal to mitigate the worst climate impacts is to limit global average temperature increases to no more than 1.5-2°C relative to temperatures at the start of the industrial revolution. As of 2018, we have already passed the halfway point as average temperatures have increased by more than 1°C since the industrial revolution.

It's with this understanding and urgency that the City of Bend adopted its Climate Action Resolution (Resolution 3044), launching their climate action work, including conducting regular community greenhouse gas (GHG) inventories starting with a 2016 inventory to establish a baseline measurement, and recurring update inventories to measure progress against the *Bend Community Climate Action Plan*. A GHG inventory quantifies the GHG emissions associated with a specific boundary – such as the geographic boundary of a community or operational control within an organization – for a specific period of time such as a fiscal or calendar year. **This report summarizes the results of Bend's 2021 Community Greenhouse Gas (GHG) Emissions Inventory** and builds upon the results of the previously conducted FY 2016 inventory. A community emissions inventory considers many sources of emissions generated by the activities of residents, businesses, and government operations within a geographic boundary, including:

Building Energy use by residential, commercial, and industrial buildings and facilities represents a large source of community emissions. These emissions come from "tailpipes" during combustion of natural gas as well as fuels to generate electricity for use in Bend.

Transportation energy, and particularly on-road vehicle transportation, of passengers and freight also represents a large fraction of community emissions. Like building energy, transportation emissions are generated at the tailpipe.

Refrigerants are potent gases lost from transportation and building cooling systems. Refrigerants are powerful global warming gases. Therefore, relatively small losses have a large climate impact.

Waste disposal in landfills and wastewater treatment produces methane, of which a fraction leaks out to the atmosphere having a negative climate impact.

Land Use emissions are generated when land that had previously been a carbon sink or storage (such as forest) gets converted into another land type (such as development) that does not store or sequester carbon.

Household Consumption emissions that are generated outside of the community during the production of goods, food, energy and services that are consumed by residents of Bend. These emissions are large in scale but are more difficult to accurately measure over time compared to other sources of emissions included in the inventory.

Upstream Energy Production produces emissions from the energy used to extract and process, transport, and distribute raw materials into energy products as well as from the process emissions created during extraction. These emissions are in addition to the "tailpipe" emissions described above for Building Energy and Transportation.

III. INVENTORY BOUNDARIES

Geographic Boundary: City of Bend Urban Growth Boundary (UGB)

Time frame: Calendar year 2021

Protocol: Greenhouse Gas Protocol's *Global Protocol for Community-Scale Greenhouse Gas Emissions (GPC)*. The GPC is focused on Sector-based Emissions, also known as "local" sources of emissions. Bend's inventory also includes an estimate of the "imported" emissions embodied in community consumption of fuels, consumer goods, construction materials, food, and air travel. Emissions sectors and applicable sub-sectors included in the GPC are shown in Figure 2. See Appendix B for more details.

Scope 1	GHG emissions from sources located within the city boundary.
Scope 2	GHG emissions occurring because of the use of grid-supplied electricity within the City's geographic boundary. *This inventory uses market-based accounting.*
Scope 3	All other GHG emissions that occur outside the city boundary because of activities taking places within the City's geographic boundary.

Figure 2: Crosswalk of emissions sectors and Scope categories.

Emissions Sector / Sub-Sector	Included in Inventory	Scope 1	Scope 2	Scope 3
Building Energy				
Residential Buildings	•	✓	✓	
Commercial Buildings and Facilities	•	✓	✓	
Industrial Facilities	•	✓	✓	
Water and Wastewater Facilities	•	✓	✓	
Fugitive Emissions from Natural Gas Systems	•	✓		
Energy Generation Supplied to the Grid	•	✓		
Agriculture, Forestry, and Fishing	*NO*			
Fugitive Emissions from Coal Production	*NO*			
Transportation				
On-Road Passenger and Commercial Vehicles	•	✓	✓	✓
On-Road Freight Vehicles	•	✓	✓	✓
On-Road Transit Vehicles	•	✓	✓	✓
Off-Road Vehicles and Equipment	•	✓	✓	✓
Local Aviation	•	✓		
Waterborn Navigation	*NO*			
Waste				
Solid Waste Generated in City	•			✓
Wastewater Generated in City	•	✓		
Biological Treatment of Waste Generated in City	•			✓
Industrial Process and Product Use				
Refrigerants	•	✓		
Industrial Processes	*NO*			
Agriculture, Forestry, and Land Use				
Land Use Change	•	✓		
Livestock	*NO*			
Other Agriculture	*NO*			
Imported Emissions Sources				
Household Consumption of Goods and Services	•			✓
Upstream Energy Production	•			✓

NE = Emissions occur but are not reported or estimated - see justification in exclusions
NO = Activity or process does not occur within City

IV. INVENTORY RESULTS

LOCAL EMISSIONS

The Bend community generated **1.3 million MT CO_2e** of local, sector-based emissions. For sense of scale, this quantity of emissions is equivalent to the carbon sequestered annually by over 1.5 million acres of average U.S. forest – a land area about 66 times the size of the City of Bend.

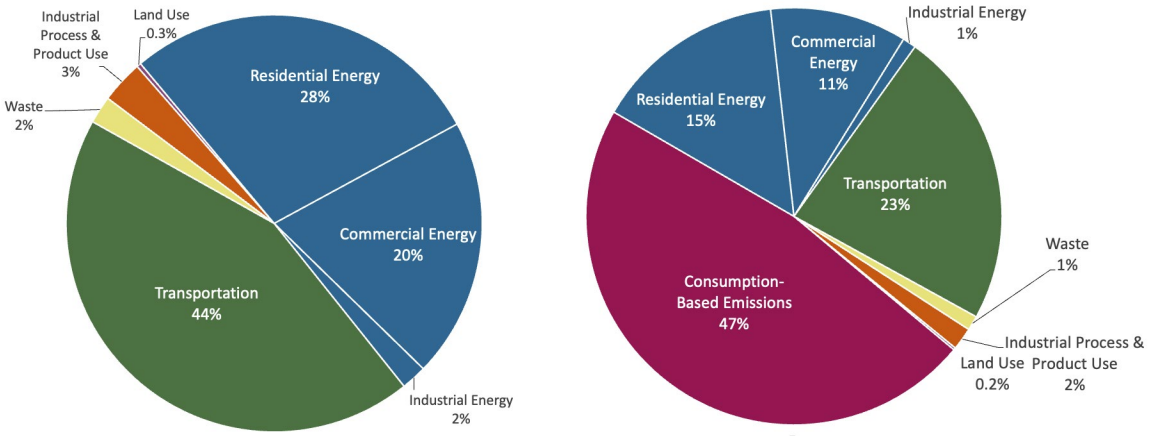
Bend's local emissions are similar in many ways to other communities around Oregon. These emissions are shown in Figure 3 on the left and come primarily from **transportation** gasoline and diesel combustion in vehicles to transport people and goods (green segment) and **building energy** combustion of natural gas and electricity use in buildings (blue segments) as well as emissions from **waste**, including landfill disposal of community solid waste and wastewater treatment (yellow). Emissions from **industrial processes and product** use include refrigerant gas loss from buildings and vehicles (orange). There is also a small segment of **land use change** emissions that came from development of green space.

IMPORTED EMISSIONS FROM HOUSEHOLD CONSUMPTION AND UPSTREAM ENERGY

In addition to accounting for local emissions, Bend's Community GHG Inventory also considers emissions that are generated outside of the community during the **production of goods, food, energy and services that are consumed** by residents of Bend. These imported emissions total an additional **1.2 million MT CO_2e**. The right side of Figure 3 compares the scale of local emissions versus emissions from household consumption and upstream fuels production[1].

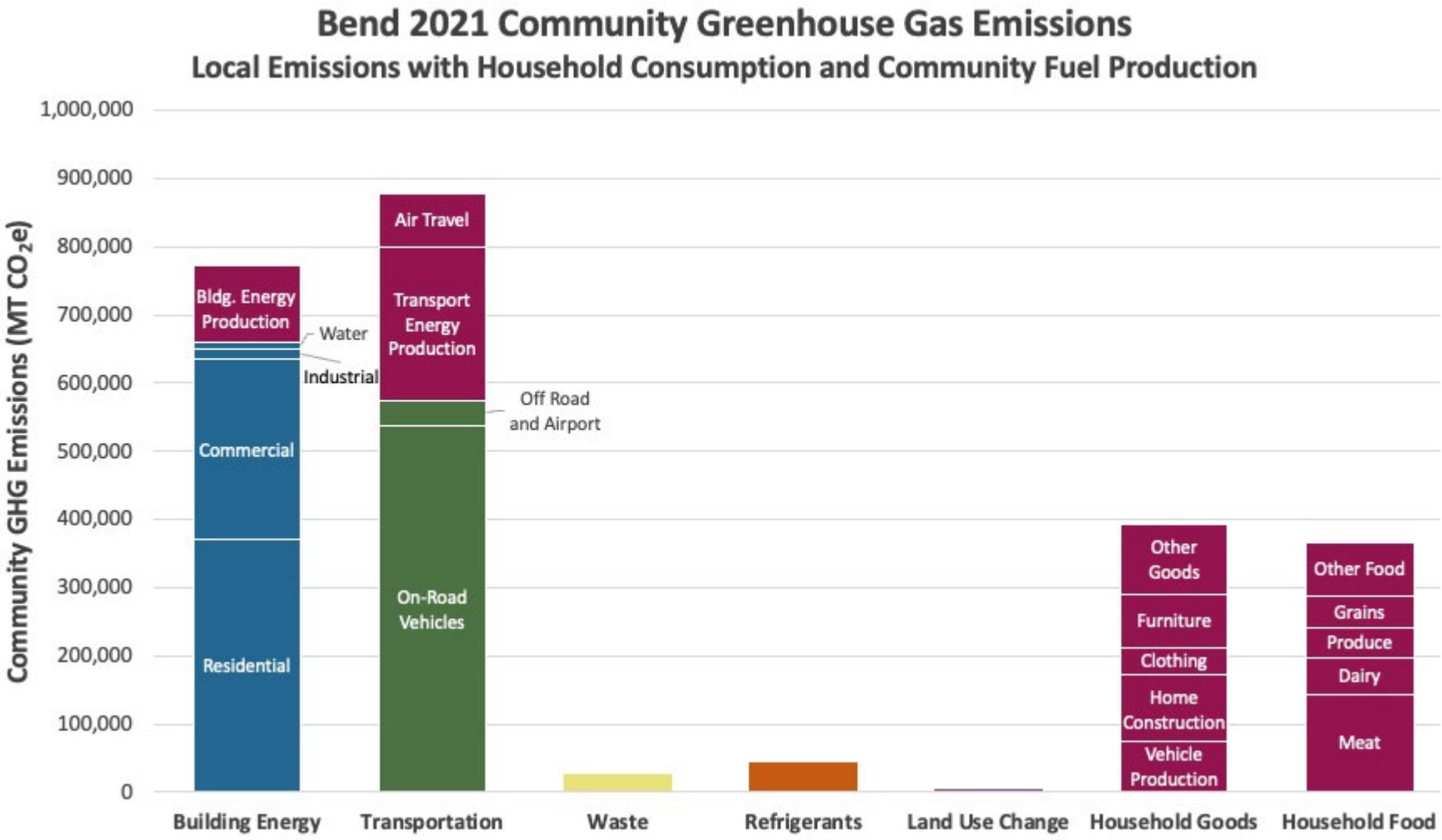
Household consumption of imported goods, food, and services is a significant source of community emissions. Within this category, emissions from the production of meat, furniture, clothing, and vehicles; home construction; and services produced outside of the city, such as health care and education. While the consumption of these goods and services represents a significant source of emissions, the production of these goods and services is occurring outside of the City of Bend. Therefore, these are considered imported emissions and the community has less control over these emissions. That said – the community does control demand for various types of products which presents opportunities to mitigate imported emissions.

Figure 3: Bend's 2021 Local GHG Emissions (left) and Local + Imported GHG Emissions (right)



[1] Local emissions account for "tailpipe" emissions from the combustion of fuels. There are also imported "upstream" emissions that account for the energy and process emissions during extraction and refinement of fuels.

Figure 4: Detailed summary of local emissions by sector (primary colors) with imported emissions from household consumption of goods, food, and energy and air travel (magenta).



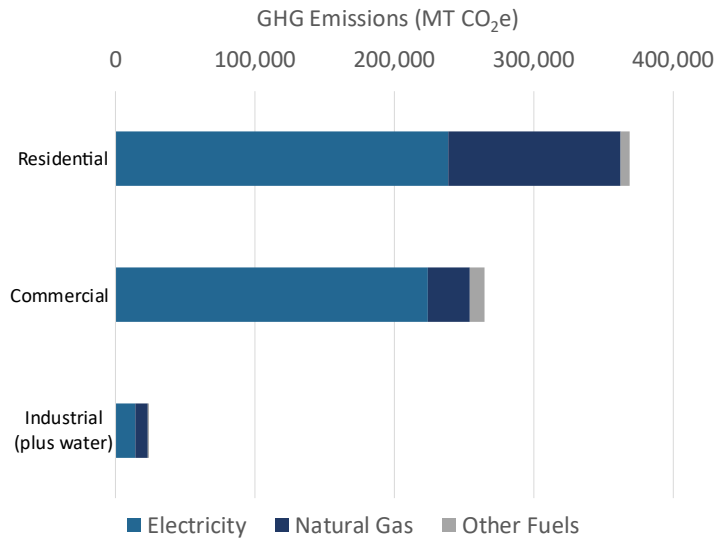
Note: Figure 4 presents market-based emissions for electricity. Location-based emissions details are included in Appendix A. Other Goods include electronics, toys, personal care products, cleaning products, printed reading materials, paper, office supplies, and medical supplies.

DETAILED RESULTS

Building Energy

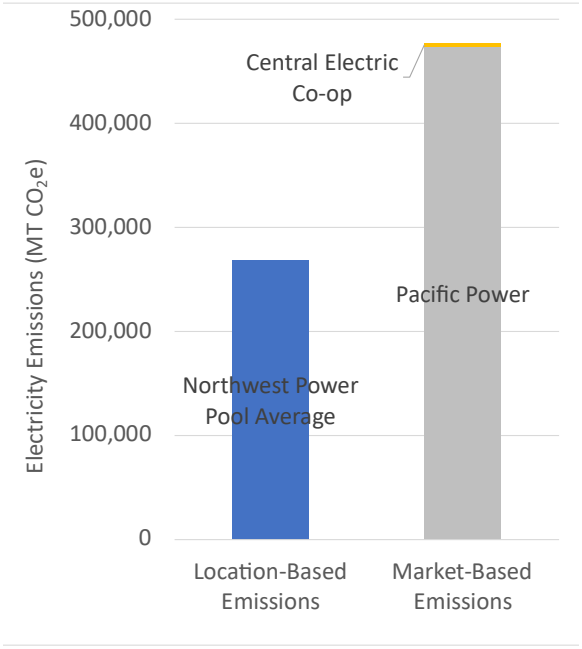
Electricity and natural gas use by the residential and commercial sectors are the largest source of local emissions with **over 650,000 MT CO_2e**. In Bend, residential homes have a larger emissions impact than commercial businesses, and industrial energy use is small by comparison. By energy type, electricity had the largest impact (73% of total building energy); followed by natural gas (24%); and other fuels (3%). Figure 5 shows building energy emissions broken down by sub-sector and energy type.

Figure 5: Comparison of stationary energy use, by sub-sector and energy type.



This report uses ***market-based accounting for electricity emissions,*** which are based on the GHG intensity of electricity contracts with local utilities. Bend's market-based emissions are much larger than emissions using the location-based method (as shown in Figure 6). Pacific Power's electricity generation from coal in 2021 is the major driver of this difference. Conversely, Central Electric Co-op (CEC) represents a very small fraction of market-based emissions as its contracts with Bonneville Power Administration are largely served by low-GHG hydroelectric and nuclear power. The market-based method also accounts for community participation in utility green power programs. In 2021, Pacific Power's residential, commercial, and industrial customers voluntarily purchased 15% zero GHG renewable electricity which decreases Bend's market-based emissions. Location-based accounting emissions are available in Appendix A.

Figure 6: Comparison of location-based and market-based electricity emissions



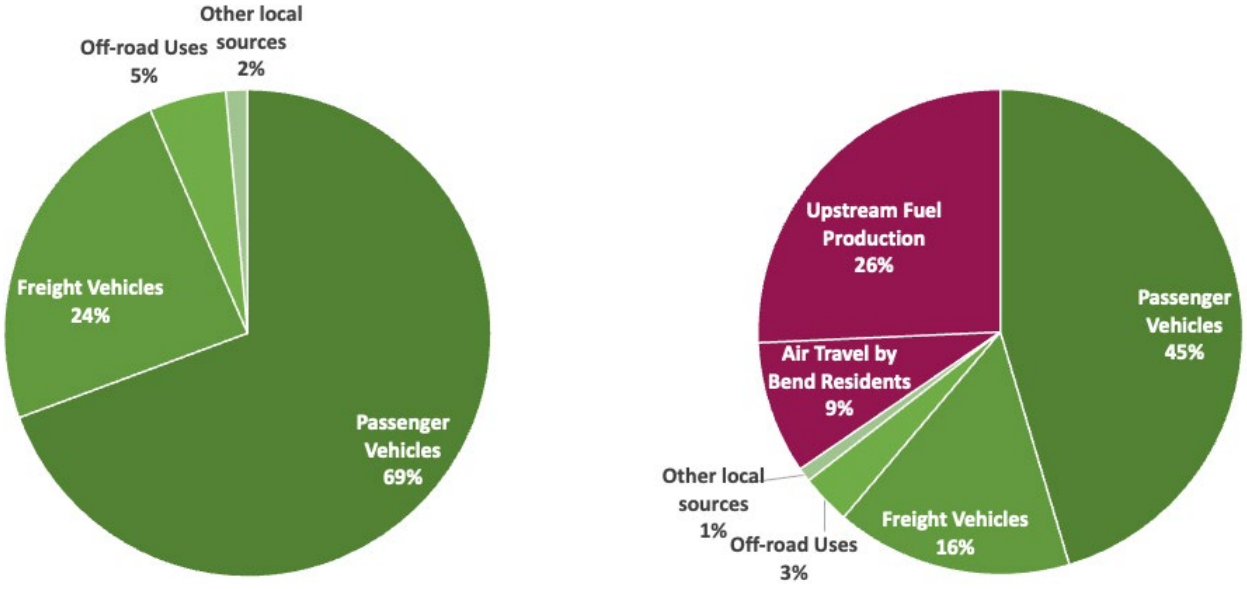
Transportation

The transportation sector is Bend's second leading source of emissions **nearly 575,000 MT CO_2e**. Local, on-road transportation of passengers makes up the overwhelming majority of these emissions (as shown in Figure 7). On-road emissions originate largely from residential-owned passenger vehicles combusting gasoline (E10). Freight vehicles also contribute a significant share of emissions, primarily combusting diesel (B5).

Off road equipment, which is dominated by construction equipment but also includes recreational vehicles, emit about 5% of local emissions. Other local sources include Bend airport aviation fuel use (making up just over 1% of transportation emissions) and transit, airport ground transportation, and electric vehicles each making up <0.1% of the total emissions.

In addition to local emissions, there are also imported emissions from air travel by Bend households, and upstream emissions from gasoline and diesel fuel production – for more information, see *Imported Emissions from Consumption of Goods, Food, and Air Travel* on page 10. Unlike local transportation emissions which are primarily calculated from fuel sales, air travel emissions are estimated based on household income data. While Bend does have a small municipal airport, these emissions are from Bend residents departing from any airport, regardless of airport location.

Figure 7: Bend's 2021 local transportation GHG emissions in green (left) and local + imported GHG emissions with air travel and upstream fuel production in magenta (right)



Solid Waste & Wastewater

Solid Waste and Wastewater emissions total **less than 30,000 MT CO_2e** – about 2% of local emissions. Local haulers send landfilled waste to Knott Landfill and local composting facilities. These landfill emissions are estimated to total roughly 27,000 MT CO_2e.

Wastewater is processed by the City of Bend, and 6,370 septic systems are located in the city. Total wastewater process emissions are estimated to total about 1,200 MT CO_2e.

Refrigerants

Refrigerant emissions are fugitive emissions; unintentional emissions, leaks, or discharges of gases and vapors from pressurized cooling and refrigeration systems that have a large climate impact, ranging from a few hundred to over 20,000 times the Global Warming Potential of an equivalent weight of carbon dioxide depending on the gas.

Refrigerant loss from residential and commercial buildings and vehicle air conditioning and refrigeration equipment are the only local source of Industrial Process and Product Use emissions. These sources are estimated using state per capita data, downscaling from emissions reported in the State of Oregon's most recent GHG Inventory, and are estimated at about **43,000 MT CO_2e**. Within the State of Oregon, sources of residential, commercial, and transportation refrigerant emissions (in DEQ's inventory as High Global Warming Potential gases) have grown by 21% since 2009.

Land Use Changes

Land use change emissions come from converting land that stores carbon into land that stores less or no carbon. This could come from converting forest into farmland or, in the City of Bend's case, it comes from developing previously undeveloped space. In 2021, 443 acres were converted within the City of Bend from undeveloped spaced to developed space, resulting in roughly **4,000 MT CO_2e** of emissions.

Imported Emissions from Consumption of Goods, Food, and Air Travel

Bend's inventory goes beyond protocol requirements to include known large sources of Other Scope 3 Emissions, described in this report as **Imported emissions** – household consumption of goods and services; air travel; and upstream emissions for production of fuels used by the community. For 2021, these emissions totaled **nearly 1.2 million MT CO_2e.**

Imported emissions are not currently included in the protocol due to limitations related to accurately accounting for these emissions over time at the community level.[2] While these accounting limitations are real, the scale of consumption-based emissions is large enough to warrant inclusion in community climate action work. Oregon Department of Environmental Quality (ODEQ) highlighted the importance of consumption-based emissions in the State of Oregon's Greenhouse Gas Inventory. The most recent version of Oregon's inventory (released in May 2018) shows that sector-based emissions are on a downward trend, but that consumption-based emissions increased by 10% between 2010 and 2015.

This category includes emissions from the production of imported food, furniture, clothing, vehicles, home building materials, and more consumed by Bend residents that are produced outside of the community. While household consumption represents a significant source of emissions, these products, and therefore emissions, are imported and so the community has less control over the energy sources and efficiency of production. That said – the community does control demand for various types of products which presents mitigation opportunities. The imported emissions that are considered in this inventory include: production of goods and food, all of the upstream emissions associated with energy and fuel production and transport, and air travel by Bend residents, regardless of where that travel originates. Figure 8 provides details and shows that the largest sources of imported emissions include transportation and building fuels, meat and other foods, construction materials, air travel, and furniture.

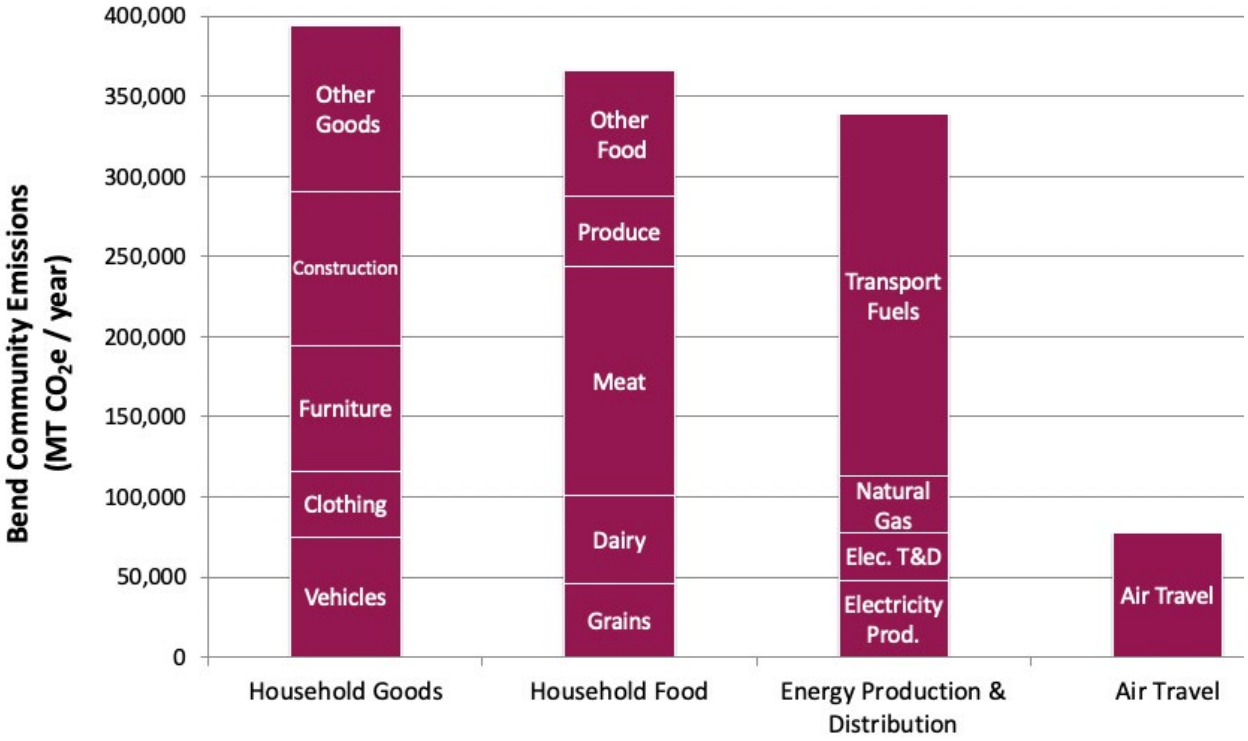
[2] The GPC authors; C40 Cities; and Oregon Department of Environmental Quality are all currently working to develop tools that will allow for more accurate community tracking of these emissions in the future

Household Goods: Emissions from extraction, manufacture, and transportation of raw materials into final products such as construction, automobile, furniture, clothing, and other goods.

Household Food: Emissions from agricultural (energy for irrigation, production of fertilizers, methane emissions from livestock, etc.), transportation of raw materials and finished products emissions. Categories included are cereal, dairy, meat, produce, and other foods.

Energy (Fuel Production & Distribution): Process and energy emissions from the extraction and production into usable fuel products (e.g. electricity from household outlets, gasoline pumped into cars, natural gas combusted by furnaces, etc.). These upstream emissions are considered at the community-scale for electricity, natural gas, gasoline, and diesel.

Figure 8: Bend's Scope 3 emissions by category



ODEQ's Materials Management program is currently focused on identifying the most effective actions to address consumption-based emissions. These actions include avoiding wasted food; the recovery and reuse of building materials; and lifespan extension of consumer goods with repair, reuse and purchasing durable goods.

V. EMISSIONS FORECAST TO 2050

In order to effectively plan for community GHG mitigation actions, it is useful to conduct an emissions forecast which considers long-term emissions trends based on existing local, state, and federal policies and programs, utility projections, and population growth based on projected population growth from Portland State University's Population Research Center.

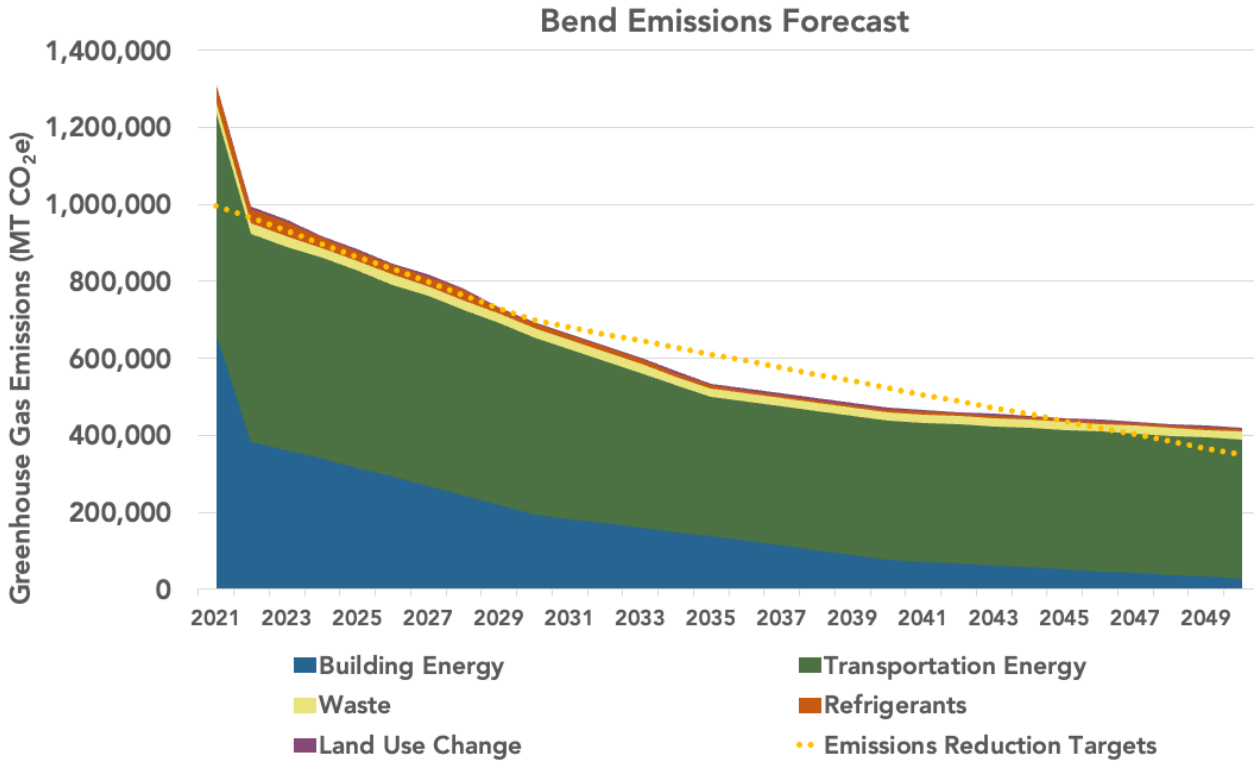
Figure 9 below shows the following emissions scenarios:

- **Bend's Emissions Targets:** The orange dotted line represents Bend's GHG emissions targets of 40% reduction in emissions compared to a 2016 baseline by 2030, and 70% reduction in emissions by 2050.
- **Existing Policy Forecast:** The stacked areas show the emissions reductions expected from existing local, state, utility, and federal policies.

The policies modeled in the forecast have significant GHG reduction impacts, particularly in the building and transportation energy sectors. If implemented as planned and/or required by law, these policies are forecast to reduce emissions by 40% compared to 2016 community emissions by 2030 **and 64% by 2050 – exactly meeting the 2030 target but just short of the 70% reduction by 2050 target**. The largest sources of forecasted emissions reductions come from Oregon's Renewable Portfolio Standards for electricity and Clean Fuel Program for natural gas. Oregon's Clean Fuel Program is also expected to reduce transportation emissions.

This forecast is based on **best estimates from available data and perfect implementation** from the policies described. **Actual emissions may be different and highlights the importance of working with energy distributors and stakeholders to create the desired outcomes.**

Figure 9: Estimated future emissions reduction based on existing policies.



Policies considered in the Existing Policy Forecast scenario include:

Building energy

- Oregon's Clean Energy Targets and Renewable Portfolio Standard (Pacific Power electricity only)
    - Zero-emissions electricity by 2040 for Pacific Power with intermediate targets (80% reduction by 2030, 90% reduction by 2035)
- PacifiCorp's Integrated Resource Plan
    - Assumed efficiencies and growth in electricity consumption
- Oregon Climate Protection Program
    - 90% reduction in natural gas and other fossil fuels by 2050

This modeling includes required reductions in electricity emissions intensity, expected growth in electricity use, and required reductions in total fossil fuel suppliers (for building energy emissions). The steep drop for 2022 is due to a linear decrease assumption for all applicable building energy emissions. It is unknown what the exact emissions from building energy will be each year, particularly electricity emissions intensity.

Transportation energy

- Oregon Clean Fuels Program
    - Assumed 37% emissions reduction by 2035 for all gasoline and diesel blends

While many factors and policies will shape transportation emissions, the Oregon Clean Fuels Program is the most comprehensive and robust, and models required reductions in Oregon, primarily from gasoline and diesel importers. The transition to widespread Electric Vehicles through the adopted Advanced Clean Cars II rule for electric and zero-emissions vehicles will also undoubtedly change transportation emissions in the future, but the exact impacts are unknown and therefore not modeled in the forecast.

Waste

- Oregon SB263 for Waste reductions
    - Assumes a diversion rate of 15% below 2016 by 2025, and 40% by 2050.

This state policy aims to reduce food waste along with other recyclable and reusable materials, which will in turn reduce landfill emissions.

Refrigerants

- American Innovation and Manufacturing (AIM) Act for Refrigerants
    - A phased step-down in production and consumption of refrigerants: 10% by 2022, 40% by 2024, 70% by 2029, 80% by 2034, and 85% by 2036.

This federal policy will limit the production and sale of high-GWP refrigerant gases, known as Hydrofluorocarbons (HFCs).

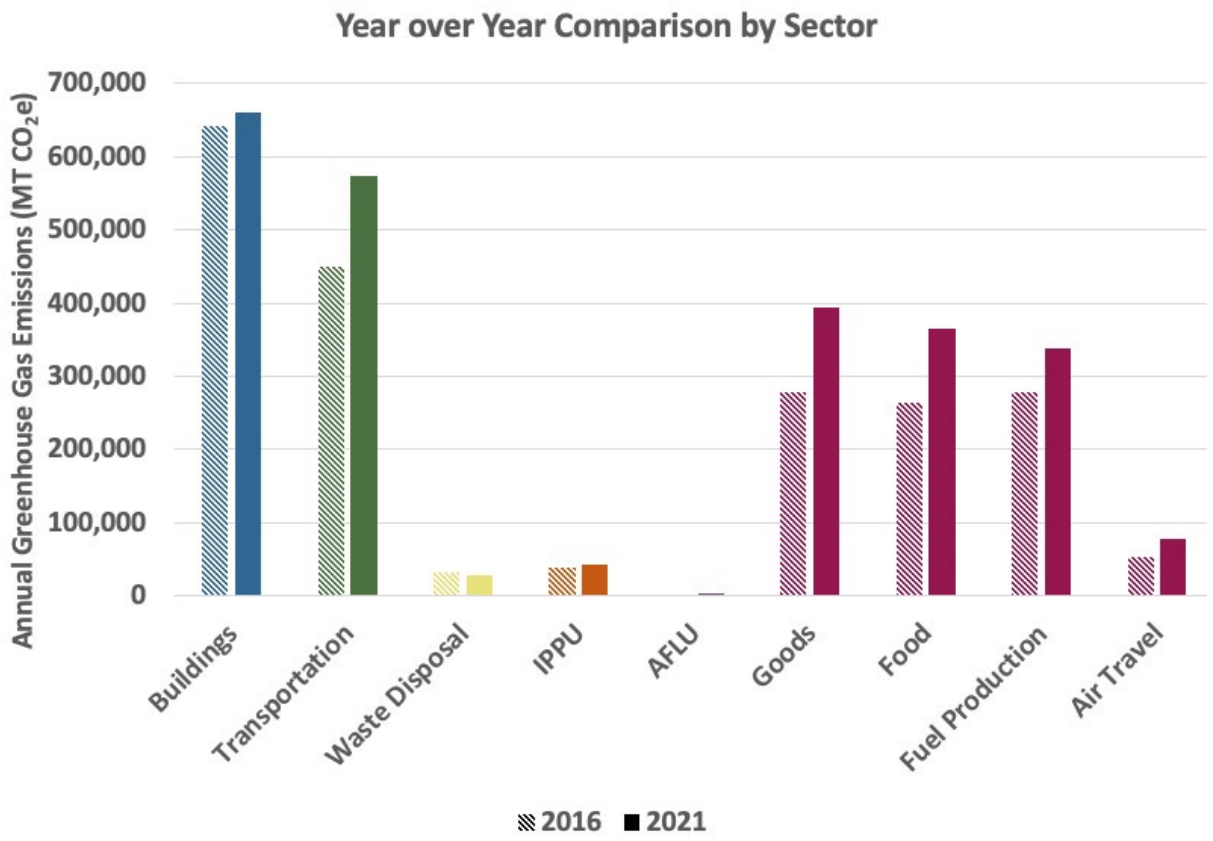
Land Use Change

Not modeled due to insufficient data and a very small emissions source.

VI. 2016 UPDATES AND COMPARISON

Figure 10 shows a year over year comparison total community emissions, using updated values for the 2016 inventory. New data was available to improve the 2016 inventory, primarily with fuel sales data from Oregon Department of Transportation. Additionally, market-based accounting was selected for reporting as it's most compatible with community targets and forecasting. For these reasons, the 2016 GHG inventory was redone. Notable changes, context, and 2021 comparisons are described below.

Figure 10: Comparison of Bend's community emissions from 2016 to 2021



NOTABLE CHANGES FROM PREVIOUS DATA AVAILABILITY TO CURRENT:

- **All data was recollected** for calendar year 2016 instead of fiscal year 2016, as available.
- **All data was recalculated** using Good Company's Carbon Calculator for Communities (G3C-Community) with updated emissions factors for all fuels as available.
- **All electricity emissions were recalculated** to show market-based electricity accounting, per best practices when combined with community climate targets, reflecting local utilities and market purchases (including renewables, e.g. RECs).
- **Transportation emissions data changed** from community VMT modeling to fuel sales reporting from Oregon Department of Transportation (except airport and transit emissions). This data is preferred for multiple reasons, primarily due to the quality, consistency, and availability of data over time. However, ODOT reporting has improved over the years, and it is unknown if 2016 fuel quantities are lower due to lower sales or incomplete data.
- **Land use change data** was previously unavailable and is included for 2021.

Table 1: Emissions in 2016 versus 2021

Inventory Year	Building Energy MT CO_2e	Transportation MT CO_2e	Waste Disposal MT CO_2e	Refrigerants MT CO_2e	Land Use Change MT CO_2e
2016	641,490	449,307	33,603	39,370	n/a
2021	660,446	574,586	28,016	43,440	4,329
% Difference	+3%	+28%*	-17%	+10%	n/a

Inventory Year	Goods Production MT CO_2e	Food Production MT CO_2e	Fuel Production MT CO_2e	Air Travel MT CO_2e
2016	278,523	263,569	279,364	52,570
2021	393,802	365,624	338,460	77,561
% Difference	+41%	+39%	+21%	+48%

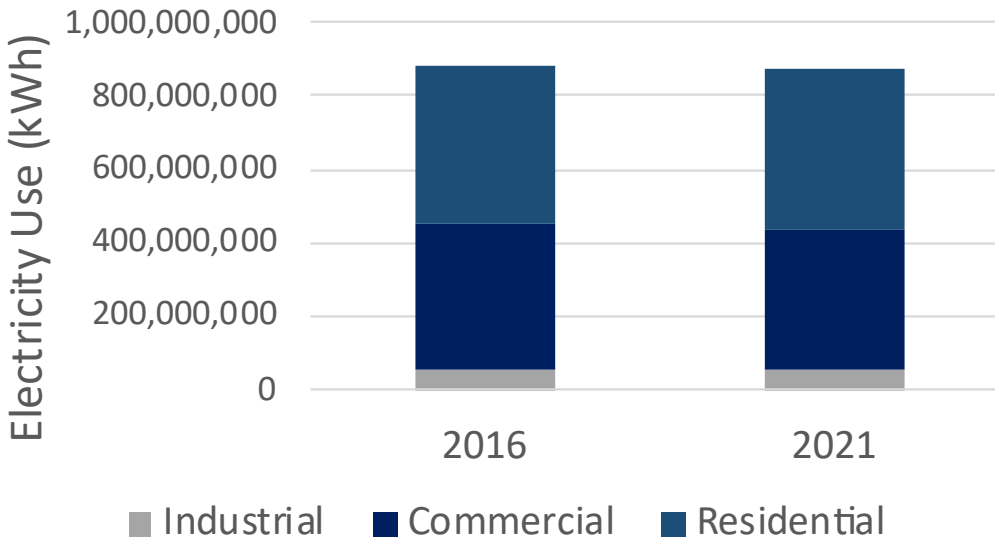
Inventory Year	Local Emissions Total MT CO_2e	Per capita MT CO_2e	Imported Emissions Total MT CO_2e	Per capita MT CO_2e	Community Total MT CO_2e	Per capita MT CO_2e
2016	1,163,771	**13.9**	874,025	**10.5**	2,037,796	**24.4**
2021	1,310,817	**12.8**	1,175,447	**11.5**	2,486,264	**24.4**
% Difference	+13%	**-8%**	+35%	**+10%**	+22%	**-0.2%**

* Fuel sales data is not confirmed to be complete for 2016, but is the most accurate available. It is unknown if 2016 fuel quantities are lower due to lower sales or incomplete data. The largest increase in fuel sales was for diesel blends.

BUILDING ENERGY CHANGES

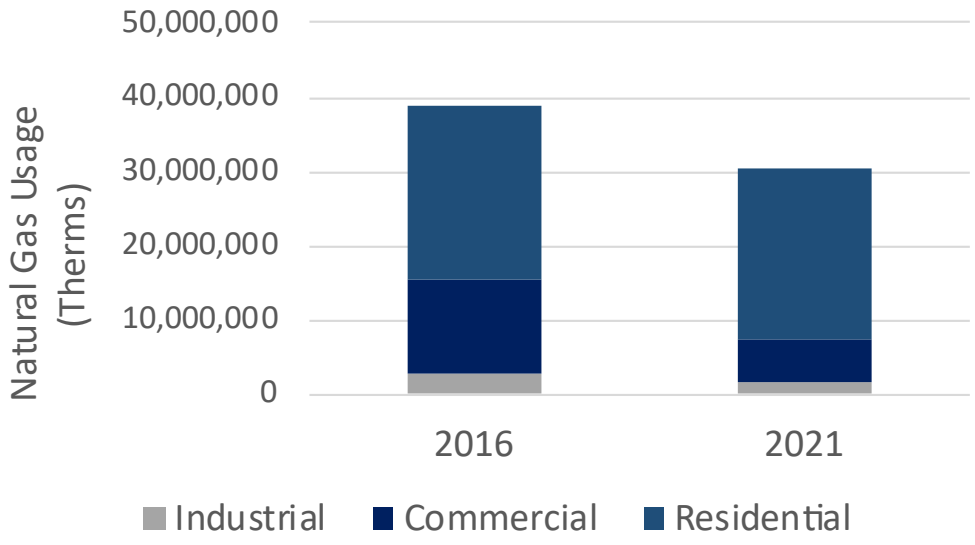
Total community electricity use decreased by 1.5% between 2016 and 2021, with residential sector use increasing by 1.3% during the period and commercial sector use decreasing by 5.7% (see Figure 11). Industrial electricity use increased by 11.2%, but this was a relatively small part of the overall usage.

Figure 11: Bend electricity use (in MWh), by sub-sector for 2016 and 2021



Total community natural gas use decreased by 21.3% between 2016 and 2021, with residential sector use decreasing by 0.5%, the commercial sector decreasing by 55.4% (accounting for the bulk of the savings), and industrial use decreasing by 40.5% (see Figure 12).

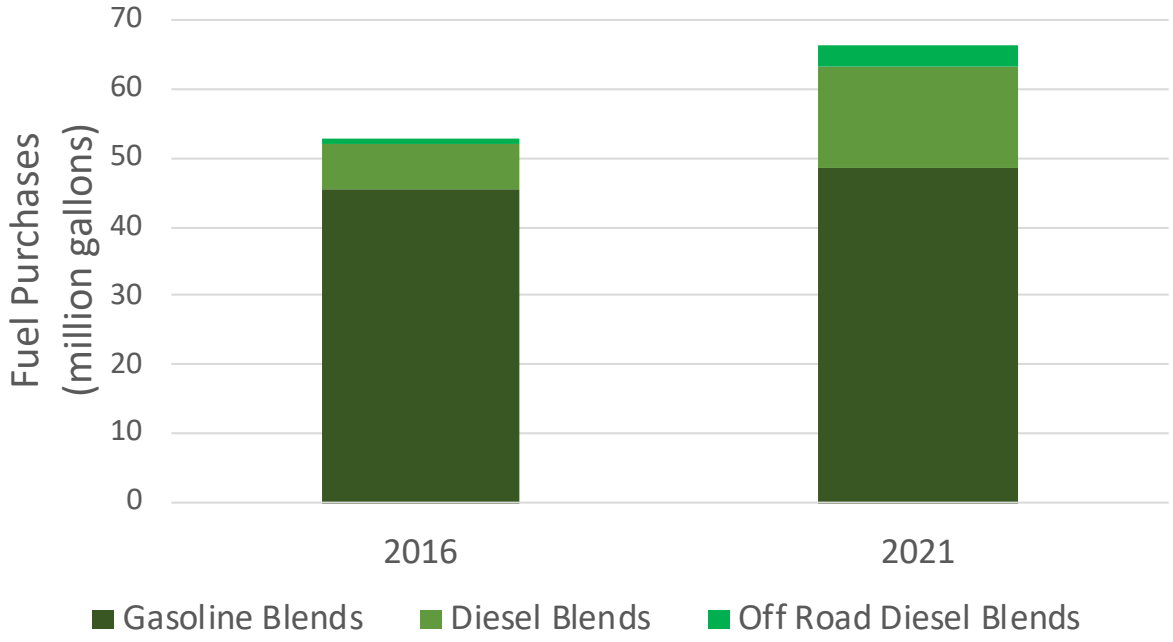
Figure 12: Bend natural gas use (in therms), by sub-sector for 2016 and 2021



TRANSPORTATION ENERGY CHANGES

All fuel sales increased between 2016 and 2021, but the growth was especially notable in diesel fuel. Gasoline purchases increased by 7%, less than population growth (18%), but on-road diesel increased by 125%, while off road uses increased by 284%. Diesel therefore accounts for almost all the increase in vehicle fuel emissions, but as noted in Table 1, 2016 fuel data is likely to be incomplete.

Figure 13: Bend fuel purchases (in million gallons) from 2016 to 2021



APPENDIX A: SUMMARY OF DATA

Figure 14: Summary Table of Bend 2021 Community Emissions

**See page 8 for a discussion of location-based and market-based electricity emissions*

Emissions Sector / Sub-Sector	2021 Emissions (MT CO_2e)		Notes
	Location-based	Market-based	
Building Energy	**451,696**	**660,446**	
Residential Buildings			*Location-Based accounting is based on the carbon intensity (CI) of regional electric grid, Market based accounting is based on the CI for local utilities and customer purchases of green energy.*
Electricity	*143,232*	*238,894*	
Natural Gas	*123,129*		
Other Fuels	*6,310*		*Incluces propane and fuel oil use*
Commercial Buildings and Facilites			
Electricity	*111,966*	*224,013*	
Natural Gas	*30,212*		
Other Fuels	*10,183*		*Includes propane and fuel oil use*
Industrial Facilities			
Electricity	*8,739*	*5,920*	
Natural Gas	*8,456*		
Water and Wastewater Energy	*8,097*	*11,957*	*Includes electricity, fuel oil, and propane*
Fugitive Emissions from Natural Gas Systems	*1,371*		
Transportation	**574,368**	**574,586**	
On-Road Passenger and Commercial Vehicles	*398,584*	*398,801*	*Includes gasoline and electric vehicles*
On-Road Freight Vehicles	*138,351*		*Diesel vehicles*
Known off-road uses	*29,355*		
Transit	*543*		
Bend Airport	*7,537*		*Local airport emissions only*
Waste	**28,016**		
Solid Waste Generated in City	*26,847*		
Wastewater Generated in City	*167*		*Process emissions only - energy use included in Stationary*
Biological Treatment of Waste	*1,002*		
Industrial Process and Product Use	**43,440**		
Refrigerants	*43,440*		
Agriculture, Forestry, and Land Use	**4,329**		
Land Use Change	*4,329*		
Imported Emissions Sources	**1,139,478**	**1,175,447**	
Household Consumption			
Goods	*393,802*		*Includes production emissions for imported construction materials, clothing, furniture, vehicles, and other goods*
Food	*365,624*		
Air Travel	*77,561*		*Air travel by residents regardless of airport*
Upstream Energy Production			
Transportation Fuels	*225,531*		
Natural Gas	*35,357*		
Electricity	*41,604*	*77,572*	*Includes Fuel Production and Transmission & Distribution loss*
Local Emissions	**1,101,849**	**1,310,816**	
Per Capita	**10.8**	**12.8**	
Local + Imported Total Emissions	**2,241,327**	**2,486,263.2**	
Per Capita	**22.0**	**24.4**	

APPENDIX B: METHODOLOGY OVERVIEW

The inventory accounted for all seven Kyoto gases, but only four were relevant: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and hydrofluorocarbons (HFC). It is important to note that the data available for the two inventory years was not identical; for example, the 2016 inventory included a more detailed breakdown of transportation emissions, while the 2021 inventory included emissions from land use conversion. Some 2016 data points were updated accordingly, primarily transportation fuel sales instead of VMT modeling.

Notable changes from previous data availability to current:

- **All data was recollected** for calendar year 2016 instead of fiscal year 2016, as available.
- **All data was recalculated** using Good Company's Carbon Calculator for Communities (G3C-Community) with updated emissions factors for all fuels as available.
- **All electricity emissions were recalculated** to show market-based electricity accounting, per best practices when combined with community climate targets, reflecting local utilities and market purchases (including renewables, e.g. RECs).
- **Transportation emissions data changed** from community VMT modeling to fuel sales reporting from Oregon Department of Transportation (except airport and transit emissions). This data is preferred for multiple reasons, primarily due to the quality, consistency, and availability of data over time. However, ODOT reporting has improved over the years, and it is unknown if 2016 fuel quantities are lower due to lower sales or incomplete data.
- **Land use change data** was previously unavailable and is included for 2021.

Protocols and Tools

This inventory follows Global Protocol for Community-Scale Greenhouse Gas Emissions Inventories (GPC) by Greenhouse Gas Protocol (GHGP). This inventory also follows GHGP's Scope 2 Guidance for location-based and market-based electricity emissions accounting and ICLEI's US Community Protocol for guidance on calculation of consumption-based emissions.

All community GHG emissions presented in this report are represented in metric tons of carbon dioxide equivalent (MT CO_2e). Quantities of individual GHGs are accounted include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), HFCs, CFCs, PFCs, and sulfur hexafluoride (SF_6) as applicable per the Kyoto Protocol. All GHG calculations use the global warming potentials (GWP) as defined in the International Panel on Climate Change's 5th Assessment Report (IPCC AR5).

G3C-Community and Audit Trail

Good Company's carbon calculator tool *G3C – Community* was used for emissions calculations. Emissions are documented in the Inventory Audit Trail. G3C – Community is an Excel-based calculator that documents all activity data; emissions factors; and emissions calculations used in the inventory. The audit trail catalogs all data, calculation, and resource files used to complete the inventory. These resources are highly detailed and will allow for those conducting future inventories to fully understand and replicate the methods used in this inventory.

Data Collection

Good Company worked with Cassie Lacy, Project Manager for the City of Bend to collect the data required to calculate emissions. City, County, and State staff members as well as utilities that serve the Bend community graciously provided data and expertise.

Table 2: Summary of Inventory Exclusions

Emissions Sector / Sub-Sector	Justification for Exclusion
Stationary Energy	
Agriculture, Forestry, and Fishing	No significant activity identified within City.
Fugitive Emissions from Coal Production	Not occurring.
Industrial propane and fuel oil	Data not available.
Transportation	
Waterborn Transportation	Included elsewhere; no significant activity identified within City but would be part of fuel sales reported.
Rail	Data not available.
IPPU	
Industrial Processes	No significant activity identified within City, per EPA FLIGHT database and Oregon DEQ reporting facilities.
AFLU	
Agriculture and Livestock	No significant activity identified within City.
Forestry	No significant activity identified within City.

Appendix C. CCAP Update Community Survey Results

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Memorandum

DATE: December 4, 2024
TO: Cassie Lacy, Senior Management Analyst, City of Bend
FROM: Maddie Cheek, Climate Consultant, Parametrix
SUBJECT: Bend CCAP Update: Community Survey Results & Key Themes

Background

The purpose of the virtual community survey was to **gather feedback on the climate action strategies** included in Bend's Climate Action Plan update. Participants were asked about which strategies the City should focus on and barriers to taking action across different climate sectors. There were several opportunities for participants to leave open-ended comments (see **Appendix A** for all comments). The survey was **open from November 8 to December 1, 2024**, and **535 community members completed the survey**. The results are summarized by climate sector below.

Survey results

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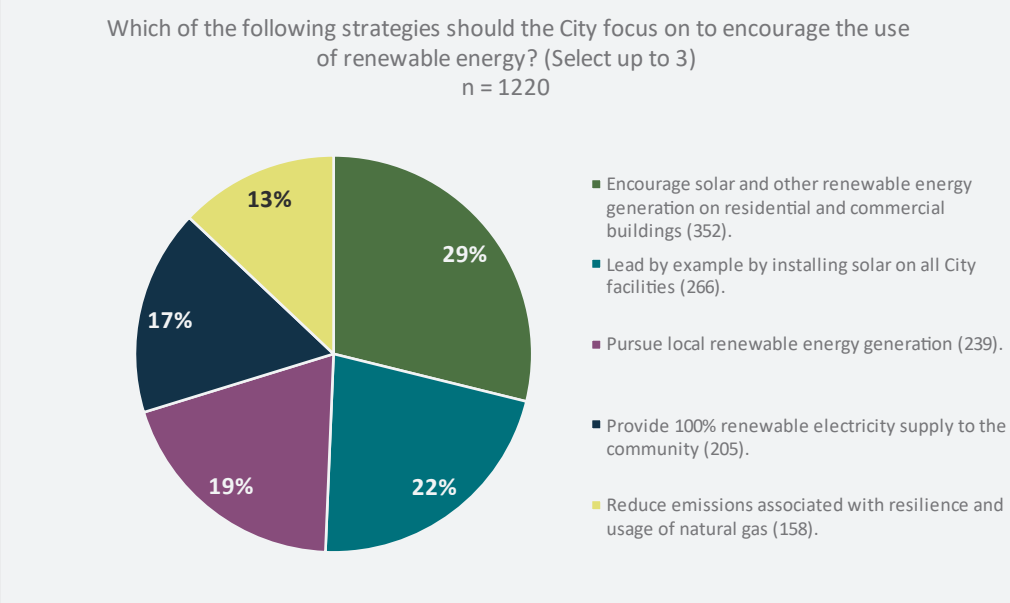

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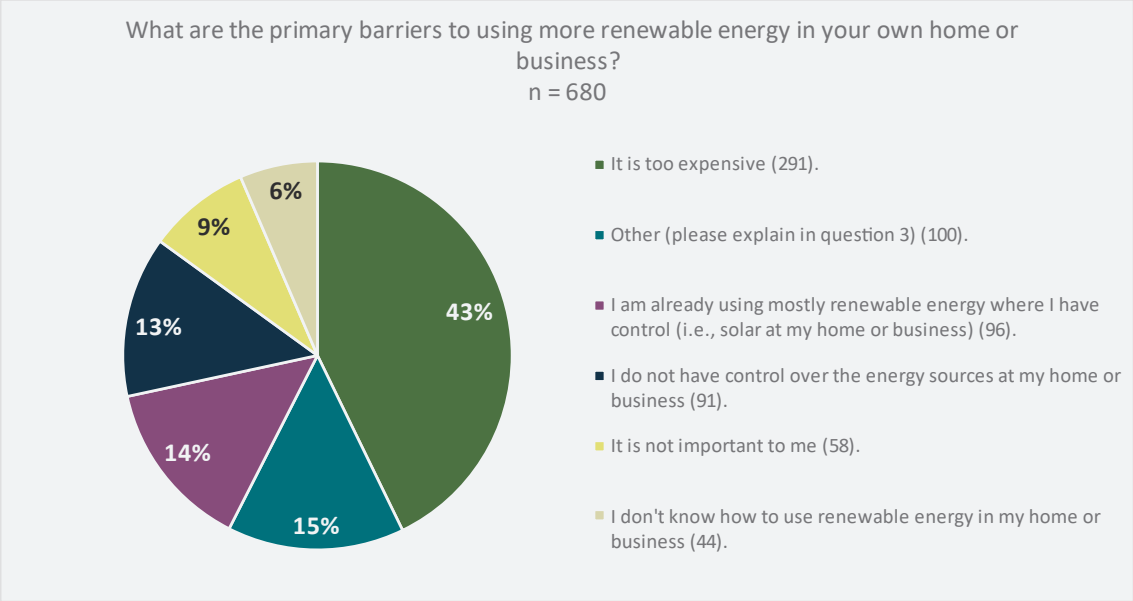

14% of respondents reported that they already use mostly renewable energy where they have control (i.e., solar at their home or business).

15% of respondents selected "Other" and wrote in answers to the "Is there anything else you'd like to share about the strategies in the energy supply sector? Please include your questions, comments, concerns, and/or ideas" question. The key themes from the open-ended responses about energy supply are below, and the full list of responses can be found in **Appendix A**.

Key themes from open-ended responses on the Energy Supply sector:

- **Concerns about all-electric buildings**, including backup power during an outage, grid reliability, solar generation reliability, and Pacific Power's current energy portfolio.
- **Comments about affordability of solar.** Some respondents expressed that they are waiting for prices to drop, for City- and/or utility-funded incentives, and/or for code changes that require the switch.
- **Comments about challenges installing solar locally** due to roof condition, accumulation of snow and/or pine needles, or shade.
- **Concerns about resources needed to construct and/or generate renewable energy**, including the types of raw materials needed to construct solar panels and the emissions associated with shipping materials and/or solar panels long distances.
- **Comments about natural gas were varied**. Concerns about natural gas included health and safety concerns, the difference between the potential to generate renewable electricity vs. renewable natural gas, and a desire to eliminate natural gas, particularly in new buildings.

Comments in support of natural gas mentioned backup power supply, cost, and energy choice.

- **Comments about not believing in climate change** and/or not wanting the City to spend time on climate change.
- **Comments about what community members are already doing** to generate renewable energy locally.

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The top 3 most popular strategies in the Buildings and Energy Use sector included:

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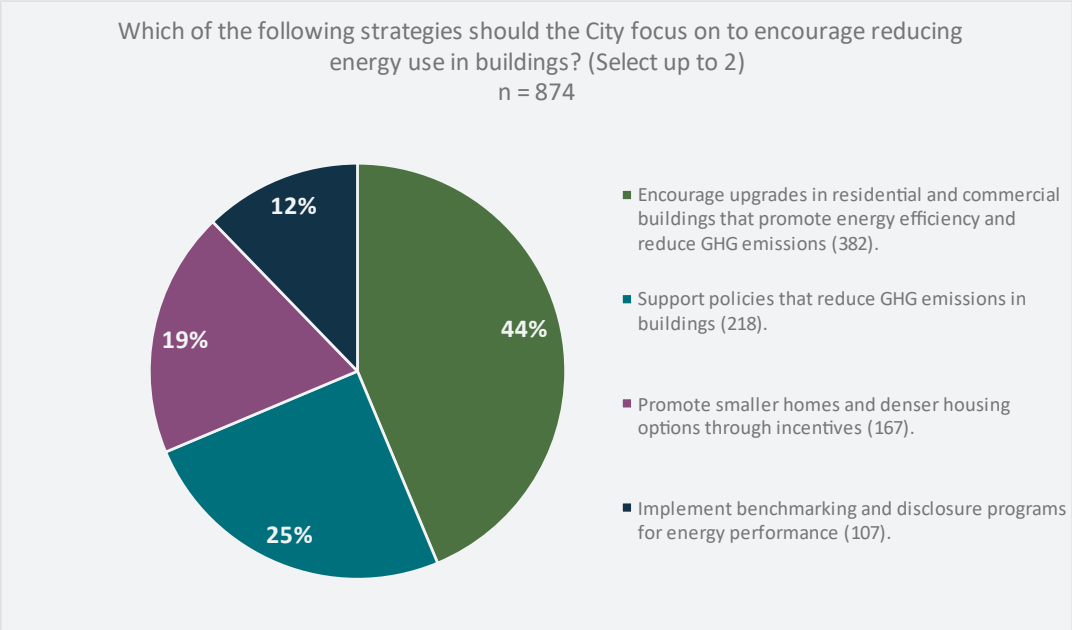

Participants were asked about which upgrades they would consider making if there was an incentive or program offered to help them do so. The top 3 answers were:

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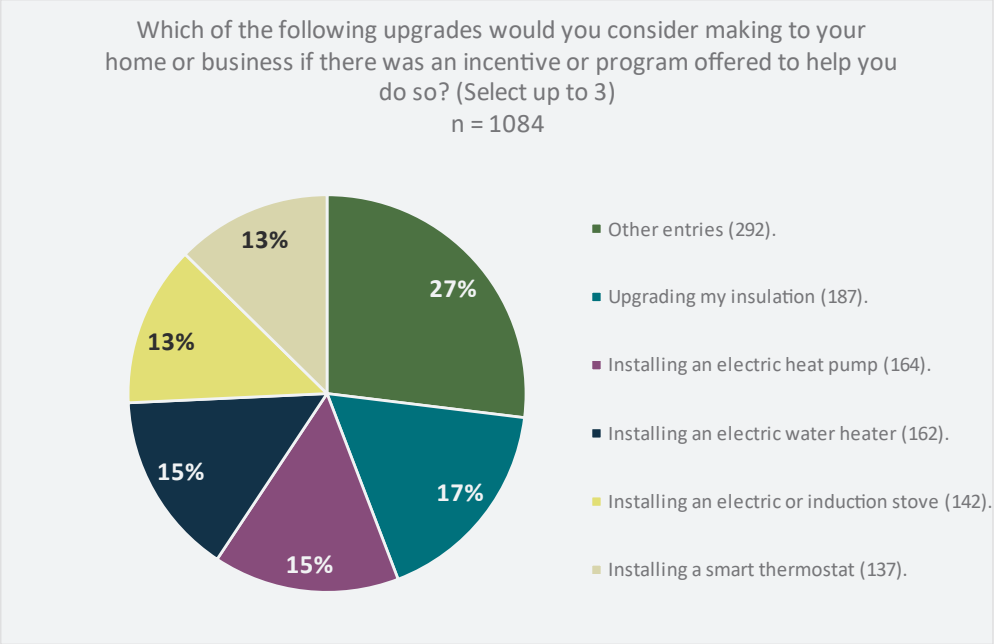
2. Installing an electric heat pump (15%)
3. Installing an electric water heater (15%)



27% of respondents selected the 'Other' category. These responses may be reflected in the key themes section below, or in **Appendix A**.

The top 3 barriers to community members making energy efficiency upgrades in their homes or businesses were:

1. It is too expensive (47%)
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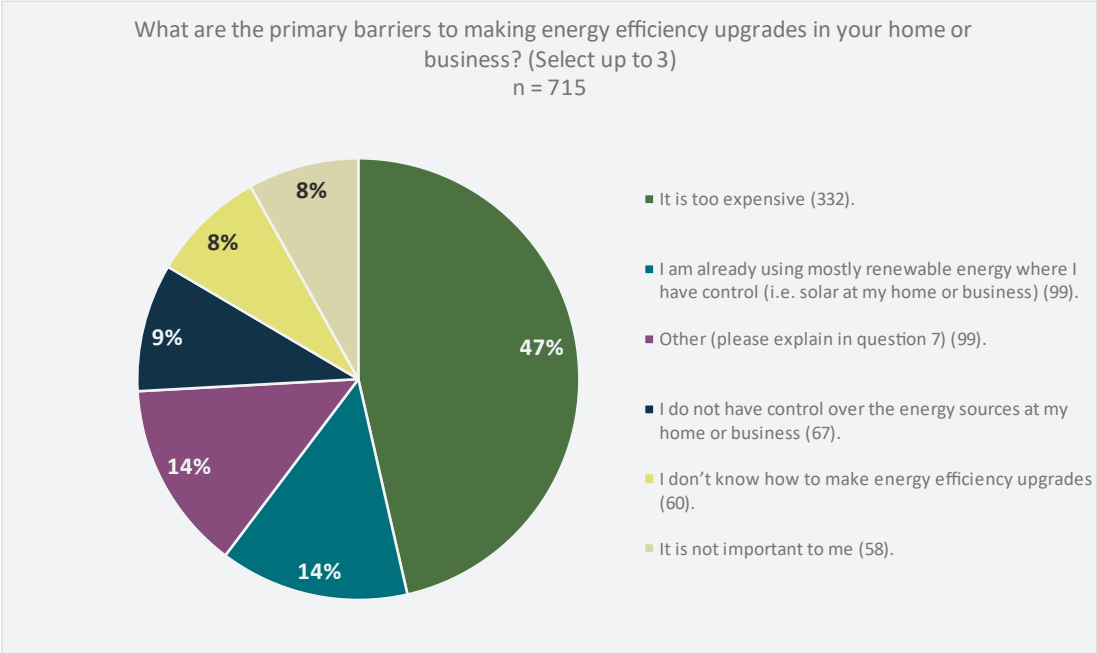


14% of respondents reported that they already use mostly renewable energy where they have control (i.e., solar at their home or business). 14% of respondents selected "Other" and wrote in answers to the "Is there anything else you'd like to share about the strategies in the energy use in buildings sector? Please include your questions, comments, concerns, and/or ideas" question.

The key themes from the open-ended responses about energy use are below, and the full list of responses can be found in **Appendix A**.

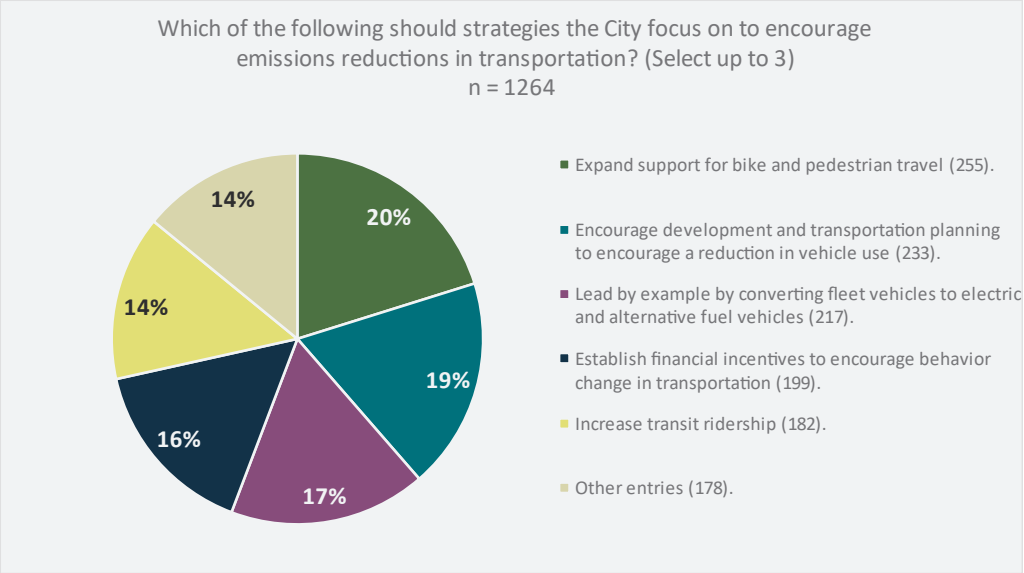
Key themes from open-ended responses on the Energy Use in Buildings sector:

- **Comments in support of:**
    - **Replacing appliances or making upgrades at the end of useful life**, rather than right now.
    - **Comprehensive, well-funded incentive programs** that are available to both homeowners and landlords.
    - More **education** about efficiency upgrades and funding options.
    - **Voluntary** efficiency measures.
- **Concerns about:**
    - The **affordability** of making efficiency upgrades and housing in general.
    - **Mandatory** efficiency measures.
    - How **densification** might impact the experience of living in Bend.
- **Comments about what community members are already doing** to use energy more efficiently in buildings, including LED lightbulb replacements, insulation replacements, HVAC upgrades, and solar.
- **Comments about not believing in climate change** and/or not wanting the City to spend time on climate change.

Transportation

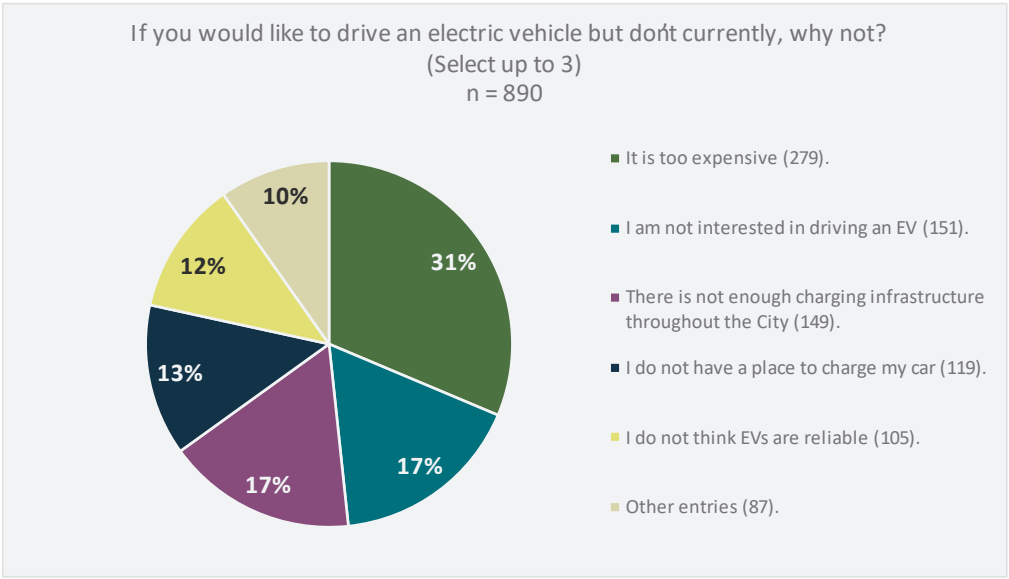
The top 3 most popular strategies in the Transportation sector included:

1. Expand support for bike and pedestrian travel. (20%)
2. Encourage development and transportation planning to encourage a reduction in vehicle use. (19%)
3. Lead by example by converting fleet vehicles to electric and alternative fuel vehicles. (17%)



For respondents who would like to drive an EV, but do not currently drive an EV, the top 3 reasons for being unable to drive an EV include:

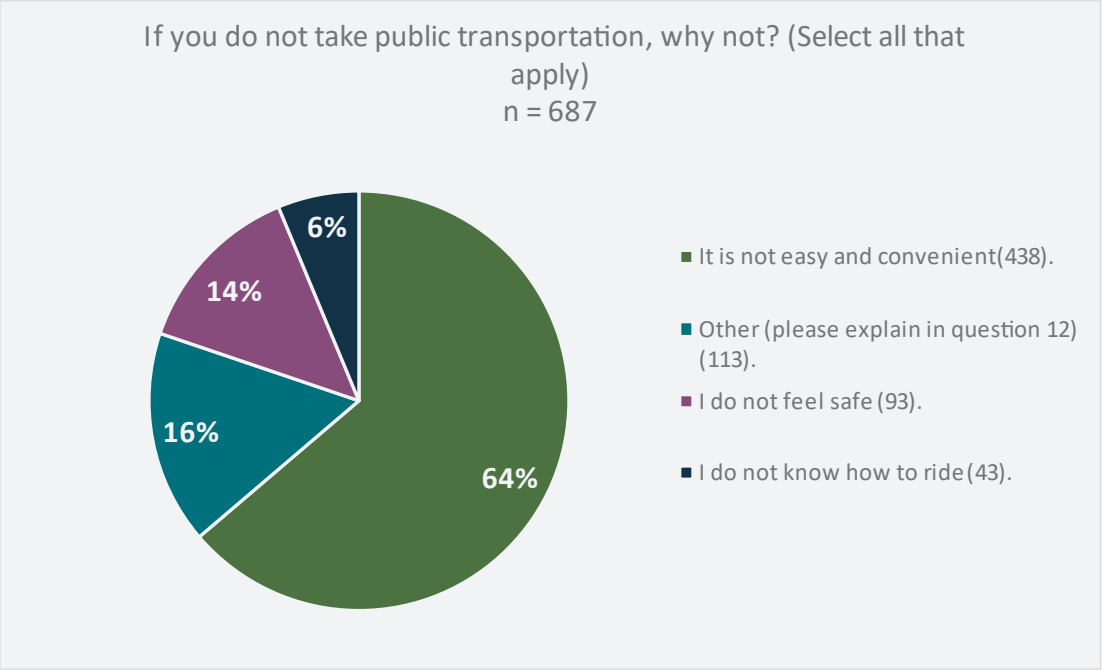
1. It is too expensive. (31%)
2. There is not enough charging infrastructure throughout the City. (17%)
3. I do not have a place to charge my car. (13%)



17% of respondents indicated that they are not interested in driving an EV, 12% indicated that they do not think EVs are reliable, and 10% responded 'Other'.

Most respondents who do not use public transportation indicated that they do not use public transportation, the 3 reasons for not taking public transportation include:

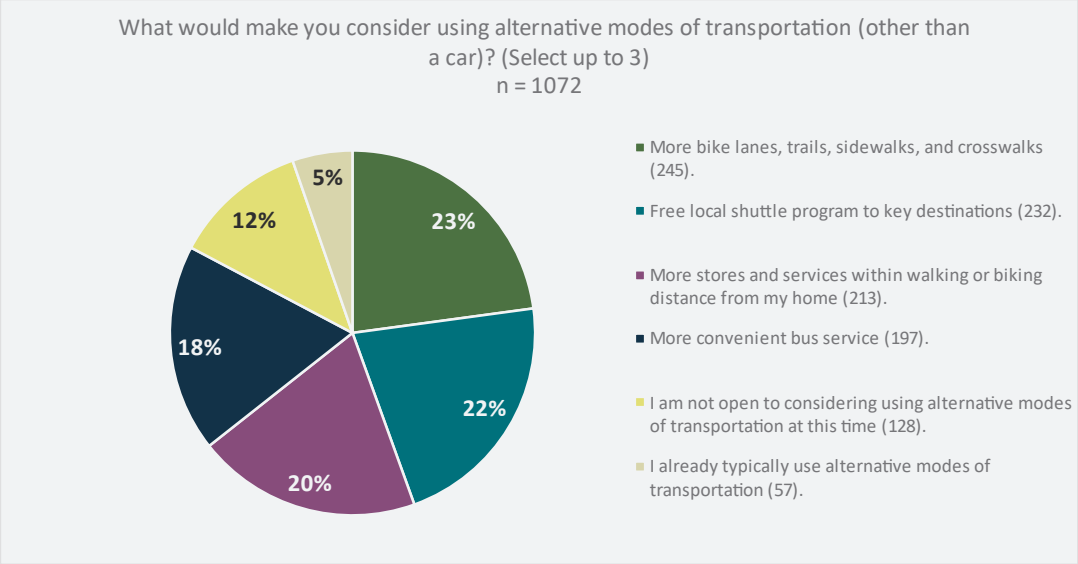
- It is not easy and convenient (64%)
- I do not feel safe (14%)
- I do not know how to ride (6%)



16% of respondents selected 'Other' and were directed to explain in the open-ended question. See the key themes section below or **Appendix A** for more detail.

Some (5%) of respondents indicated that they already typically use alternative modes of transportation to get around. For the remaining 95%, the top 3 changes that would make respondents consider using alternative modes of transportation (other than a car) include:

1. More bike lanes, trails, sidewalks, and crosswalks. (23%)
2. A free local shuttle program to key destinations. (22%)
3. More stores and services within walking or biking distance from my home. (20%)



Key themes from the transportation open-ended questions:

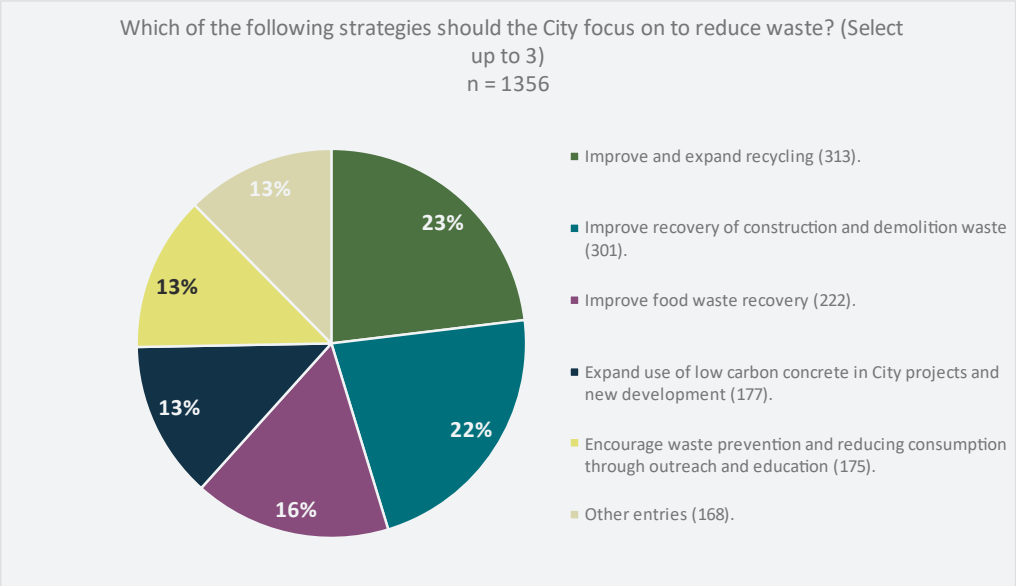
The key themes from the open-ended responses about transportation are below, and the full list of responses can be found in **Appendix A**.

- **Comments in support of:**
  - A free/low-cost **shuttle to key destinations** (e.g. downtown, Mt. Bachelor, the airport).
  - Upgrading **bicycle infrastructure** and maintaining it to a higher standard.
  - Making neighborhoods more **walkable**.
  - **Hybrid vehicles**.
- **Concerns about:**
  - Transportation **mode shift** for people who **cannot easily get around** (e.g., elderly people, children).
  - The **reliability of the public transportation system** in Bend/Central Oregon because routes don't get people to where they need to go, buses take too long or run at inconvenient times, and unsheltered bus stops.
  - The impact of **inclement weather** in the winter **and extreme heat** in the summer on the ability of people to comfortably and safely use alternative or active modes.
  - **Bicycle and pedestrian safety** when sharing the road with cars.
  - Raw materials needed to **produce batteries** for EVs.
  - Being able to charge an EV during **longer-range trips** outside of Bend.

Waste and Materials

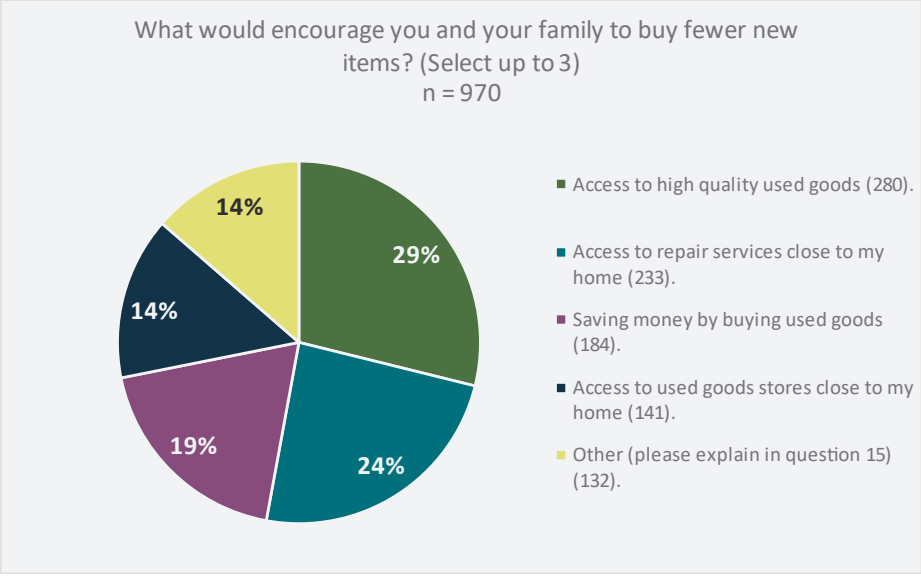
The top 3 most popular strategies in the Waste and Materials sector included:

1. Improve and expand recycling. (23%)
2. Improve recovery of construction and demolition waste. (22%)
3. Improve food waste recovery. (16%)



Respondents were asked about what might encourage them and their families to buy fewer new items. The top 3 responses were:

1. Having access to high quality used goods. (29%)
2. Having access to repair services near home. (24%)
3. Saving money by buying used goods. (19%)



Key themes from the waste and materials open-ended questions:

- Comments in support of:
  - Providing **education** about waste and materials management **best practices.**
  - **Expanding and improving recycling** options and services, including **expanding current recycling service to include hard-to-recycle items** like clamshells and plastic film, and allowing Ridwell to operate in Bend.
  - Advocating for **retailers and manufacturers to be responsible for waste**, rather than just the consumer.
  - **Expanding and improving composting** services in Bend.
  - **Expanding access to repair services** (e.g. a shoe cobbler, repair cafes) and **sharing of materials** (e.g. tool library, library of things, Buy Nothing groups).
- Concerns about:
  - **Individual choice** and **the City's role** in managing waste and materials.
  - The **role of consumerism** in society.
  - The volume of **construction and demolition waste** that goes to the landfill.
- **Comments about waste and materials management activities that community members already engage in**, such as only buying what they need, buying higher quality items that hold up well over time, and donating usable items when they no longer want or need to use them.

General feedback

The final survey question asked respondents, "Is there anything else you would like to share?" Key themes from this question included:

- **A focus on practical and affordable solutions**: Many respondents emphasized the need for practical and affordable solutions that fit their lifestyles and budgets. They expressed concerns about the high cost of electric vehicles and other green technologies and advocate for solutions that are accessible to all income levels.
- **The importance of education and individual action**: While opinions on government intervention vary, there was widespread support for education and individual action in addressing climate change. Many respondents emphasize the need for public awareness campaigns to promote sustainable practices and encourage community members to make environmentally responsible choices.
- **Gratitude that the City is taking action:** Many respondents expressed that they are pleased that the City is taking action locally and that they had an opportunity to provide input via the community survey.
- **Skepticism about climate change and government intervention**: Some respondents expressed skepticism about climate change and the effectiveness of government intervention in addressing it. Some doubted the validity of climate change data and advocated for individual choice over government mandates. Others believe that local actions have minimal impact on global climate change.
- **The importance of prioritizing essential City services**: A recurring theme was the call for the city to prioritize essential services like road maintenance, public safety, and affordable housing over what some perceive as less critical issues like climate action.

- **Opposition to urban sprawl and a desire to preserve Bend's character**: Many respondents expressed concern about the negative impacts of urban sprawl on Bend's environment and quality of life. They advocated for preserving green spaces, limiting development outside the urban growth boundary, and maintaining Bend's small-town charm.

Demographic information

There were 4 optional questions pertaining to demographic information. The following information was collected from the participants who chose to answer these optional questions.

- **Renters or homeowners:** The majority of respondents (85%) own their homes, while 11% rent, and 4% preferred not to answer.
- **Connection to the City of Bend:** The majority of respondents were residents (76%), some respondents reported that they work in Bend (11%) or own a business in Bend (9%). Only 2% of respondents were students, 1% were visitors, and 1% preferred not to answer.
- **Age:** Overall, survey respondents tended to be older.
    - 25-34 years old (7%)
    - 35-44 years old (16%)
    - 45-54 years old (18%)
    - 55-64 years old (16%)
    - 65+ years old (35%)
    - Other (8%)
- **Race and ethnicity:** Most survey respondents were white (75%), followed by Asian/Pacific Islander (3%), Hispanic/Latino (2%), and Other (4%). 16% of respondents selected 'Prefer not to answer'.

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Memorandum

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FROM: Maddie Cheek, Climate Consultant, Parametrix
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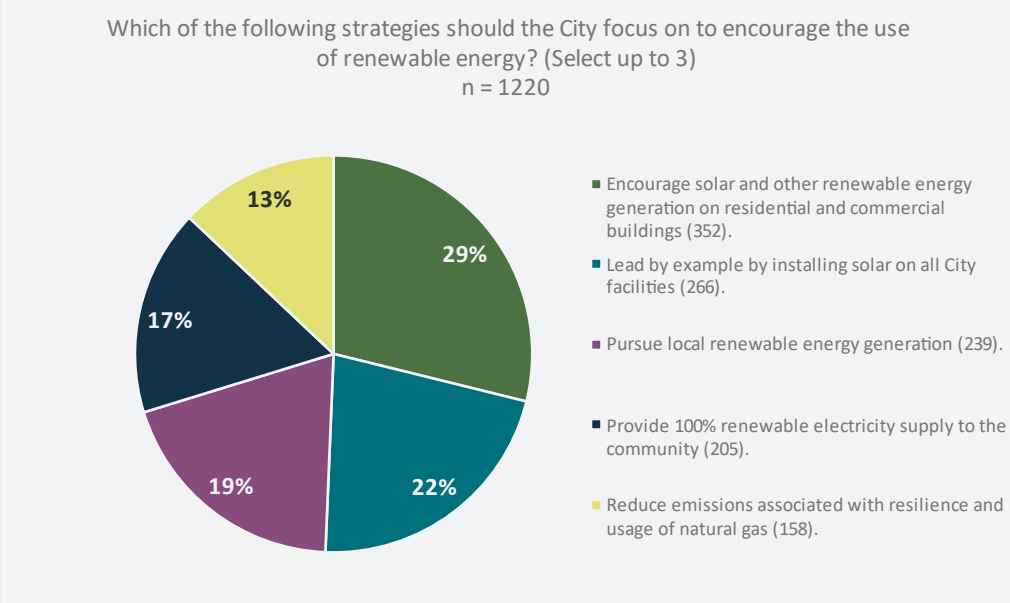

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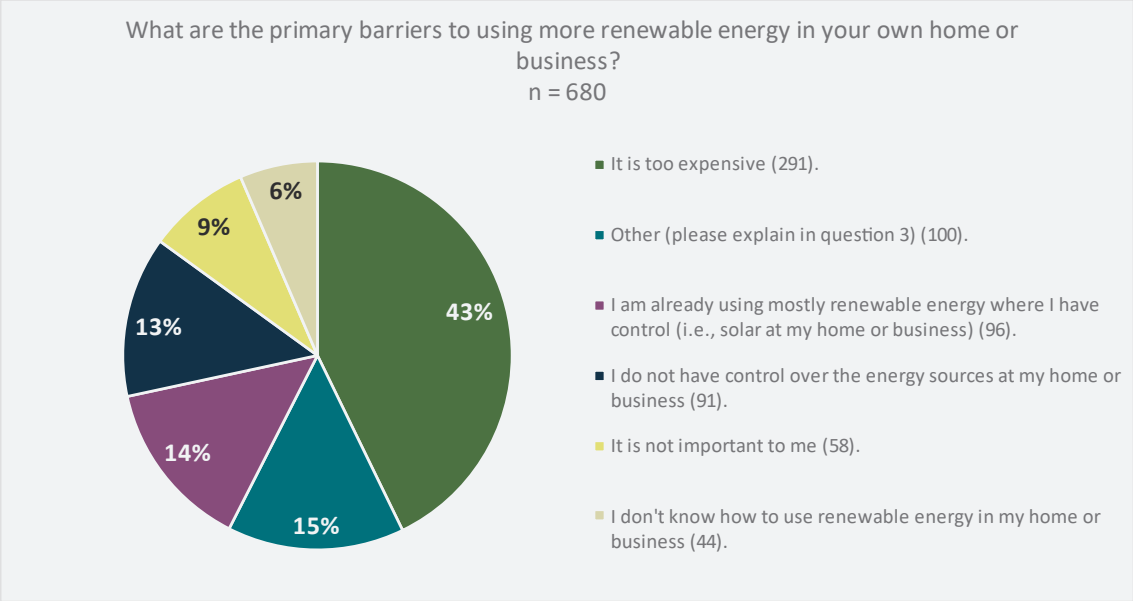

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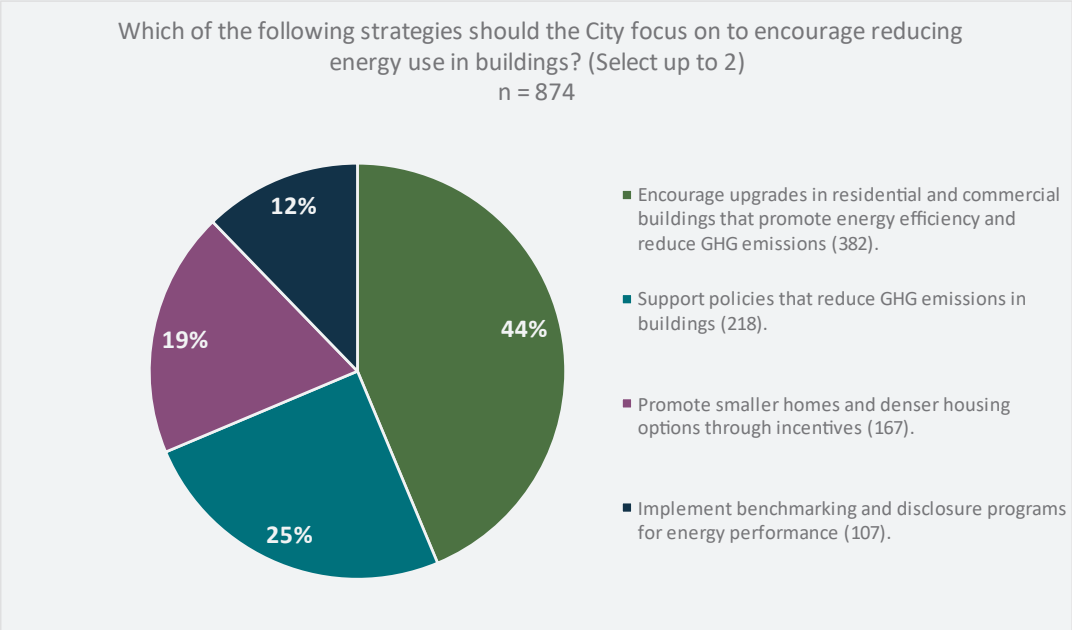

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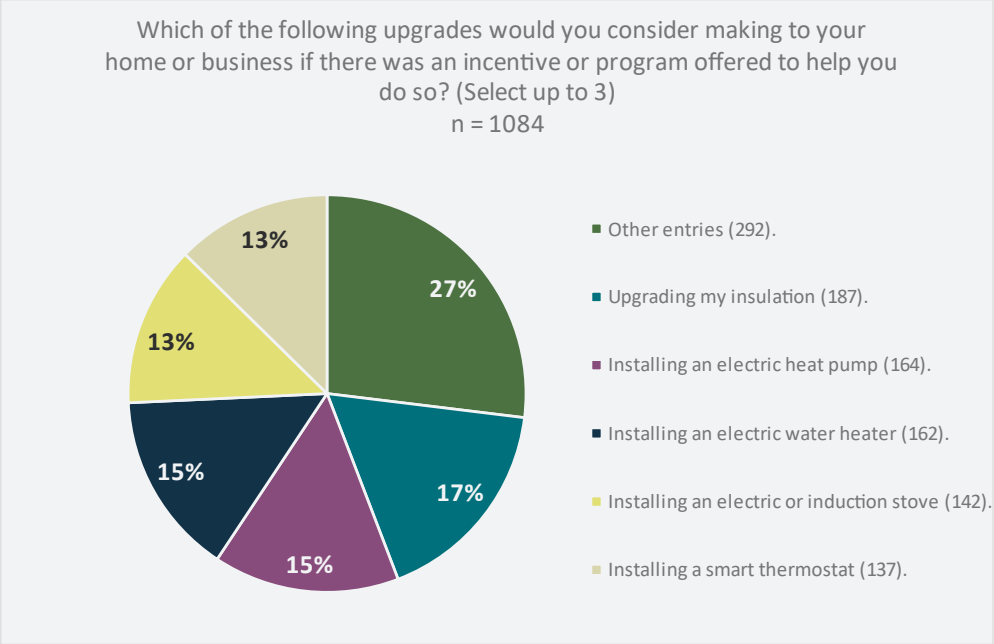

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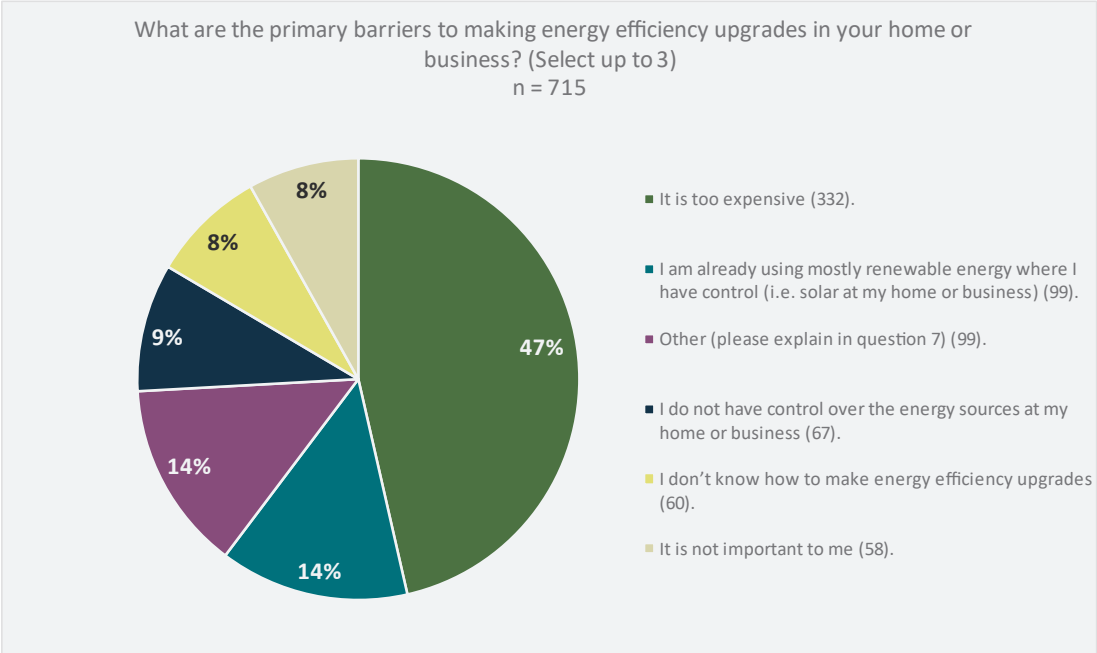

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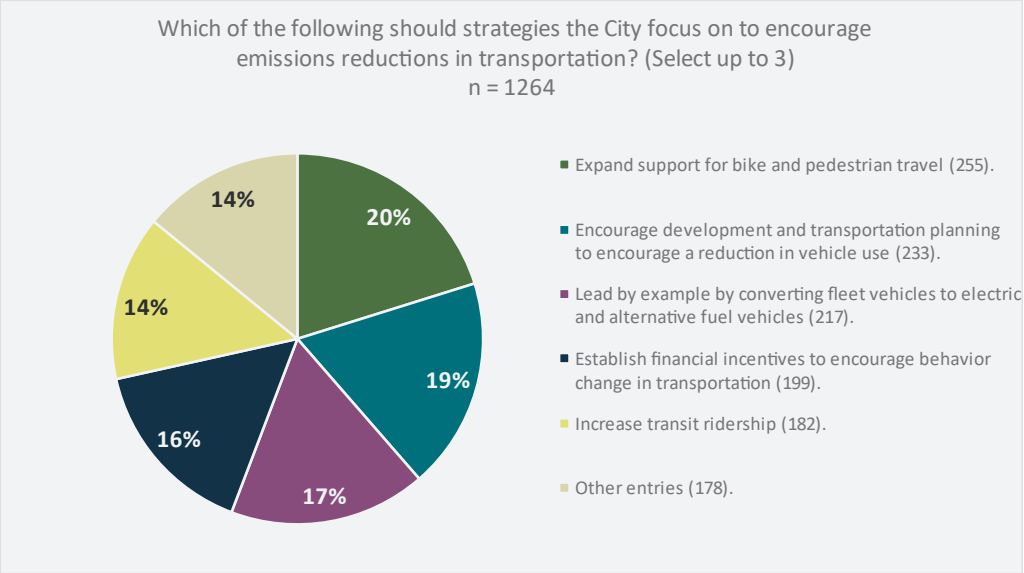

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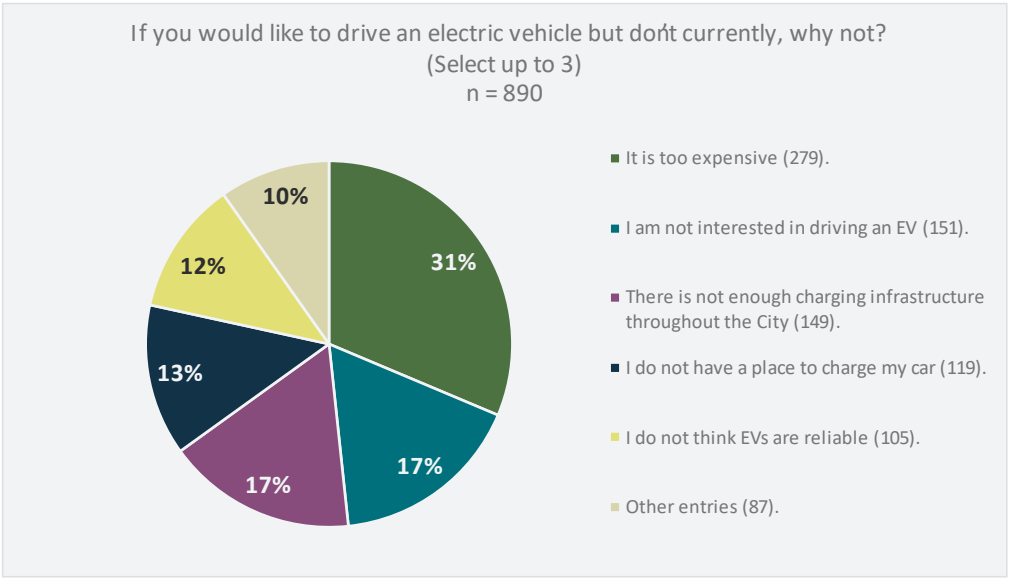
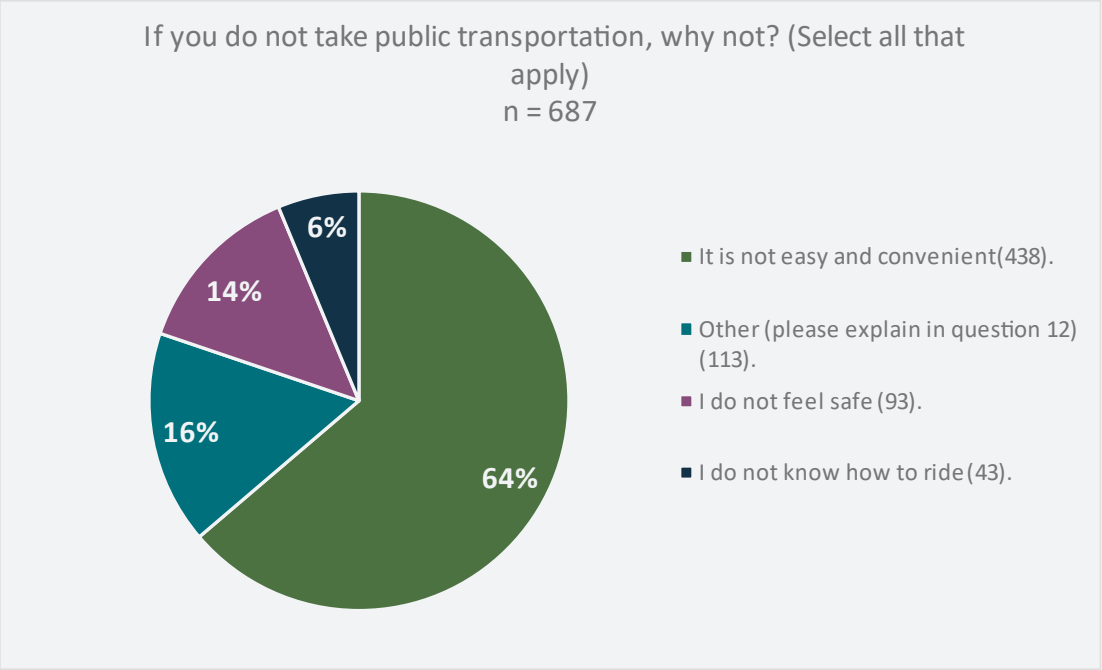
2. There is not enough charging infrastructure throughout the City. (17%)
3. I do not have a place to charge my car. (13%)



17% of respondents indicated that they are not interested in driving an EV, 12% indicated that they do not think EVs are reliable, and 10% responded 'Other'.

Most respondents who do not use public transportation indicated that they do not use public transportation, the 3 reasons for not taking public transportation include:

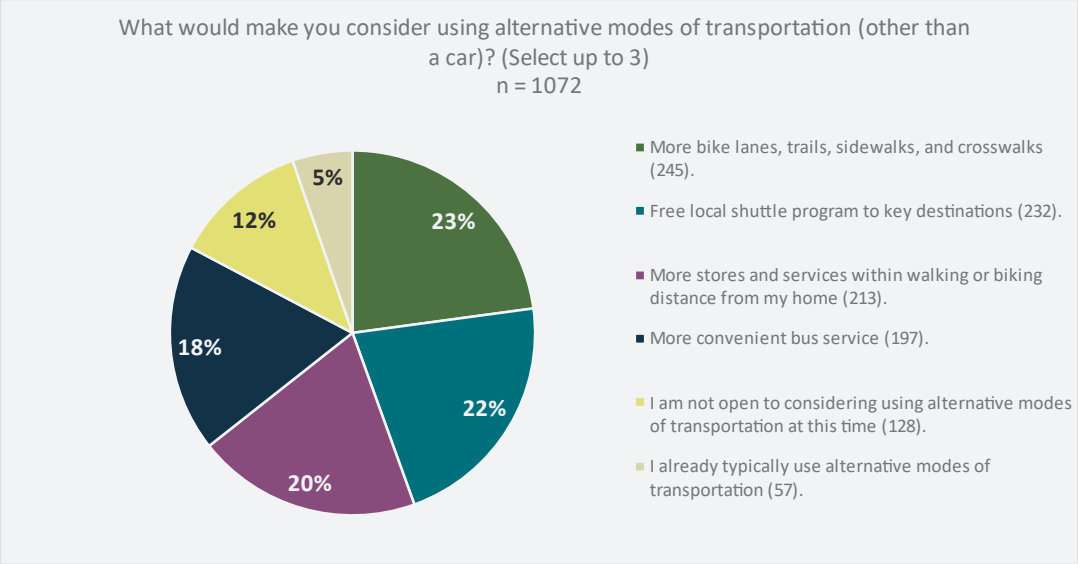
- It is not easy and convenient (64%)
- I do not feel safe (14%)
- I do not know how to ride (6%)



16% of respondents selected 'Other' and were directed to explain in the open-ended question. See the key themes section below or **Appendix A** for more detail.

Some (5%) of respondents indicated that they already typically use alternative modes of transportation to get around. For the remaining 95%, the top 3 changes that would make respondents consider using alternative modes of transportation (other than a car) include:

1. More bike lanes, trails, sidewalks, and crosswalks. (23%)
2. A free local shuttle program to key destinations. (22%)
3. More stores and services within walking or biking distance from my home. (20%)



Key themes from the transportation open-ended questions:

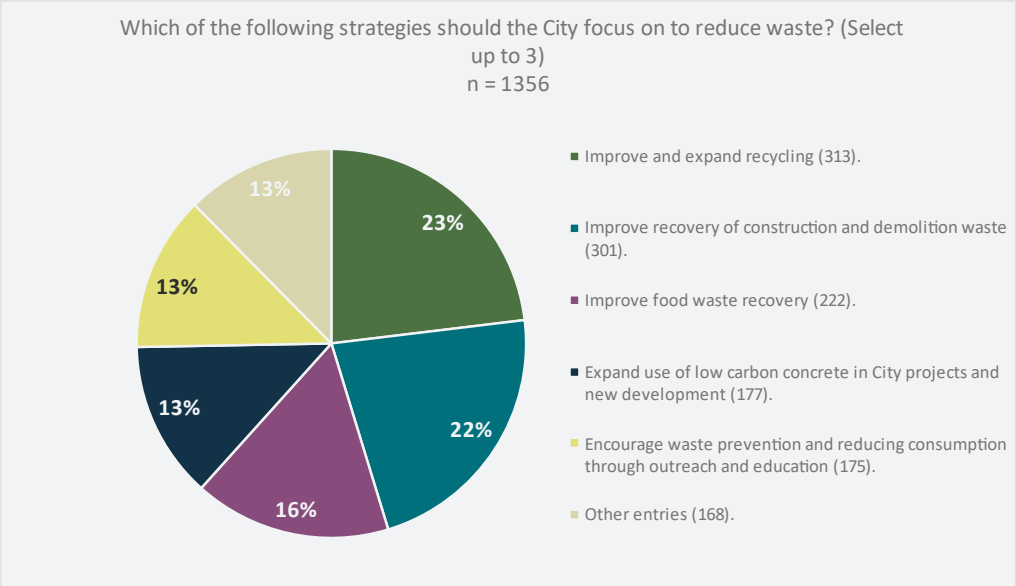
The key themes from the open-ended responses about transportation are below, and the full list of responses can be found in **Appendix A**.

- **Comments in support of:**
  - A free/low-cost **shuttle to key destinations** (e.g. downtown, Mt. Bachelor, the airport).
  - Upgrading **bicycle infrastructure** and maintaining it to a higher standard.
  - Making neighborhoods more **walkable**.
  - **Hybrid vehicles**.
- **Concerns about:**
  - Transportation **mode shift** for people who **cannot easily get around** (e.g., elderly people, children).
  - The **reliability of the public transportation system** in Bend/Central Oregon because routes don't get people to where they need to go, buses take too long or run at inconvenient times, and unsheltered bus stops.
  - The impact of **inclement weather** in the winter **and extreme heat** in the summer on the ability of people to comfortably and safely use alternative or active modes.
  - **Bicycle and pedestrian safety** when sharing the road with cars.
  - Raw materials needed to **produce batteries** for EVs.
  - Being able to charge an EV during **longer-range trips** outside of Bend.

Waste and Materials

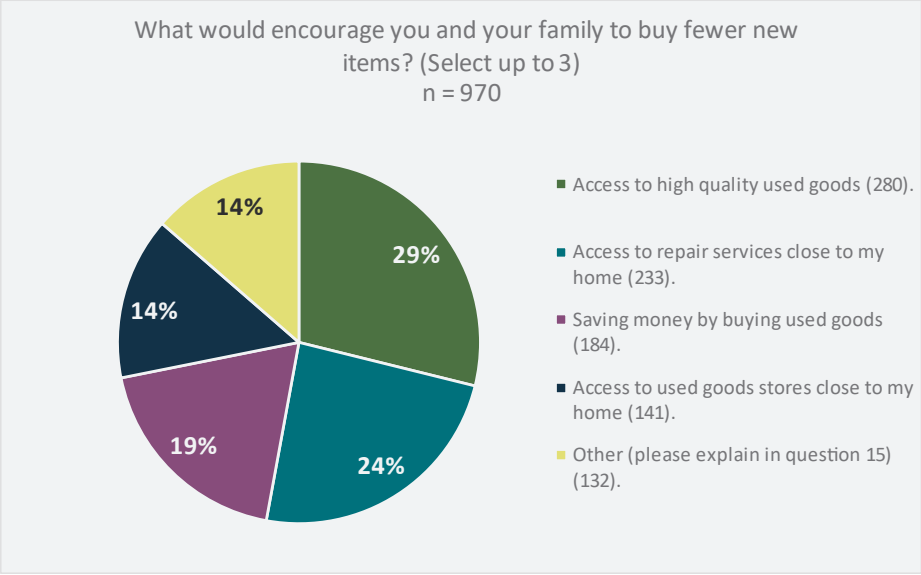
The top 3 most popular strategies in the Waste and Materials sector included:

1. Improve and expand recycling. (23%)
2. Improve recovery of construction and demolition waste. (22%)
3. Improve food waste recovery. (16%)



Respondents were asked about what might encourage them and their families to buy fewer new items. The top 3 responses were:

1. Having access to high quality used goods. (29%)
2. Having access to repair services near home. (24%)
3. Saving money by buying used goods. (19%)



Key themes from the waste and materials open-ended questions:

- Comments in support of:
  - Providing **education** about waste and materials management **best practices.**
  - **Expanding and improving recycling** options and services, including **expanding current recycling service to include hard-to-recycle items** like clamshells and plastic film, and allowing Ridwell to operate in Bend.
  - Advocating for **retailers and manufacturers to be responsible for waste**, rather than just the consumer.
  - **Expanding and improving composting** services in Bend.
  - **Expanding access to repair services** (e.g. a shoe cobbler, repair cafes) and **sharing of materials** (e.g. tool library, library of things, Buy Nothing groups).
- Concerns about:
  - **Individual choice** and **the City's role** in managing waste and materials.
  - The **role of consumerism** in society.
  - The volume of **construction and demolition waste** that goes to the landfill.
- **Comments about waste and materials management activities that community members already engage in**, such as only buying what they need, buying higher quality items that hold up well over time, and donating usable items when they no longer want or need to use them.

General feedback

The final survey question asked respondents, "Is there anything else you would like to share?" Key themes from this question included:

- **A focus on practical and affordable solutions**: Many respondents emphasized the need for practical and affordable solutions that fit their lifestyles and budgets. They expressed concerns about the high cost of electric vehicles and other green technologies and advocate for solutions that are accessible to all income levels.
- **The importance of education and individual action**: While opinions on government intervention vary, there was widespread support for education and individual action in addressing climate change. Many respondents emphasize the need for public awareness campaigns to promote sustainable practices and encourage community members to make environmentally responsible choices.
- **Gratitude that the City is taking action:** Many respondents expressed that they are pleased that the City is taking action locally and that they had an opportunity to provide input via the community survey.
- **Skepticism about climate change and government intervention**: Some respondents expressed skepticism about climate change and the effectiveness of government intervention in addressing it. Some doubted the validity of climate change data and advocated for individual choice over government mandates. Others believe that local actions have minimal impact on global climate change.
- **The importance of prioritizing essential City services**: A recurring theme was the call for the city to prioritize essential services like road maintenance, public safety, and affordable housing over what some perceive as less critical issues like climate action.

- **Opposition to urban sprawl and a desire to preserve Bend's character**: Many respondents expressed concern about the negative impacts of urban sprawl on Bend's environment and quality of life. They advocated for preserving green spaces, limiting development outside the urban growth boundary, and maintaining Bend's small-town charm.

Demographic information

There were 4 optional questions pertaining to demographic information. The following information was collected from the participants who chose to answer these optional questions.

- **Renters or homeowners:** The majority of respondents (85%) own their homes, while 11% rent, and 4% preferred not to answer.
- **Connection to the City of Bend:** The majority of respondents were residents (76%), some respondents reported that they work in Bend (11%) or own a business in Bend (9%). Only 2% of respondents were students, 1% were visitors, and 1% preferred not to answer.
- **Age:** Overall, survey respondents tended to be older.
    - 25-34 years old (7%)
    - 35-44 years old (16%)
    - 45-54 years old (18%)
    - 55-64 years old (16%)
    - 65+ years old (35%)
    - Other (8%)
- **Race and ethnicity:** Most survey respondents were white (75%), followed by Asian/Pacific Islander (3%), Hispanic/Latino (2%), and Other (4%). 16% of respondents selected 'Prefer not to answer'.

Appendix D. GHG Emissions and Cost Methodology and Assumptions

	Sector/Strategies	GHG Methodology and Assumptions	Cost Methodology and Assumptions
Energy Supply			
ES1	Provide 100% renewable electricity supply to the community	Forecasted electricity use over time by scaling 2021 electricity use by population growth. Assumed Pacific Power complies fully with HB 2021 (Oregon Clean Energy Targets), which require investor-owned utilities like Pacific Power to decrease electricity emissions to 80% below baseline by 2030, 90% below baseline by 2035, and 100% below baseline by 2040. Assumed Central Electric Cooperative's emissions factor stays constant from 2025 to 2050.	No additional cost beyond state implementation of Clean Energy Targets.
ES2	Reduce emissions associated with reliance on and usage of natural gas	In the context of the Bend electrification policy analysis project, this analysis looked at emissions reductions from electrification of commercial and residential buildings by assuming fossil fuel use (natural gas, fuel oil, and propane) are reduced linearly to zero from 2025-2050 and replaced by electricity usage. The analysis assumes that Pacific Power meets its Clean Energy Targets, that the emissions factor for Central Electric Cooperative remains constant over time, and that energy demand increases with population growth over time. This strategy closely aligns with EB-1. As a result, EB-1 was not scaled separately.	Not scaled. Bend is considering a variety of policies as part of its 2024 Electrification Policy Analysis, including education and outreach, state-level policy advocacy, incentive programs, and local regulations. More specifics are needed to scale costs. This strategy closely aligns with EB-1. As a result, EB-1 was not scaled separately.
ES3	Encourage solar and other renewable energy generation on residential and commercial buildings	Project Sunroof, developed by Google, provides reasonably high-resolution data on rooftop solar potential for many large US metropolitan areas, including Bend. For this analysis, solar potential was estimated as the full economic solar potential estimated by Sunroof for Bend. Sunroof builds its estimates using LiDAR, latitude, and regional weather averages to calculate the expected solar capacity and annual output for every rooftop in Bend, including roof obstructions and shading from trees and nearby buildings. Sunroof excludes rooftops with an expected array size of less than 2kW and excludes all roof sections that cannot hold a minimum of four adjacent panels. The area-wide estimates only include solar panels expected to receive at least 75% of the maximum annual sun exposure for the county. Panels are assumed to by 400W, and approximately 2 square meters in area. All residential and commercial rooftops detected in the data are included. More information can be found at the Sunroof website: https://sunroof.withgoogle.com/about/.	Estimated $2.68 per Watt of installed residential generation capacity and retail electricity costs increasing by 5% per year from base price of $0.12/kWh. NREL data as used to estimate cost for residential rooftop costs. However, solar costs have followed a steep downward trend over the last two decades, and solar is likely to become more cost effective over time as retail electricity costs increase. Note: The effect of grid decarbonization skews up the cost effectiveness per metric ton of mitigated CO_2e (as grid emissions approach zero, dollars per ton of mitigated emissions approaches negative infinity for interventions with cost savings). For this reason, base savings ($140 per ton mitigated) were estimated as the benefits of a project installed in 2025. Cost effectiveness per ton of emissions reduced is expected to rise dramatically until 2040. Sources: Sunroof: sunroof.withgoogle.com/data-explorer/place/ChIJUdLTpf_AuFQRtNEgx6zniBA/#?overlay=flux PVWatts: pvwatts.nrel.gov/pvwatts.php NREL Cost Data: nrel.gov/solar/market-research-analysis/solar-installed-system-cost.html
ES4	Pursue local renewable energy generation	Local energy generation was calculated using estimates developed for the City of Bend. Estimates for community solar come from the Oregon Clean Power Cooperative. Estimates for in-conduit hydro are from a Jacobs Engineering study developed for Bend. Estimates for the wastewater biodigester are derived from an Ameresco technical assessment. From the Ameresco report, it was calculated that approximately 650K therms of renewable natural gas could be produced annually using conservative assumptions. Biogas emissions are considered biogenic and part of the carbon cycle, and for this reason, GHG accounting protocols generally do not consider biogenic emissions as contributing to anthropogenic climate change. No potential projects were identified for microgrids, battery storage, and district energy, and the potential benefit of those technologies was not estimated.	System costs for in-conduit hydro were developed as part of the Jacobs Engineering study. Costs for community solar were estimated from NREL market research and data on solar installation costs. Costs for the wastewater biodigester were estimated from Ameresco reports.

ES5	Lead by example by decarbonizing City facilities	ES-5a: Solar on public facilities assumes 1200kW installations on the public works campus and the new city hall facility. Solar potential calculated using PVWatts from NREL, rounded. ES-5b: City Hall replacement is in progress. Assumed natural gas use in City Hall is eliminated and replaced by renewable electricity use, that electricity and natural gas use in remaining City facilities are held constant at 2019 levels, that Pacific Power meets its Clean Energy Targets, and that Central Electric Cooperative's emissions factor remains constant over time.	Estimated for solar installation costs ($1.80 per Watt of generation capacity) and retail electricity savings ($0.19/kWh). NREL was used to estimate cost for commercial rooftop costs. However, solar costs are on a downward trend, and may become even more affordable over time as retail electricity costs increase. Source: NREL Cost Data: https://www.nrel.gov/solar/market-research-analysis/solar-installed-system-cost.html

Energy in Buildings			
EB1	Support policies that reduce greenhouse gas emissions in buildings	See ES-2 above. This strategy closely aligns with ES-2. As a result, this strategy was not scaled separately.	See ES-2 above.
EB2	Encourage upgrades in residential and commercial buildings that promote energy efficiency and reduce greenhouse gas emissions	Energy efficiency opportunities for both electricity and natural gas were available for residential, commercial, and industrial energy and applied to the 2021 emissions accordingly. Energy efficiency assumptions were taken from the 2021 Power Plan Supporting Materials by the Northwest Power and Conservation Council for electricity, and Energy Trust of Oregon Energy Efficiency Resource Assessment Report by Navigant for natural gas.	"A report from Center for Climate Solutions titled Greenhouse Gas Marginal Abatement Cost Curve Development and Macroeconomic Foundational Modeling for Oregon considered over 130 individual efficiency measures and found the cost effectiveness for the bulk of the efficiency potential to be between -$50 and $50 per ton reduced. This includes cost-effective, achievable, and technical potential options. Because ETO programming is focused on cost-effective resources and serves the voluntary market, this strategy is assigned a cost of between -$50 and $0 per ton reduced. Source: 10-Year Energy Action Plan Modeling: Greenhouse Gas Marginal Abatement Cost Curve Development and Macroeconomic Foundational Modeling for Oregon (2012). The Center for Climate Strategies: oregon.gov/energy/energy-oregon/Documents/2012%20Energy%20Action%20Plan%20Modeling%20Report.pdf "
EB3	Implement benchmarking and disclosure programs for energy performance	Energy benchmarking provides motivation to improve voluntary uptake of home energy efficiency upgrades. In alignment with the previous scaling exercise, this action is scaled as a reduction of home energy usage (electricity and natural gas), phased in gradually until 2050. The amount of energy use reduction is derived from a Navigant report for Energy Trust of Oregon (ETO) quantifying the potential efficiency gains from a wide range of home efficiency upgrades. Navigant categorized potential efficiency benefits by the relative cost of implementing them: cost-effective achievable efficiency includes actions that pay themselves off entirely over their expected lifetime, while the full technical potential is the maximum achievable efficiency benefit of all the efficiency actions covered by the study. Navigant classified the 'achievable' efficiency gains as 85% of the technical potential. For this action, it is assumed that benchmarking incentivizes going beyond cost-effective measures, and the total emissions reductions for this action are assumed to be equal to the difference between ETO's assessment of cost-effective efficiency and achievable efficiency potential (85% of technical potential), phased in gradually until 2050.	Benchmarking incentivizes going beyond the most cost-effective measures, so base cost for benchmarking is assumed to be $0, equivalent to installing break-even efficiency measures at home. For this measure, it is assumed that over time, benchmarking will result in additional uptake of achievable efficiency measures, but the lifecycle cost and emissions savings are highly sensitive to timing of installation and future electricity prices. Given these factors, the upper bound for cost is highly uncertain, but is estimated here to be $150/MTCO2e, which represents a measure that costs $0.24 per reduced kWh (50% premium over approximate current energy rates in Bend) and current grid emissions in Bend. Note that this cost value is associated with the cost of deploying the efficiency measures driving the scaled emissions reductions, not the administrative cost of a benchmarking program, which is expected to be marginal compared to the total cost of efficiency upgrades.

EB4	Promote smaller homes and denser housing options through incentives	"Choosing smaller housing lowers household carbon footprints from a variety of sources. Smaller houses use less building materials during construction and maintenance. A smaller space also means less heating and cooling requirements over the home's 70+ year lifespan. A smaller space also likely means having to purchase less furniture and other goods to fill the space. Emissions reductions from building materials and energy use are provided by Oregon Department of Environmental Quality's report titled A Life Cycle Approach to Prioritizing Methods of Preventing Waste from the Residential Construction Sector in the State of Oregon. This report compares a variety of home square footages, but this strategy assumes that future single-family homes in Bend will decrease in size from 2,300 square feet to 1,600. These per unit savings are applied to single family home projections for Bend as reported in Bend Housing Needs Analysis - Bend's Growth to 2028, which estimates that about 325 single family homes will be needed annually in Bend. Given Portland State University projections of population growth for Bend, this same rate is assumed through 2050. Emissions reductions are calculated based on the per housing unit reductions detailed in ODEQ's report for building materials and energy use. The same rate of reduction is applied to other consumption-based emissions sources included in Bend's 2021 Greenhouse Gas Inventory that will be impacted by a smaller home including furnishings and other goods. Sources: A Life Cycle Approach to Prioritizing Methods of Preventing Waste from the Residential Construction Sector in the State of Oregon (2010). Oregon Department of Environmental Quality. https://www.oregon.gov/deq/FilterDocs/ADU-ResBldgLCA-Report.pdf Bend Housing Needs Analysis (2016). City of Bend. https://www.bendoregon.gov/Home/ShowDocument?id=28130 Coordinated Population Forecast, 2022-2072. Deschutes County Urban Growth Boundaries & Area Outside UGBs (2022). Portland State University Population Research Center. pdx.edu/population-research/sites/populationresearch.web.wdt.pdx.edu/files/2022-06/Deschutes.pdf"	"Cost effectiveness for smaller homes is calculated based on cost savings from construction of a smaller space in addition to life-cycle energy use. Building costs are assumed to be $150 per square foot per Homeadvisor.com. Annual energy costs are based on statistics from U.S. Energy Information Administration's, Residential Energy Consumption Survey, for appropriately sized homes in Bend's climate zone. Costs for decreased consumption of furniture and other goods are not readily available and therefore are not factored into the estimate, but if they were included would further increase the climate benefit. In other words, this strategy would result in a greater costs savings per unit reduced of climate pollution. "

Transportation			
T1	Encourage community-wide electric vehicle adoption	Electric vehicle technology is progressing rapidly - increasing battery range and reducing production costs. This will reduce the cost of electric vehicles and increase the number and type of styles available for purchase. It is difficult to predict how rapidly EVs will replace conventional fossil fuel combustion vehicles, but Bend established a mid-range target of 6,250 EVs by 2025 in the EV Readiness Strategy. Latest data indicate Bend is on track for that target, so 6,250 was assumed to be the EV population for bend in 2025. In alignment with the State Transportation Strategy, share of EVs by 2050 is assumed to be 95%. Vehicle ownership per capita and VMT per capita are assumed to remain static through the analysis period for this strategy, and the resulting compound annual EV population growth rate is calculated to be 13.2%. This ambitious but possible scenario achieves 11% EVs as share of all vehicles by 2030 and 42% EV share by 2040. Electricity emissions are linked to the grid decarbonization scenario.	Costs are based on previous Good Company work for the City of Eugene's Fleet Division and Fire Department Climate Action Plan (available for download online). That plan includes EV technology and market research for a variety of vehicle types as well as a number of scenarios that consider a range of initial vehicle costs combined with various combinations of Federal, State, and local utility financial incentives. This research found a range between -$50 per ton for small passenger vehicles at current market prices for new EVs combined with all currently available incentives up to $75 per ton for larger vehicles without available incentives. These prices include consideration of consider reduced fuel and maintenance costs for EVs compared to internal combustion engines per reporting from Argonne National Laboratory's AFLEET tool as well as charger and infrastructure costs.

T2	Encourage bike and pedestrian travel	"Accurately measuring VMT and transportation emissions is challenging -- different approaches may produce dramatically different results. Bend's current inventory uses a fuel sales method for estimating transportation emissions. Fuel sales are generally the most reliable data source, but they may not translate well to local VMT, especially for communities like Bend, which is both a regional center and a major tourist destination. For this analysis, ODOT household trip survey data provided average trip mode and distance, which was used to estimate the benefits of trip substitution by walking and biking. Average vehicle fleet fuel efficiency was developed from a full census of Bend fleet vehicles performed by ODOT in 2020. In the scenario, walk-bike trip share is set to increase from a 12% baseline to 20% in 2035 and 25% in 2050. Source: Personal Travel in Oregon: A Snapshot of Daily Household Travel Patterns (2019). Prepared for ODOT: oregon.gov/odot/Planning/Documents/OHAS-Daily-Travel-In-Oregon-Report.pdf#:~:text=On%20a%20per%20capita%20basis%2C%20this%20equates,household%20vehicles%2C%20and%20children%20in%20the%20household."	Costs are assumed to be equal to the costs for active transportation upgrades in the financially constrained scenario, reported in 2045 Bend Metropolitan Transportation Plan as $248.5 billion between now and 2045. Financial savings are calculated based on a cost of $0.137 per displaced passenger mile traveled from single occupancy vehicles based on Argonne National Laboratory's AFLEET carbon calculator.
T3	Increase transit ridership	Between 2020 and 2040 Cascade East Transit plans a 60% increase in the frequency of service for fixed routes within the City of Bend. No additional routes are current planned within the City. In addition, modeling done for Bend's TSP predicts a 1.7% increase in ridership by 2040. Emissions reductions for this strategy are calculated with information provided by Cascade East Transit staff; the 2016 National Transit Database (NTD); and an emissions benefits calculator for transit developed by Transit Cooperative Research Program. The tool was used to calculate the baseline transit benefit in Bend for 2023 as well as the benefit with increased service frequency, ridership, and Bend population in 2040.	"Costs for this strategy are based on all current CET operational costs for Bend bus service. These costs were used as a ratio with CET service miles to estimate future costs for additional service miles. Financial savings from avoided fuel costs are calculated based on a cost of $0.137 per passenger mile traveled in a single occupancy vehicle based on Argonne National Laboratory's AFLEET carbon calculator. Source: National Transit Database, 2023 Operating Expenses tables, COIC for Bend City bus service."
T4	Promote the use of carpooling and vanpooling	Scaling scenario assumes doubling of carpooling by 2030 and a 10% annual increase in carpooling from 2030 to 2040. For consistency, trip characteristics were maintained from T-2, encourage bike and pedestrian travel. Additional commute mode share data comes from the 2022 ACS commuting characteristics data set. Trips by mode were calculated as work-related trips in the ODOT survey data multiplied by the share of commute trips by mode in ACS. GHG per mile for vehicle trips is linked to the EV transition scenario to account for changes in vehicle fleet.	Updates to the GHG methodology show strong benefits from this action, and due to the very low assumed cost of implementation, this is a highly cost-effective measure that achieves substantial VMT reductions in addition to reduced GHGs. That said, the targets here are ambitious, but due to low cost of implementation, even incremental progress is a win-win.
T5	Lead by example by converting fleet vehicles to electric and alternative fuel vehicles	This strategy assumes that by 2030, the City's gasoline use (E10) will be 100% substituted with electric vehicles and that 100% of fossil diesel use (B5) is substituted with renewable biodiesel (R99). Fuel use data was provided by the City and Oregon Department of Environmental Quality, and fuel carbon scores from the Clean Fuels Program are used to estimate emissions reductions. Data on "other public fleets", such as school buses, was not readily available for this analysis and therefore was not included.	Costs for this study include marginal cost of electric vehicles over gasoline engines ($8,000/vehicle), savings from avoided gasoline purchases ($2.31/gallon), increased costs of electricity (19 cents/kWh), added cost of EV charging infrastructure ($1,750/charger), and reduced maintenance costs ($610/year/vehicle). Assumptions include an EV fleet size of 40 vehicles, a gasoline fuel economy of 25.4 miles per gallon and average EV fuel economy of 35.5 kWh/100 miles. Gasoline, electricity, and maintenance costs are expected to increase 2% annually. Net present value is calculated based on a vehicle life of 5 years and infrastructure lifespan of 10 years, with a 3% discount rate. These estimates are conservative, and the benefit may be even greater if gasoline costs are higher, electricity pricing is lower, or EVs become more price competitive.
T6	Use land use policy and transportation planning to encourage VMT reduction	Currently, it is a challenge to precisely model the effects of land use and transportation policy changes in the Bend region. Estimates of the net effects of land use interventions are highly uncertain, and often hard to extrapolate beyond the original study region, and for this scaling process, a comprehensive model including expected land use and transportation policy changes based on state goals was not available. For these reasons, a calculator from the Transit Cooperative Research Program (TCRP) was used to estimate the general emissions benefits of densification and transit expansion in Bend. The calculator was used to estimate baseline values for 2023 as well as target values in 2040. The emissions benefit of land use change is estimated as the difference in land use emissions benefit from the 2023 baseline and the 2040 forecast.	

T7	Establish financial incentives to drive behavior change in transportation	For this project, we were unable to identify reliable models for road/parking pricing measures. The emissions benefits from these interventions are not quantified.	

Materials and Waste			
MW1	Improve waste recovery through recycling	"By 2025, Deschutes County will need to increase the landfill recovery of materials from 33% to 45% of total collected materials. The Deschutes County Solid Waste Management Plan (2019) details the materials of focus to meet these recovery goals - which include food waste, construction and demolition waste (e.g. wood waste, cardboard, metals), and also mentions textiles. There are additional Oregon sub-goals of 25% of plastics waste by 2025, as well as decreasing total waste generation by 15% by 2025 (compared to 2012) and 40% by 2050. Bend's current SWMP focuses on achieving its County-specific recovery goal and does not offer much planning toward the generation goal. Therefore, emissions calculations here focus on recovery goals. There are four strategies considered in this analysis related to solid waste - this one, food waste recovery (W-3), foods waste prevention (W-6), and C&D waste recovery (W-4). See the other rows for specifics on food waste and C&D waste. This row represents increased commingled recycling material recovery for projected Bend population increases as well as additional material collection required to reach the County's 45% recovery goal. In order to achieve that goal our analytical team had to assume a very high recovery of food waste (50%) and wood waste (50%). Calculations of emissions reductions use EPA's Waste Reduction (WARM) Model combined with projected solid waste totals from the County's 2019 SWMP. Source: Solid Waste Management Plan (2019). Deschutes County. deschutes.org/sites/default/files/fileattachments/solid_waste/page/11560/deschutes_county_swmp_2019.pdf"	Costs for this action are not readily available.
MW2	Expand use of low-carbon concrete in City projects and new development	This action assumes that the community of Bend pursues best practices in reducing emissions from concrete: (1) use less for each project, (2) clinker substitution, and (3) purchasing from suppliers using green kilns. Together, these actions are estimated to be able to reduce carbon intensity of concrete by 66%. Scaling scenario estimates 50% of 'use less' reduction potential by 2030, 20% of 'clinker substitution' by 2030, and 10% of green kiln reduction potential by 2030. Full achievement of the total 66% reduction in concrete carbon intensity is estimated at 2050. No additional carbon capture & sequestration (CCS) is modeled.	"Emissions reductions for reduced concrete use calculated assuming $150/cy concrete (high typical value for the region), and 245 kgCO2e/cy (central value from EC3 database for Oregon ready-mix concrete mixes). On the lower end of cost, assumed ~10% reduction in concrete use per project. Larger reductions are likely possible in many projects, which could unlock additional cost savings. Upper end cost premium for lower carbon concrete inputs (+15% per cubic yard) estimated using reports from RMI and recent work with users and suppliers of low carbon concrete. Note, evidence indicates the carbon intensity of concrete in the Pacific Northwest has lowered significantly in recent years with little to no impact on cost, and upper bound in cost is unlikely to be reached in the vast majority of cases. Source: rmi.org/low-carbon-concrete-in-the-northeastern-united-states/ "

MW3	Improve food waste recovery	"By 2025, Deschutes County will need to increase the landfill recovery of materials from 33% to 45% of total collected materials. The Deschutes County Solid Waste Management Plan (2019) details the materials of focus to meet these recovery goals - which include food waste, construction and demolition waste (e.g. wood waste, cardboard, metals), and also mentions textiles. There are additional Oregon sub-goals of 25% of plastics waste by 2025, as well as decreasing total waste generation by 15% by 2025 (compared to 2012) and 40% by 2050. Bend's current SWMP focuses on achieving its County-specific recovery goal and does not offer much planning toward the generation goal. Therefore, emissions calculations here focus on recovery goals. There are four strategies considered in this analysis related to solid waste - this one, food waste recovery (W-3), foods waste prevention (W-6), and C&D waste recovery (W-4). See the other rows for specifics on food waste and C&D waste. This row represents increased commingled recycling material recovery for projected Bend population increases as well as additional material collection required to reach the County's 45% recovery goal. In order to achieve that goal our analytical team had to assume a very high recovery of food waste (50%) and wood waste (50%). Calculations of emissions reductions use EPA's Waste Reduction (WARM) Model combined with projected solid waste totals from the County's 2019 SWMP. Source: Solid Waste Management Plan (2019). Deschutes County. deschutes.org/sites/default/files/fileattachments/solid_waste/page/11560/deschutes_county_swmp_2019.pdf"	In order to increase participation in and access to food waste collection services, including expanding in the multifamily and commercial sectors, and to develop and deliver educational programs that teach and encourage residents to compost their food waste, program costs for one (1) FTE were assumed. Costs per MT CO_2e avoided were calculated by dividing annual program costs by forecasted average annual emissions reductions.
MW4	Improve Construction and Demolition Waste Recovery	The 2019 Deschutes County Solid Waste Management Plan (SWMP) estimates that as much as 30% of the County's total waste is from building construction and demolition (C&D). The County is planning a waste composition study to learn more about C&D waste quantities and composition. County staff speculated that C&D waste offers material recovery opportunities for cardboard, metals, and clean wood waste. To estimate GHG savings for this strategy C&D waste quantities for these materials, as reported in the 2019 SWMP, were estimated by assuming 30% of these materials are from C&D sources. For this strategy it is assumed that new sorting requirements and infrastructure are put in place to allow for sorting and recovery from this waste stream. Specific material recovery for these materials, by weight, is assumed to be at the same recovery rate as is currently achieved in the County for these materials. GHG reductions are calculated using EPA's Waste Reduction (WARM) Model using Oregon and Bend specific waste facility inputs.	The County is in the early stages of planning recovery for C&D waste and therefore capital and operational costs for this strategy have yet to be determined and are not readily available for this analysis.
MW5	Encourage waste prevention and reducing consumption through outreach and education	"In December of 2016, ODEQ released the Strategic Plan for Reuse, Repair, and Extending the Lifespan of Products in Oregon. In the plan, ODEQ cites a 2009 study from the U.K. that found that best practices for ""quick wins"" for extending the lifespan of products could reduce more than twenty times the greenhouse gas emissions than best practices for commercial and industrial recycling. The study estimates that ""product lifespan optimization"" could reduce business as usual emissions by 3%. To estimate emissions reductions, this value is applied to Bend's 2021 consumption-based emissions for building materials, clothing, furniture, and the other goods categories. Sources: Meeting the UK climate change challenge: The contribution of resource efficiency (2009). WRAP. york.ac.uk/media/sei/documents/publications/Final%20Report-%20Meeting%20the%20UK%20climate%20change%20challenge.pdf Strategic Plan for Reuse, Repair, and Extending the Lifespan of Products in Oregon (2016). Oregon Department of Environmental Quality. oregon.gov/deq/FilterDocs/wprStrategicPlan.pdf"	Cost effectiveness for waste prevention, which includes repair and reuse, presented in Center for Climate Strategies report Greenhouse Gas Marginal Abatement Cost Curve Development and Macroeconomic Foundational Modeling for Oregon (2012) found the cost effectiveness of waste prevention at -$270 / MT CO_2e ($270 is saved for every ton of emissions reduction). This cost effectiveness considers avoided emissions for production of a new replacement good.

MW6	Encourage food waste prevention through outreach and education	This action assumes that the community of Bend, through a variety of recommended actions from EPA and ODEQ, will reduce edible food waste by 5% compared to current disposal rates. The Bend community does not currently have a source reduction goal; therefore 5% was selected to illustrate the potential, but is not grounded in existing, local policy. This strategy focuses on reducing household and commercial edible food waste. To better understand implementation actions for this strategy is the ReFed Road Map to Reduce U.S. Food Waste. To estimate GHG reductions, it is assumed that Bend community food waste is source reduced at a rate of 1% annually over the period 2020 - 2025 to culminate in a total 5% reduction compared to 2016 levels. We also assume that the community remains diligent to hold this rate of reduction at 5% annually post-2025 compared to 2016 generation rates. Current and projected food waste quantities are found in Deschutes County's Solid Waste Master Plan (SWMP). The fraction of edible food waste is available from ODEQ's 2016 Solid Waste Composition Study for the "Rest of Oregon" region. For this region edible food waste represents about 60% of the total. Greenhouse gas reductions are calculated using EPA's Waste Reduction Model (WARM) using Oregon and Bend specific waste facility inputs.	Costs for this action assume 1 full time employee to run and maintain programmatic efforts over the time period. 1 FTE is estimated at $100,000 annually (salary + benefits). Community financial savings from avoiding edible food waste are valued at $2.5 per pound of food waste per information from the ReFed Roadmap document.
MW7	Promote low-carbon food choices	Estimates of emissions from food by type (grains, dairy, meat, produce, and other) were pulled from the 2021 Bend GHG Emissions Inventory. Baseline emissions from food were scaled up over time based on population growth. For the alternative scenario, we assumed a 'no beef' diet and calculated that a 'no beef' diet would result in a 24% reduction in emissions from food compared to the average U.S. diet. Annually, the low-carbon food choices scenario is 24% lower than the baseline scenario.	Not estimated.

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