Salem Climate Action Plan

2021

Final Draft, November 2021

CITY OF Salem AT YOUR SERVICE

verdis GROUP

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Acknowledgments

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Executive Summary

EXECUTIVE SUMMARY

The City of Salem is taking action to respond to climate change.

The City of Salem is taking action to respond to climate change. Knowing that climate impacts have already begun to exacerbate hazards for our residents, the City has adopted ambitious greenhouse gas reduction goals and is strengthening our ability to address climate-related challenges. Building on regional action and with global deadlines to reduce greenhouse gas (GHG) emissions rapidly approaching, Salem's Climate Action Plan comes at an opportune time to make real progress.

This climate action plan has two overarching strategic goals: to reduce GHG emissions (mitigation) and to increase climate resilience (adaptation). Both goals must be accomplished through equitable processes so that residents who are most vulnerable to climate-related hazards are engaged in planning processes, protected from severe impacts, and are able to access resources and opportunities to better prepare for climate change.

In addition to the main goals of reducing emissions and increasing resilience, the plan also aims to identify strategies to accomplish these goals, to prioritize these strategies, and to identify key partners in implementing the plan.

SALEM'S CHANGING CLIMATE

Salem residents will notice several changes in the climate in coming decades. The shifts in

climate are projected to occur in three main areas: warming temperatures, changing precipitation patterns, and increased risk of wildfire. Some of the most significant projected climate impacts are the following:

- The number of days with a heat index over 90°F will increase from a historic average of 7 per year to 33 per year by mid-century.
- Hotter and drier conditions are likely to cause more frequent droughts.
- More intense rainfall and rain-on-snow events could also lead to flood events in areas outside of historical high-risk zones.

- Wildfire is a significantly increasing risk across the state of Oregon. The number of extreme fire danger days[1] in Salem will double by mid-century, increasing from a historic average of 10 per year to 20 per year. Extremely large, intense fires will become more likely under hotter and drier climate scenarios.
- Poor to hazardous air quality resulting from wildfires could greatly impact unsheltered populations and people with underlying health issues such as asthma, diabetes and obesity.

SALEM'S EMISSIONS REDUCTION GOAL

In October 2020, the Salem City Council voted to adopt GHG emissions reduction goals. The goals are as follows:

BY 2035

SALEM'S **GREENHOUSE GAS EMISSIONS ARE REDUCED TO 50%** OF THE CITYWIDE GREENHOUSE GAS EMISSIONS FROM THE BASELINE YEAR OF 2016, AND

BY 2050

SALEM **IS CARBON NEUTRAL.**

These goals have guided the development of the strategies in this plan. Meeting these goals will require the community to rally around a shared vision of the future and to adopt new policies, behaviors and practices.

Through the planning process, Salem residents contributed their ideas for a vision of Salem's future that is carbon-free, resilient, and thriving. This vision entails:

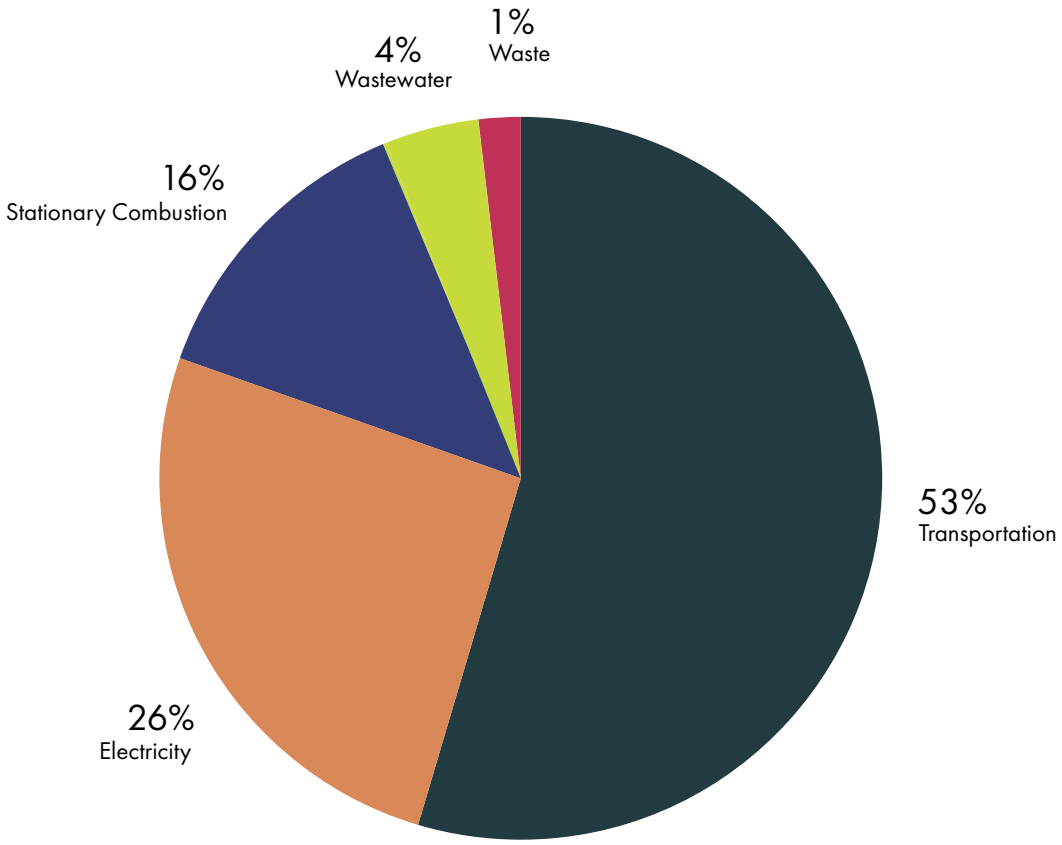
- Net zero emissions from energy
- A connected, multi-modal transportation network
- A healthy local food system
- Accessible and affordable resources for all residents
- Zero waste
- Climate-smart economic development
- Natural resource protection
- A cohesive and caring community

WHERE DO SALEM'S EMISSIONS COME FROM?

53% OF SALEM'S GHG EMISSIONS COME FROM TRANSPORTATION

Salem's greenhouse gas inventory[2] shows the source and helps to show where emissions reductions can occur. Using 2016 as the baseline year, the City completed its first GHG inventory in 2019. The inventory shows that total GHG emissions in 2016 were 1,553,573 metric tons of carbon dioxide equivalent ($MtCO_2e$). This equates to roughly 9.59 $MtCO_2e$ per capita. Emissions from transportation were by far the largest source of emissions, constituting more than half (53%) of the total. Emissions from electricity was the second largest category at 26%. Stationary combustion from the use of natural gas, propane, and other fossil fuels was the third largest contributor at 16%.

CITY OF SALEM GROSS GHG EMISSIONS BY SOURCE (2016)*



TOTAL EMISSIONS: 1,553,573 $MtCO_2e$

**Agriculture and urban forestry not included due to a net reduction in GHG emissions.*

Figure 1.

REDUCING EMISSIONS

To achieve reductions in emissions, it will be necessary to make significant changes in the ways that the Salem community uses transportation and energy.

GREENHOUSE GAS EMISSIONS FORECASTS

Two forecasts were created to show what levels of GHG reductions Salem might be able to achieve under different scenarios. A baseline, or business-as-usual, scenario was created that modeled how GHG emissions may change over time if no climate actions were taken. Building upon that baseline forecast, two different emissions reduction scenarios were modeled that showed the projected effects of actions that Salem could take.

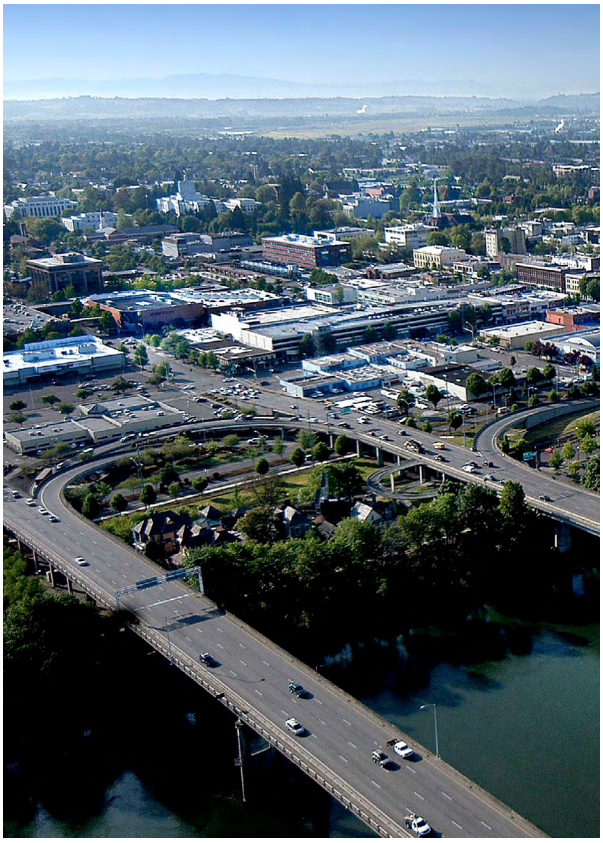
The first scenario modeled the outcome of Salem achieving ten emissions reductions targets. The outcome of Scenario 1 showed a 40% net reduction from 2016 levels by 2035, and a 65% net reduction from 2016 levels by 2050. In this scenario, Salem would not meet its goals.

The second scenario modeled what it would take to meet Salem's 2035 and 2050 goals. This model assumed that all emissions reduction targets in the Scenario 1 were met, and then added nine additional targets.

The model shows just one possible way of achieving the goal. The actual path that Salem will take will undoubtedly look different as time goes on. Some of the emissions reductions could be accomplished in other ways and in different combinations. Technological and behavioral solutions that cannot yet be quantified may play an important role by 2050.

CLIMATE ACTION STRATEGIES

Appendix 8 contains a robust list of 183 recommended strategies to reduce emissions and increase climate resilience in the City of Salem. The majority of Salem's GHG emissions come from the transportation and energy sectors, so the majority of strategies address ways to reduce emissions in these two sectors. Most strategies have co-benefits such as improving public health, improving Salem's environmental quality, enhancing the local economy, increasing mobility choice for residents and visitors, and contributing to a more equitable community. Taken together, these strategies represent a valuable roadmap for Salem's climate progress for years to come.



BENEFIT-COST ANALYSIS

A detailed benefit-cost analysis (see Appendix 6) was performed on ten climate action strategies selected by three Salem City Council members who served on the Climate Action Plan Task Force. The strategies were selected based on their projected impact to the City of Salem's budget and the desire for analysis that may inform future policy decisions.

In-depth interviews with subject matter experts from the City of Salem, the Mid-Willamette Valley Council of Governments, Cherriots, Friends of Trees, the City of Portland, and the Energy Trust of Oregon were conducted to inform the analysis. The top-level findings are as follows:

MOST COST-EFFECTIVE CLIMATE ACTION STRATEGIES

1. Charge for on-street parking in downtown.
2. Support energy efficiency and weatherization for lower income households (including renters) and small business owners.
3. Support additional tree canopy in low canopy neighborhoods.

LOOKING FORWARD

With strategic planning, determined resolve, collaborative partnerships, and collective will, the Salem community can achieve significant progress in reducing emissions and becoming a climate-smart city.

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Introduction

INTRODUCTION

This Climate Action Plan seeks to chart a course of action for Salem to become a climate-smart city of 2050.

Situated in an agricultural valley with forested riparian areas along the Willamette River, Salem enjoys an idyllic natural setting which is a source of joy and pride for residents. Residents of Salem are also accustomed to periodic natural disasters. Earthquakes and floods have been defining characteristics of the area since the beginning of recorded history, but in recent years, the impacts of climate change have become increasingly evident. The area has experienced record temperatures, record drought, flooding, and, most recently, a historic wildfire season in 2020 and destructive ice storm in early 2021.

The serious impacts of these events have prompted governments across the Pacific Northwest to take ambitious steps to assess future climate impacts, reduce greenhouse gas emissions—what's known in the climate world as "mitigation"—and increase resilience to climate change, or the effort known as "adaptation." This Climate Action Plan seeks to chart a course of action for Salem to become a climate-smart city of 2050: a city that has embraced a carbon-free way of life, that has enhanced equity for all residents, and that protects its residents from the most severe impacts of climate change so that the city can continue to thrive.

A GROWING POPULATION

Changes to Salem's climate will take place in the context of a rapidly growing city. Salem's population is projected to grow 28% by 2035[3]. This growth will likely lead to increased climate hazards, as the need for additional housing may lead to increased pressure to build in fire and flood risk zones, and more people may need health or emergency services during extreme heat or hazardous air quality events. In addition, a higher population means that in the future, more individuals will be driving, using electricity and consuming goods, which may lead to increased GHG emissions at the same time the city is trying to make deep reductions.

APPROACH TO EQUITY

The effects of climate change will not be borne equally by Salem residents—those who contribute least to climate change will suffer the most serious consequences. Some Salemites already experience intersecting vulnerabilities due to racial discrimination, poverty, disability, housing insecurity, linguistic isolation, and barriers to nature, healthy food, and economic opportunities. Climate change will exacerbate those vulnerabilities and create new ones. People who live in floodplains, who live with medical conditions, who are unsheltered, and/or who have limited financial and social resources to recover from extreme weather events will have the most difficulty adapting to climate impacts.

Equity means all residents have the opportunity to participate and thrive in an inclusive society. This requires rectifying unequal access to resources and opportunities caused by historic and current systems of oppression and exclusion related to race, income, ability, gender, sexual identity, and other factors. An equitable community overcomes disparities by providing increased levels of support to community members based on their needs. In Salem, it is a priority to advance equity in decision-making processes and the outcomes of those processes, including policies, investments, practices, and procedures. Several strategies in this plan have the potential to increase equity in Salem by addressing systems and practices that have historically disadvantaged groups of Salem residents and by maximizing benefits for frontline communities. Many of the equity strategies are overarching actions that apply to not only the climate action plan, but other facets of City governance and community equity.

Going forward, as the recommendations of this plan are implemented, it will be important for Salem to act from the following equity principles to ensure a fair transition to a climate-smart future. Each of these principles corresponds to one of the seven Action Areas of this Plan:

1. Prioritize actions and allocation of public funding that improve safe mobility and increase transportation choice in low-income neighborhoods. Intentionally engage residents in low-income neighborhoods during planning and decision-making phases to better understand the needs and priorities of specific areas in Salem.

2. Implement strategies such that those responsible for the greatest amount of GHG emissions take the greatest action towards reducing emissions. Ensure the transition to renewable energy generation does not disproportionately affect low-income individuals and households. In decision-making and implementation, elevate the perspective of those most affected by climate change. Use equity frameworks and criteria to evaluate and execute all strategies.

3. Make green spaces and benefits of natural resources accessible to all Salem residents. Prioritize underserved areas and neglected neighborhoods when implementing strategies. Intentionally include residents of these areas and neighborhoods throughout planning and decision-making processes.

4. Cultivate affordable cost of living standards within Salem's economy. Ensure all residents have access to safe and affordable housing options.

5. Intentionally and thoughtfully engage historically excluded communities throughout future planning and implementation efforts related to climate action strategies.

6. Prioritize residents who do not currently have access to healthy foods and grocery stores during implementation of food-related strategies.

7. Ensure that waste disposal practices do not disproportionately affect low-income neighborhoods or historically marginalized communities.

Going forward, as the recommendations of this plan are implemented, it will be important for Salem to act from equity principles to ensure a fair transition to a climate-smart future.

SALEM 2050 VISION

What would a carbon-neutral and resilient Salem of 2050 be like?

In the fall of 2020, Salem residents contributed hundreds of ideas in response to the question, "What would a carbon-neutral and resilient Salem of 2050 be like?" Their responses paint a picture of a carbon-free, resilient, and thriving community. This vision drove the development of strategies in this plan.

Residents' vision for a climate-smart city of the future is that by 2050, Salem will have achieved:

NET ZERO EMISSIONS FROM ENERGY

Salem's utilities have transitioned to carbon-free sources of energy and all residents have benefited from stable electricity prices. All buildings are maximally energy efficient, solar energy is widely used, and the city has achieved its goal of carbon neutrality.

A HEALTHY LOCAL FOOD SYSTEM

A thriving local food system provides abundant, accessible and affordable healthy food for all. Community gardens and farmers markets can be found throughout the city, providing both food and social connectivity.

A CONNECTED, MULTI-MODAL TRANSPORTATION NETWORK

Residents have the ability to travel safely and affordably in all transportation modes, including the zero-emissions public transit system. New housing and commercial developments have added density, sidewalk and transit connectivity, and walkable neighborhoods. Biking and walking trails have been expanded.

ACCESSIBLE AND AFFORDABLE RESOURCES FOR ALL RESIDENTS

All Salem residents have access to affordable housing, healthcare, healthy food, jobs and transportation. When natural disasters strike, people know where to go to get help, which allows them to bounce back successfully.

ZERO WASTE

("Zero waste" is defined as diverting 90% of waste from landfills through waste reduction, composting, recycling and reusing.)

A closed-loop system in which products are recycled or remanufactured has resulted in a dramatic reduction of waste. A city-wide composting program collects all food scraps and yard waste and turns it into compost which is sold to gardeners.

NATURAL RESOURCE PROTECTION

Salem's parks and trees are thriving, thanks to investments in the tree canopy and the incorporation of native plants in parks across the city. Careful management practices have reduced storm runoff, and water quality has been protected with increased buffers.

CLIMATE-SMART ECONOMIC DEVELOPMENT

Local small businesses are thriving, thanks to a variety of partnership and support programs and the choices by residents to support their local economy. Environmentally sustainable business practices are the norm, and green jobs have substantially increased.

A COHESIVE AND CARING COMMUNITY

Salem is an engaged, caring community with a shared vision that works together to achieve climate goals. Formerly underrepresented voices have helped to shape city policies and practices in ways that have improved quality of life for all residents.

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Process

PROCESS

In 2020, the City of Salem hired Verdis Group to lead the community through the climate action planning process. Because of the coronavirus pandemic, the majority of the project was completed virtually. Most meetings and workshops were held via Zoom. Community engagement was conducted in person and virtually in the summer and fall of 2021.

The planning process included the following key steps:

1. CLIMATE ACTION TASK FORCE:

A Task Force of 35 members and 5 City staff representing a diverse cross-section of the Salem community was formed. This group participated in five virtual planning workshops.

2. ADVISORY GROUP:

A group of 13 City staff was created and provided technical input and advising throughout the process. Some members of the City Staff Advisory Group also served on the Climate Action Task Force.

3. CONSUMPTION-BASED EMISSIONS INVENTORY:

An analysis of the GHG emissions associated with the products and services that Salem residents purchase and consume was completed.

4. PUBLIC ENGAGEMENT:

Stakeholder mapping and analysis helped inform representation on the Task Force as well as the creation of a Public Engagement Plan, which outlined approaches and strategies for engaging the public in the climate planning process. A website was created to serve as a hub for information

and community engagement related to the Climate Action Plan. At the outset of the project, a survey was conducted, gathering input from 499 community members regarding their views on climate change, characteristics of Salem, and the planning process. Community partners and Task Force members were asked to share requests for public input to their networks at various stages. Specific public engagement activities are included in the steps below.

5. VISIONING:

Nearly 75 community members and Task Force members contributed 221 ideas to identify a vision for a resilient Salem of 2050. These activities resulted in a set of visionary ideas categorized into eight main action areas.

6. VULNERABILITY ASSESSMENT:

Twelve interviews were conducted with 23 stakeholders and subject matter experts to ascertain the ways in which climate impacts have already affected Salem, how some residents are and may be disproportionately affected by climate impacts, and the kinds of climate hazards that residents may experience in the future. Discussions were held on topics like water quality, stormwater management, fire risk, homelessness, emergency management, and equity. From the information gathered during interviews and through supplemental resources shared by interviewees, a methodological assessment of the climate risks Salem faces was conducted to identify the greatest threats to the community and how these climate-related threats interact with existing vulnerabilities. (See Climate Vulnerability Assessment chapter for details.)

7. STRATEGY DEVELOPMENT:

Members of the Task Force and community members were invited to submit their ideas on an online activity about the ways in which Salem could reduce GHG emissions and increase climate resilience. Nearly 250 individuals contributed ideas or comments. Next, additional strategies and best practices were generated by the consultants, ultimately leading to a list of over 200 ideas. A survey was conducted in which the Task Force and community members were asked to express their degree of support for each idea. The strategy ideas then went through a rigorous refinement process in which dozens of subject matter experts were consulted and strategies were refined in order to ensure relevance and specificity.

8. BENEFIT-COST ANALYSIS:

A benefit-cost analysis was performed by Ecotone Analytics on 10 strategies selected by three Salem City Council Task Force members. The analysis is different from a usual benefit-cost analysis in that it takes a broader view of impacts to account for social, environmental and economic valuations that can come from each strategy. A series of interviews with 29 subject matter experts in local and regional agencies was conducted to inform the analysis, in addition to extensive research (see Appendix 6).

9. GHG FORECASTING AND PLANNING:

An in-depth analysis of Salem's GHG reduction potential over the next 30 years was performed. Three separate business-as-usual forecasts were prepared, along with three separate forecasts showing the potential reductions Salem could make with ambitious climate action. Ten target scenarios, or assumptions about future GHG reductions, were modeled to show results by 2035 and 2050 (see Chapter 7).

10. COMMUNITY ENGAGEMENT:

Gathering perspectives and expertise from the Salem community was an essential part of creating a climate action plan tailored to the unique needs of the community. Throughout the Salem Climate Action Plan preparation process, the public provided input through online activities, community meetings, surveys, and by commenting on the draft plan (see Appendix 7). Public input from each phase of the process framed the next phase — feedback from the public was discussed by the project team and incorporated into the visioning, vulnerability assessment, strategy development phase, and finalization of the plan.

11. CITY COUNCIL WORK SESSION:

The Salem City Council received a briefing on the Climate Action Plan and discussed next steps at a Work Session on September 20, 2021.

12. IMPLEMENTATION PLANNING:

Task Force members and City Staff were engaged in creating a prioritized Implementation Plan.

INTEGRATION WITH "OUR SALEM"

The climate action planning process was coordinated with "Our Salem," the City's project to update the Salem Area Comprehensive Plan. Climate action strategies will achieve multiple and overlapping community goals and thus many strategies in this plan, particularly those related to land use planning, are applicable to Our Salem as well. Including these climate-friendly strategies in Salem's comprehensive plan will ensure that the City will be able to make progress toward its climate goals over the next several years.

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Building on State and Local Strengths

BUILDING ON STATE AND LOCAL STRENGTHS

Salem conducted its first greenhouse gas inventory in 2019 and joined ICLEI - Local Governments for Sustainability, a global network of more than 1,750 local and regional governments committed to sustainable urban development, in 2020. These recent commitments build on the city's dedication to creating a more sustainable Salem and on the state's longstanding foundation of improving regional environmental quality. For decades, the State of Oregon has been leading the way for a climate-smart future. Understanding past and present efforts to address climate change at the state level helps provide context for Salem's actions at the local level. This section provides an overview of recent actions from the State of Oregon and a summary of Salem's efforts to mitigate and adapt to the realities of climate change.

STATE OF OREGON LEADERSHIP

Recent legislation at the state level helps incentivize and reinforce equitable climate action here in Salem. In March 2020, Governor Kate Brown signed Executive Order 20-04.[4] This executive order set greenhouse gas (GHG) emissions reduction goals for the State of Oregon:

- At least 45% reduction in GHG emissions from 1990 levels by 2035; and
- At least 80% reduction in GHG emissions from 1990 levels by 2050.

Prior to these state-level goals, Governor Brown also issued Executive Order 17-21 in 2017, which focuses on accelerating the adoption of electric vehicles (EVs).[5] Both executive orders highlight the importance of the transportation sector in achieving GHG emissions reduction goals. In 2020, a new law (SB 1044) went into effect that establishes goals that promote zero-emission vehicle use and requires entities of executive departments to promote zero-emission vehicle use. At a national level, as well as at a state level in Oregon, the transportation sector currently represents the largest source of GHG emissions.[6]

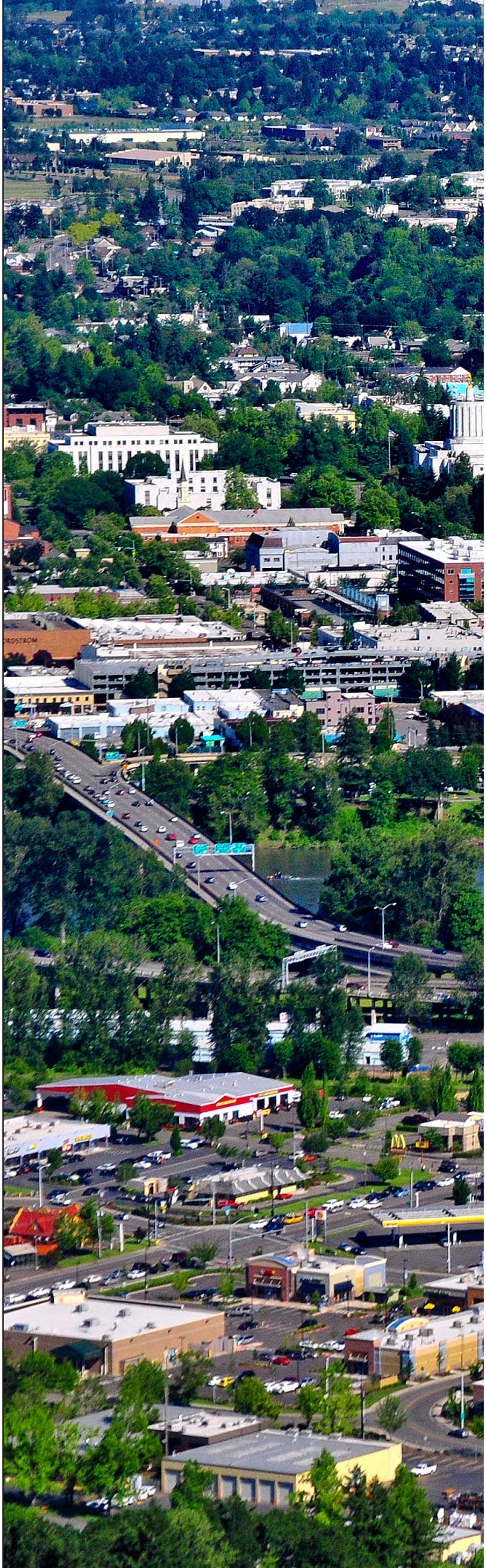
In 2021, several important new pieces of climate-related legislation were signed into state law.

- HB 2021, the 100% Clean Energy Standard, requires retail electricity providers to reduce greenhouse gas emissions associated with electricity sold to Oregon consumers to 80% below baseline emissions levels by 2030, 90% below baseline emissions levels by 2035, and 100% below baseline emissions levels by 2040. It also establishes the Community Resilient Renewables Investment Fund to provide $50 million in grants for cities other than Portland for renewable resource projects. In addition, the law now allows cities to work with their electric utility to create community-wide green electricity tariffs which allow all of the residents in the city served by that utility to get their power from cleaner electricity sources.
- HB 2062 establishes new energy efficiency standards for appliances and certain water fixtures.
- HB 2165, the Transportation Electrification Package, provides incentives and rebates to Oregon residents, including low- and moderate-income individuals, toward the purchase of electric vehicles (EVs). It also expands EV charging infrastructure with a particular emphasis on underserved communities.
- HB 2180 requires certain newly constructed buildings to be EV-ready, meaning they are built with the electrical service capacity for charging electric vehicles.
- HB 2475 requires the Public Utility Commission to set different rates for lower-income energy users, and allows for greater public engagement in PUC proceedings by low-income and environmental justice advocates.
- HB 2842 establishes the Healthy Homes program that will provide $10 million in grants to repair, rehabilitate and weatherize residences of low-income households and landlords.
- HB 3141 continues funding energy efficiency projects across the state.

In September 2021, the Oregon Department of Environmental Quality announced a new rulemaking process to establish a Climate Protection Program.

Under the rule, suppliers of natural gas, gasoline, diesel, kerosene, and propane must cut emissions by 40% by 2035 and by 80% by 2050 from a base of the average emissions from the 2017-2019 period. The DEQ rule, set to be in place in 2022, also sets up a Community Climate Investment Fund in which suppliers can pay for emission reductions in communities that are most vulnerable to climate change through such measures as reducing home energy use, fuel switching, or paying for electric vehicles.

Focused rulemaking has been established by the State to help ensure transportation and land use planning efforts are equitable and help the State of Oregon, as well as local governments, achieve climate-related goals. Oregon's Land Conservation and Development Commission initiated Climate-Friendly and Equitable Communities (CFEC) Rulemaking in September 2020 and is responsible for several different actions and outcomes related to meeting Oregon's GHG emissions reduction goals and other climate-related targets. From the CFEC Rulemaking initiative, local governments can expect requirements from the State regarding climate-friendly and equitable



land use and transportation planning. According to the CFEC Rulemaking Charge, specific requirements are expected to include:[7]

1. Creation of climate-friendly areas allowing high levels of mixed-use development, focused transportation investments.
2. Planning for high-quality pedestrian, bicycle, and transit infrastructure.
3. Limiting off-street minimum parking mandates.
4. Limiting motor vehicle congestion standards.
5. Prioritizing and selecting transportation projects to meet climate and equity goals.
6. Supporting EV charging.

CITY OF SALEM INITIATIVES

Over the past decade, the City of Salem has completed dozens of climate actions. The City's Climate Actions Audit,[8] completed in 2020, includes an inventory of past climate actions based on interviews with City staff and a thorough review of projects, practices, programs, 11 core City of Salem plans, and 12 climate action plans adopted by peer municipalities. Many of Salem's actions align with the forthcoming transportation and land use planning requirements from the State listed above. Additionally, Salem has completed or has in place over 25% of the recommended actions and policies identified for inclusion in CAPs. Examples of Salem's previous actions across five categories are listed on the next page.

BUILDINGS AND ENERGY

- All new city facilities are built to Leadership in Energy and Environmental Design (LEED) Silver Standard.
- City of Salem participates in PGE's Green Future Impact program. Through the program, Salem expects 80% of the energy that powers city operations will come from renewable sources by the end of 2021.
- Streetlights and signals have been converted from older, less energy efficient light fixtures to longer lasting and more efficient LEDs.
- Improvements to the Willow Lake Wastewater Treatment Plant continue the City's production of renewable energy from biogas to power the plant. At full capacity, the plant will be able to produce up to 1,200 kW of electricity, which is about 50% of the electricity needed to operate the plant for a year, or enough to power over 900 homes in Salem.

LAND USE

- Three new Mixed-use Zones have been added that prioritize pedestrian-oriented development.
- To accommodate dense and affordable living, barriers to Accessory Dwelling Unit (ADU) developments have been reduced.

TRANSPORTATION

- Between 2008 – 2016, the City completed nearly 50 different projects to upgrade existing or add new sidewalks, crosswalks, bike lanes, pedestrian crossing islands, shortened crossings at certain intersections, and radar speed signs.
- Access to bicycles and support of biking as a transportation mode have increased through a downtown-focused bikeshare program and installation of rentable bike lockers for storage.
- To enhance collaboration and efficiency, the City has increased its communication with Cherriots, the agency that provides public transit in Salem.
- EV charging stations have been installed at City and community facilities. Currently there are 41 publicly accessible EV charging stations in Salem.[9]

MATERIALS MANAGEMENT

- The City participates in the State of Oregon Sustainable Procurement procedures to help reduce waste at the source and reuse materials before resorting to recycling or landfilling items.

NATURAL SYSTEMS AND COMMUNITY WELLBEING

- Salem facilitates an environmental education program for the community's youth. The program serves an average of 12,530 students every year.
- Access to and connectivity between parks has increased.
- Salem has a tree canopy goal and invests in tree planting projects on City owned properties.
- Access to and connectivity between parks has increased, with acquisition of new park land, as well as sidewalk and crossing improvements.
- Salem has a tree canopy goal of 28% by 2030 and invests in tree planting projects on City owned properties.

Though great efforts have been made in Salem since 2010, the City recognizes that there is always more work to be done. The City's Climate Actions Audit laid the groundwork for this current Climate Action Plan, including an evaluation of areas for improvement. One such area is the development of a climate vulnerability assessment.

6

Climate Vulnerability Assessment

CLIMATE VULNERABILITY ASSESSMENT

Salem is fortunate to have a mild climate—only 21 degrees separate the average annual maximum temperature of 63.1°F from the average annual minimum temperature of 42.1°F.[10] While this mild baseline means that the changes to Salem's temperatures due to climate change may be less extreme than other locations in the country, the City will nevertheless experience notable shifts in the future.

Climate change is already affecting Oregon. The *Fifth Oregon Climate Assessment* describes increasing temperatures, changes to precipitation patterns, increased risk of floods, and increasing risk of wildfire across the state.[11] Since 1895, Oregon has already experienced an average temperature increase of 2.2°F per century. The state is on pace to see temperatures rise by an average of 5°F by mid-century and by an average of 8.2°F by the 2080s. Summer temperatures are projected to increase the most. Rising temperatures, combined with changes in precipitation patterns, may lead to hotter and drier conditions that increase the risk of wildfires across the state and in the Salem area.

HOW CLIMATE RISK IS CREATED

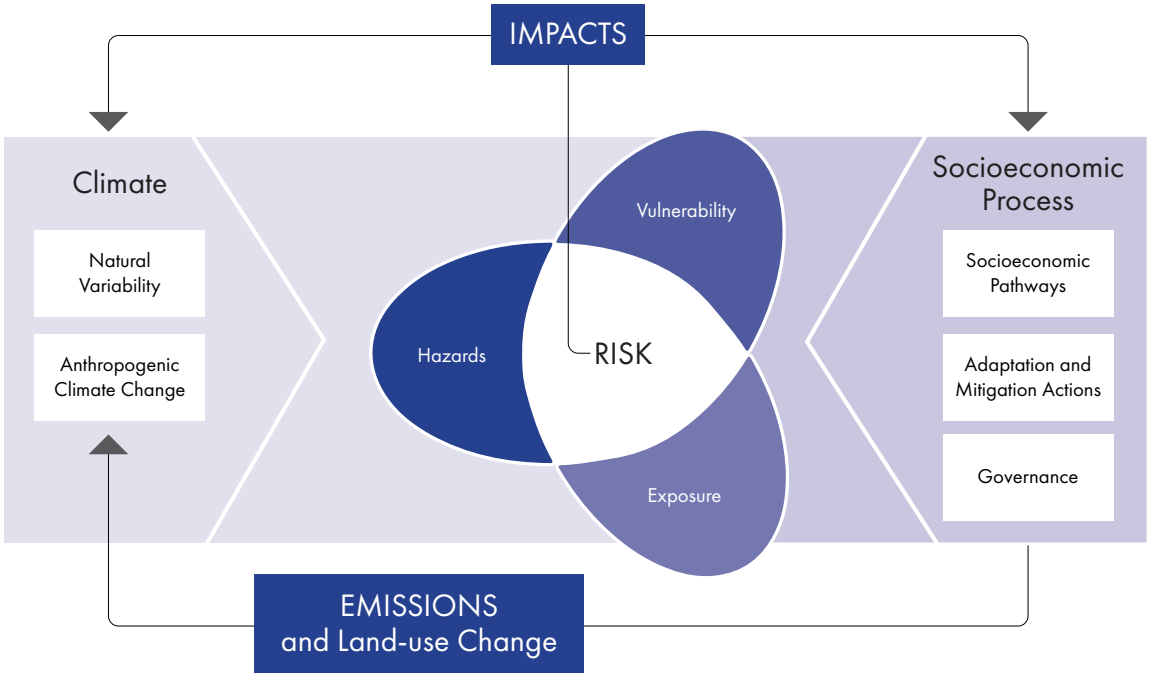


Figure 2. Source. IPCC, 2014: Summary for policymakers. *In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field, et. al. Mastrandrea, et. al., (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1-32.

A critical step of the climate planning process is to take a close look at the specific ways that Salem will be affected by projected climate change impacts. This process helps to identify potential hazards, which then allows the community to take steps to reduce those hazards. As the Climate Assessment report notes, "disasters may result either from single, major events or from recurrent events that individually are not extreme, but degrade a community's social and economic infrastructure."[12]

The climate action planning process for Salem included the important step of assessing Salem's specific vulnerabilities to climate change. The process yielded valuable results which can inform the city's approach to improving climate resilience.

METHODOLOGY

The methodology for completing the climate vulnerability assessment included the following steps:

1. OCCRI CONSULTATION

A consultation was conducted with Dr. Erica Fleishman, Director of the Oregon Climate Change Research Institute at Oregon State University. Dr. Fleishman recommended the online resource known as the Climate Toolbox as a source of climate projection data for Salem. She also recommended a vulnerability assessment framework developed by the Climate Impacts Research Consortium (CIRC).[13]

PROJECTED TEMPERATURE INCREASES FOR OREGON

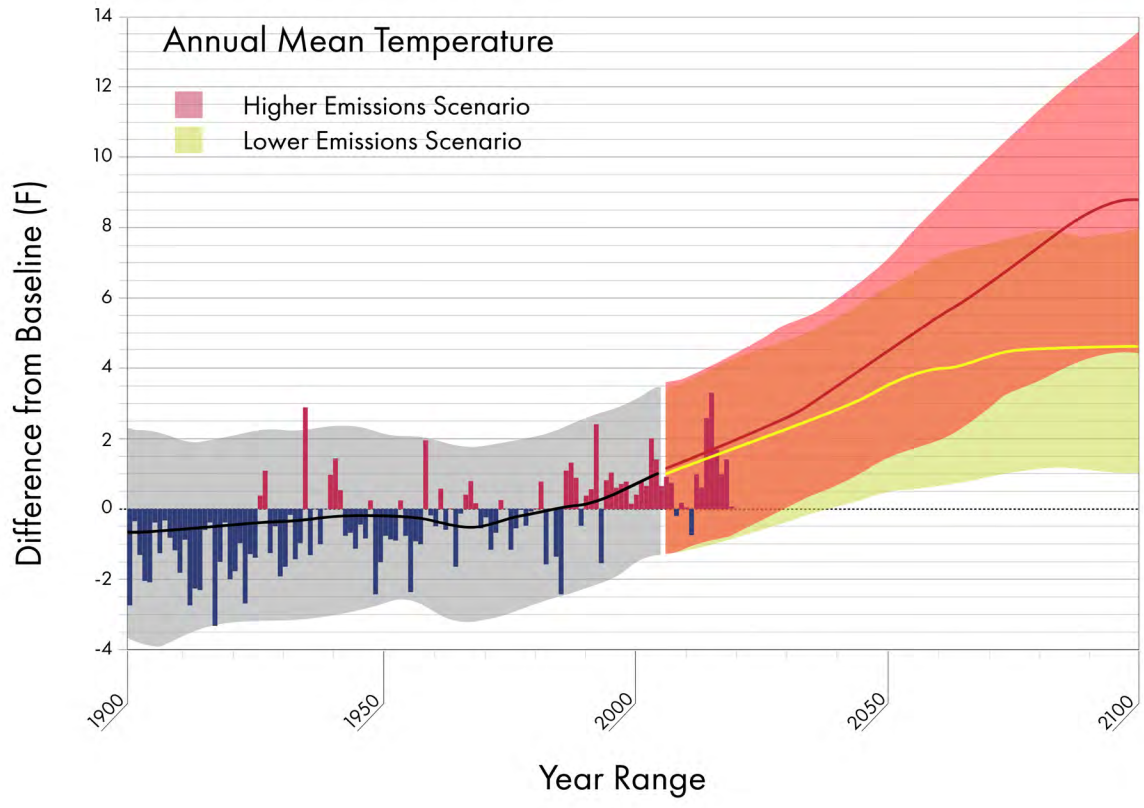


Figure 3. Observed, simulated, and projected changes in Oregon's mean annual temperature relative to 1970–1999 (baseline) under lower (RCP 4.5) and higher future (RCP 8.5) emissions scenarios. Blue and red bars are observed values (1900–2019) from the National Centers for Environmental Information. The thicker solid lines are the mean values of simulations from 35 climate models for the 1900–2005 period, which were based on observed climate forcings (black line), and the 2006–2099 period for the two future scenarios (yellow is lower emissions and red is higher emissions). Source: Dalton, M., and E. Fleishman, editors. Fifth Oregon Climate Assessment. Oregon Climate Change Research Institute. Oregon State University: Corvallis, Oregon, 2021.

2. CLIMATE PROJECTIONS

Climate projection data for the location of Salem, Oregon was obtained using the "Future Climate Dashboard" tool from the Climate Toolbox.[14] Data was collected in the categories of heat indices, summer temperatures, winter temperatures, water, growing season, chilling hours, and fire danger. Additional sources were consulted to gain a full profile of Salem's future climate.

3. CLIMATE IMPACTS

A Vulnerability Assessment Table was created based on the framework developed by CIRC. Climate impacts were grouped into four categories: warming temperatures, changes in precipitation patterns, increased fire risk, and reduced chilling hours.

4. COMMUNITY IMPACTS

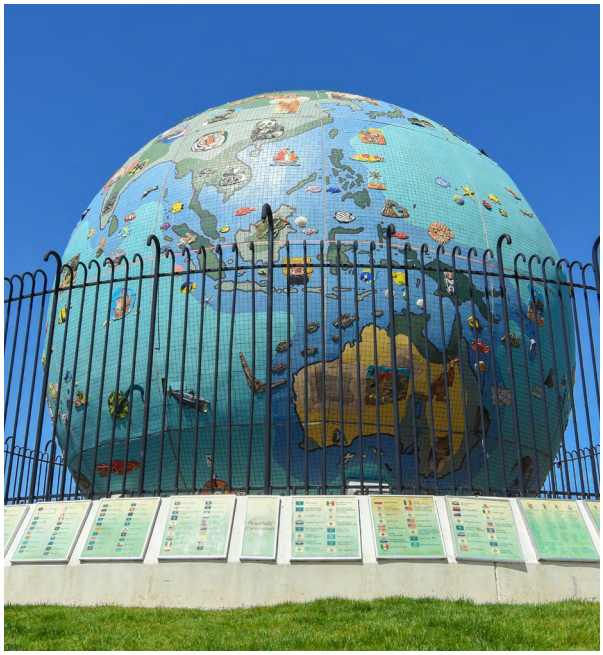
The ways in which each climate projection data point could impact the Salem community was summarized in narrative form.

5. LIKELIHOOD

The likelihood of each climate impact occurring was rated according to the level of evidence.

6. STRESSORS AND CONSEQUENCES

Next, projected intersections between non-climate and climate stressors were assessed. Non-climate stressors contain multiple impacts to the community that are not related to climate, and the examples assessed for Salem were population changes, increased demand for affordable housing, vulnerable populations, emerging health trends, local economy, and earthquake. Each of these non-climate stressors was examined in terms of how it might intersect with the identified climate stressors related to warming temperatures, changes to precipitation patterns, increased fire risk, and reduced chilling hours. From this assessment a consequence level between "negligible" and "catastrophic" was determined.



7. RISK

Using the determined values for likelihood and consequence level, a risk value from "low" to "extreme" was determined.

8. ADAPTIVE CAPACITY

Next, Salem's adaptive capacity was rated. This assessment involved understanding where capacities exist in a community, where weaknesses exist, and how well the community is poised to respond to change from multiple stressors and impacts. To obtain information about Salem's adaptive capacity, a meeting was held with City staff members on the project Advisory Committee. They were asked to respond to a survey in which they rated Salem's adaptive capacity to respond to warming temperatures, changes in precipitation patterns and increased fire risk in the areas of social potential, organization capacity, and management potential. Their scores were analyzed and then used to assign an adaptive capacity rating of "low," "medium," or "high."

9. VULNERABILITY

Finally, using the determined values for risk and adaptive capacity, a vulnerability level between "low," "moderate," and "high" was assigned for each climate impact area.

PROJECTED CLIMATE IMPACTS

Salem's projected climate impacts will fall into three main categories: warming temperatures, changes in precipitation patterns, and increased risk of wildfire. A fourth impact, reduced number of chilling hours, is primarily pertinent to the agricultural sector.

WARMING TEMPERATURES

Salem's average annual temperatures are expected to increase in the coming decades, with the most notable changes occurring in summer and winter. All projections assume a high-emissions scenario based on Representative Concentration Pathway 8.5 and use the 1990s average compared to projections by mid-century.[15] The reason mid-century (year 2050) is used for projections rather than end-of-century (year 2100) is to align with the mid-century emissions reduction goal of this Climate Action Plan.

The average summer temperature increase will be mild: it is projected to increase from a historic average of 66°F to 71°F by mid-century, while the average high summer temperature will increase from a historic average of 79°F to 86°F by mid-century.

What is of more concern is the projected increase in the number of extreme heat days, meaning days where the temperature exceeds 90°F. These temperatures can have serious health consequences such as heat exhaustion, heat cramps, mild heat

PROJECTED EXTREME HEAT DAYS PER YEAR

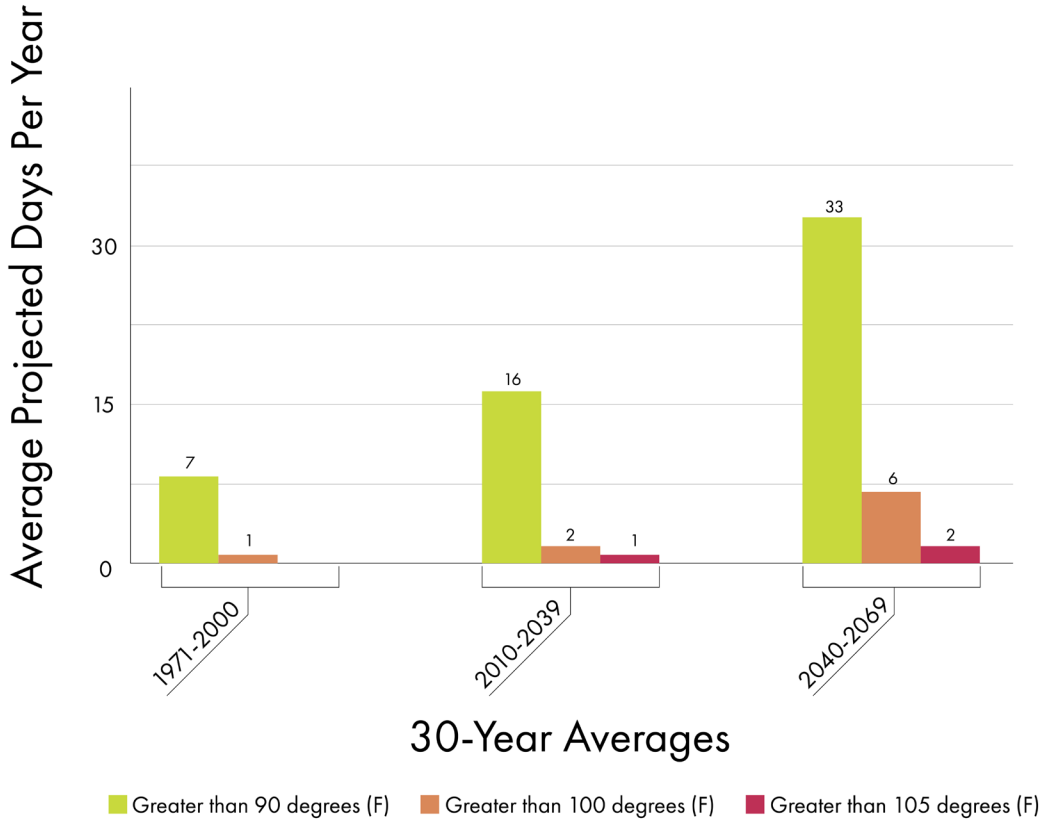


Figure 4: Extreme heat days (days over 90°F) are projected to increase from a historic average of 7 per year to 33 per year by mid-century. Average days over 100°F will increase from 1 to 6.

edema (swelling in the legs and hands), heat syncope (fainting), and heat stroke.[16] Salem's increasing hot days will bring an increased risk of heat-related illnesses for small children, the elderly, people with chronic diseases, residents living at or near the poverty line, people who are unsheltered, and people who work outdoors. People who live in urban areas with little to no tree canopy are at risk of experiencing urban heat islands, areas where heat intensifies due to the absorption and re-emitting of the sun's heat by buildings and roads. The Oregon Health Authority's Climate and Health Profile Report identifies the urban heat island effect as the reason why residents of low-income urban neighborhoods are at greater risk of health-related illness and death from extreme heat.[17] More extreme heat conditions may also bring an increase in respiratory problems, because higher temperatures contribute to the build-up in the air of harmful air pollutants.[18]

Winter temperatures, already mild in Salem, will become slightly warmer. The average high winter temperature is projected to increase from a historic average of 48.2°F to 52.5°F by mid-century. The coldest winter temperatures won't be quite so cold in the future—the average winter low is projected to increase from a historic average of 34.6°F to 39°F by mid-century. Heating needs may decline and put slightly less demands on the energy system, but this could be offset by air conditioning energy demands on hot days.

PROJECTED WINTER TEMPERATURES

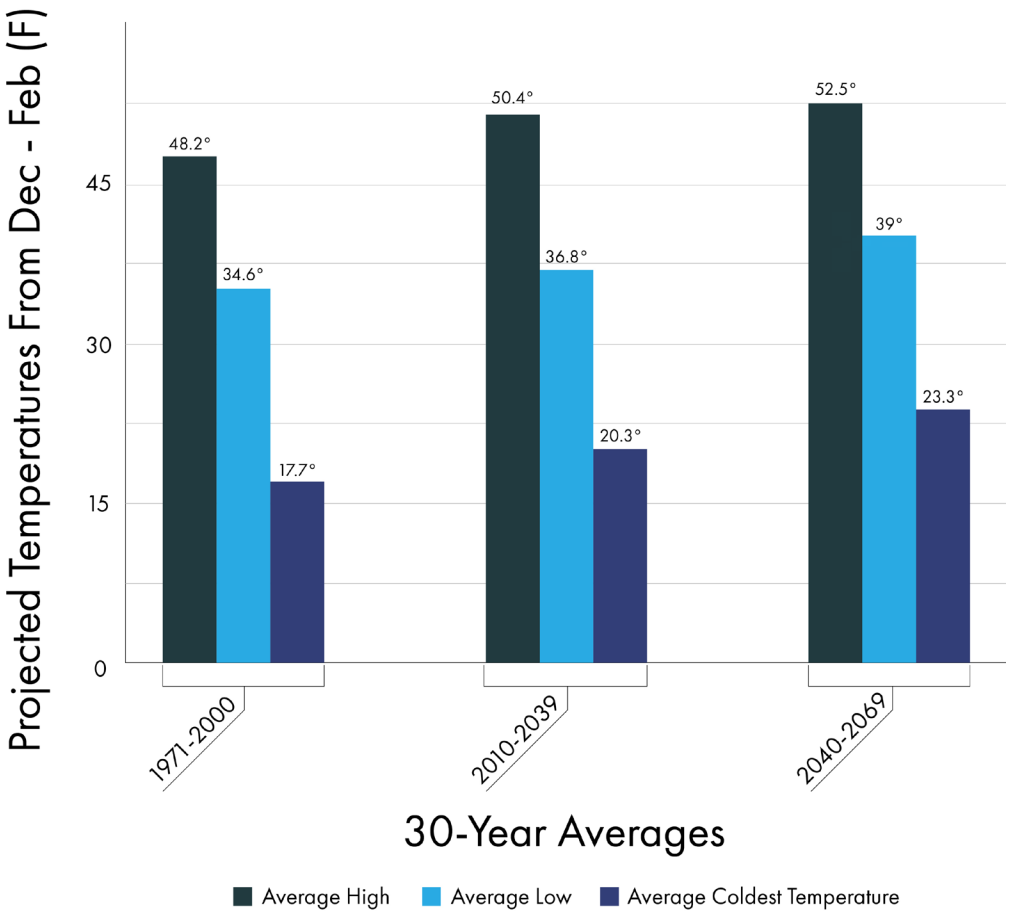


Figure 5: The average high winter temperature is projected to increase from a historic average of 48.2°F to 52.5°F by mid-century.

Warming temperatures will lengthen Salem's growing season, which may bring advantages to agricultural producers in the region. By mid-century, the growing season is expected to lengthen by 68 days, stretching from February to December. By the end of the century, the growing season will last nearly the entire year. While this shift may allow more varieties of crops to be grown in the area, any gains may be offset by other climate impacts like drought, wildfire, increased pests and diseases, and the shift away from traditional cold-season dependent crops.

PROJECTED GROWING SEASON

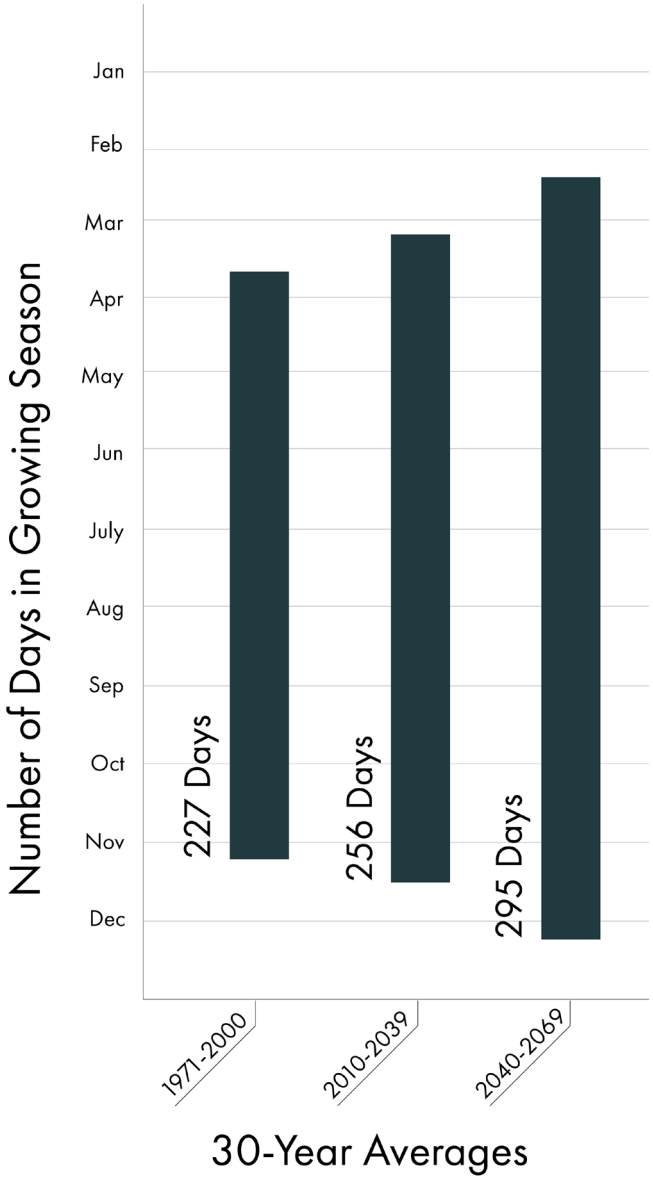


Figure 6: The growing season is expected to lengthen from a historic average of 227 days to 295 days by mid-century. By the end of the century, the growing season will last for nearly the entire year.

POTENTIAL CONSEQUENCES

While Salem's projected temperature increases will be mild, some consequences may be of concern:

- Increased risk of heat-related illnesses to small children, the elderly, people with chronic illnesses, residents living at or near the poverty line, and people who work outside (e.g., farmworkers and construction workers), and people who are unsheltered.
- Increased risk of respiratory problems.
- Salem's population is expected to grow 28% by 2035.[19] Combined with warming temperatures, increases in population mean more people will likely use air conditioning on the warmest days, which may lead to an increased demand for electricity.
- Warming temperatures will also likely lead to sustained or increased frequency of cyanotoxins, or harmful algal blooms, in the freshwater systems surrounding Salem. Exposure to cyanotoxins can cause hay fever-like symptoms, skin rashes, respiratory and gastrointestinal distress, and drinking untreated water containing cyanotoxins can cause liver and kidney damage.[20] Salem has been monitoring and treating drinking water for cyanotoxins for years, and recently invested in a new ozone filtration system at the Geren Island water treatment plant to ensure drinking water for residents will continue to be safe. But recreational activities in local lakes and rivers could be inhibited.

- Warming temperatures may allow for new pests to infiltrate the area New pests may have the ability to negatively impact Salem's ecosystems, for example by harming the city's tree canopy and spreading disease.
- Decreased water levels in the reservoirs on the North Santiam River which provide all of Salem's water.

In summary, while higher summer temperatures may lead to health impacts for vulnerable populations, the temperature increase is not projected to be extreme and may be offset by people's ability to naturally acclimate to changing temperatures over time. The issue of increasing cyanotoxins in drinking water due to algal blooms would be a significant risk to Salem's residents if not for the important water treatment efforts already underway. In the vulnerability assessment (see Appendix 4), the overall risk level from warming temperatures was categorized as moderate. Salem's assessed adaptive capacity, or ability to address these changes, was rated as moderate, which led to an overall vulnerability rating as moderate as well.

PROJECTED SUMMER TEMPERATURES

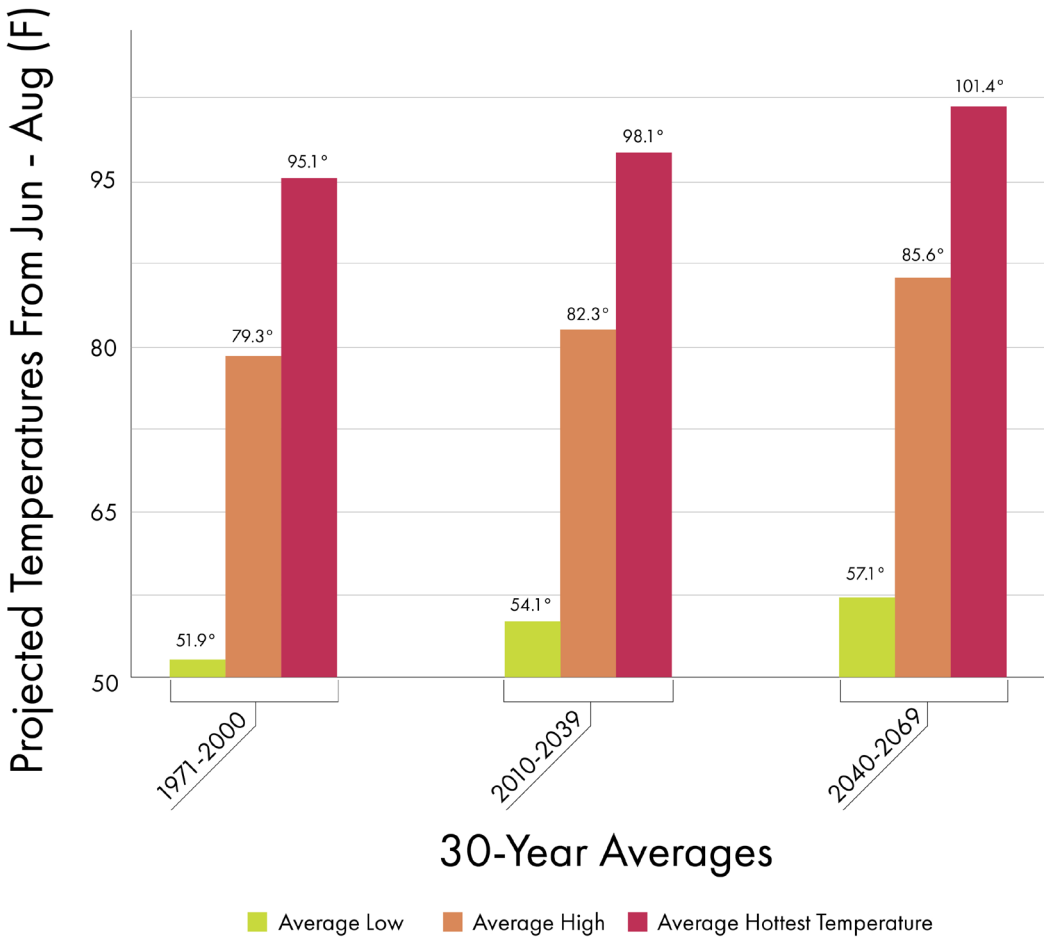


Figure 7: The average high summer temperature is projected to increase from a historic average of 79.3°F to 85.6°F by mid-century.

CHANGES IN PRECIPITATION PATTERNS

Overall precipitation in Salem is not projected to change significantly—an increase of only one inch per year is projected. However, because of warming temperatures, the type and timing of precipitation is likely to shift. One change will be a shift from mountain snow to rain in winter due to warming temperatures. Another change is a likely increase in unpredictable cloudburst events, in which an extreme amount of precipitation falls in a short amount of time. These events could lead to flash flooding in areas not designated as high risk.[21] According to Dr. Erica Fleishman, Director of the Oregon Climate Change Research Institute, events where rain falls on existing snow accumulation (rain-on-snow events) have been increasing in Oregon, and can cause unexpected flooding due to runoff. Peak streamflows in the Willamette River are expected to increase from a historic average of 48,863 cfs (cubic feet per second) to 54,982 cfs by mid-century, meaning increased risk of flooding is possible.

While there will be more water flowing in some areas, other waterways will have less water. Salem's water balance (the amount of annual rainfall minus the annual potential evapotranspiration) is projected to decrease from a historical surplus of three inches per year to a deficit of nearly one inch per year by mid-century, due to increasing evapotranspiration rates. A water deficit occurs when the amount of precipitation that falls in a

U.S. DROUGHT MONITOR-OREGON

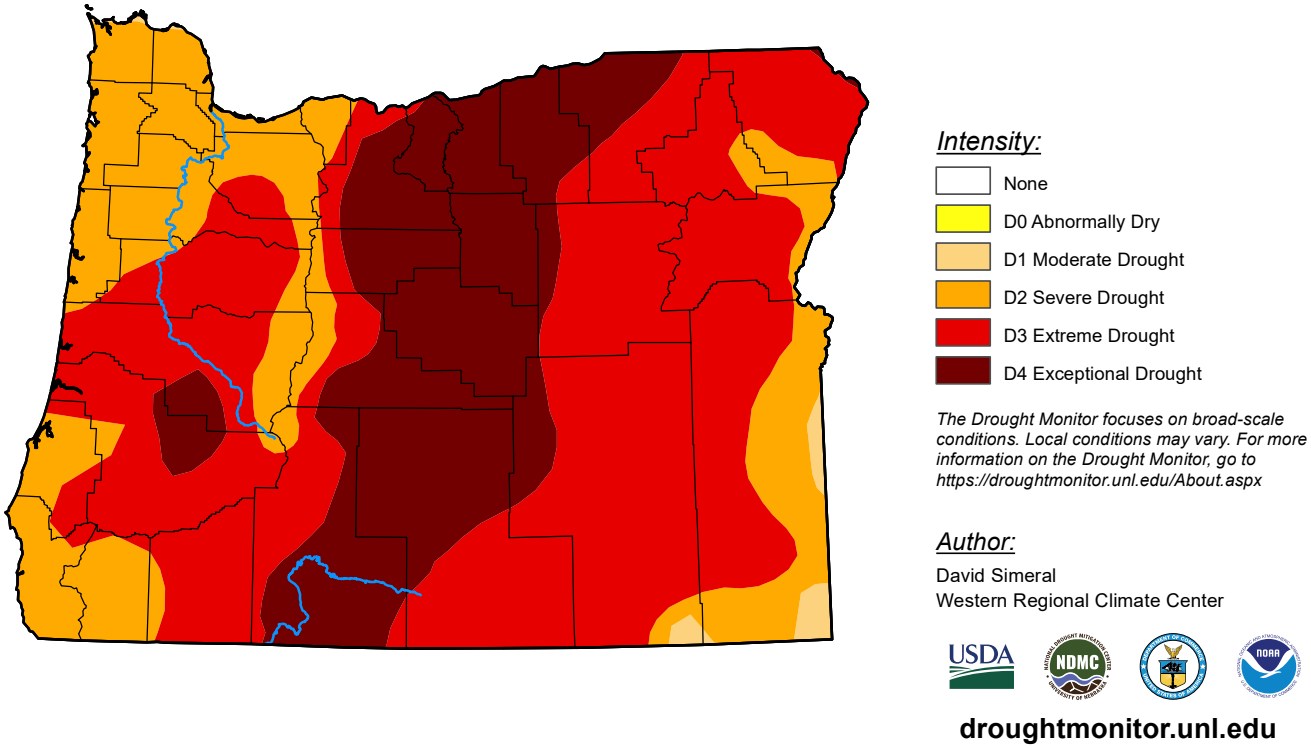


Figure 8: Oregon drought map as of September 7, 2021.

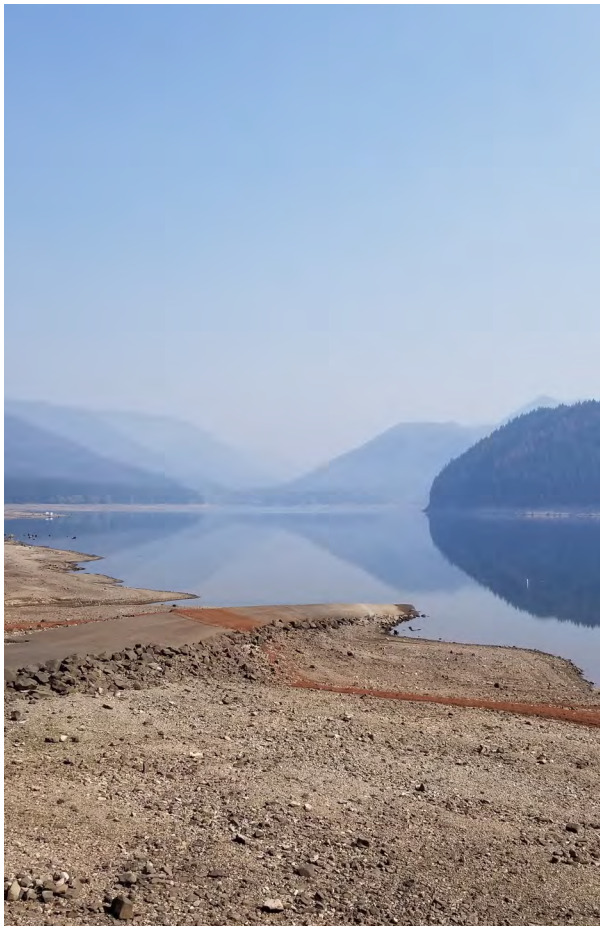
specific period is exceeded by the amount of evapotranspiration that occurs during the same time period.[22]

Drought is an important risk for the Salem area. The Fourth National Climate Assessment states that in Pacific Northwest, "periods of prolonged drought are projected to be interspersed with years featuring heavy rainfall driven by powerful atmospheric rivers and strong El Nino winters."[23] In recent years, Oregon has experienced many of the associated impacts of drought, including stress to crops and livestock, reduced agricultural yields, reduced snowpack and runoff, reduced winter and summer recreation activities, fish die-offs, drinking water quality concerns, hydropower shortages, and larger wildfires. These impacts are expected to continue as climate change worsens.

POTENTIAL CONSEQUENCES

The consequences from changing precipitation patterns could include the following:

- Flood conditions could be exacerbated in areas outside the historical high-risk floodplain and where new development is occurring. Risks to unsheltered people living near waterways could increase.
- Risk of water damage to homes and businesses from flooding.
- Water intrusion in homes can create mold issues, respiratory issues, and psychological stress.
- Potential harm to railroads, bridges, and overpasses from flooding.
- Increased risk of drought, especially when combined with warmer temperatures.
- Water use restrictions and food insecurity in periods of drought.



Water level at the Detroit Reservoir on the North Santiam River, 2021.

In summary, though overall precipitation amounts are expected to remain consistent, hotter temperatures will lead to a water deficit which may impact water supply and demand. Precipitation patterns may change, leading to increased frequency of heavy downpour events and flooding. Because Salem has had extensive experience dealing with flood events throughout its entire history as a city, the community's adaptive capacity is relatively high when it comes to mitigating flood risk and recovering from flood events. Therefore, the overall vulnerability rating from changing precipitation patterns was rated as low in the vulnerability assessment.

INCREASED RISK OF WILDFIRE

Wildfire is a significant increasing risk across the state, and the 2020 fire season presented historic events. According to the Fifth Oregon Climate Assessment report, "The total area burned in Oregon during summer and autumn 2020 was among the largest in recorded history. During the 2020 fire season, five wildfires over 100,000 acres, ignited by lightning and human activity, burned in wildlands and the wildland-urban interface. These and other fires across the western United States led to the displacement of thousands of people and loss of structures and infrastructure, and contributed to hazardous air quality in many parts of Oregon and the Northwest."[24]

PROJECTED WILDFIRE RISK

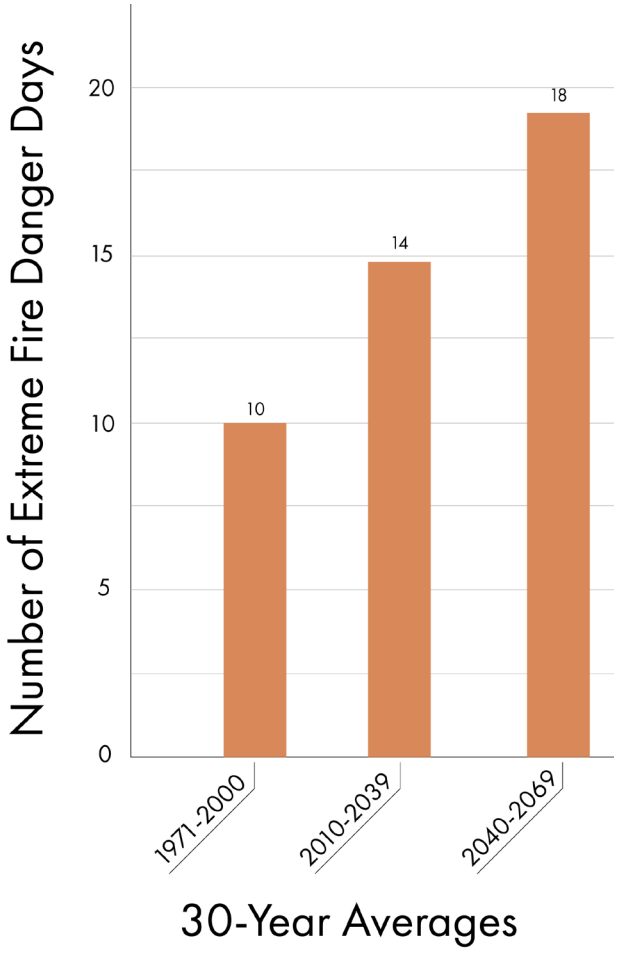


Figure 9: The number of extreme fire danger days will double by mid-century.

By the year 2100, annual area of land burned in the state, burn severity and frequency of wildfires are all projected to increase. One study estimated that the annual area burned in the Willamette Valley is projected to increase 900% by the end of the century, relative to the 1986-2010 average.[25] A recent analysis of the impact of climate change on wildfire hazard in the nearby Clackamas Basin found that "all climate and baseline scenarios illustrate that extremely large, intense fires are plausible, and that they will become more plausible under hotter and drier climate scenarios."[26]

The number of extreme fire danger days*[27] in Salem will double by mid-century, increasing from a historic average of 10 per year to 20 per year. A majority of the increase will occur during the summer months.

With increased risk of fire comes the increased risks of fire damage to public and private properties, smoke inhalation, evacuation of residents, economic losses, landslides, erosion, water quality degradation, and transportation disruption. Unhealthy and hazardous air quality related to wildfire smoke can also take a physical and mental health toll on residents. Wildfire smoke contains a variety of gases and particles, including ozone, carbon monoxide, polycyclic aromatic compounds, nitrogen dioxide, and particulate matter—pollutants linked to respiratory and cardiovascular illnesses.[28] What's more, wildfires release great amounts of carbon dioxide, which works against local efforts to reduce GHG emissions.

Additional risks occur after a fire, including increased risk of landslides, potential

negative environmental impacts from firefighting materials on soil and water resources, and degraded quality of surface water and drinking water due to post-fire debris, hazardous materials and soil movement.

POTENTIAL CONSEQUENCES

- The consequences from increasing wildfire risk could include the following:
- Poor to hazardous air quality resulting from wildfires would greatly impact vulnerable populations—for example, people who are unsheltered, people who work outdoors, and people who live with chronic medical conditions such as asthma.
- Salem's drinking water source, the North Santiam River, could be degraded. Debris and chemicals in surface water following a fire could put additional pressure on water treatment facilities. The Geren Island water treatment plant could itself be at risk of wildfire.
- Oregon's population growth could lead to increased pressure to build housing in fire-prone zones, further exacerbating fire risk.
- Higher than expected population growth. If people choose to relocate from other areas with higher climate change risk, the population influx could strain existing resources, services, and contribute to housing-related issues.
- Fire-damaged forests and trails and poor air quality may reduce tourism and outdoor events in the area, resulting in economic impacts.

Wildfire smoke at Fairview Park, 2020

In summary, hotter and drier conditions will lead to increased fire risk in forested areas outside of Salem. Main impacts to Salem include health risks due to poor air quality, increased emergency operations and evacuations, and reductions in revenue and employment in the tourism industry. Salem could also experience higher than expected population growth as people from more climate change affected locations relocate due to their own fire risk. In the vulnerability assessment, the consequences from fire risk were rated as moderate and the risk high. However, Salem's adaptive capacity was rated moderate, which led to an overall vulnerability rating of moderate.

* Extreme fire danger days are defined as the mean number of days in summer which are classified as very high fire danger days, calculated as the days with 100-hour fuel moisture that is below the 3rd percentile from historical years.

REDUCED NUMBER OF CHILLING HOURS

"Chilling hours" generally refers to the number of hours between 32° and 45° that fruit and nut trees need to produce fruit successfully.[29] Climate projections show that the number of chilling hours in Salem will decline from a historic annual average of 2,408 hours to 1,553 hours by mid-century. This reduction could have implications for fruit and nut tree growers in the Willamette Valley, but should not affect Salem residents directly. The risk level was rated as negligible in the vulnerability assessment.

COMPOUNDED RISK OF CLIMATE IMPACTS AND EARTHQUAKE

According to the Marion County Emergency Operations Plan, a major earthquake is the highest-ranked risk to the area. There is approximately a 40% chance of an earthquake occurring along the Cascadia Subduction Zone in the next 50 years.[30] Depending on the earthquake's magnitude, critical infrastructure systems could be disrupted, including severe damage to energy, water, transportation, and communication systems.

If a major earthquake were to occur during an extreme weather event such as a wildfire or flood, the compounded effects could be catastrophic. Furthermore, earthquakes have the potential to cause wildfires (e.g., breaks in natural gas lines and downed power lines). With fire seasons projected to lengthen and extreme fire danger days to multiply, the risk of an earthquake occurring during fire season grows. Such overlapping events could lead to catastrophic consequences for the Salem area.

CONCLUSION

Whether it be extreme heat, prolonged drought, wildfires, dangerous air pollution from wildfire smoke, or ice storms, Salem residents are already feeling the effects of the changing climate.

These impacts will continue and may become exacerbated as the climate continues to change. Increased heat leads to reduced snowpack, reduced streamflow runoff, increased evapotranspiration, wildfire, drought, increased water use and risks to water quality. Increasing wildfire events and their associated impacts are the most serious projected climate risks for the Salem area.

Caution will need to be taken during extreme heat days in summer to protect vulnerable residents from heat stroke. The risk of flooding from unpredictable cloudburst events, or from rain-on-snow events, may cause problems for neighborhoods already at risk of flooding.

Food security for Salem residents may be impacted as local agricultural producers experience climate impacts or as regional transportation and supply chain networks may be disrupted by extreme weather events.

Having a clear understanding of these future climate risks will allow the Salem community to adequately prepare for a climate-altered future.

The state of Oregon is on pace to see temperatures rise by an average of 5°F by mid-century and by an average of 8.2°F by the 2080s.

7

Greenhouse Gas Emissions Forecasts

GREENHOUSE GAS EMISSIONS FORECASTS

The City of Salem has set ambitious targets, aiming for a 50% reduction in GHG emissions by 2035 and net-zero emissions by 2050. Forecasting was completed to show possible pathways for Salem to achieve these goals. These forecasts are strictly examples of how Salem could possibly reach the goals, and they illustrate the difficulty of the challenge. Many factors will emerge over coming decades that will shape Salem's actual emissions trajectory.

Greenhouse gas (GHG) emissions are produced primarily by the burning of fossil fuels for purposes such as transportation and electricity,[31] and are the main driver of climate change. A sector-based GHG inventory completed in 2019 details the sources of all GHG emissions in Salem and forms the baseline from which future emissions reductions can be measured.

To complement the sector-based GHG inventory, a consumption-based GHG inventory was completed in 2020. This inventory measured emissions that are associated with the goods and services that are purchased and used by Salem residents. This alternate way of measuring emissions takes into account the production, transport, sale, use and eventual disposal of any purchased item or service, and thus has a global footprint.

The consumption-based GHG inventory showed that the purchase, use, and disposal of vehicles, food and beverages, and furnishings were the three largest categories of consumer-driven GHG emissions in Salem (see Appendix 2).

In accordance with industry norms and protocols, the sector-based GHG inventory was the version used as the baseline for planning emissions reductions.

Salem's success is highly reliant on its three utility companies (Salem Electric, Portland General Electric, and NW Natural) achieving their goals to reduce emissions. Salem needs to continue to collaborate and communicate with these partners, as well as with residents, to ensure Salem can meet its goals.

BASELINE FORECAST OVERVIEW

To measure the impact of GHG reduction strategies, Salem first needs a baseline from which to measure reductions. Unlike most baselines, which measure the past, GHG baseline forecasts make assumptions

about what the future might look like. Salem has a GHG Protocol compliant sector-based GHG inventory measuring emissions from 2016, from which the baselines were projected. Commonly, Climate Action Plans include a "Business As Usual" (BAU) forecast, which generally assumes only small changes in emissions intensity coupled with population growth. Typically these forecasts predict a significant increase in GHG emissions over time, which leads to an overstatement of the impact of target reductions. This is true because these forecasts often make an unrealistic assumption by holding per-capita emissions steady, so emissions grow with population. However, outside of these simulations and in the real world, per-capita emissions in many parts of the US are trending downward over time for numerous reasons, such as increases in energy efficiency standards. If BAU forecasts do not take these decreases into account, then municipalities may unduly claim credit for decreased emissions in future GHG inventories—decreases that would have occurred regardless. Typical BAU forecasts also rarely include a quantitative or qualitative measurement of certainty, which can lead to overconfidence in the model projection.

To address these problems, Salem developed three baseline forecasts from which to measure emissions. These forecasts provide a range of possible BAU outcomes and provide a qualitative estimate of forecast certainty (see Appendix 5). Based on the outcomes of these three forecasts, the model which represented the middle outcome was used to perform further analysis.

In the forecasts, emissions from the utility providers were assumed to decline according to adopted and pending regulatory requirements. Specifically, electricity providers are required to achieve net-zero emissions by 2040 according to HB 2021, while proposed regulation from the Oregon Department of Environmental Quality would require natural gas providers to achieve a 45% reduction in emissions by 2035 and 80% by 2050.

The way in which these regulatory requirements account for carbon emissions differs from those of GHG inventory protocols (ICLEI's US Community Protocol was used for Salem's GHG inventory). One difference is that Salem's GHG inventory accounts for only those emissions within the City's geographic boundaries, with the exception of emissions from electricity generation. Another difference is the way in which emissions from renewable natural gas (RNG) are accounted for. RNG comes from capturing methane that is released from biomass such as human waste, food waste, or cow manure. This fuel is considered "biogenic" because it is derived from biological processes. There are three greenhouse gases released from burning renewable natural gas: carbon dioxide, methane, and nitrous oxide. Renewable natural gas carbon dioxide emissions in the US Community Protocol are reported as biogenic emissions and reported separately from other emissions, while methane and nitrous oxide released from burning non-renewable natural gas are reported as emissions. Following the guidance from ICLEI, carbon offsetting by NW Natural is not credited in the Salem forecast, even though it does count toward state regulations.

To inform these forecasts, NW Natural provided three detailed analyses of projected annual emissions from 2021-2050. The scenario that was selected for this modeling effort was the scenario that most evenly distributed energy production amongst different sources (natural gas, renewable natural gas, and hydrogen). No effort was taken to determine the viability of the three scenarios. PGE did not have similarly detailed projected emissions data available, so the assumptions of the declines mandated by HB 2021 were used.

Actual future emissions from both utilities will likely differ from these forecasts. Actual emissions and forecasts should continue to be revisited to adjust implementation as needed.

Salem's baseline forecast showed a 47% reduction in emissions between 2016 and 2050. This does not include an estimated 112,000 MtCO2e derived from biogenic sources. Emissions peaked in 2020-2021 before declining until 2045, after which emissions began to increase slightly, primarily because of increased wastewater and transportation emissions from population growth. Electricity emissions reached near-zero in 2040, and remaining natural gas emissions are primarily biogenic, with the remaining portion being primarily offset by NW Natural through either the purchase of offsets or obtaining credit for offsets they generate. Transportation emissions declined until 2045 and then increased slightly.

Given the forecasting results, it appears likely that absolute GHG emissions will decline in Salem and reach lower levels in 2050 than in 2016 even without direct intervention by the City of Salem. This is because of factors such as state regulatory requirements, expected increases in energy efficiency, renewable energy, and the use of electric vehicles. However, without local action to pursue opportunities to reduce net GHG emissions, Salem does not appear likely to achieve its 2035 or 2050 GHG emissions goals.

BASELINE GREENHOUSE GAS (GHG) EMISSIONS FORECAST

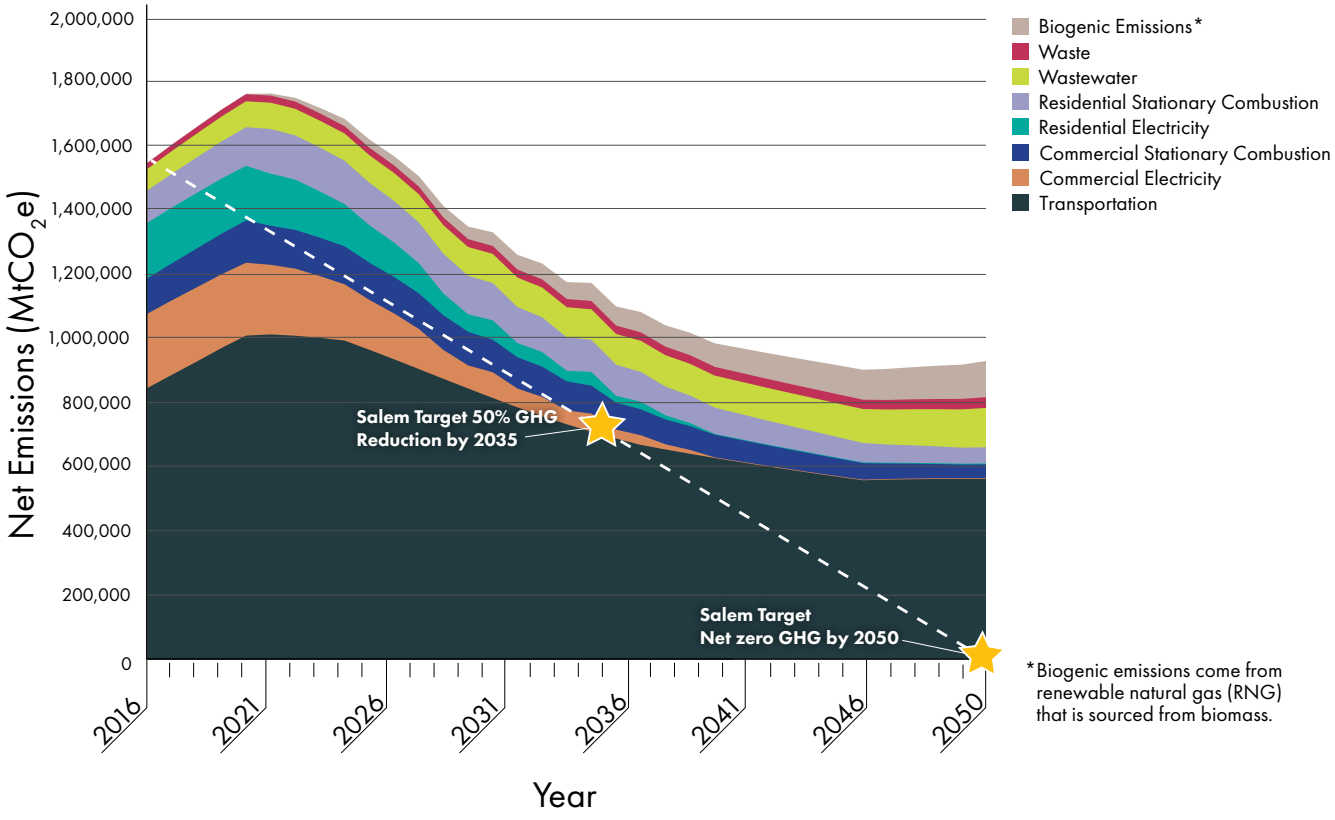
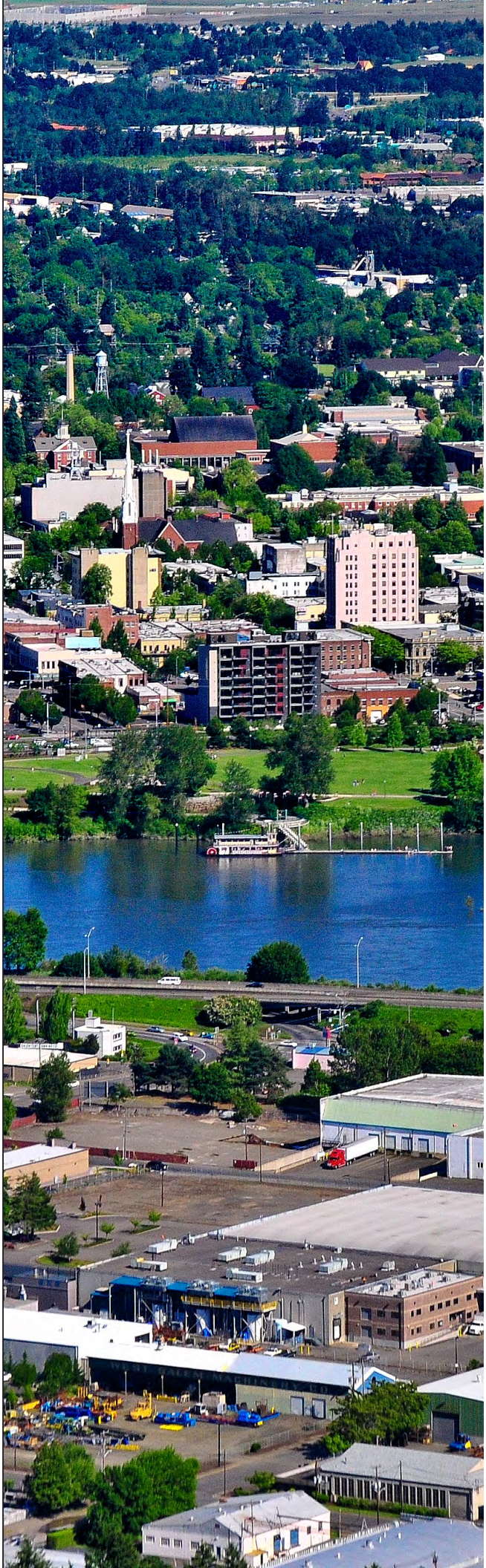


Figure 10: Baseline forecast.



SALEM EMISSIONS REDUCTIONS PROJECTIONS

Salem produced future emissions projections for two scenarios measured from the baseline discussed above. The first projection, labeled “Scenario 1,” shows a challenging but achievable pathway for Salem to significantly reduce emissions. While it may be achievable with serious effort, this scenario shows that Salem will miss its goal of reducing emissions 50% by 2035 and achieving net zero by 2050. The second projection, labeled “Scenario 2,” shows one model of what it would take for Salem to meet both the 2035 and 2050 goals. In order to achieve either scenario, the Salem community will need to implement a number of highly impactful GHG reduction strategies.

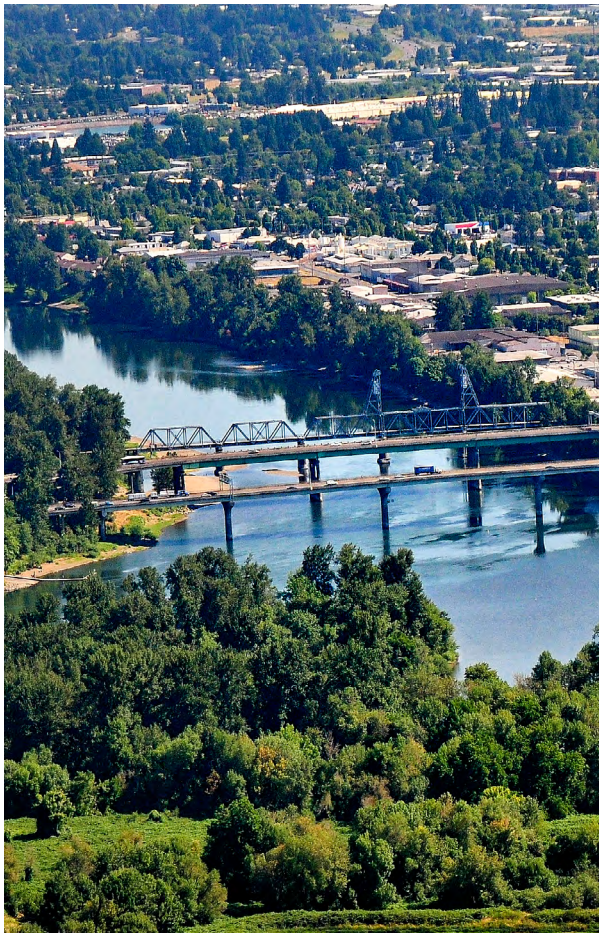
SCENARIO 1

In the first scenario, ten emissions reduction assumptions were selected for modeling based on subjective criteria. The majority of assumptions reflect areas in which there are significant opportunities to reduce emissions. For example, because transportation is the largest source of emissions, the majority of reductions tackle different ways to reduce emissions from the transportation sector. Reducing transportation emissions can be pursued by reducing the number of miles driven or the emissions intensity per mile. These reductions can be further broken down, for example, into whether the reduction in emissions intensity per mile is pursued while retaining vehicles (e.g. electric vehicles) or by shifting more trips to public transit, biking, or walking.

The need for significant reductions in GHG emissions was weighed with the desire to model the outcomes of a wide variety of strategies. Therefore some emissions reduction assumptions, such as increasing carbon sequestration, have a small impact on total emissions. However, modeling these reductions provides information on their relative impact and informs the value of pursuing relevant strategies. Further, these ten target source reductions are interdependent, so reducing investment in one area may result in additional carbon offset by another target scenario. It is important to note that these ten modeling outcomes do not necessarily correspond to the top prioritized strategies in the Climate Action Plan. Listed are the ten emissions reduction assumptions modeled:

EMISSIONS REDUCTION ASSUMPTIONS MODELED

1. Building energy efficiency has improved 10%.
2. Onsite solar is maximized in new construction.
3. Carbon sequestration of plantings such as plants and trees is maximized.
4. Growth in natural gas emissions has halted.
5. EV adoption rate has doubled.
6. The rate of residents walking and biking has doubled.
7. Transit ridership has quadrupled.
8. Vehicle traffic coming into and out of Salem has declined by 40%.
9. Traffic within Salem has declined by 10%.
10. The Cherriots bus fleet has transitioned to zero emissions.



The ten target emissions reductions led to a decrease of 280,000 $MtCO_2e$ in 2050 from forecast levels. Most of these reductions can be attributed to transportation (252,000 $MtCO_2e$ remaining in 2050, 85%), but reductions in natural gas also played an important role (23,000 $MtCO_2e$, excluding biogenic emissions, remaining in 2050, 8%).

THE SCENARIO 1 PROJECTION RESULTED IN THE FOLLOWING OUTCOMES:

- 40% net reduction from 2016 levels by 2035
- 65% net reduction from 2016 levels by 2050

In this scenario, Salem would not meet its goal of reducing emissions 50% by 2035 and achieving net zero by 2050.

WHY WASN'T THE TARGET MET?

Given that the Scenario 1 target reductions did not achieve the target goals, it is worthwhile to examine the remaining GHG emissions to understand their sources. The projected remaining emissions in 2050 fall into the following categories:

1. WASTE

Waste comprises a small fraction of remaining emissions (33,000 $MtCO_2e$, 6%). No change in per-capita landfill emissions was assumed, which means that as the population grows, materials are disposed of at the same per-person rate and that the material is sent to the landfill and Covanta at the same proportion as 2016. Programs that address per-capita waste generation or that reduce landfill emissions could further reduce GHG emissions. A number of strategies in the CAP could impact GHG emissions from waste.

2. WASTEWATER

Wastewater GHG emissions (121,000 $MtCO_2e$, 23%) were projected to grow with the population, and it was assumed that additional growth was entirely connected to the wastewater treatment system. It was also assumed that wastewater in the future was treated using the same methods as today. Operational changes in wastewater treatment or capture and use of methane could lead to a reduction or elimination of wastewater emissions depending on GHG protocol guidance.

3. NATURAL GAS

Commercial (29,000 $MtCO_2e$, 6%) and residential (36,000 $MtCO_2e$, 7%) natural gas constitute 13% of the remaining emissions projected in 2050, excluding 77,000 $MtCO_2e$ from biogenic sources. Although eliminating natural gas would remove these emissions, no comparable city

SCENARIO 1 GREENHOUSE GAS (GHG) EMISSIONS FORECAST

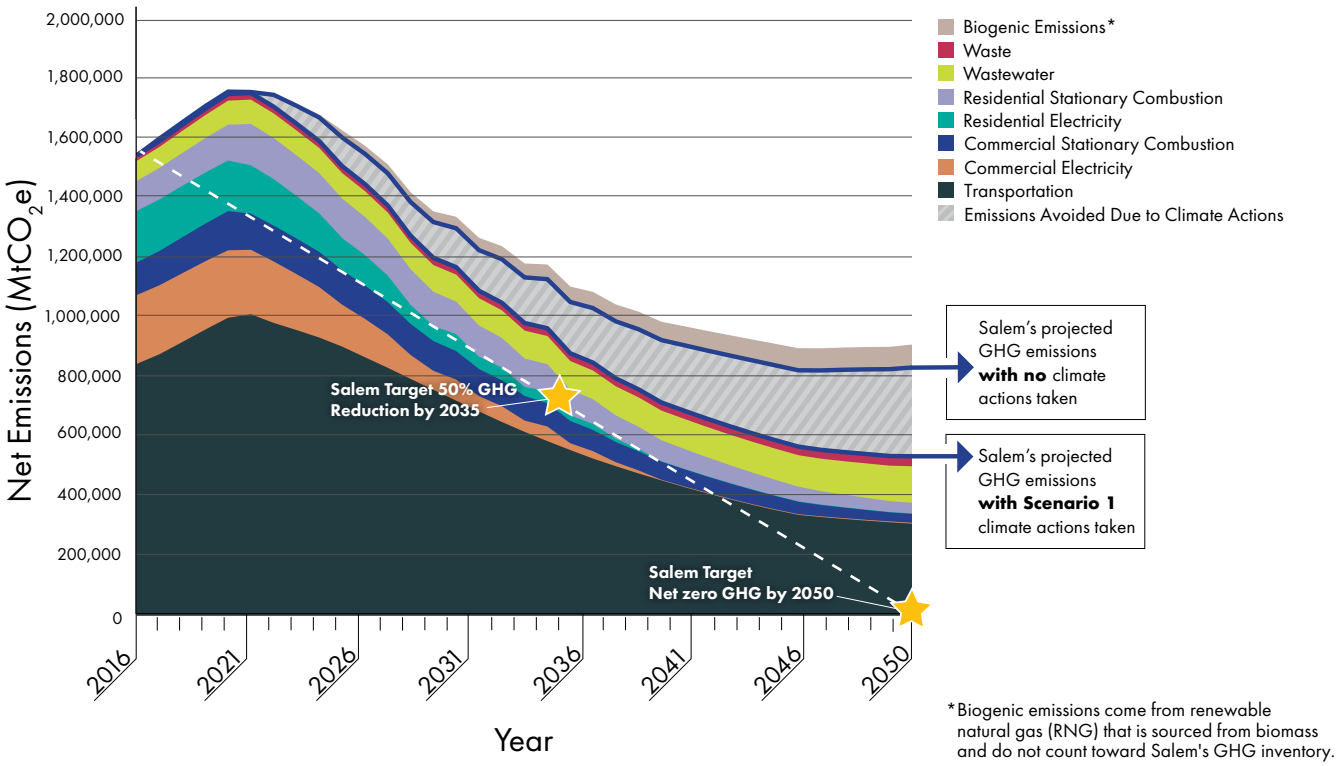
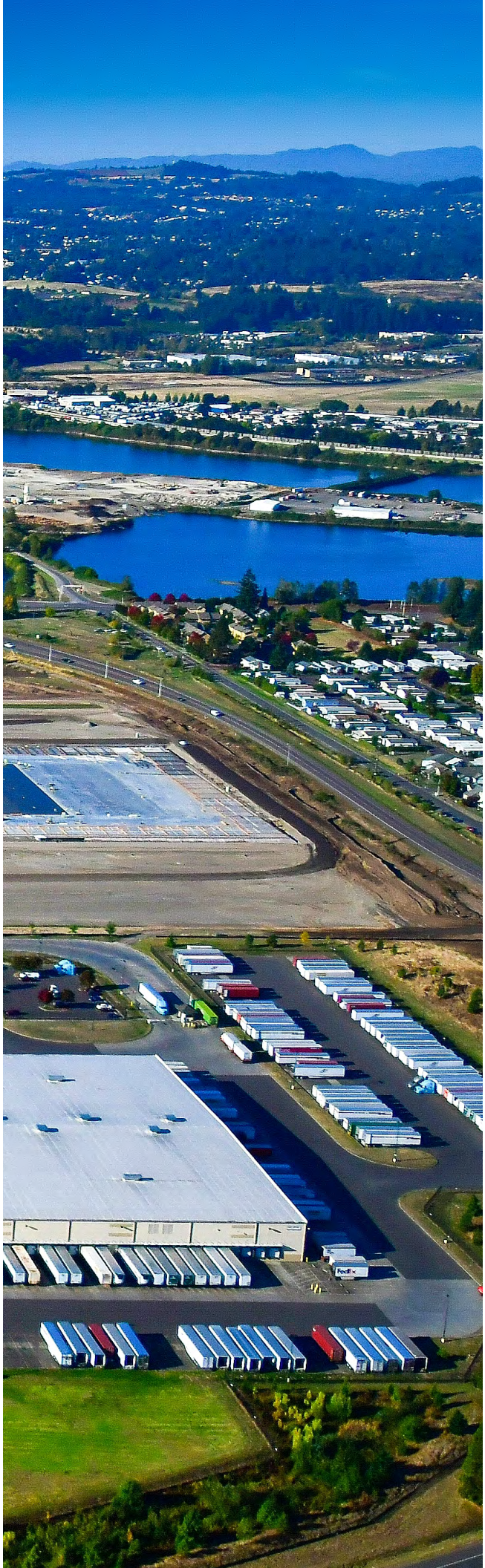


Figure 11: Scenario 1.



has yet enacted a comprehensive ban on fossil-derived natural gas that terminates current connections. Natural gas bans that eliminate future growth of new natural gas hookups are becoming more common, and Salem would be ahead of its peers and most cities in the U.S. if it were to enact this kind of ban. Additionally, these models assumed that offset natural gas did not result in an increased electricity emissions factor (although it did lead to increased electricity use). Fully offsetting natural gas with electricity for all uses might lead to an increase in the electricity emissions factor due to a need for increased electricity generation capacity. Additionally, reducing natural gas consumption might allow for a larger proportion of fuel to be renewable natural gas or hydrogen.

NW Natural is seeking several opportunities to reduce emissions. One is by increasing the use of renewable natural gas (RNG), which is methane sourced from biogenic sources such as landfills, wastewater treatment, and dairies. When burned, RNG emits carbon dioxide. By burning methane, a potent greenhouse gas, that otherwise would have been released, NW Natural would reduce total GHG emissions.

NW Natural is also pursuing carbon-free hydrogen. This hydrogen is produced through hydrolysis, an energy-intensive process that can be employed when there is excess energy available on the grid. With increases in solar and wind generation, periods of excess generation are becoming increasingly common. Hydrolysis acts like a battery to store excess energy in hydrogen which can then be burned as clean fuel.

NW Natural is also pursuing extensive customer efficiency opportunities and is seeking a 47% efficiency improvement from 2002 by 2037. They are also pursuing carbon offsets, which can be used to achieve net-zero. Those offsets are not

shown in the forecasted emissions because the methodology follows ICLEI guidance.

4. TRANSPORTATION

Transportation emissions are the largest remaining contributor to total emissions in 2050 (306,000 $MtCO_2e$, 58% of total remaining emissions). Although there are many strategies to reduce GHG emissions, there are also many sources of transportation emissions. Emissions from heavy-duty trucking are projected to make up the majority of GHG emissions from transportation in 2050 (149,000 $MtCO_2e$, 49%), followed by emissions from non-resident passenger vehicles (101,000 $MtCO_2e$, 33%). These emissions are particularly challenging to reduce because most strategies target residential passenger vehicles, and Salem's ability to directly impact heavy trucking vehicle miles traveled (VMT) or miles per gallon (MPG) is far more limited, as is Salem's ability to reduce non-resident traffic. These emissions assume heavy trucking remains dependent on fossil fuels, which may change as electric options or other fuels become available. However, those changes would likely be driven by federal, state, or market forces rather than Salem. Although this model assumes 100% electric vehicle (EV) adoption in Salem by 2050, there are out-of-jurisdiction vehicles that are not subject to the EV rate used in the model. Removing all internal-combustion engine vehicles before 2050 is unlikely, although federal, state, or market forces might eliminate these emissions further than the model shows. The remaining emissions come from light trucking, commercial vehicles, and air travel, and can be eliminated in much the same way as heavy-trucking and passenger cars—by switching to cleaner fuels or batteries.

BREAKDOWN OF REMAINING GHG EMISSIONS

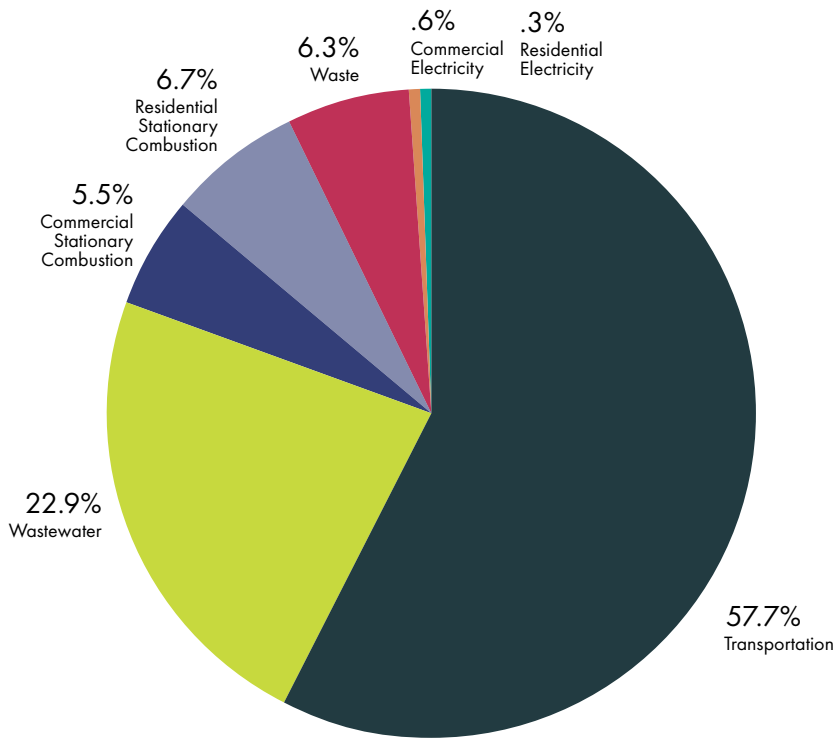


Figure 12: Breakdown of remaining GHG emissions in 2050 in Scenario 1 after achieving all ten target reductions.

SCENARIO 2

The results of Scenario 1 show that reaching net-zero emissions by 2050 will require more significant reductions in GHG emissions. To that end, a second model was run to show what it would take to meet Salem's emissions reduction goals.

In the Scenario 2 model, an analysis was performed to drive down the remaining GHG emissions from Scenario 1 to hit both the 2035 and 2050 goals for the purposes of better understanding where more effort may need to be applied in order to achieve these goals. It is important to note that there are many possible iterations of the model that could lead to the reduction targets; the results presented here are but one possible outcome.

Achieving the outcome of Scenario 2 requires attaining the same ten target reductions modeled in Scenario 1, plus attaining eight more emissions reduction outcomes. Thus, Scenario 2 assumes the following targets are achieved:

1. Building energy efficiency has improved 10%.
2. Onsite solar is maximized in new construction.
3. Carbon sequestration of plantings such as plants and trees is maximized.
4. Growth in natural gas emissions has halted.
5. EV adoption rate has doubled.
6. The rate of residents walking and biking has doubled.
7. Transit ridership has quadrupled.
8. Vehicle traffic coming into and out of Salem has declined by 40%.
9. Traffic within Salem has declined by 10%.
10. The Cherriots bus fleet has transitioned to zero emissions.
11. Emissions from non-resident internal combustion traffic are zero.
12. Emissions from air traffic are zero.
13. The electricity grid is sourced from 100% renewable sources.
14. All fossil fuel-derived natural gas in the built environment has been replaced.
15. All other fossil fuels in the built environment (e.g., diesel, propane) have been replaced.
16. Net-zero waste achieved through a combination of implementing a circular economy, composting, and recycling.
17. All wastewater emissions have been captured.
18. All septic emissions have been captured or replaced by joining septic to a centralized wastewater treatment system.

In the Scenario 2 modeling, remaining transportation emissions were driven down by 10% aggressively between 2030-2040, natural gas and other building fossil fuels were phased out between 2040-2050, and waste and wastewater were phased out from 2030-2050.

THE SCENARIO 2 PROJECTION RESULTED IN THE FOLLOWING OUTCOMES:

- 57% reduction from 2016 levels by 2035
- Net zero emissions by 2050.

Neither the Scenario 1 or 2 models includes carbon offsets, virtual power purchase agreements (VPPAs), or other options for achieving net zero through increasing investment in carbon sinks outside of tree planting within Salem's geographic boundary. Carbon offsets could be considered as a strategy for Salem to reach net zero emissions, but would likely be cost-prohibitive. In 2021, lower-range offsets typically cost between $6-$15 USD/$MtCO_2e$. With Scenario 1 showing close to 600,000 $MtCO_2e$ remaining in 2050, the annual cost to the City of Salem to offset those emissions in today's dollars would range from $3.9M - $9.7M per year. Options for carbon offsets vary, but the most common is to fund reforestation and afforestation efforts. VPPAs are more complex and can result in profits over the long term. Funding is likely better spent on projects to reduce or sequester carbon emissions locally. The most likely outcome to achieve net zero will probably include some carbon offsets or other similar strategies to offset hard-to-eliminate niche GHG emissions sources.

Technological solutions that cannot yet be quantified may play an important role by 2050, as would actions that may be deemed infeasible today for technological or political reasons.

With strategic planning, determined resolve, collaborative partnerships, and collective will, the Salem community can achieve significant progress in reducing emissions and becoming a climate-smart city.

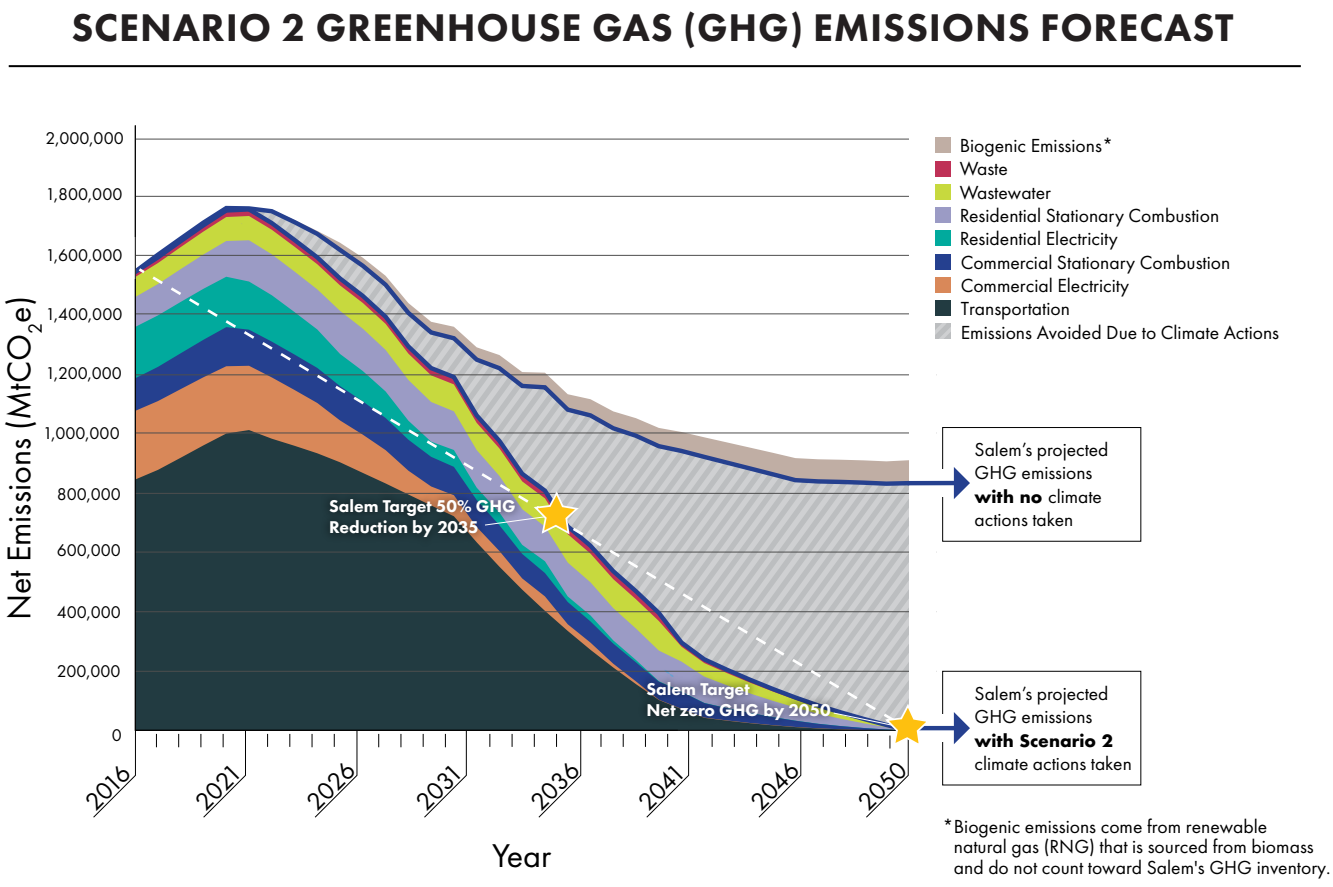


Figure 13: Remaining emissions under Scenario 2.

8

Climate Action Strategies

CLIMATE ACTION STRATEGIES

The core component of this Climate Action Plan is the set of strategies that the Salem community can undertake to achieve its emission reduction goals and become a climate resilient community. Strategies were developed with three aims in mind: to reduce emissions, to increase climate resilience, and to increase equity in the community.

Equity was an important driver of many strategies, and it means that all residents have the opportunity to participate and thrive in an inclusive society. Several strategies in this plan have the potential to increase equity in Salem by addressing systems and practices that have historically disadvantaged groups of Salem residents and by maximizing benefits for frontline communities.

Appendix 8, the *Climate Action Plan Strategy List*, contains a list of 183 recommended strategies to help Salem become a climate-smart city. Ideas in this list were initially generated by Salem community members and Climate Action Task Force members. The ideas then went through a detailed refinement process by a wide range of subject matter experts and consultants. Ideas were then shared with community members at in-person meetings and online, and refinements were made according to their feedback.

STRATEGIES ARE ORGANIZED INTO SEVEN SECTIONS:

1. Transportation and Land Use
2. Energy
3. Economic Development
4. Natural Resources
5. Community
6. Food System
7. Materials and Waste

All of these areas will have a vital role to play in achieving Salem's emission reduction goals while also building resilience and increasing equity.

Each strategy was given a generalized rating for GHG reduction potential, cost to the City, and co-benefits. These ratings were informed by expert opinion, but are subjective and should not be understood as definitive. Full benefit/cost analyses have not been prepared for the majority of these strategies.

A lead agency is designated for each strategy. For most, the City of Salem will be the lead agency, but many strategies designate other community agencies like Cherriots, the energy utilities, and non-profit organizations. These agencies have co-developed these strategies in cooperation with one another.

Because of the interconnected nature of strategies that address climate change, co-benefits are identified for each strategy. Co-benefits are advantages to the community that any climate action strategy may have beyond reducing emissions. The strategies

in this plan specifically take into account the following co-benefits:

- Public health
- Environmental quality
- Local economy
- Mobility choice
- Community equity

A suggested timeframe designation was given during which each strategy is recommended to begin after plan approval. The timeframe designations are as follows:

- Short-Term (S) = Occurring now to next 2 years
- Medium-Term (M) = Next 3-5 years
- Long-Term (L) = Beyond the next 5 years

The strategies within this plan are non-regulatory and non-binding recommendations provided for the consideration of Salem City Council and other parties that have the authority to implement. The wording used to describe the strategies should not be taken to mean an outcome has been predetermined. Additionally, local, state, and federal regulatory or statutory requirements may exist that will impact the degree to which some strategies can be implemented.

Each policy recommendation will need to go through the City of Salem's normal regulatory process before it would become law. That process includes further study, benefit-cost analyses, public engagement, public hearings, and City Council approval. All of the strategies will need further engagement, discussion, and planning in order to be enacted.

Please see Appendix 8, the *Climate Action Plan Strategy List*, for the full set of recommended actions from this Climate Action Plan.

Due to the long timeframe covered by the Climate Action Plan (30+ years) and the number of strategies included for consideration, implementation priorities are recommended. A document titled "Strategies Recommended for Implementation" contains a list of strategies that should be considered for action early in the implementation phase. The list include strategies:

- That have high potential for GHG reduction
- Where the City is the lead agency
- Where the cost to the City is considered low
- Where there are community equity co-benefits
- Where the initiation of the strategy could occur in the next two years

In addition to those strategies, other strategies are recommended as priorities if they:

- Have potential for the City to lead by example, establish Climate Action Plan governance and enhance equity, or
- Are in-process or ongoing actions, or
- Are actions that are already planned for initiating within two years, or
- Will be required by current or pending State rules and requirements.

The final recommended priorities for implementation will be selected by Council.

IMPLEMENTATION RECOMMENDATIONS

A clear and effective governance structure must first be established before successful implementation of strategies in this climate action plan can occur. City of Salem employees, business leaders, community group members, and individual residents all have a role in implementing strategies from this plan, adapting to changing conditions, and working together to build community-wide resilience to climate change and meet Salem's GHG

reduction goals. Because recommended strategies in this plan involve multiple responsible parties, span a variety of timelines, and will require coordination of resources, it is necessary that a manager is designated/hired to guide the implementation process. Guiding the implementation of this climate action plan also includes the responsibility of building and maintaining strong partnerships with entities including but not limited to the State of Oregon, Mid-Willamette Valley Council of Governments (MWVCOG), Cherriots, neighborhood associations, local non-profit organizations, and businesses.

The implementation manager, in partnership with City of Salem employees and stakeholders, should support and coordinate efforts across departments, businesses, agencies, community-based organizations, and timelines. Recognizing the importance of collaboration, it is also recommended that an implementation work group is established and charged with facilitating implementation efforts in conjunction with, and supported by, the City of Salem manager. The implementation work group should meet regularly to share progress updates, resources, assist each other with barriers, and celebrate successes.

The Benefit-Cost Analysis Report (see Appendix 6) provides valuable information that can help inform implementation of the ten strategies studied. This information can be used to inform policy decisions that may come before the Salem City Council, or highlight avenues for further exploration.

In addition to local partners and the recommended strategies in this plan that are specific to Salem, the State of Oregon is moving quickly to take more action on climate change and it will be vital for the City of Salem to keep up with new rule-making, regulations, goals, and targets. The City's manager should be responsible for staying up to date with changes at the state-level, understanding how to access resources from the state, and leading implementation efforts at the local level.

All processes and outcomes related to the implementation of this plan should center equity. Multiple strategies in the Community action area should be implemented during the establishment of a governance structure described in this section of the plan, to ensure equitable access, participation, and results. Intentionally and thoughtfully engaging historically excluded communities during initial implementation and throughout future planning and implementation efforts related to climate action is one such strategy to prioritize. Salem's community vision of being a cohesive and caring city, where engaged community members of diverse backgrounds work together to achieve climate goals can be realized through the identification and use of guiding equity principles and evaluation criteria that measure progress towards a more equitable Salem.

As Salem progresses with its GHG emissions reductions and as recommendations from the State of Oregon evolve, the City must maintain clear and consistent communication with residents. Regular tracking and reporting of GHG emissions, as described in the Tracking Progress chapter, should be shared with residents in accessible communication and media outlets. Ongoing tracking and reporting allows the City and partner organizations the ability to make necessary adjustments to strategies in this plan and implement new strategies that are not possible today. As with all implementation efforts, communication about progress should be inclusive and accessible.

CONSIDERATIONS FOR IMPLEMENTATION

1. Hire an FTE manager to lead implementation of this Climate Action Plan. Provide funding for the person and the program. Responsibilities should include, but are not limited to, the following duties:
   - Guide the implementation process and manage the status of implementation initiatives.
   - Identify new information from the State of Oregon that affects Salem's climate action efforts, e.g., new rule-making, regulations, goals, and targets.
   - Identify and access new sources of funding, including local, state, and federal grant opportunities.
   - Track and report progress toward implementing the recommended strategies and achieving the City's GHG reduction goals.
   - Coordinate working group (see below).

2. Establish an implementation working group. A charge for the working group may include the following responsibilities:
   - Provide regular status updates on strategy implementation progress.
   - Collaboration amongst members to share resources and remove barriers to better implement strategies.

3. Prioritize equity at the onset of implementation efforts. While building the governance structure described in the first two steps, the following recommendations should be followed:
   - Charge the working group described above or otherwise hold them accountable (i.e., through the establishment of a specialized equity task force) for ensuring equitable access, participation, and results with implementation efforts.
   - Prioritize inclusion of historically excluded communities during implementation and future planning efforts.

4. Communicate with Salem residents.
   - Provide clear and consistent updates to community members.
   - Ensure that updates to community members are accessible (e.g, culturally appropriate and responsive, available in multiple languages, and shared in channels that residents commonly utilize).
   - Collaborate with partner organizations and community groups to distribute information related to Salem's climate action plan.

5. Track and report emissions at regular intervals.
   - Update Salem's GHG inventory every two years or as often as possible.
   - Use an online dashboard tool to communicate progress toward the emissions reduction goal.

6. Update the Climate Action Plan every five years.
   - Regular assessment of the progress Salem has made toward its goals will be necessary. As the implementation process proceeds, new information will influence direction in ways that should be formally reviewed and incorporated. New GHG forecasts should be made according to new information that is obtained, which will portray a clear pathway for Salem's future progress.

9

Tracking Progress

TRACKING PROGRESS

Regular tracking of key metrics is essential to ensuring that Salem is making progress toward its goals.

Assessing the status of all strategies in Salem's climate action plan will be critical to realizing the vision of being resilient to climate change and achieving the goals to reduce GHG emissions. An internal tracking document should be created for all responsible parties to easily share updates and view progress made related to implementing strategies, becoming more resilient to climate change, improving equity, and reducing GHG emissions in Salem. This tracking document may also serve as the source for updates provided to the community via an online dashboard, GIS maps, and other communication channels.

Regular tracking of GHG emissions is essential to ensure that Salem is making progress toward its goals of 50% reduction by 2035 and net-zero emissions by 2050. As a best practice, emissions should be estimated consistently over time using the same methods, data sources, boundaries, and assumptions. Salem's 2016 greenhouse gas inventory was prepared with the widely-used Global Protocol for Community Scale Greenhouse Gas Emission Inventories (GPC). This protocol should continue to be used for subsequent GHG emissions inventories.

Over the 30-year time horizon of Salem's long-term goal, maintaining consistent evaluation practices will likely become increasingly challenging. Salem may need to consider updating its original inventory if there are changes in the City's boundaries, improvements in GHG methodology that warrant a re-evaluation, changes in data accuracy that

warrant a re-calculation or use of a new data source, or discovery of errors and/or incorrect assumptions in the original inventory. Any changes, or decisions to maintain previous inventory assumptions, will need to be well-communicated to the community and well-documented.

The interval at which Salem inventories emissions should be decided upon early and should be kept as consistent as possible throughout the time period of the plan. It is recommended that Salem update its GHG inventory every two years, with additional inventories in the goal years of 2035 and 2050. Salem should make these updates

publicly available and should include an overview that tracks overall progress as more data points are available. This will provide a clear picture of Salem's emissions trajectory.

Reporting can occur directly via the City of Salem's website or through a reporting platform. If the City of Salem decides to adopt a third-party reporting system, the Carbon Disclosure Project (CDP) offers one avenue for robust reporting. The CDP includes GHG inventories from other cities that have entered data into the City Inventory Reporting and Information System (CIRIS) tool. Either way, it is essential that this data is readily available and clearly articulated to the public. Care should also be taken to provide GHG updates in accessible and inclusive modes of communication.

In addition to tracking emissions, it is recommended that the City of Salem establish a baseline of community equity metrics. These data would be tracked over time to provide data showing how Salem residents are faring across a range of indicators related to income, race, health, housing, language access, disaster recovery and more. Though this City effort will inform far more than the Climate Action Plan, it is recommended that variables related to equity and climate impacts are regularly tracked and reported, and that new strategies to address identified needs are added to the Climate Action Plan implementation as needed.

RECOMMENDATIONS FOR TRACKING PROGRESS

- Create an internal tracking document for the City and partners to track progress on implementing Climate Action Plan strategies.
- Update Salem's greenhouse gas (GHG) inventory every two years or as often as possible using the Global Protocol for Community Scale Greenhouse Gas Emission Inventories. Make these updates readily available and clearly articulated to the public. Ensure that the inventory is updated for the goal years of 2035 and 2050.
- Document and communicate to the community any changes to GHG inventory methodology or data that may become necessary over time.
- Establish a baseline of community equity metrics and track and report these data over time.
- Add new strategies to address community equity to the Climate Action Plan implementation as they are identified over time.
- Use an online dashboard tool to communicate goals and progress toward achieving them.

10

Community Action: Everyone Has a Role to Play

COMMUNITY ACTION

Everyone has a role to play.

Reducing GHG emissions to the extent necessary to avoid the worst impacts of climate change will require actions at all levels. While individual efforts may seem insignificant compared with large-scale actions, personal lifestyle changes can help shift social norms. The more people make individual changes, the more their networks are encouraged to do the same, which results not only in a greater impact, but also puts pressure on larger entities and builds momentum for more systemic change.

Salem's consumption-based greenhouse gas inventory (see Appendix 2) measured the emissions associated with the goods and services purchased and used by Salem residents. This analysis showed that the purchase, driving, and disposal of vehicles is the largest source of emissions when measured through a consumptive lens. One of the most important ways that individuals can reduce emissions is to drive less and own fewer gasoline-powered vehicles and equipment.

The second-largest source of consumption-based emissions in Salem was the consumption of food and beverages. Emissions from this category include those associated with meat consumption, especially beef, which has a large carbon footprint due to all the inputs associated with growing cattle feed, the methane released in manure and through rumination, and transporting product to stores. Therefore, another important step individuals can take to reduce emissions is to eat a plant-based diet.

For the average resident, making choices regarding consumption can be a tangible way to reduce greenhouse gas emissions, minimize the amount of material you send to the landfill, and eliminate unnecessary expenditures. Below are some of the most impactful actions you can take in your own life to contribute to Salem's efforts to mitigate climate change.

ACTIONS FOR INDIVIDUALS

1. OPT FOR ACTIVE TRANSPORTATION.

Transportation represents approximately 29% of emissions in the U.S.[33] Opting to use alternative modes of transportation, such as busing, walking, biking, or sharing a ride, is one of the top ways to reduce your impact.[34] Look for bike sharing stations at locations near Cherriots transit and downtown parks.

2. REDUCE DRIVING TRIPS IN GASOLINE-POWERED VEHICLES.

When you need to drive, reduce the effects of driving by combining trips, working from home/videoconferencing when possible, or buying an electric vehicle next time you're in the market for a car. Consider taking a bus to your destination. Cherriots transit system can help you get where you want to go.

3. AVOID UNNECESSARY AIR TRAVEL.

Carbon emissions from one long flight are often more than the total emissions of the average person in many countries for an entire year, and aviation is one of the fastest growing sources of pollution.[35] How about taking the train? Amtrak has a station in Salem and connections to their regional and national system.

4. EAT A PLANT-BASED DIET.

The livestock industry is responsible for about 14.5% of global greenhouse gas emissions, and cattle (both meat and dairy production) accounts for 65% of that.[36] Get fresh produce from Salem's local farmers markets or support local growers by becoming a Community Supported Agriculture subscriber.

5. BUY LOCAL, IN-SEASON FOODS.

Fresh produce in the grocery store often travels a long way to arrive in Salem, so purchasing local foods that are in season (or growing your own!) eliminates significant transportation emissions. There may be a community garden near you where you could not only grow your own food but learn from other gardeners too. Marion Polk Food Share Community Garden program can help you get started.

6. IMPROVE THE EFFICIENCY OF YOUR HOME.

When you're looking to make changes in your home, consider upgrading your appliances to be more efficient, replacing natural gas furnaces with electric heat pumps, using more effective insulation, and installing LED light bulbs or smart thermostats. Creating more shade by adding trees, awnings, lattices or vines; and adding an evaporative cooler or whole house fan can all make big differences in reducing cooling needs in the summer. Sealing leaks and replacing windows will reduce heating needs in the winter. All of these strategies can save you energy and money in the long-term. Energy Trust of Oregon offers a range of resources and incentives.

7. CONSERVE ENERGY AND WATER AT HOME.

Simple actions like turning off lights, unplugging appliances, limiting laundry loads, and minimizing use of heating and cooling can add up to both resource and cost savings. Water conservation also conserves energy. For every gallon of water not used, energy usage is reduced. Find tips for water conservation on the City website.

8. INSTALL OR PURCHASE RENEWABLE ENERGY.

If you have the financial capability, consider installing solar panels on your roof or accessing solar energy through a community solar project. Energy Trust of Oregon might be able to provide technical or financial assistance.

9. REDUCE NATURAL GAS USAGE.

When possible, replace natural gas-powered appliances like furnaces, stoves, and water heaters with electric alternatives.

SALEM'S PER CAPITA EMISSIONS COMPARED WITH OTHER CITIES[38]

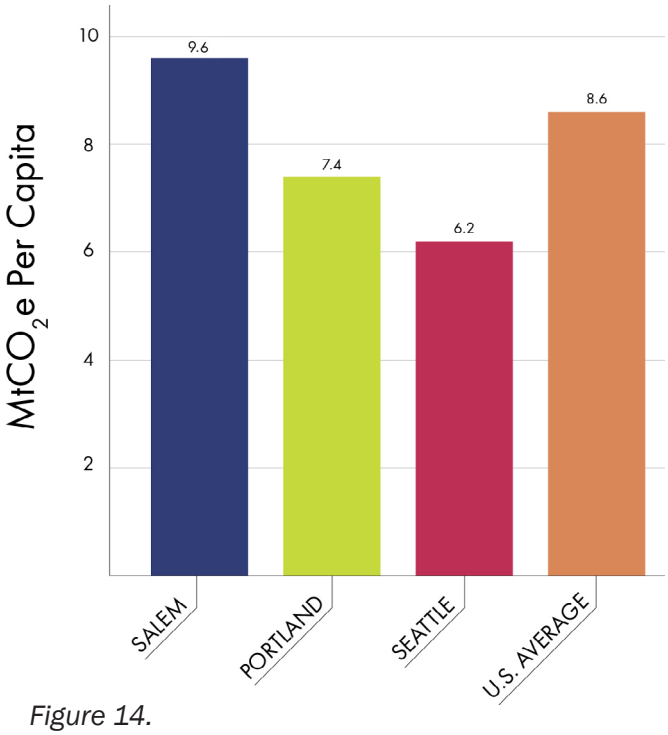


Figure 14.

10. REDUCE WASTE (ESPECIALLY FOOD WASTE).

Materials sent to landfills directly release methane gas into the atmosphere, and food waste accounts for 6% of global emissions.[37] Reduce, recycle, or compost instead! Consider using your grass clipping and green food waste to produce valuable compost to add to your yard and garden.

11. BUY LESS STUFF.

Clothes and other consumer goods are often discarded after little use because of fast fashion and planned obsolescence. Reduce consumption by purchasing second-hand items, sharing tools, or repairing broken items rather than throwing them away.

12. LEARN ABOUT AND PURSUE ACTIONS THAT ADDRESS INTERSECTIONALITY.

The effects of climate change disproportionately fall on Black, Indigenous, and people of color, people living with disabilities, people living below the poverty line, the elderly, and other historically marginalized groups, making it all the more important to integrate social justice into our environmental work and daily actions.

13. SUPPORT ELECTED OFFICIALS, POLICIES, AND ORGANIZATIONS DOING THE LARGE-SCALE WORK.

To meet the challenge of curbing climate change before it's too late, governments and large entities must also take action. Supporting those who are leading the way helps push us forward faster and more effectively.

To get a more precise understanding of the carbon emissions your lifestyle generates, you can use a carbon footprint calculator that will measure the impact of things like the heating and cooling needs of your home, your diet, your car and air travel, and more. (One free example is carbonfootprint.com.)

Some of the individual changes mentioned require financial investments that just aren't feasible for many people, and that's okay. The important thing is to start where you are and take action whenever and wherever you can. Being mindful of the impact of your actions on the planet and fellow humans, investing in the Salem community, and building relationships with your neighbors all contribute to our collective resilience and our thriving future.

ACTIONS FOR ORGANIZATIONS AND EMPLOYERS

Salem is unique in hosting the state capitol and many state agencies. These organizations can work together and with the City on initiatives to reduce GHG emissions, such as active commuting programs, telecommuting, energy efficiency, purchasing, and more.

Organizations and businesses have an essential role to play in responding to climate change.[39] Below are some of the larger scale actions these entities can take.

1. ENCOURAGE ACTIVE TRANSPORTATION.

Make biking, busing, carpooling and walking easy for employees through flexible work-from-home policies,

infrastructure for employees who bike or walk (like showers, protected bike racks or bike lockers), employee discounts for bus fare, carpool matching, incentives, and more. Institute policies that encourage the use of videoconferencing tools rather than frequent business travel.

2. MEASURE YOUR CARBON FOOTPRINT.

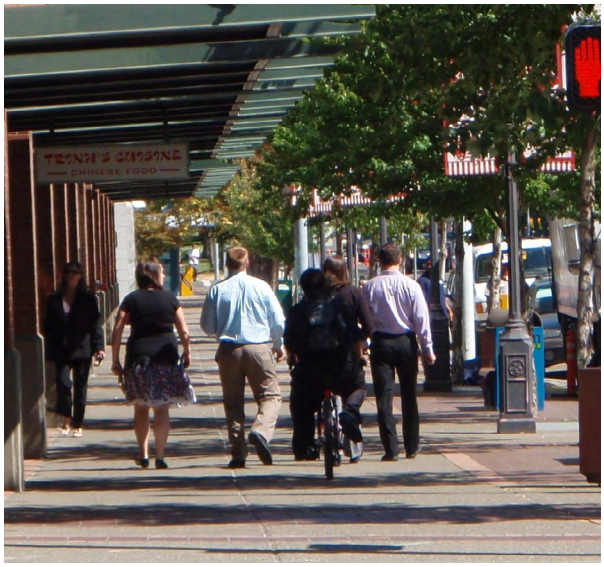
Knowing your own emissions impact is the first step toward making reductions. Set up a regular interval for assessing your organization's GHG inventory, set emissions reduction targets, and monitor your progress toward those goals. Even better: share your progress with your clients or customers. About one-fifth of the world's largest public companies have committed to net zero emissions.[40]

3. REDUCE CONSUMPTION.

Reduce energy and water consumption by making upgrades to your building if you own it (like replacing lights with LEDs). Whether you own or not, managing office energy use is critical to reducing consumption. Set thermostats a few degrees higher in summer and lower in winter; close vents in unused spaces; turn off unneeded lights; and make sure to use energy efficient computers and appliances. Create a culture of conservation among your employees, monitor your energy usage monthly, set reduction goals, and report your progress to your customers.

4. PURCHASE SUSTAINABLY.

Take a closer look at your supply chain and consider the ethical and environmental impacts of the purchases you make (like compostable containers vs. styrofoam, or 100% recycled content paper) and the suppliers and vendors you hire. Work to reduce transportation emissions throughout the supply chain.



5. REDUCE WASTE.

Improve your waste infrastructure by ensuring that recycling (and composting, if available) containers are present wherever landfill bins are located. Increase awareness among your employees about the importance of correctly sorting waste.

6. ENCOURAGE NEW BEHAVIORS.

Implement targeted sustainability initiatives by engaging your employees in campaigns, competitions, or other opportunities to learn and change behaviors.

7. SPEAK UP.

The business community has an influence. Work with your elected officials to encourage the development of renewables and divest from fossil fuels.

1 out of 5

OF THE WORLD'S LARGEST PUBLIC COMPANIES HAVE COMMITTED TO NET ZERO EMISSIONS.

11

Conclusion

CONCLUSION

Achieving the City's GHG reduction goals will require a shared vision and an all-hands-on-deck approach.

The Salem community is well-positioned to make innovative progress toward its climate goals. With this Climate Action Plan serving as a comprehensive roadmap, and the support of residents and key agencies, Salem can embark on implementing an array of strategies that will reduce emissions and improve resilience to climate change.

Leadership, partnership and collaboration will be key to the successful implementation of this plan. Achieving the City's GHG reduction goals will require a shared vision and an all-hands-on-deck approach. Government agencies, businesses, neighborhoods and individuals must be willing to adopt new ways of doing things and be willing to adapt over time.

Regular tracking and reporting of GHG emissions will reflect the community's progress toward its goals and allow the City to make adjustments as time goes on.

At each step of the way, equitable representation and inclusive engagement will ensure that every Salem resident will have the chance to participate in the transition to a climate-smart city of 2050.

"I hope we can have a plan in place to be more prepared for future events, looking out for all neighbors, even those who are unhoused. I would like to be confident that my community has a plan going forward, to have less of a carbon footprint as a City and be flexible with more progressive changes as the climate crisis becomes worse."
— Salem resident

12

Glossary

GLOSSARY

Adaptation is the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities.[41]

Adaptive capacity refers to the level of ability a community has to leverage relationships, social constructs, and knowledge to adjust to changing conditions in the community and/or greater society or world.

Carbon dioxide equivalent (CO_2e) is a measure used to compare the emissions from various greenhouse gases on their global-warming potential by converting gases into the equivalent effect of releasing carbon dioxide. For example, a unit of carbon dioxide equals one unit of carbon dioxide equivalent, whereas a unit of methane, which has a global-warming potential of 25 is equivalent to 25 units of carbon dioxide equivalent.

Carbon neutral refers to the net quantity of carbon dioxide released from operations being zero. Carbon neutrality can be achieved by releasing no carbon dioxide or by balancing carbon dioxide emissions with offset activities, such as sequestration.

Closed-loop system. A system of handling production supply chains in which materials at the end of their product life are re-used, recycled or re-manufactured into new products such that no waste is created.

Co-benefits are advantages to the community that any climate action strategy may have beyond reducing emissions. The strategies in this plan specifically take into account the co-benefits of public health, mobility choice, environmental quality, resilience, local economic development, and community equity.

Community equity means all residents have the opportunity to participate and thrive in an inclusive society. This requires rectifying unequal access to resources and opportunities caused by historic and current systems of oppression and exclusion related to race, income, ability, gender, sexual identity, and other factors. An equitable community overcomes disparities by providing increased levels of support to community members based on their needs. In Salem, it is a priority to advance equity in decision-making processes and the outcomes of those processes, including policies, investments, practices, and procedures. Strategies with the Community Equity indicator have the potential to increase equity in Salem by addressing systems and practices that have historically disadvantaged groups of Salem residents and by maximizing benefits for frontline communities.

Environmental quality is integrally connected to individual and community wellbeing and refers to the health of our air, water, and land. Strategies with the Environmental Quality indicator have the potential to improve the health of Salem's air, water, and land.

Frontline communities. People of color, immigrants, refugees, and lower-income residents who have increased exposure and sensitivity to hazards and a reduced capacity to adapt due to systemic and institutional racism and classism.

GHG Protocol. Greenhouse gas protocol, commonly referred to as GHG Protocol. The GHG Protocol is a global framework for measuring and reporting greenhouse gases.

Greenhouse gases (GHG) trap heat in the atmosphere and contribute to climate change. Examples of greenhouse gases include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases (such as hydrofluorocarbons).

Local economy refers to employment opportunities and the production, buying, and selling of goods and services in Salem. Strategies with the Local Economy indicator are those that can contribute to the health or growth of Salem's economy by benefiting local businesses, encouraging entrepreneurship, creating jobs, and keeping money in Salem.

A **metric ton** is a unit of mass equal to 1,000 kilograms.

Mitigation refers to a human intervention to reduce the sources or enhance the sinks of greenhouse gases (GHGs).[42]

Mobility choice is connected with public health and environmental quality and refers to Salem residents and visitors having access to multiple ways of moving throughout the city and not having to rely only on individual ownership of vehicles. Strategies with the Mobility Choice indicator have the potential to increase mobility choice by providing safe and convenient access to transportation options such as walking, biking, carpooling, taking public transit, and working from home.

Public health refers to the protection of a community's health and the prevention of problems before they happen through educational programs, policies, services, and research. Strategies with the Public Health indicator have the potential to improve the physical and mental health of Salem's communities.

Representative concentration pathways (RCPs) refer to the possible scenarios resulting from greenhouse gas emissions and land use practices over time. RCP8.5 is a high-emission scenario that is frequently used as a "business-as-usual" scenario.

Resilience is the ability of people and their communities to anticipate, accommodate and positively adapt to or thrive amidst changing climate conditions and hazard events. Resilient communities enjoy a high quality of life, reliable systems, and economic vitality, and they conserve resources for present and future generations.[43]

Strategies in this CAP refer to the recommended actions for implementation throughout Salem to reduce greenhouse gas emissions and increase climate resilience. Strategies are nested under "Objectives" in the Climate Action Strategy List (see Appendix 8). The term "strategy" in this plan is differentiated from "scenarios," which refer to the modeling of possible future GHG emissions pathways; "targets" refer to emission reduction outcomes that were modeled (see Chapter 7).

Vehicle Miles Traveled (VMT) measures the amount of travel for all vehicles in a geographic region over a given period of time, typically a one-year period. It is calculated as the sum of the number of miles traveled by each vehicle.[44]

Zero waste is defined as diverting 90% of waste from landfills through waste reduction, composting, recycling and reusing.

13

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Appendix 1

CITY OF Salem AT YOUR SERVICE

SALEM, OREGON

Community Greenhouse Gas Inventory

Prepared by
Cascadia Partners
May 24, 2019

Introduction

Salem is growing. By 2035, the population of Salem's Urban Growth Boundary (UGB) is projected to reach nearly 270,000.[1] This growth will bring jobs, construction, and investment to the region while contributing to a global population expected to surpass 8.5 Billion by 2030[2].

Along with the benefit that increased human activity can provide, comes a potential cost: climate change. The Intergovernmental Panel on Climate Change (IPCC), the United Nations body that regularly convenes climate scientists, has identified human activity as the primary driver of global climate change[3].

Salem is not immune to the impacts of climate change. Everything from the Willamette Valley produce on our table to the Santiam River water flowing from our taps is susceptible to climate change. Recognizing this, the 2017 Salem Strategic Plan identified a GHG inventory as a way to measure the community's impact on the environment.

This Community Greenhouse Gas (GHG) Inventory report was prepared using the "Global Protocol for Community Scale Greenhouse Gas Emission Inventories" (GPC). The GPC is an internationally-accepted method for community-scale GHG accounting that covers a range of emissions sources including transportation, waste production, and energy use. The report provides a snapshot of emissions from human activity within and originating from Salem's city limits and surveys a variety of emissions sources, highlighting areas for further study.

Looking ahead, this inventory will allow Salem to track progress toward any future emissions reduction targets by providing a baseline against which to compare future years of inventory data. Most importantly, this inventory represents the City of Salem's first step toward understanding the community's impact on the environment and mitigating its contribution to global climate change.

1. *Salem Housing Needs Analysis 2015-2035 (2014), ECONorthwest*
2. *United Nations News Centre (2015)*
3. *IPCC Climate Change 2014 Synthesis Report (2014)*

About the Inventory

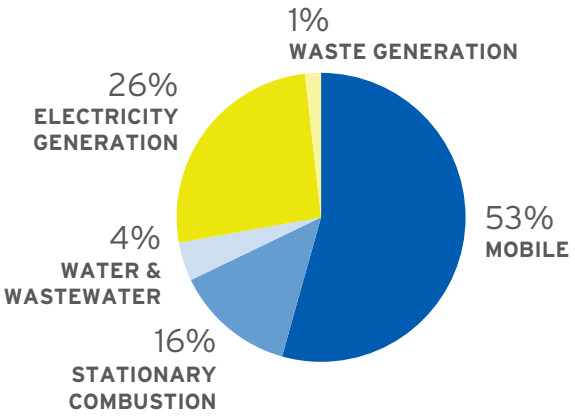
The Salem Community Greenhouse Gas Inventory was prepared in accordance with the Global Protocol for Community Scale Greenhouse Gas Emission Inventories using the EPA's Local Greenhouse Gas Inventory Tool. Inventory data was gathered for the 2016[4] calendar year from federal, state, and local sources, including utilities. The inventory spans six emissions source categories as shown below. As a community-scale inventory, it accounts for emissions from Salem's residents, employees, and visitors undertaken within or originating from its city limits. It does not include GHG emissions related to the consumption of goods within Salem's city limits that originated elsewhere[5].

SCOPE 1			SCOPE 2	SCOPE 3	
MOBILE EMISSIONS	STATIONARY COMBUSTION	WATER & WASTEWATER	ELECTRICITY GENERATION	AGRICULTURE / URBAN FORESTRY	WASTE GENERATION
Driving within city limits and local flights originating from Salem's airport.	Combustible fuel use, such as natural gas, in residential and commercial buildings.	Water supply and wastewater generation within city limits.	Electricity used by Salem's residential and commercial customers.	Carbon released by agriculture fertilizer and carbon removed by urban tree cover.	Solid waste sent to landfills and waste-to-energy facilities.

Results In Brief

In 2016, the City of Salem's residents, businesses, employees, and visitors produced 1,553,573 Metric Tons of CO_2 equivalent (CO_2e). This equates to roughly 9.59 Metric Tons of CO_2e per capita. Of the six emissions source categories surveyed, mobile emissions made up over half (53 percent) of the CO_2e produced. Electricity generation comprised over one quarter of all emissions, while residential and commercial fuel combustion was the third largest contributor at 16 percent.

CITY OF SALEM GROSS GHG EMISSIONS BY SOURCE* (2016)



** Agriculture and urban forestry not included due to a net reduction in GhG emissions.*

4. *2016 was chosen for analysis due to availability of American Community Survey data*
5. *It is possible that future inventories could include both consumption and sector-based sources of emissions once data is becomes more readily available.*

SCOPE 1

MOBILE EMISSIONS

The majority of Salem's greenhouse gas emissions (53 percent) are attributable to mobile sources. Of this, over 99 percent came from tailpipe emissions from driving within Salem's city limits while less than 1 percent came from local traffic through McNary Field, Salem's municipal airport.

Using data provided the Mid-Willamette Valley Council of Governments (MWVCOG), it was estimated that over 4 million vehicle-miles per day, on average, were traveled within the City of Salem in 2016[6]. That amounts to nearly 1.5 billion vehicle-miles traveled (VMT) annually. Each mile driven within the City of Salem emits roughly 1.2 pounds of CO_2e[7], totaling over 837,000 metric tons each year.

As the center of commerce for the mid Willamette Valley and Oregon's state capital, Salem has an abundance of jobs. However, many of the people who hold these jobs do not live in Salem. Of the nearly 90,000 people who work in Salem, over 63 percent commute from somewhere else[8].

Commuters from outside Salem are only part of the picture. Over 86 percent of Salem's employed residents commute to work by car, a higher rate than other large Oregon cities and a major contributor to Salem's mobile emissions.

6. *MWVCOG SKATS Travel Demand Model (2015), trips starting and/or ending in Salem city limits only*
7. *ODOT Fuel Economy Survey (2017)*
8. *Census Longitudinal Employee-Household Dynamics (2015)*

MOBILE EMISSIONS:

AT A GLANCE

OVER 4 MILLION AVERAGE DAILY VMT

From trips starting and/or ending in Salem city limits

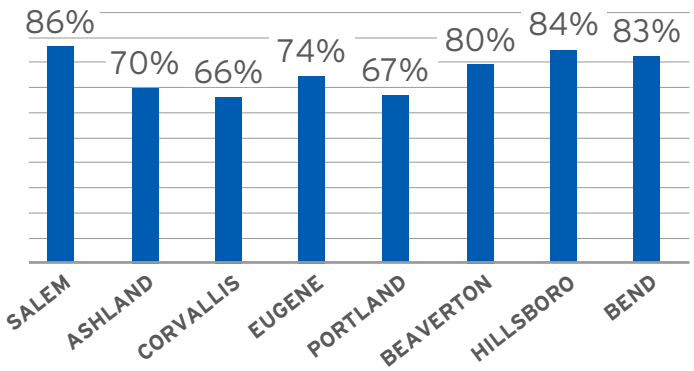
11,085 ANNUAL TRIPS

Made by local air traffic from McNary Field

837,185 METRIC TONS OF CO_2e

Released into the atmosphere from this emissions source

PERCENT OF WORKERS COMMUTING BY AUTOMOBILE
(DROVE ALONE OR CARPOOLED)



Source: 2012 -2016 American Community Survey (ACS) 5-Year Estimates

SCOPE 1

STATIONARY COMBUSTION

Stationary combustion was responsible for just over 14 percent of Salem's annual greenhouse gas emissions in 2016. Stationary combustion includes the use of combustible fuels like natural gas for cooking, heating, and commercial processes. Data from the Oregon Department of Environmental Quality (DEQ), Northwest Natural, and the US Census Bureau were used to estimate stationary combustion within Salem's city limits.

The vast majority of stationary combustion emissions (98 percent) occurred as the result of natural gas use. The remainder was the result of home heating using fuel oil, or propane[9]. Of the natural gas consumption that occurred, the greatest intensity of use came from commercial/industrial users. As the chart to the right shows, the average commercial/industrial customer used roughly 10 times as much natural gas as the average residential customer.

Of the 254,018 metric tons of CO_2e released as a result of stationary combustion, just under 39 percent was attributable to residential heating and cooking while the remainder was the result of combustion for commercial, industrial, or institutional applications.

STATIONARY COMBUSTION:

AT A GLANCE

OVER 50% OF SALEM HOUSEHOLDS

Heat their homes through stationary combustion

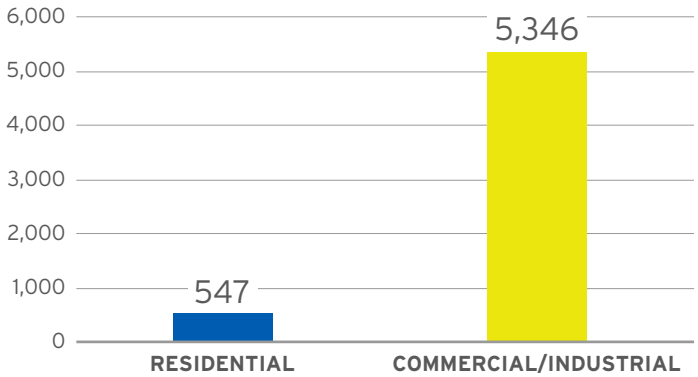
OVER 28 MILLION THERMS OF NATURAL GAS

Delivered to residential and commercial customers

254,018 METRIC TONS OF CO_2e

Released into the atmosphere from this emissions source

THERMS OF NATURAL GAS PER METER



9. *2012 - 2016 American Community Survey (ACS) 5-Year Estimates*

SCOPE 1

WATER & WASTEWATER

Water delivery and wastewater treatment accounted for roughly 4 percent of Salem's annual GHG emissions in 2016. Because Salem receives water from the North Santiam River watershed, the only emissions associated with its delivery are the result of electricity used by pump stations. This is captured in Scope 2: Electricity Generation.

The sole source of emissions captured within this emissions source category is the treatment of wastewater at the Willow Lake Wastewater Pollution Control Facility. Each day, Willow Lake processes up to 200 million gallons of wastewater[10].

The primary greenhouse gas produced as a byproduct of the wastewater treatment process is methane. Specifically, of the 360,000 cubic feet of biogas produced by Salem's wastewater treatment processes each day, 61 percent is methane[11].

While the metric tons of CO2e produced by Salem's wastewater treatment plant reflect operations as of 2016, it should be noted that upgrades are currently being made to the Willow Lake plant. As of this writing, the City of Salem is working with Energy Trust of Oregon to install a new co-generation facility that will convert much of the methane produced as a result of wastewater treatment into energy.

10. www.cityofsalem.net/Pages/willow-lake-wastewater-treatment.aspx
11. *Interview with City of Salem Public Works (October, 2018)*

WATER & WASTEWATER:

AT A GLANCE

NEARLY 98% OF SALEM HOUSEHOLDS

Are served by sanitary sewer

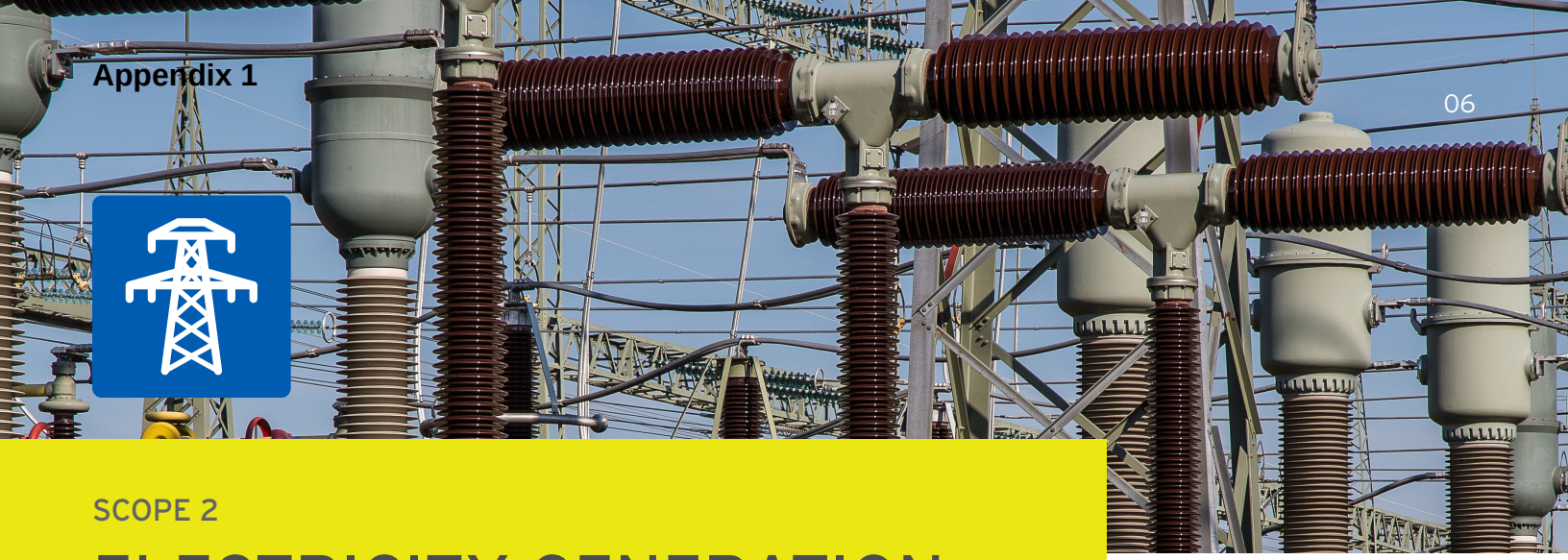
360,000 CUBIC FEET OF BIOGAS

Produced daily by Salem's wastewater treatment plant

66,736 METRIC TONS OF CO_2e

Released into the atmosphere from this emissions source

Willow Lake Wastewater Treatment (Source: City of Salem)



SCOPE 2

ELECTRICITY GENERATION

At just over 26 percent, electricity generation contributed the second largest share of Salem's greenhouse gas emissions in 2016.

Salem's residents and businesses are served by two electric utilities: Salem Electric, a publicly owned cooperative, and Portland General Electric (PGE), an independent public utility. Salem Electric serves roughly 13,000 customers primarily in West Salem, while PGE serves over 60,000 customers in the Marion County portion of Salem's city limits.

Just over half (54 percent) of Salem's annual electricity demand is from commercial / industrial users who make comprise roughly 18 percent of the electric meters served by Salem Electric and PGE.

Salem has some of the cleanest electric power in Oregon, but each kWH delivered to Salem's rate payers is not created equal. That is because Salem Electric purchases all of its electricity from the Bonneville Power Administration (BPA) as hydopower.[12] Portland General Electric, as the chart to the right shows, generates electricity from plants it owns as well as power it purchases from the wholesale market[13]. This includes a mix of wind, hydropower, natural gas, and Oregon's last remaining coal-fired power plant, located in Boardman[14].

12. *www.salemelectric.com/cooperative/faq*
13. *Includes power purchased from the Covanta Marion Waste-to-Energy Facility*
14. *www.portlandgeneral.com/our-company/energy-strategy/how-we-generate-electricity*

ELECTRICITY GENERATION:

AT A GLANCE

OVER 54% OF SALEM'S ELECTRICITY USE

Is the result of commercial or industrial activities

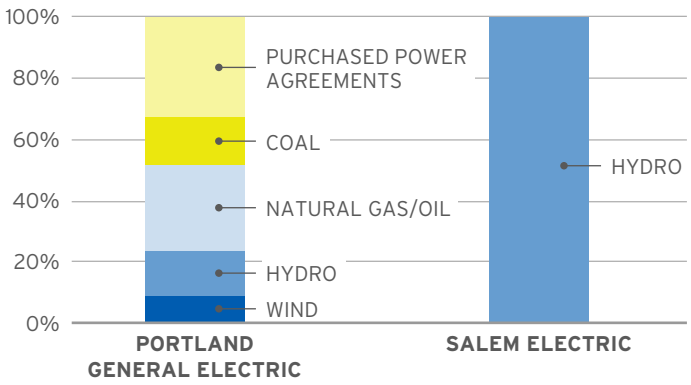
1.28 BILLION KILOWATT HOURS (kWh)

Delivered to Salem residents and businesses in 2016

400,814 METRIC TONS OF CO_2e

Released into the atmosphere from this emissions source

ELECTRICITY FUEL MIX



SCOPE 3

AGRICULTURE / URBAN FORESTRY

Agriculture and urban forestry play a unique role in greenhouse gas emissions inventories. On the one hand, agriculture can release greenhouse gases into the atmosphere through the use of certain fertilizers. On the other hand, the plants that comprise some agricultural activities and the trees and shrubs that grow in urban areas are a source of carbon sequestration - the long-term storage of carbon in plants, soils, and water bodies.

Because there are relatively few farms or other agricultural uses within Salem's city limits and because Salem has a robust tree canopy, this emissions source category produces a net reduction in CO_2e for the city of Salem. The 7,045 acres of urban forest within Salem's city limits sequesters 23,312 metric tons annually, or roughly a 1 percent reduction in citywide greenhouse gas emissions.

The annual net reduction from carbon sequestration was calculated using data from the city of Salem's 2014 Community Forestry Strategic Plan[15].

AGRICULTURE AND URBAN FORESTRY

AT A GLANCE

7,045 ACRES

Of urban tree canopy in Salem city limits

NEARLY 18% OF SALEM'S LAND AREA

Is covered by urban tree canopy

23,312 METRIC TONS OF CO_2e

Absorbed into Salem's urban tree canopy annually

Credit: Ron Cooper

15. www.cityofsalem.net/citydocuments/community-forestry-stategic-plan.pdf

SCOPE 3

WASTE GENERATION

Solid waste generated by Salem residents, visitors, and businesses accounted for roughly 1 percent of citywide GHG emissions in 2016.

The vast majority of Salem's solid waste is sent to two locations: the Coffin Butte Landfill (Benton County) and the Covanta Waste-to-Energy Facility (Marion County). The way these two facilities process waste is very different. At Coffin Butte, waste is landfilled, and some of the resulting methane is burned for power. At Covanta, solid waste is incinerated to produce power resulting in ash byproduct which is then sent to Coffin Butte.

Using data from Oregon DEQ, Republic Services, and the Mid-Valley Garbage Recycling Association, it was estimated that the city of Salem sent 46,469 metric tons of solid waste to the Coffin Butte Landfill in 2016 resulting in 2,376 metric tons of CO_2e. For Covanta, it was estimated that 46,250 metric tons of the solid waste it received in 2016[16] came from the city of Salem leading to net emissions of 15,744 metric tons of CO_2e.

16. *Mid-Valley Garbage Recycling Association*
17. *Case Study: Marion County Waste to Energy Facility, Governmental Advisory Associates (2013)*
18. *Salem's share of these emissions proportional to amount of solid waste sent to the Covanta WTEF.*

WASTE GENERATION

AT A GLANCE

92,719 METRIC TONS OF SOLID WASTE

Generated within Salem city limits in 2016

93,506 MEGAWATT HOURS GENERATED

By the Covanta WtEF in 2016[17]

18,120 METRIC TONS OF CO_2e

Released into the atmosphere from this emissions source

WHAT'S THE DEAL WITH COVANTA MARION?

Marion County is unique in how it manages solid waste. Instead of decomposing in landfills, waste is used to generate electricity. Waste sent to the Covanta WtEF emits little to no landfill gas, but as a result of incineration, still results in GHG emissions.

Though the GPC does not require communities to account for emissions from energy generation outside their municipal boundary, a portion of the emissions generated by the Covanta WtEF were included in this inventory. That portion is the difference between the emissions Covanta Marion produced and the emissions that a reasonable source of alternative power, such as natural gas, would emit to generate the same amount of electricity[18].

How do other cities compare?

In 2016, Salem emitted 9.57 metric tons of CO2e per capita. This puts Salem squarely in the "middle of the pack" compared to other Oregon cities. In order to better understand what drove Salem's 2016 Greenhouse Gas Emissions Inventory performance, it is helpful to break apart the key components of total emissions.

When compared to other cities based on per capita emissions from energy generation alone, Salem performs among the best. This is due to the relatively clean mix that Salem Electric and PGE provide to Salem's residents and businesses. Only Eugene has lower per capita emissions, likely owing to the fact that over 80 percent of its electricity comes from hydropower.

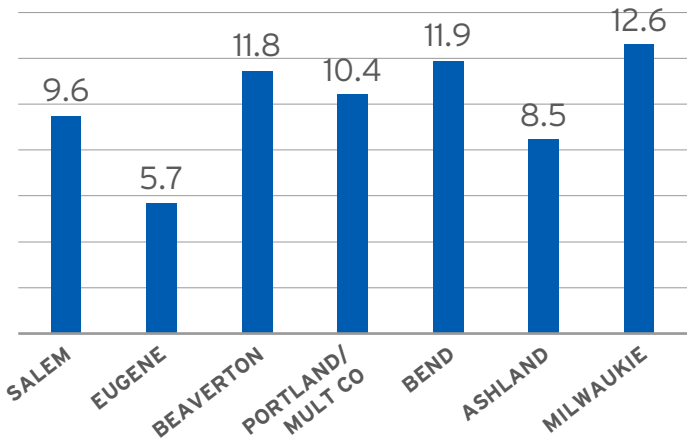
Transportation emissions per capita tell a different story. With 5.2 metric tons of CO_2e per capita, Salem ranks among the biggest emitters of mobile emissions among major Oregon cities. As discussed previously, the is due in large part to the driving habits of residents and the commute patterns of workers who live elsewhere.

What's next?

We are in a defining moment. With the completion of this Community GHG Inventory, Salem now has a better understanding of its emission sources and its environmental impact. This inventory will help Salem set emission reduction goals, track progress toward those goals, and prepare a Climate Action Plan.

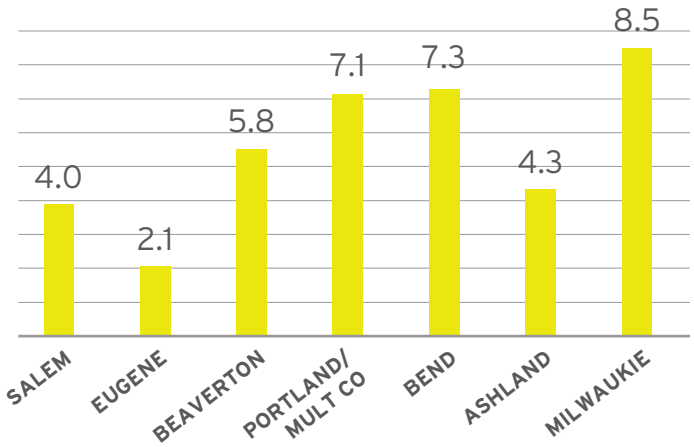
Salem is also in the midst of updating its Comprehensive Plan, which will guide future growth and development in the area. Salem can use this inventory to inform policies about how the city grows, which can have a major impact on community-scale GHG emissions.

PER CAPITA EMISSIONS ($MTCO_2e$)*



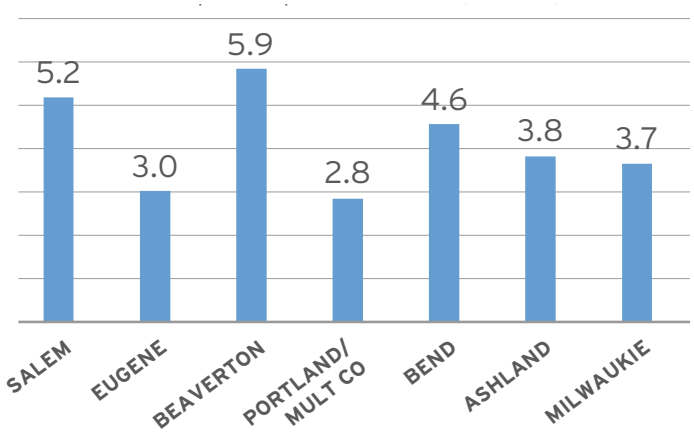
Comparison inventory years vary (Eugene: 2015, Beaverton: 2013, Bend: 2016, Portland: 2008, Ashland: 2015, Milwaukie: 2016)

PER CAPITA ENERGY EMISSIONS ($MTCO_2e$)*



Stationary energy use from electricity, natural gas, and other fuels.

PER CAPITA TRANSPORTATION EMISSIONS ($MTCO_2e$)



Glossary

Anthropogenic Emissions
Emissions that are associated with human activities, of greenhouse gases, greenhouse gas precursors, and aerosols. These include burning of fossil fuels for energy, deforestation, and land-use changes that result in net increases in emissions.

Biogenic
Produced, or brought about by, living organisms. Biogenic emissions occur as the result of combustion or decomposition of biological materials.

Carbon Sequestration
A natural or artificial process, by which carbon dioxide is removed from the atmosphere and held in solid or liquid form. Trees, for example, sequester carbon over the lifetime of the tree by turning atmospheric carbon into wood, leaves, and other parts of the tree.

CO2 Equivalents
A measure of how much global warming a given type and amount of greenhouse gas may cause, or its Global Warming Potential (GWP), using the functionally equivalent amount or concentration of carbon dioxide (CO2) as the reference. For example, the GWP for methane over 100 years is 34, and for nitrous oxide is 298. This means that emissions of 1 million metric tons (MMT) of methane and nitrous oxide respectively is equivalent to emissions of 34 and 298 MMT of carbon dioxide.

Greenhouse Gas
A gas that contributes to the greenhouse effect by absorbing infrared radiation, such as carbon dioxide, methane, and chlorofluorocarbons.

Kilowatt Hours (kWh)
A measure of electrical energy, equivalent to the consumption of 1,000 watts of power for 1 hour.

Scope
The extent of the area or subject matter that something deals with or to which it is relevant. For GHG emissions reporting and inventory purposes, GHG emissions are classified into three 'scopes'.

- **Scope 1** emissions are direct emissions from sources located within the city boundary.
- **Scope 2** emissions are indirect emissions from the generation of purchased energy, or otherwise occurring as a consequence of the use of grid-supplied electricity, heat, steam and/or cooling within the city boundary.
- **Scope 3** are all other GHG emissions that occur outside the city boundary as a result of activities taking place within the city boundary.

Urban Forestry
The planting, care, and management of single trees and tree populations in urban settings for the purpose of improving the urban environment, and providing the benefits of trees and tree cover to urban human and wildlife populations.

Urban Growth Boundary (UGB)
A land use planning line used to control urban sprawl by mandating that the area inside the boundary be used for urban development and the area outside be preserved for farm and forest lands.

Vehicle-Miles Traveled (VMT)
A measure of the amount of travel by vehicles over a given period of time, typically a one-year period, but also reported daily, and sometimes cumulatively over a period of many years.

Waste-to-Energy Facility (WtEF)
Waste-to-energy (WtE) or energy-from-waste (EfW) is the process of generating energy in the form of electricity and/or heat from the primary treatment of waste, or the processing of waste into a fuel source. A WtEF is a physical facility that conducts energy recovery activities fueled, at least partially, by solid, liquid, and/or gaseous waste.

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Appendix 2

City of Salem, Oregon

2016 Consumption-Based Greenhouse Gas Inventory

December 2020

CITY OF Salem AT YOUR SERVICE

Prepared by verdis GROUP

Introduction

In the effort to address climate change by reducing greenhouse gas (GHG) emissions, it is critical to first measure where emissions are coming from. This baseline is known as a GHG inventory. For municipalities, there are two different kinds of GHG inventories: sector-based and consumption-based.

In 2019, a sector-based GHG inventory of Salem's emissions was completed using 2016 data. This inventory measured emissions that are generated within Salem's city limits from activities such as energy generation, transportation, waste and manufacturing.

To complement this sector-based inventory, Salem called for the creation of a consumption-based inventory. This inventory measures GHGs that are associated with the goods and services that are purchased and used by Salem residents. For every good or service used, GHG emissions may be produced from the production, transportation, wholesale or retail sales, consumer use, and eventual disposal of the purchased item or service.

For example, if a Salem resident purchases a new pair of athletic shoes, a sector-based GHG inventory would measure the emissions created by driving to the store to purchase the shoes and later disposing of the shoes. But a consumption-based inventory will also measure all the GHG emissions that went into manufacturing that pair of shoes overseas and shipping them to the store. In essence, the consumption-based GHG inventory measures the carbon footprint of residents' purchasing and use behaviors.

Key Terms

GHG - Greenhouse gas. Examples of greenhouse gases include carbon dioxide, methane, nitrous oxide, and fluorinated gases.

CO_2e - Carbon dioxide equivalent. This is a metric that describes different GHGs in a common unit. It signifies the amount of CO_2 which would have the equivalent global warming impact.

$MtCO_2e$ - Metric tons of carbon dioxide equivalent. This is the unit of measurement by which atmospheric GHGs are measured.

In North America and Europe, the emissions from a consumption-based emissions inventory are typically higher than a sector-based inventory, because they take into account a much larger web of activity that occurs outside of their geographic bounds.

Consumption-based emissions occur both within and outside of the geographic bounds of Salem, meaning some of the emissions that occur are already counted within the sector-based inventory. The methodology for the two inventories differs significantly, so caution should be taken when interpreting the results. The emissions from these inventories cannot be added together for a total footprint because some emissions overlap. Instead, the inventories complement each other as two methods for viewing Salem's carbon footprint.

Generally, government has less ability to directly impact consumption emissions through legislation, compared with sector-based inventories. That's because most consumer behavior is not regulated. Instead, consumption-based emissions can be reduced by individual consumer behavior. These behavior changes might include, for example, reducing meat consumption or driving fewer miles. For the average resident, making choices regarding consumption can be a tangible way to reduce greenhouse gas emissions, minimize the amount of material they send to the landfill, and eliminate unnecessary expenditures. Therefore, measuring and communicating consumption-based emissions can be an effective message for environmentally-conscious residents.

Appendix 2
Methods

A consumption-based inventory requires two variables: per-capita expenditures across a range of consumer categories; and emission factors for each purchase, use, sale or disposal of those goods and services (a specified quantity of carbon dioxide equivalents per unit of each good or service).

Data on per-capita expenditures was provided by the Bureau of Economic Analysis (BEA). The BEA provided per capita consumer spending by state and year for multiple categories, which were combined into the 14 categories analyzed. Verdis Group then extrapolated the data from the state to the local level. Expenditure data varied by less than 1% between the State of Oregon and Salem.

The Salem metropolitan area includes the adjacent counties of Marion and Polk Counties as defined by the United States Office of Management and Budget according to published standards that are applied to Census Bureau data. The general concept of a metropolitan area is that of a core area containing a large population nucleus, together with adjacent communities having a high degree of economic and social integration with that core.

Emission factors were sourced from the Oregon's Greenhouse Gas Emissions through 2015 report and are a composite of multiple greenhouse gases that have been converted into carbon dioxide equivalents. For example, each metric ton of methane released into the atmosphere will have the same effect as 25 metric tons of carbon dioxide, so the quantity of methane released is multiplied by 25 to turn it into carbon dioxide equivalents.

Verdis Group sub-categorized the emissions into two categories: **Three-phase** (production & supply chain, transportation, and wholesale & retail) and **use and disposal**.

Since the source for emissions factors (noted above) was from 2015, but the target analysis year was 2016, Verdis Group wanted to confirm that the emissions per unit of activity were the same from one year to the next. The expected change between 2015 and 2016 emissions intensity was thus analyzed. It was determined that no significant change occurred over one year, and thus emission factors for 2015 were assumed for 2016.

These two pieces of data (dollars expended per resident and emissions per dollar) were used to calculate average emissions per category per resident for 2016.

Results

Verdis Group calculated that purchases of goods and services by residents of Salem were responsible for nearly 4.2 million metric tons of carbon dioxide equivalent ($MtCO_2e$) greenhouse gases in 2016. Each resident's use of goods and services (consumption) produced almost 20 $MtCO_2e$ in 2016 (Table 1). Vehicles and parts (29%) and food and beverages (22%) constituted over half of consumption-based emissions (Figure 1, Figure 3). Salem's consumption-based emissions were over 250% of sector-based emissions (Figure 4). This finding is in line with other North American and European cities, which typically have higher emissions in a consumption-based inventory than a sector-based inventory, as determined by a study completed by the C40 Cities Climate Leadership Group.

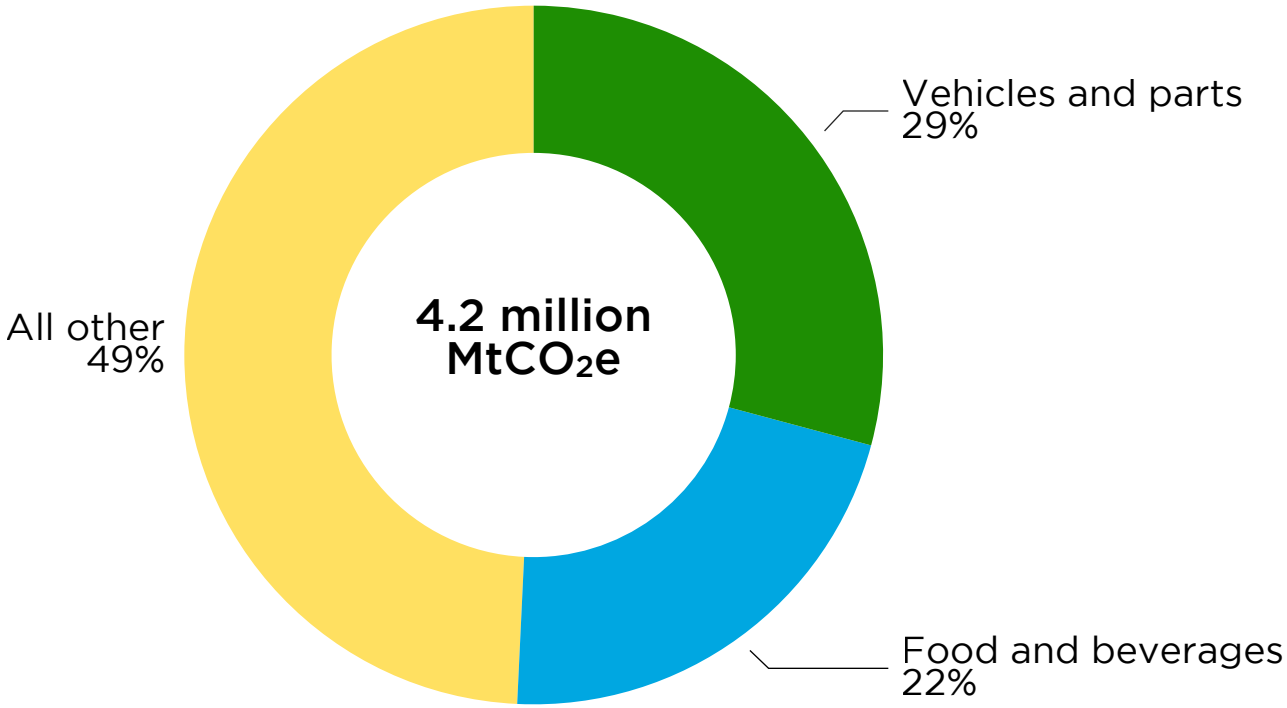

Figure 1. City of Salem consumption-based emissions for 2016.

Each resident's consumption produced almost **20 metric tons of CO_2e.**

Salem's consumption-based emissions were over **250%** greater than sector-based emissions.

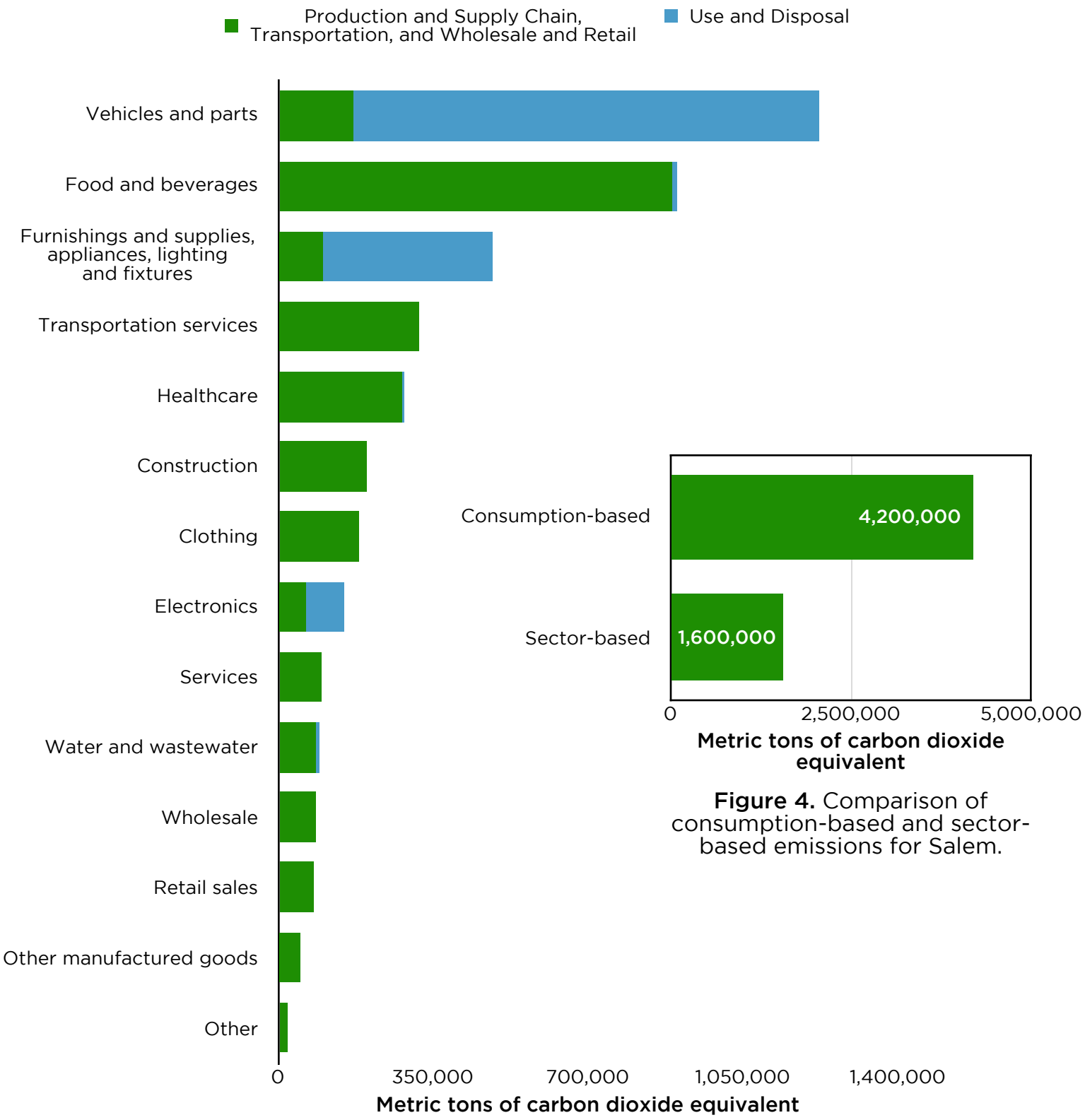

Figure 4. Comparison of consumption-based and sector-based emissions for Salem.

Figure 3. City of Salem consumption-based emissions by category for 2016.

Table 1. Sources of Salem's GHG emissions.

Source	$MtCO_2e$	$MtCO_2e$ Per Resident
Vehicles and parts	1,220,800	5.7
Food and beverages	903,600	4.2
Furnishings and supplies, appliances, lighting and fixtures	486,400	2.3
Transportation services	317,700	1.5
Healthcare	286,400	1.3
Construction	201,700	0.9
Clothing	184,600	0.9
Electronics	149,500	0.7
Services	97,600	0.5
Water and wastewater	92,700	0.4
Wholesale	88,200	0.4
Retails sales	82,500	0.4
Other manufactured goods	52,000	0.2
Other	22,100	0.1
Total	**4,185,700***	**19.7***

*Differences in total due to rounding

The vehicles and parts category is the largest source of consumption-based emissions in Salem. The primary reason for this is because of the GHG emissions released by the combustion of gasoline and diesel fuel in motor vehicles. This result should come as no surprise because mobile emissions, which includes motor vehicles and other sources, were responsible for 53% of all sector-based emissions in Salem and 28% of emissions nationally.

The consumption of food and beverages is the second-largest source of consumption-based emissions. Emissions from this category include those associated with meat consumption, especially beef, which has a large carbon footprint due to all the inputs associated with growing cattle feed, the methane released in manure and through a process of digestion known as rumination, and transporting product to stores. Food waste is another significant source because all of the emissions associated with producing, transporting, and storing food that is not eaten create needless GHG emissions.

Sector-Based vs. Consumption-Based Inventories

The City of Salem, Oregon, completed a sector-based greenhouse gas inventory of 2016 data in 2019. Sector-based inventories account for emissions that occur within the geographic bounds of a municipality (i.e., within City limits), typically with several exceptions (e.g. electricity produced outside of the boundary but consumed within, waste produced within but transported outside). Complementary to these efforts is a consumption-based inventory, which assesses emissions from the sourcing, production, retailing, use, and disposal of goods and services used by Salem residents regardless of where the goods and services were produced.

In some cases, emissions are counted in both inventories which can lead to double counting if emissions from the inventories are added together. The infographic (Figure 2) to the right lays out three scenarios involving commuting as an illustrative example of how these emissions would be accounted for in a consumption-based vs. sector-based inventory.

- In the first scenario, a Salem resident commutes to work outside the city limits. In this scenario, all emissions from the trip are included in the consumption-based inventory because the resident is from Salem. However, in the sector-based inventory, only emissions from driving within the city limits are counted.

- In the second scenario, a resident from another city commutes into Salem for work. No emissions are counted towards the consumption-based inventory because the individual does not live in Salem. However emissions from driving within the city limit are included in the sector-based inventory.

- In the third scenario, a resident of Salem lives and works within the city. Total trip emissions are included for both inventories but for different reasons: the consumption-based inventory because the individual is a resident of Salem, and the sector-based inventory because all activity takes place within the city limits.

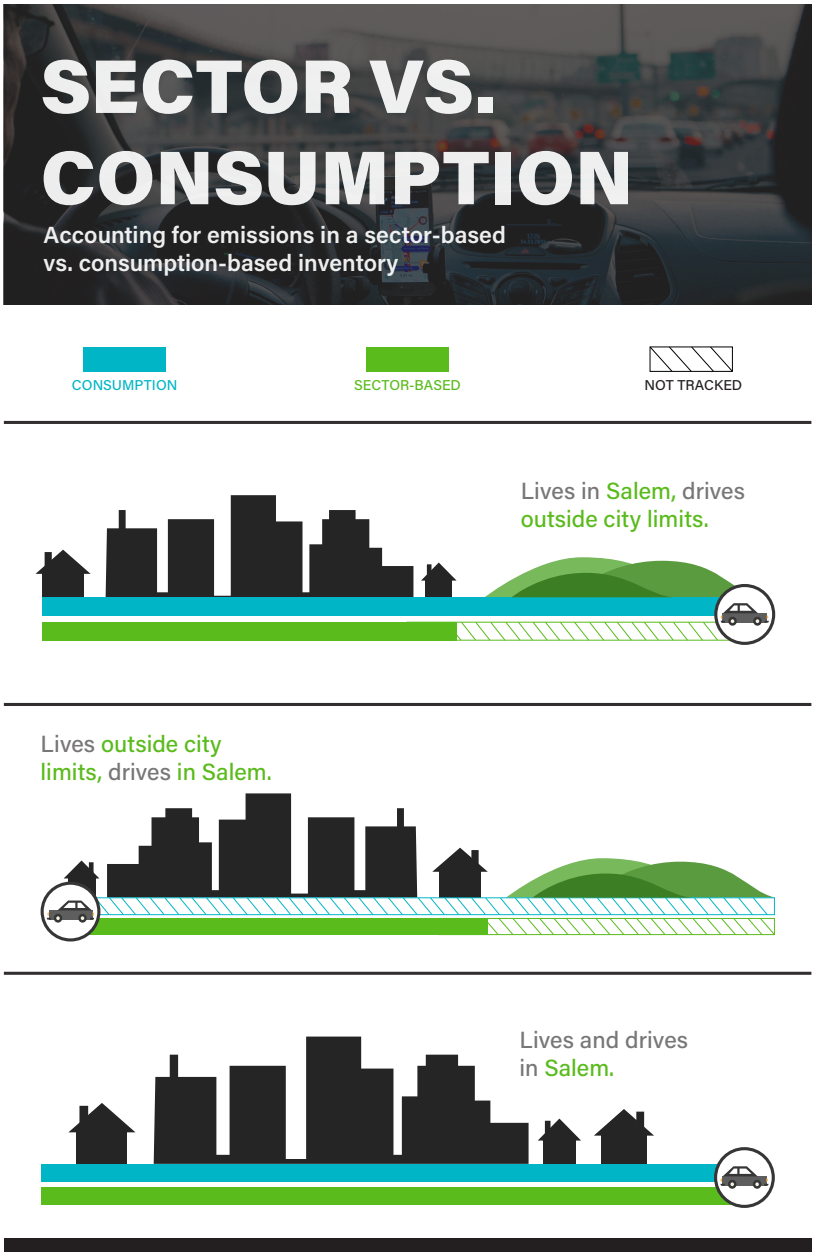

Figure 2. Three scenarios comparing how emissions are accounted for depending on whether the inventory is sector-based or consumption-based.

Appendix 2
Goal-Setting

When goal-setting, the sector-based and consumption-based inventories should be treated separately. Goals need not be set for both inventories. It remains uncommon to set consumption-based goals because of the difficulty of measuring the effect of changes in consumer behavior and because municipalities have little control over the purchasing decisions of residents.

It is helpful to keep in mind that all consumption-based emissions are another location's sector-based emissions. For example, many of the products purchased in Salem were produced in China, where the production would be counted in sector-based inventories. Widespread goal-setting and rigorous actions to reduce sector-based emissions will lower consumption-based emissions.

Verdis Group recommends setting goals based on sector-based inventories due the challenges associated with directly impacting and measuring a reduction in GHG emissions in a consumption-based inventory.

What You Can Do

Individual choices can add up to make a big difference in reducing emissions. Here are some of the most impactful ways that you can reduce your carbon footprint:

Reduce the number of trips you make in a gasoline-powered car by carpooling, busing, biking, or walking instead.

If purchasing a new vehicle, purchase an electric vehicle or hybrid to reduce emissions per mile.

Reduce the amount of red meat you consume. Animal husbandry is a significant source of agricultural emissions. Beef cattle are the most emissions-intensive commonly consumed meat.

Reduce the number of airplane flights you take.

Reduce food waste by buying only what you need. Wasted food accounts for 6% of global emissions.

CITY OF SALEM

555 Liberty St SE
Salem, OR 97301

Legislation Details (With Text)

File #:	20-383 **Version:** 1		
Type:	SOB - Councilor Item	**Status:**	Agenda Ready
File created:	9/30/2020	**In control:**	City Council
On agenda:	10/12/2020	**Final action:**	10/12/2020
Title:	Motion from Councilor Tom Andersen regarding adopting goals as part of the City's Climate Action Plan. Ward(s): All Wards Councilor(s): All Councilors Neighborhood(s): All Neighborhoods		
Sponsors:			
Indexes:			
Code sections:			
Attachments:	1. Public Comments received by 11:00 a.m. 10-12-20.pdf, 2. Public Comments received by 3:30 p.m. 10-12-20.pdf, 3. Public Comment received by 5:00 p.m. 10-12-20.pdf		

Date	Ver.	Action By	Action	Result
10/12/2020	1	City Council	adopted	Pass

TO: Mayor and City Council

FROM: Councilor Tom Andersen, Ward 2

SUBJECT:

Motion from Councilor Tom Andersen regarding adopting goals as part of the City's Climate Action Plan.

Ward(s): All Wards
Councilor(s): All Councilors
Neighborhood(s): All Neighborhoods

MOTION:

I move that the City Council adopt the following goals as part of the City's Climate Action Plan (CAP):

- By 2035, Salem's greenhouse gas emissions shall be reduced to 50% of the citywide greenhouse gas emissions for the baseline year of 2016, and
- By 2050, Salem should be carbon neutral.

DISCUSSION:

Gov. Brown' Executive Order 20-04 calls for Oregon's Greenhouse Gas (GHG) levels to

be:

- At least 45 percent below 1990 levels by 2035; and
- at least 80 percent below 1990 levels by 2050.

The Governor's goals do not include consideration of sequestration of carbon in trees and soils. Carbon neutrality includes consideration of carbon sequestered in trees and soils.

From 1990 to 2016 Oregon's emissions roughly grew from 56 to 62 million metric tons of carbon dioxide equivalent (MMTCO2e) according to the Oregon Global Warming Commission.

Having 2035 and 2050 goals is a reasonable timeline for GHG goals. They are far enough away to set stringent goals, but close enough to inspire early actions. They represent the timelines urged by international agreements.

Annual targets are not practical for two reasons: it is impractical to do annual emission inventories and even if it were, annual emissions have considerable variation, making analysis of one-year trends difficult.

Ultimately, protecting the stability of our climate and adapting to climate change impacts are the most urgent tasks our city faces. The City should adopt goals that are strong yet achievable. The action plan should lay out policies that could reasonably achieve these goals.

Achieving the emissions reductions necessary to stabilize the climate this century will require strong actions by every party. This includes strong actions by city, state and federal governments and by most citizens and businesses. See below for the goals from other northwest cities.

Examples of GHG Reduction Goals in Other City Climate Action Plans

The City of Portland's CAP had the following:

- Achieve a 40 percent reduction in carbon emissions by 2030 and
- an 80 percent reduction by 2050 (compared to 1990 levels)

In June of 2020 this policy was amended to; at least a 50% reduction in carbon emissions below 1990 levels by 2030 and net-zero carbon emissions before 2050.

The City of Corvallis CAP has the following:

The Task Force set a target to reduce greenhouse gas emissions 75% by 2050 (as compared with 1990 levels), [aligning with Oregon's statutory target ORS 468A.205(1)(c)].

The City of Eugene CAP has the following:

- Reduce community fossil fuel use by 50% of 2010 levels by 2030

The City of Bend CAP has the following:

- Achieve a 40% decrease in fossil fuel use by 2030 and a 70% decrease by 2050 (from a baseline year of 2016).

The City of Milwaukie CAP has the following:

- By 2040, Milwaukie's buildings will have no net emissions, and by 2050, Milwaukie will be a fully carbon-neutral city. [The difference between emissions and net emissions would be the carbon sequestered by growing the tree canopy from 27 to 40 percent].

The City of Ashland CAP has the following:

- For the Ashland community: Reduce overall Ashland community greenhouse gas emissions by 8% on average every year to 2050 [With a 2016 base this would be a 94 percent reduction by 2050].

Attachments:
None.

Appendix 4

Salem Climate Action Plan - Vulnerability Assessment Table

A. Climate Impact	B. Summary of Climate Impacts	C. Summary of how climate impacts may be felt in the community	D. Likelihood	E. Consequences	F. Risk	G. Adaptive Capacity	H. Vulnerability level
			See D. Likelihood tab for scale	*See E1. Intersections and E2. Assessment of Intersections tabs*	*See F. Risk tab*	*See G. Adaptive Capacity tab*	*See H. Vulnerability level tab for scale*
Warming temperatures	Average summer temperatures will increase from 66°F (1990s) to 71°F (2055s).	As temperatures become warmer on average throughout the summer, potential for drought conditions increases. For context: The 2015 drought occurred when air temperatures were 5 to 10 °F above normal in the early months of 2015. Additionally, June 2015 was the warmest it had ever been on record (7.7 °F above normal). Warming temperatures will also likely lead to sustained or increased frequency of cyanotoxin/harmful algal blooms in Salem's drinking water.	Likely	Minor	Moderate	3.22	Moderate
	Average high summer temperature will increase from 79°F (1990s) to 86°F (2055s).	More heat-related illnesses, especially for those who work outside (e.g., farmworkers and construction workers) who have vulnerable health status, or who are unsheltered.	Likely				
	Extreme heat days (days >90°F) are projected to increase from 7 per year (1990s) to 33 per year (2055s). Days >100°F will increase from 1 (1990s) to 6 (2055s).	Increased risk of heat stroke to small children, the elderly, people with chronic diseases, low-income populations and outdoor workers. Increase in repiratory problems.	Likely				
	Growing season will lengthen from 227 days (1990s) to 295 days (2055s).	Longer growing seasons may provide benefits to agricultural producers, such as ability to grow and sell crops that were previously not suitable for the area. This could create the possibility of an agricultural production boom in coming decades; however, this benefit may be offset by increasing pests and weeds that will also occur from warming temperatures.	About as Likely as Not				
	Average winter temperatures will increase from 41°F (1990s) to 46 °F (2055s).	Warmer winter temperatures may lead to a precipitation shift where the area experiences less snow and more rain in winter. Heating needs may be slightly less demanding of the energy system.	Likely				
	Average low winter temperature will go from 35°F (1990s) to 39°F (2055s).	Precipitation shift: less snow/ice to more rain. Focus on mitigation potentially turns towards flood risk reduction rather than winter storm risk mitigation. Potentially slight decrease in demand for heating with average winter temperatures going up by about 4°F by mid-century and 7°F by end of century.	Likely				

Appendix 4

A. Climate Impact	B. Summary of Climate Impacts	C. Summary of how climate impacts may be felt in the community	D. Likelihood	E. Consequences	F. Risk	G. Adaptive Capacity	H. Vulnerability level
Changes in precipitation patterns	Annual Precipitation will go from 40 (1990s) to 41 (2055s) inches per year.	Though quantity of precipitation is not projected to change significantly by mid-century, the type and timing of precipitation is likely to shift from winter snow to winter rain. Changes in the timing of precipitation temperature compounded with changes in wind and precipitation patterns may cause unpredictable cloudburst events, which lead to flash flooding/flooding in areas not designated as "high risk." Impacts from flooding include: Loss of vehicles, loss of vehicle fuel, street closures and home and business damage (source: Marion County Emergency Operations Plan, pg. 60). Increased evapotranspiration rates, coupled with warming temperatures, may increase likelihood of drought.	Likely	Minor	Moderate	3.78	Low
	Water deficit will change from +3 inches (1990s) to -0.7 inches (2055s).	Increased likelihood of drought; increased needs for water for irrigation.	Likely				
	Willamette River January streamflow will increase from 48,863 cfs (historic) to 54,982 cfs (by 2069).	Corps of Engineers may adjust management actions to conserve water in winter/spring for drought conditions in summer/fall.	TBD				
	Increasing rain on snow events.	Increasing number of events where rain is combined with snow/snowmelt may create increased number of flooding events.	About as Likely as Not				
Increased fire risk	Extreme fire danger days will increase from 11 per year (1990s) to 20 pear year (2055s) - with a majority of increase in extreme fire danger days occurring in the summer (18.3 days by mid-century compared to 10.1 days historically) - and a very slight increase expected in the fall (0.8 days by mid-century compared to 0.6 historically) and spring (0.5 days by mid-century compared to 0.3 days historically) - no change in extreme fire danger days is expected in the winter (0 days projected by mid-century and 0 days historically) Modeling from Portland State University researchers shows that in Western Oregon: - "wildfire hazard will likely increase by mid-century as a result of larger, more frequent fires" - "annual burn probabilities were similar to those found in higher frequency fire regimes" - "All climate and baseline scenarios illustrate that extremely large, intense fires are plausible, and that they will become more plausible under hotter and drier climate scenarios"	With increased risk of fire comes the increased risk of fire damage to public and private properties, smoke inhalation, evacuation of residents, economic losses, landslides, and transportation disruption. Potential impacts to major national rail lines. Unhealthy and hazardous air quality related to wildfire smoke can also take a mental health toll on residents in addition to physical harm. Wildfires release great amounts of carbon dioxide, which may work against global efforts to reduce GHG emissions. In burned areas, increased risk of landslides, potential negative environmental impacts from firefighting materials on soil and water resources. Drinking water is currently dependent on surface water; quality of surface water is at risk of degraded quality due to post-fire debris and soil movement.	Likely	Moderate	High	3.19	Moderate
Reduced number of chilling hours	Will go from 2,408 hours (1990s) to 1,553 hours (2055s)	Some fruit tree species may be adversely affected	Likely	Negligible	Low	N/A	N/A

Appendix 4

D. Likelihood Rating Scale

Level of Evidence	Term	Likelihood	Examples of Common Phrasing by Community Members
High	*Very Likely*	*95–99%*	*"Beyond a reasonable doubt"*
	Likely	*65–94%*	*"Pretty much convinced, clear and convincing evidence"*
Some	*About as Likely as Not*	*34–66%*	*"Increasingly supporting evidence (possible/probable)"*
	Unlikely	*5–33%*	*"Unlikely, not a lot of supporting evidence"*
Low	*Improbable*	*1–5%*	*"Pretty much not gonna happen, little evidence*

Appendix 4

Projected Intersections Between Non-Climate and Climate Stressors

This worksheet shows the ways that certain changes, or stressors, to the Salem community may intersect with the ways that Salem's climate is projected to change. Understanding the potential intersections between overlapping dynamics is key to obtaining a clear understanding of Salem's vulnerabilities.

Definitions:

Non-climate Stressor: A broad category containing multiple impacts to your community that are not related to climate (Example: population growth is a non-climate stressor associated with multiple non-climate impacts, including land-use changes and changes to the tax base)
Non-climate Impact: An effect on human communities and natural systems that results from stressors other than climate (e.g., land-use changes, economic recessions, pandemics)
Climate Stressor: A broad category containing multiple climate impacts (Example: a projected future increase in temperature is a climate stressor that contains several climate impacts, including a rise in heat-related illnesses, droughts, and increased wildfire risk)

1 Non-climate Stressor	2 Non-climate Impact (+/-)	3. Intersection with Climate Stressors			
		3a. Warming temperatures	3b. Changes in precipitation patterns	3c. Increased fire risk	3d. Reduced number of chilling hours
Population changes: Marion and Polk counties are "growing, aging, and becoming more diverse" (MWVHA, 2020, pg. 15). Possibility of population growth due to climate migration.	Increased demand for housing New housing and road construction Increased VMT Higher housing costs Land use changes New Salem residents Need for more school capacity Need for more energy, water, natural gas, food, etc. Impact on jobs/economy? Potential for a divided community which could lead to ineffective politics and governance	Increased demand for air conditioning/ energy Increased demand for irrigation/ water Increased demand for drinking water treated for cyanotoxins More forested land being converted to developments (+) New agricultural opportunities (+) Less demand for heating/ natural gas	Increased risk of flooding Unpredictable precipitation patterns may lead to flood events in areas outside the historical high-risk floodplain where new development is occurring Increased pressure to build housing in floodplains More impervious surfaces and runoff, which puts stress on stormwater treatment facilities Potential harm to railroads, bridges, overpasses from flooding Increaeses in population will may increase demand for water and could put pressure on potentially strained water sources	Population growth rate could be higher than expected if people choose to leave higher risk areas, e.g. California Increased pressure to build housing in fire risk zones More people = more potential sources of fire As development occurs further from the urban core, people living on the edges of Salem may experience greater impacts related to wildfires (e.g., disruption in telecommunications and natural resource services). Increased health risks due to poor air quality from smoke	N/A
Increased demand for and access to affordable housing	Increased financial pressure for residents Increased rate of homelessness Increased wealth for property owners Higher housing costs Increased demand for housing New housing and road construction	Heat-related health impacts to unsheltered populations	Increased pressure to build housing in floodplains Unsheltered people are more vulnerable to flood risk	Increased need to retrofit existing and build new homes with higher grade air filters and fire resistant materials	N/A

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Vulnerable populations (unsheltered, elderly, young, medically fragile, speak English less-than-very-well)	Specialized care and outreach	Warming temperatures and extreme heat days disproportionately affect vulnerable populations Could be beneficial in that vulnerable populations might experience less adverse health impacts related to colder temperatures During hot summer days, residents tend to visit local waterways to cool off. If harmful algal blooms increase, access to waterways as cooling opportunities may be denied	Unsheltered populations at risk for flood-related harm due to living in flood-prone areas Evacuation during a flood event of the young, elderly, medically fragile, and people who speak English less-than-very-well could be challenging	Poor to hazardous air quality resulting from wildfires would greatly impact vulnerable populations	N/A
Emerging health trends and risks (increased rates of diabetes, obesity, depression, and sexually-transmitted infections, persons with disabilities)	Increased costs associated with healthcare; more people at risk for climate-related health impacts due to underlying conditions	Warming temperatures and extreme heat days disproportionately affect vulnerable populations	Water intrusion in homes can create mold issues, respiratory issues, psychological stress	Poor to hazardous air quality resulting from wildfires could greatly impact people with underlying health issues such as asthma, diabetes and obesity Increased risk of negative mental health impacts	N/A
Earthquake (Cascadia)	Catastrophic disruption of life in the area	If the earthquake were to occur during extreme heat days, more people, not just vulnerable populations, are at risk for heat-related illnesses (all become vulnerable) If the earthquake were to occur during winter months, a benefit could be that warmer temperatures would prevent negative health impacts related to cold temperatures	If the earthquake were to occur during a flood event, more damage, displacement, and bodily harm would likely occur	If the earthquake were to occur during wildfire season, more damage, displacement, and bodily harm would likely occur Earthquakes have the potential to generate wildfires (e.g., causing breaks in natural gas lines and downing power lines). Such destruction would lead to disastrous increases in fire risk if a major earthquake were to occur during fire season	N/A
Local economy	Climate impacts may affect local and regional economic activity in addition to acute economic loss resulting from extreme weather events such as flooding and wildfires	Local food producers may be able to grow a wider variety of crops Increasing algal blooms in lakes may inhibit recreational activities Warming temperatures may allow for new pests to infiltrate the area; invasive pests may have the ability to negatively impact Salem's tree canopy.	Possibility of property damage from nuisance flooding Drought may negatively impact food producers	Fire-damaged forests and trails may reduce number of visitors Wine industry may experience negative consequences from smoke	Some flowering fruit and nut crop varieties may be adversely affected

Appendix 4

Assessment of Interactions

This worksheet assesses the consequence level of the given impact by deciding the cumulative impact of each climate stress (from tab E1. Intersections) and assigning an assessed consequence level using the following scale:

- Catastrophic: Community will cease to exist or have functions permanently altered
- Major: Functions of the community may be dramatically altered, such that value is undermined
- Moderate: Function of the community may be diminished, such that it is degraded but still present
- Minor: Community will continue to function but specific activities may be impaired
- Negligible: Community will not be visibly or functionally affected

	3a. Warming temperatures	3b. Changes in precipitation patterns	3c. Increased fire risk	3d. Reduced number of chilling hours
Synthesis statement	While higher summer temperatures may have health impacts on vulnerable populations, the temperature increase is not projected to be extreme and will be offset by potential benefits to agriculture. The issue of increasing cyanotoxins in drinking water due to algal blooms would be a significant risk if not for the important water treatment efforts already underway.	Though overall precipitation amounts are expected to remain consistent, hotter days will lead to a water deficit which may impact agricultural producers. Precipitation patterns may change, leading to increased frequency of heavy downpour events and nuisance flooding.	Hotter and drier conditions will lead to increased fire risk in forested areas outside of Salem. Main impacts to Salem include health risks due to poor air quality, increased emergency operations and evacuations, and reduction in tourism. Salem could also experience higher than expected population growth as people from more southern locations relocate due to their own fire risk.	The reduction in the number of cool nights may have adverse effects on some flowering fruit and nut tree species, which could have negative economic consequences for agricultural producers in and around Salem.
Assessed consequence level	**Minor**	**Minor**	**Moderate**	**Negligible**

Appendix 4

F. Risk Rating Scale

This table uses the likelihood and consequences previously assessed (Columns D and E) and uses the table below to combine the two values of likelihood and consequence. Where the likelihood row and the consequences column meet is the assessed risk value. This step is repeated for each climate stressor.

Likelihood	Consequences				
	Negligible	Minor	Moderate	Major	Catastrophic
Improbable	Low	Low	Low	Low	Low
Unlikely	Low	Low	Moderate	Moderate	Moderate
About as Likely as Not	Low	Moderate	Moderate	High	High
Likely	Low	Moderate	High	High	Extreme
Very Likely	Low	Moderate	High	Extreme	Extreme

Appendix 4

G. Adaptive Capacity Rating

Adaptive capacity of a system combines community adaptation potential with social constructs, shining a light on a community's strengths and areas needing improvement. To determine vulnerability, it is critical to determine what capacities exist in a community, where weaknesses might be, and how well the community is poised to respond to change from multiple stressors and impacts. The goal of this exercise is to assess your community's adaptive capacity in relation to your identified climate stressors (identify where you are already strong and where you might improve).

Advisory Group Members were asked to assess the community's capacity to adapt to climate impacts. The following scale was used:

5 = Superior (This is the ideal condition)
4 = Good (Better than adequate, but could use improvement)
3 = Fair (Could easily be improved)
2 = Poor (Not adequate, but provides modest function)
1 = Nonexistent (Not functional or does not exist)

Community Adaptation Capacity to Climate Impact	Warming Temperatures	Changes in precipitation patterns	Increased fire risk	Notes
Social Potential				
Extent, distribution and connectivity of social networks	3.33	3.33	2.89	Generally, I think our social potential for most things is "fair" because we have had some experience with each albeit in limited scenarios. "Good" for both high temps (short term) and "Fair" for high temps (long term). "Good" for flooding owing to relatively recent experiences. [Warning: I'm generally an optimist in most things....]
Past evidence of responsiveness to disasters	3.78	3.80	3.20	Recent wildfire events caused mass confusion and panic within the community. It seemed clear that community expertise and connectivity was lacking.
Community expertise	3.50	3.90	3.30	
Community participation and collaboration	3.20	3.00	3.00	I feel as though Salem Residents are capable of managing all of these. I do feel there is a lack of experience and expertise in some of the categories that residents as well as most people will have a hard time dealing with.
Average Social Potential	3.45	3.51	3.10	

Definitions:

Community Adaptation Potential — connections in a community based on existing relationships as well as evidence of past collaborative efforts and actions. This information is typically something you can learn about in news stories or by soliciting input from local residents with experience in the region.
Social Constructs — social rules and governance structures that a community operates within. These are usually unspoken and unwritten, although most everyone understands them through training, experience, and time in the community.
Adaptive Capacity — ability (or lack thereof) of the community to utilize social relations, social constructs, and knowledge to adapt to changing conditions in the community and/or larger world.
Social Potential — relationships between people that allow them to make collective decisions about the future.
Organizational Capacity — individual employee capacity combined with others in the organization and the community to make organizational choices in the face of change.
Management Potential — rules, regulations, and management styles that allow the organization and its employees to adapt to changing conditions.

Appendix 4

Organization Capacity				
Staff capacity (training/time)	3.09	3.83	3.27	Stormwater Operations staff seem to be at full capacity with existing conditions. Changes in precipitation and storm events will likely require more staff and funding.
Responsiveness	2.83	3.75	3.18	Generally, we're well organized with good relationships and reasonably good responsiveness to issues related to flooding and droughts. Fire risks and warming, less so, and are ranked a little less because we have less experience with these.
Relationships	3.25	3.75	3.64	
Stability/Longevity	3.36	4.08	3.45	I believe the organization will take some additional training and efforts to be able to respond to some of these changes as a whole. I feel as though some people don't use a long term/longevity view on the actions they take as part of the organization.
Average Organization Capacity	3.13	3.85	3.39	

Management Potential				
Existing mandates	2.60	4.00	2.60	
Monitoring and evaluation capacity	2.92	4.00	2.83	
Ability to learn and change	3.42	4.25	3.33	I believe a lot of the organization has struggle adapting to changes in the community and environment, but could improve over time.
Proactive management	2.92	3.58	3.08	
Partner relationships	3.58	4.33	3.80	Our partnerships with other agencies is quite good, particularly with respect to flooding/drought. We are most prepared for drought and flooding with our regulations (including curtailment plans) and floodplain management regulations. The wildfires last year were lessons learned factories.
Science and technical support	3.08	3.67	2.91	
Average Management Potential	3.09	3.97	3.09	

(Average Social + Organization + Management Potential) /3	3.22	3.78	3.19	

Conversion to Adaptive Capacity Rating:

1 - 2.3 **Low**
2.4 - 3.6 **Moderate**
3.7 - 5 **High**

Appendix 4

H. Vulnerability Level Rating Scale

This table uses the risk and adaptive capacity values previously assessed to determine a Vulnerability Level Rating.

Risk	Adaptive Capacity		
	Low	Moderate	High
Low	Low	Low	Low
Moderate	Moderate	Moderate	Low
High	High	Moderate	Moderate
Extreme	High	High	Moderate

Appendix 4

Sources

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McEvoy, Andy, Max Nielsen-Pincus, Andrés Holz, Arielle J. Catalano, and Kelly E. Gleason 2020. "Projected Impact of Mid-21st Century Climate Change on Wildfire Hazard in a Major Urban Watershed outside Portland, Oregon USA" *Fire* 3, no. 4: 70.

Salem Climate Action Plan Advisory Committee meeting and survey, February 2, 2021.

Appendix 5

GREENHOUSE GAS FORECASTING/PLANNING ASSUMPTIONS AND DATA SOURCES

NOVEMBER 2021

GREENHOUSE GAS FORECASTING/PLANNING ASSUMPTIONS AND DATA SOURCES

The following section includes the assumptions and data sources that were used to conduct the greenhouse gas (GHG) forecasting described in the Greenhouse Gas Emissions Forecast chapter of this plan.

Baseline Forecast Assumptions
Salem developed three baseline forecasts from which to measure emissions reductions. These forecasts provide a range of possible business-as-usual (BAU) outcomes and provide a qualitative estimate of forecast certainty.

The baseline forecasts that were developed provide three projections for possible future GHG levels, assuming no proactive steps were taken by Salem to reduce emissions through its Climate Action Plan. In the end, the Mid-Range forecast (described below) was used for further modeling. The other two scenarios provide context on the range of possible forecasted futures. These forecasts are not an estimate of where Salem *will* be, because they exclude actions that Salem will take to reduce GHG emissions. Rather, these baseline forecasts provide possible scenarios for Salem's GHG emissions if no strategies from this Climate Action Plan are implemented.

Labeled as "Pessimistic," "Mid-Range," and "Optimistic," the following baselines are built on varying degrees of assumptions about changes in transportation and stationary emissions (e.g., like those from power plants) intensity in the future (see Table 1). For example, the Pessimistic forecast assumes no change in fuel efficiency of onroad passenger vehicles. Although that assumption may seem extreme, new vehicle MPG has increased slowly through much of the last few decades[1] and those increases are diluted by older vehicles on the road and the market prevalence of SUVs in recent years.[2] Whereas the Mid-Range and Optimistic baselines include a 5% annual efficiency improvement that aligns with Obama-era regulations requiring a higher rate of increased MPG for new vehicles. These forecasts also differ in their treatment of emissions factors (the amount of CO_2e produced per unit of activity) for electricity and efficiency of natural gas.

BASELINE FORECAST RESULTS AND DISCUSSION

The three baseline forecasts yield a wide range of outcomes. Descriptions of the outcomes for each forecast is provided in this section. The Pessimistic forecast predicted an increase in GHG emissions of 14% in 2050 from 2016 levels. Emissions remained fairly flat between 2025-2040 but began increasing at a more rapid pace between 2040-2050 as transportation emissions were no longer offset by decreases in emissions from other sources. Emissions from electricity declined, but those declines were significantly offset by increases in transportation emissions, which rose throughout the forecast period.

The Mid-Range forecast showed a 47% reduction in emissions between 2016 and 2050. Emissions peaked in 2020-2021 before declining until 2045, after which emissions began to increase, primarily due to transportation. Electricity emissions reached near-zero in 2040. Transportation emissions declined until 2045 and then increased slightly.

The Optimistic forecast led to a 64% decline in emissions between 2016 and 2050. Emissions peaked in 2020-2021 before

rapidly declining and then stabilizing around 2045. Electricity emissions declined and then effectively disappeared by 2040 due to very-low electricity emission factors. Transportation emissions declined after 2020 although the rate of decline decreased with time. By 2050, transportation ranked as the largest source of GHG emissions (55%). Wastewater constituted 20% of remaining emissions and natural gas, 16%.

Given the range of 2050 outcomes predicted by the three forecasts (14% increase, 47% decrease, 64% decrease) and given equal likelihood of occurrence, then together the models predict an average decrease of 32% and a median decrease of 47%. Whether the three forecasts are equally likely to occur is subjective. For simplicity, the Mid-range model was used for further projections rather than developing a composite model. The Pessimistic forecast is the closest to a standard BAU model, and therefore most comparable to forecasts from most other CAPs. The assumptions in this forecast are fairly stark and may approach the upper limits of what is likely to occur. For example, the assumption that passenger vehicle MPG efficiency does not improve by 2050 may be too conservative. In all forecasts, PGE achieves carbon neutrality, Salem Electric emissions (which are negligible) remain constant, and NW Natural follows a single scenario to achieve carbon neutrality according to state regulations. If actual utility emissions differ, or if NW Natural seeks a different strategy mix to achieve regulatory requirements, then emissions will differ.

PESSIMISTIC GREENHOUSE GAS (GHG) FORECAST

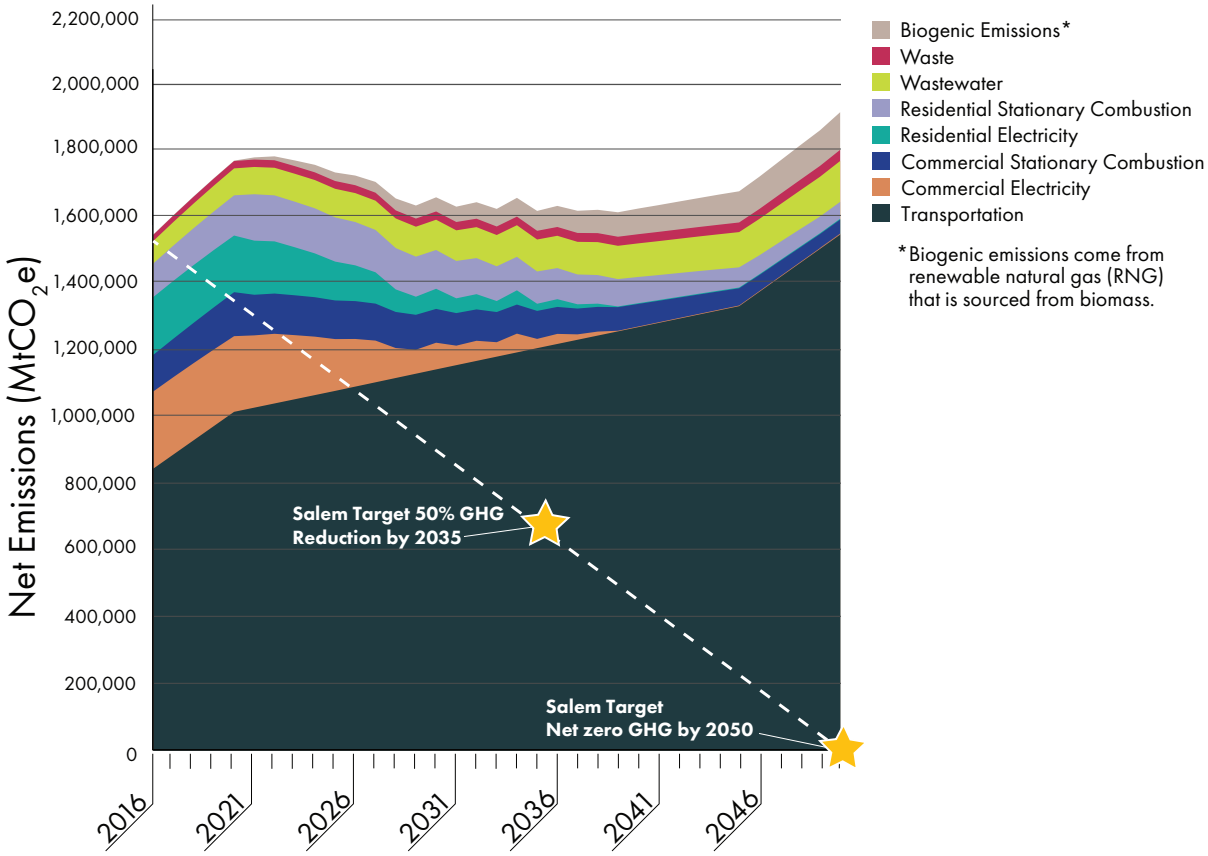

Figure 1. Pessimistic forecast.

MID-RANGE GREENHOUSE GAS (GHG) FORECAST

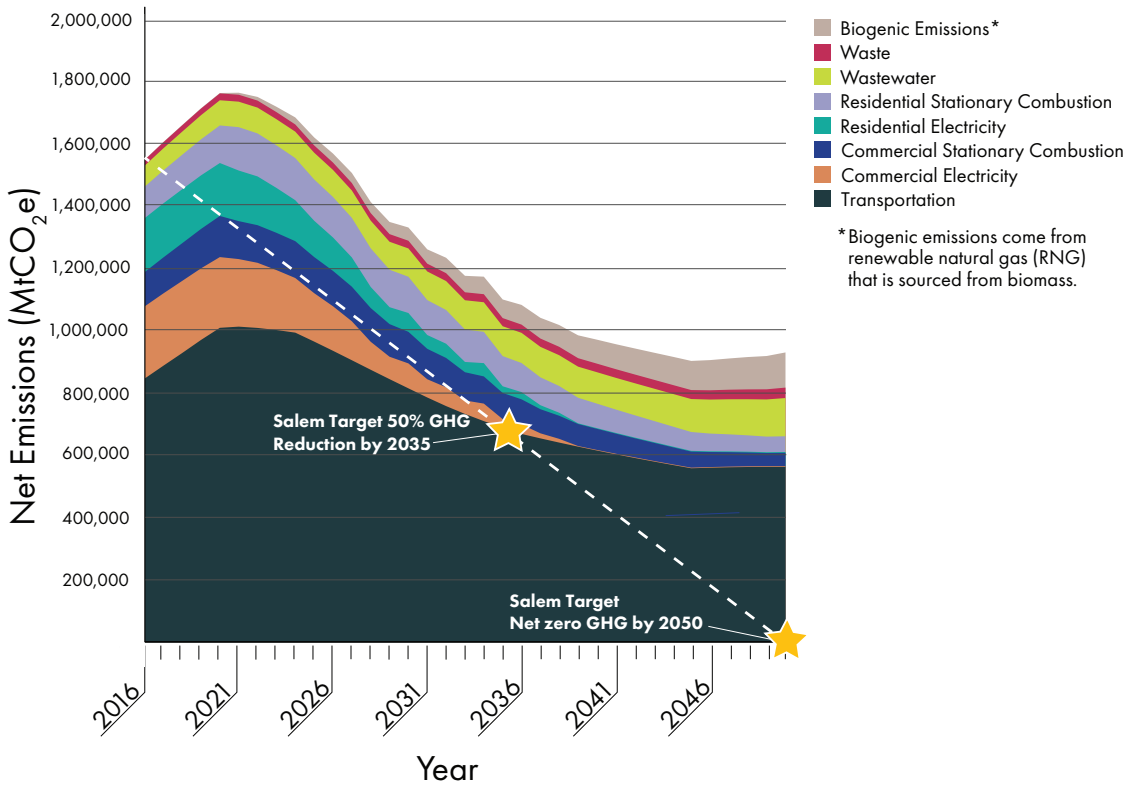

Figure 2. Mid-Range forecast.

OPTIMISTIC GREENHOUSE GAS (GHG) FORECAST

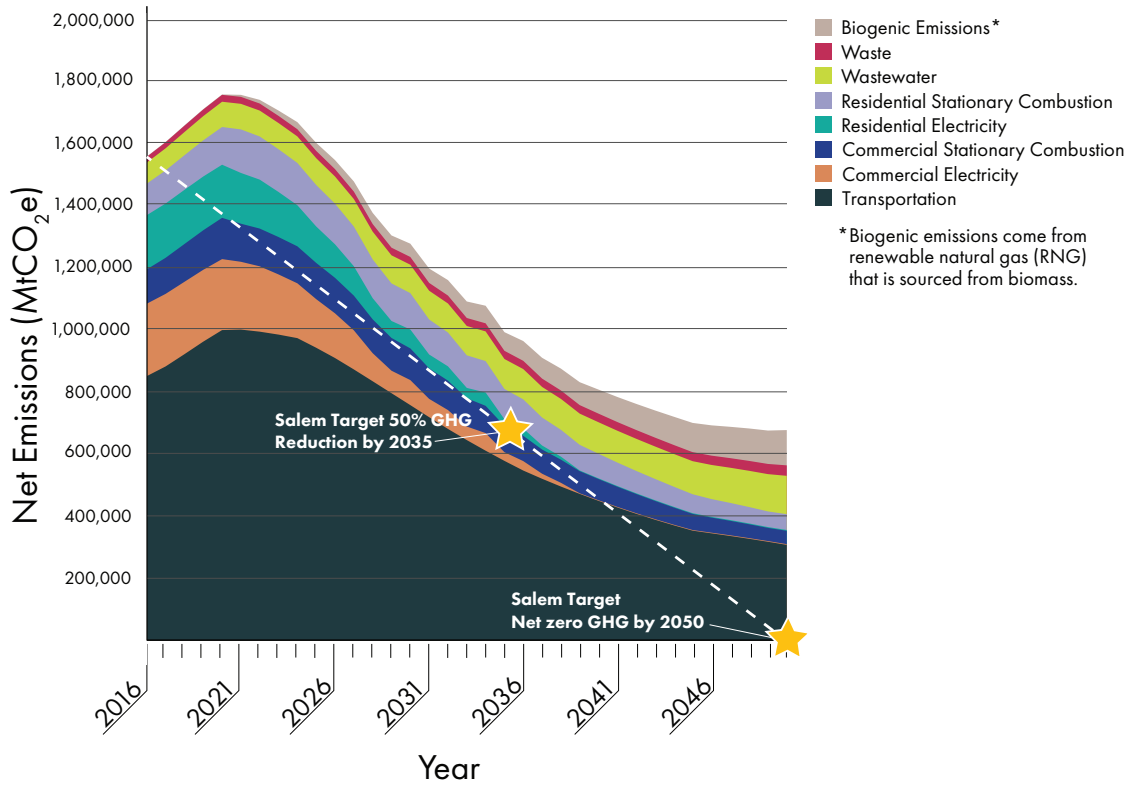

Figure 3. Optimistic forecast.

Conversely, the Optimistic forecast may not be the lower bounds of what is possible without Salem's intervention. The Optimistic forecast is grounded in what is known today and does not include technological interventions that are not currently expected to become feasible. For example, direct carbon capture and sequestration are already possible but are not yet economically feasible or deployable on a large scale. These types of technologies might be deployed en masse before 2050, but without concrete plans, they could not be included in the forecast.

FUNDAMENTAL MODELING ASSUMPTIONS BY BASELINE FORECAST

CATEGORY	VARIABLE	PESSIMISTIC	MID-RANGE	OPTIMISTIC
Population	Growth Rate	Annualized estimates from 5-year Portland State University Projections	Annualized estimates from 5-year Portland State University Projections	Annualized estimates from 5-year Portland State University Projections
Transportation	Passenger MPG	No change from 2016	Annualized 5% improvement	Annualized 5% improvement
	EV Adoption Rate	No change from 2016	Low adoption rate	High adoption rate
	Heavy vehicle MPG	No change from 2016	Annualized improvement rate	Annualized improvement rate
	Air travel emissions	Grows with population, baseline 2016	Grows with population, baseline 2016	Grows with population, baseline 2016
Electricity	Salem Electric Emissions Factor	No change from 2016	No change from 2016	No change from 2016
	PGE Emissions Factor	Achieves 2040 net-zero	Achieves 2040 net-zero	Achieves 2040 net-zero
Stationary combustion	NW Natural	Scenario provided by NW Natural	Scenario provided by NW Natural	Scenario provided by NW Natural
	Other fuels (ex: diesel, propane)	No change from 2016	No change from 2016	No change from 2016
Waste	Waste	No change in per capita use	No change in per capita use	No change in per capita use
Wastewater	Wastewater	No change in per capita use	No change in per capita use	No change in per capita use

Table 1. Fundamental modeling assumptions by baseline forecast.

DATA SOURCES

ENERGY EMISSIONS FACTOR PROJECTIONS

The PGE 2019 Integrated Resource Plan (IRP) goal, NW Natural efficiency, and NW Natural high efficiency goal were obtained verbally. NW Natural Efficiency has a goal to improve efficiency 47% from 2002 values by 2037. Given the challenge in achieving that goal, two columns were created to represent different assumptions for baselining. In one scenario, NW Natural achieves a 11% efficiency gain while in the other scenario, NW Natural achieves its goal. Salem Electric's projected emissions factor was obtained from Salem's 2016 sector-based GHG inventory[3] and held constant. The PGE 2040 was linearly modeled from actual 2016 to goal 2040.

TRANSPORTATION-RELATED ASSUMPTIONS			
YEAR	VEHICLE FUEL EFFICIENCY IMPROVEMENTS (MPG)[4]	EV ADOPTION RATE[5]	HEAVY TRUCK EFFICIENCY IMPROVEMENTS (MPG)[6]
2016	25	1%	0%
2020	26	3%	0%
2025	40	8%	8%
2030	49	24%	17%
2035	57	43%	27%
2040	66	54%	36%
2045	74	65%	46%
2050	83	76%	55%

Table 2. Fundamental model assumptions for transportation.

ENERGY EMISSIONS FACTOR PROJECTIONS			
YEAR	PGE 2040 IRP GOAL ($MTCO_2E$/ MWH)	SALEM ELECTRIC ($MTCO_2E$/ MWH)	NW NATURAL ($MTCO_2E$ EXCLUDING BIOGENIC EMISSIONS AND OFFSETS)
2016	0.37	0.01	205,809
2020	0.30	0.01	247,250
2025	0.20	0.01	243,329
2030	0.09	0.01	212,783
2035	0.03	0.01	176,254
2040	0	0.01	142,217
2045	0	0.01	108,193
2050	0	0.01	89,417

Table 3. Projected emissions factors for Salem Electric and PGE. Projected emissions (excluding biogenic and offsets) from NW Natural.

POPULATION GROWTH PROJECTIONS[7]	
YEAR	POPULATION SALEM
2016	162,060
2020	194,692
2025	206,712
2030	219,061
2035	231,260
2040	243,302
2045	255,373
2050	296,470

Table 4. Salem population projections, based on Portland State University projections, used for modeling.

Appendix 5

REDUCTION VALUES USED TO DRIVE OUTCOMES IN SCENARIO 2								
YEAR	**Emissions from non-resident internal combustion traffic are zero**	**Emissions from air traffic are zero**	**Electricity grid is 100% renewable**	**Fossil fuel-derived natural gas in the built environment has been replaced**	**All other fossil fuels in the built environment (e.g., diesel, propane) have been replaced**	**Net-zero waste achieved**	**All waste-water emissions captured**	**All septic emissions captured**
2030	100%	100%	100%			100%	100%	100%
2031	90%	90%	95%			95%	95%	95%
2032	80%	80%	90%			90%	90%	90%
2033	70%	70%	85%			85%	85%	85%
2034	60%	60%	80%			80%	80%	80%
2035	50%	50%	75%			75%	75%	75%
2036	40%	40%	70%			70%	70%	70%
2037	30%	30%	65%			65%	65%	65%
2038	20%	20%	60%			60%	60%	60%
2039	10%	10%	55%			55%	55%	55%
2040	5%	5%	50%	100%	100%	50%	50%	50%
2041	0%	0%	45%	90%	90%	45%	45%	45%
2042	0%	0%	40%	80%	80%	40%	40%	40%
2043	0%	0%	35%	70%	70%	35%	35%	35%
2044	0%	0%	30%	60%	60%	30%	30%	30%
2045	0%	0%	25%	50%	50%	25%	25%	25%
2046	0%	0%	20%	40%	40%	20%	20%	20%
2047	0%	0%	15%	30%	30%	15%	15%	15%
2048	0%	0%	10%	20%	20%	10%	10%	10%
2049	0%	0%	5%	10%	10%	5%	5%	5%
2050	0%	0%	0%	0%	0%	0%	0%	0%

Table 5: Percentage of 2016 emissions projected to decrease by year in order to achieve Scenario 2.

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Appendix 6

BENEFIT-COST ANALYSES OF 10 STRATEGIES FOR SALEM'S CLIMATE ACTION PLAN

AUGUST 2021

ECOTONE
ANALYTICS

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GROUP

Appendix 6

Contents:

I. EXECUTIVE SUMMARY

This report summarizes the findings of the City of Salem's Climate Action Plan (CAP) Benefit-Cost Analysis conducted by Ecotone Analytics. The analysis covered 10 strategies that the City may consider implementing. Not all strategies will necessarily be pursued - this analysis was conducted to provide additional insight into future decisions that may come before City Councilors and other stakeholders. The 10 strategies were selected by the 3 City councilors on the Climate Action Plan Task Force, namely Councilors Andersen, Gonzalez, and Nordyke.

The 10 strategies selected for analysis are:

1. Charge for Parking
2. Support Energy Efficiency and Weatherization of Existing Buildings
3. Energy Efficiency Benchmarking in Municipal Buildings
4. Implement a Gas Tax
5. Connect Bikeways
6. Complete Salem's Sidewalk Network
7. Create Bus Lanes
8. Increase Tree Canopy
9. Make Home EV Charging Accessible to Renters
10. Solar-ready New Construction

Typically, a benefit-cost analysis will focus on direct financial costs and benefits while noting there may be externalities (often social and environmental in nature) that occur but are outside of the scope of analysis. This analysis is different, as it takes a broader view of impacts to account for social, environmental *and* economic valuations that can accrue from each strategy. This helps to bring otherwise often intangible value propositions into greater focus.

Results of this analysis are communicated as a range of benefit-cost ratios. A ratio that is greater than one means the projected benefits of the strategy outweigh the projected costs; and if the ratio is less than one, the costs are greater than the benefits. The range between the high and the low estimates illustrates the level of uncertainty in the analysis and the sensitivity of the results to one or more of the assumptions made in the analysis. Some strategies have a low benefit-cost ratio indicating the costs are greater than the benefits and a high benefit-cost ratio indicating the benefits are greater than the costs. For example, consider the strategy "Complete Salem's sidewalk network - both sides of street." Its high benefit-cost ratio is 1.46, which means that $1.00 invested in the strategy will produce $1.46 in combined social, environmental, and economic benefits. In contrast, this same strategy has a low benefit-cost ratio is 0.25, which means that $1.00 invested in the strategy will produce $0.25 in benefits. This range is due to the uncertainty around the sidewalk users' characteristics (health, age, etc.) and the extent access to a sidewalk will lead to a change in behavior. individual's behavior and whether residents will actually use the sidewalk.

In some instances, the low and the high benefit-cost ratios span more than an order of magnitude. "Solar-ready New Construction" for example, has a high benefit-cost ratio that is over 50 times the low benefit-cost ratio (4.28 vs. 0.08). The analysis conducted to estimate the benefit-cost ratios is complicated; this means that one cannot simply choose the midpoint between the high and low benefit-cost ratios (2.18 in the above example) and assume that is the expected result.

Appendix 6

There are multiple stakeholders impacted by each strategy. Stakeholders may appear on the cost side of the equation, having to pay for activities of the strategy, whether that be the City paying for construction of sidewalks or developers paying to build electric vehicle charging stations required by the City. Likewise, different stakeholders will receive different types of benefits. Increased use of public transit could increase the health of riders as well as improve air quality for residents who live along the roadway. Four stakeholder groups are accounted for on both cost and benefits projections. Stakeholders who bear costs include: City of Salem, local residents, housing and commercial developers, and Cherriots. Stakeholders who benefit include: City of Salem, local community members, participants (those individuals who directly engage with the activities associated with the strategy), and the global society (who are impacted by greenhouse gas emissions). Not every stakeholder pays for or is impacted by every strategy.

Findings:

- Top strategies in terms of cost-effectiveness include:
  - Charge for parking on-street in downtown Salem (when accounting for revenues to the City).
  - Support energy efficiency and weatherization for lower income households (including renters) and small business owners.
  - Support additional tree canopy in low canopy neighborhoods.
- Strategies that were least cost-effective include:
  - Make EV-charging accessible to renters.
  - Create shared use transit lanes in the Cherriots Core Network.
  - Implement a gas tax in the City.
- Benefit-cost ratios that consider *only* the City's expenses tend to result in a net benefit - ratio greater than 1. However, when incorporating the full scope of costs incurred by the multiple stakeholders, the net benefit of strategies is reduced and the design and targeting of the strategy become more important to achieve net benefits.
- Several strategies had benefit-cost ratios that are very sensitive to the modeling assumptions, meaning that there are a wide range of potential valuations that may occur as the existence and quality of evidence for the effectiveness of strategies varies considerably. When the evidence is weak, modeling assumptions are utilized (described in Section V) to conservatively frame the bounds of the value projected. This often results in wide ranges of benefit-cost ratios, sometimes stretching from less than 1 to above 1, the distinction between a strategy that pays off and one that does not. Strategies where this is most apparent include:
  - Energy benchmarking for municipal buildings.
  - Complete Salem's sidewalk network within ½ mile of bus stops.
  - Create shared use transit lanes on the Core Network.
  - Require EV charging at multi-family units.
  - Require solar-ready new construction.
- The impacts of strategies are intertwined. As time goes on, the relationship between strategies becomes more and more influenced by the state of the other strategies. To minimize risk of double counting benefits, this analysis was structured to assess each strategy in isolation from the others.

II. INTRODUCTION

Ecotone Analytics is an impact accounting organization that conducts benefit-cost analyses for clients' social and environmental impacts. Combining evidence-based research analysis and monetization of impact outcomes, Ecotone derives a benefit-cost ratio and identifies the key stakeholder groups to whom those impact benefits accrue. This approach monetizes social and environmental impacts that extend beyond the traditional financial impacts of benefit-cost analysis, creating a fuller understanding of the types of value being generated from each of the 10 selected strategies under consideration by the City of Salem.

As a part of the City of Salem's Climate Action Plan development, Ecotone Analytics conducted benefit-cost analyses of 10 strategies. The strategies were selected by three City Councilors on the project Task Force and with input from the consultant team from a list of over 100 strategies proposed by community stakeholders and Task Force members. Through an in depth scoping process with subject matter experts, the strategies were refined, in some cases replaced, and researched through a combination of desk research by Ecotone and interviews with subject matter experts. The extent to which strategies had previously been studied in Salem varied considerably, but as feasible, City staff provided insights and estimations around the figures that would be most applicable to implementing the given strategy in their city.

This report is laid out as follows. Section III details the specific strategies analyzed including the language that encompasses the strategy. Review of this report requires a thorough reading of the description of each strategy to ensure appropriate interpretation of the findings. Section IV provides a description of the methodology and key elements of the approach to these analyses. Section V continues by summarizing the findings of each analysis, outlining the range of benefit-cost ratios, the benefits that accrue to each stakeholder group accounted for, and an accounting of which stakeholder bears the costs of each strategy. Section VI then serves to provide a more detailed description of the findings for each strategy, the insights gained, the assumptions used, and the equity implications discussed in the literature that align with each strategy. Section VII and Section VIII summarize the limitations to the analysis as well as the key findings from the analysis. Section IX houses the appendices which provide detailed insights into the cost and benefit valuations, the logic models built for each strategy, the scoping process for the analysis, interviews conducted as well as a detailed bibliography to show the resources used for each strategy ranked by their level of evidence of causality.

III. STRATEGIES ANALYZED

Ten strategies were analyzed for this report. The table below notes the shorthand name of each strategy and the accompanying description for what the strategy consists of in practice and what the benefit-cost analysis covers within that strategy. The shorthand name of the strategy is used throughout the document when discussing strategies. It is highly recommended to review the description of the strategy prior to reviewing the resulting benefit-cost ratios. For several strategies multiple scenarios were developed to assess how changes in framing and assumptions change the benefit-cost ratio (see Section VI for details on the scenarios).

Table 1: Strategies Analyzed

Strategy	Description
Charge for Parking	Charge for city-controlled parking (starting with on-street parking) using a supply/demand model intended to reduce parking in the central business district to 70-80% of supply, particularly where alternative transportation modes are available. The benefit-cost analysis will focus on costs and benefits of charging for on-street parking in the downtown parking district.
Support Energy Efficiency and Weatherization of Existing Buildings	Develop and implement a program that helps residents and business owners weatherize and increase the efficiency of residential and commercial buildings, with a priority emphasis on properties with low-income renters, homeowners, and business owners. The benefit-cost analysis will focus on the city providing energy audits to single-family and multi-family units and connecting to funding and service providers after.
Energy Efficiency Benchmarking in Municipal Buildings	Develop a comprehensive approach to increasing energy efficiency in municipal buildings, including benchmarking, deep energy retrofits, policies to require energy efficient practices, and regular reporting. The benefit-cost analysis will focus on monitoring and benchmarking energy use of municipal buildings.
Implement a Gas Tax	Research the feasibility of implementing a gas tax. Revenue from this tax can fund connectivity and safety improvements to the city's transportation network and/or roadway maintenance and improvement projects. The benefit-cost analysis will focus on costs and benefits of a Salem gas tax, but does not take into account how revenue generated will be used.
Connect Bikeways	Prioritize and fund the City's planned comprehensive network of bikeways that connect major employment centers with areas of high density housing, essential services (schools, grocery stores, health care), and entertainment (restaurants, retail, event venues). The benefit-cost analysis will focus on a case study from the Kroc Center to the downtown area.
Complete Salem's Sidewalk Network	Complete Salem's sidewalk network throughout the city, with a priority emphasis on areas within a half-mile of a transit route and areas such as northeast Salem that have been historically neglected. The benefit-cost analysis will focus on the costs and benefits of completing the sidewalk network in Salem for those areas within a half-mile of bus stops (on major and minor arterials and collector streets).
Create Bus Lanes	Add shared use transit lanes[1] for specific corridors and consider creating bus-only lanes on select routes along the Cherriots Core Network, such as Lancaster and River Rd/Broadway/Commercial Rd. The benefit-cost analysis will focus on costs and benefits of shared use transit lanes in the Core Network.

1 Shared used transit lanes are defined as a right-side dedicated transit lane that accommodates right-turns for personal vehicles.

Increase Tree Canopy	Provide a set of incentives to property owners (which includes residential properties as well as large property owners such as schools, employers, etc.) to support increased tree planting with particular emphasis on increasing coverage in underserved areas and neighborhoods. The benefit-cost analysis will review a range of incentive values to understand how people may respond to the size and type of the tree planting incentive provided by the City.
Make Home EV Charging Accessible to Renters	The City will require electric vehicle (EV) charging stations as part of the development of new multifamily residences (based on a 5-unit minimum) and incentivize the installation of EV charging stations at existing multifamily residences/complexes. The benefit-cost analysis will focus on the costs and benefits of installing EV charging stations at multi-family residences with 5 or more units.
Solar-ready New Construction	Require all new commercial and multifamily housing to be built solar-ready, meaning the buildings would have the electrical infrastructure ready for the building owner to install solar panels if they so choose. The benefit-cost analysis will focus on the costs and benefits of building for solar-ready - and the benefits from using either rooftop photovoltaics or solar water heating. Consideration will be given to incentives the City can provide to support adoption of solar.

IV. METHODOLOGY SUMMARY

Interpreting the Benefit-Cost Ratio

The Benefit-Cost Ratio is used to assess the relationship between the benefits and costs of a project or action. If the resulting benefit-cost ratio is greater than 1, the benefits outweigh the costs. If the ratio is between 0 and 1, the costs outweigh the benefits, but the benefits generated are still positive. In the case of a negative benefit-cost ratio, when the value is less than 0, an investment is being incurred that does not create any net benefits. None of the strategies analyzed here resulted in a negative ratio.

Some costs and benefits will accrue over multiple years. However, a dollar today is worth more than a dollar tomorrow, due to inflation and risk. To account for this, costs and benefits must be discounted to a present value (PV) to allow for an 'apples to apples' comparison. For example, a benefit being projected to occur 5 years from now is discounted back to 2021 dollars to compare directly with a cost incurred in 2021. This process serves to place greater value on near-term costs/benefits than on those that will occur in the future. The size of the discount rate determines the extent the present is valued over the future. This report utilizes a 3% discount rate throughout - a common benchmark used for benefit-cost analyses. All benefit-cost ratios communicated in this report are a comparison of the present value of costs and the present value of benefits.

Direct Costs/Benefits vs. External Costs/Benefits

This analysis includes both direct costs/benefits and external costs/benefits. Direct Benefits include cost savings, such as a lower utility bill or fuel purchase reductions. Direct Costs include the purchase, installation, and maintenance of equipment or other services, such as energy tracking equipment for municipal buildings or sidewalk construction. External benefits and costs associated with each strategy can be difficult to quantify, but are very important to understand the full scope of value creation. External benefits and costs (often referred to as externalities) are indirect effects from the investment

made in a given strategy. For example, an investment in sidewalks can lead to improved health from increased walking which can lead to a net reduction in greenhouse gas emissions. This analysis works to incorporate external costs and benefits into the calculations as much as the evidence base allows.

Valuation Approaches

There are a myriad of valuation approaches that have been used to understand the social and environmental implications of government investments. This analysis focuses most heavily on the market-price method which leverages the market-price of a given event as a signal for the value being realized. For example, improved health from increased walking may be valued through reduced lifetime health care expenditures. The avoided health care expenditures are the 'market-price', so to speak, of the benefit being generated. Other forms of valuation that are referenced in this analysis include hedonic pricing, which isolates how changes in, for example, the built or natural environment can influence the property values of homes and buildings. The difference in price between similar quality homes can with careful modeling determine the extent the difference in value is due to, for example, having a shaded street. Other valuation approaches that can be used include contingent valuation which determines a value by asking individuals their perceived benefit from changes in different variables. For example, this could include asking residents of Salem how much they would value a 10% improvement in air quality, or the willingness to pay for a 10% reduction in road congestion. Community engagement that occurs during implementation of the CAP may incorporate elements of contingent valuation to supplement the market-based methods used here.

Social Cost of Carbon

One of the key valuation tools used in this analysis which captures some of the value of external costs/benefits is the social cost of carbon. This is an estimate of the future societal cost incurred from each additional metric ton of carbon (or CO2 equivalency) emitted into the atmosphere. These estimates are very complex, taking into account a wide range of social and environmental costs and tying them back to the rate of climate change occurring due to carbon emissions. Given the complexity of this estimation, there is a wide range of values used for the social cost of carbon. Estimates that account for social costs at the global level can range from a few dollars per ton to hundreds of dollars per ton. This analysis includes a more conservative range of values to align with both the latest literature (Carleton and Greenstone, 2021, note a median value of $125 per ton), the market price of carbon seen in carbon markets (such as in California where prices have risen from $15-$18 per ton), and the U.S. Environmental Protection Agency's estimates over the past 6 years (Median value of about $50 per ton). Noting these three elements, this analysis uses a range from $15 to $125 per metric ton. Thus, for each ton of carbon that is no longer emitted due to the City's CAP, this amounts to a cost avoidance for global society of $15 to $125.

Stakeholder Attribution

Understanding the extent to which different stakeholders are impacted by a given strategy is important for any investment planning. This analysis grouped stakeholders into 4 categories:

- The City of Salem: the municipal government budget
- The local community: those residents who are indirectly affected by the investment
- Participants: those residents who directly participate in the strategy
- Global Society: those residents of society around the world who will be affected by climate change

Similarly, the costs accounted for are borne by 4 stakeholder categories:

- The City of Salem
- Housing and commercial developers
- The local community
- The Salem Area Mass Transit District, referred to as Cherriots

V. SUMMARY OF BENEFIT-COST RATIOS

Each analysis answers the question: What are the impacts associated with the investment made for each strategy?

In Table 2, the benefit-cost ratios are summarized for each strategy analyzed. The ratios represent the low and high end of a range of possible outcomes based on existing evidence. Low-end ratios are those instances where costs are at their highest projected value, and benefits are at their lowest projected value. And vice versa, the high-end ratios are those instances where costs are at their lowest projected value and benefits are at their highest.

No strategies analyzed here resulted in a ratio less than 0, in part due to data limitations which restrict the extent unintended negative impacts can be effectively monetized and included in the analysis. Many of the strategies did however have benefit-cost ratios between 0 and 1. These strategies do not 'pay off,' so to speak. For these strategies slightly below 1, it may be that with more strategic implementation of the given investment, a more efficient deployment of resources could lead to a positive ratio.

Some strategies have a very wide range of projected benefit-cost ratios due to the often limited evidence base to build the projection with or uncertainties in how the investment may drive value creation. A wider range between the low and high projections signifies the level of certainty in the estimations. Low levels of certainty mean there are many possible outcomes that could result from the given strategy and either it is difficult to predict how a strategy will perform in the Salem context, and only preliminary signals of value creation exist. In other strategies however, the range of ratios is much smaller, a signal of higher quality evidence. Higher levels of certainty exist in cases where the City has previously conducted analyses specific to Salem and/or when rigorous external evidence has been developed for an investment that closely mirrors the strategy being analyzed. Further, some strategies range from below 1 to, at times, far above 1 - the difference between a strategy that doesn't pay off versus one that does. For example, the benefits that come from supporting energy efficiency and weatherization of existing buildings through the provision of an energy audit are in large part tied to the resulting likelihood of investing in energy retrofits and home upgrades. There is however little research to show what that likelihood of investment is and as result, there is a wide range of possible values. Topics recommended for future research by the City of Salem are discussed in Section IX.

Given the limited certainty around the figures, the middle value between the high- and low-end ratios is also not necessarily the average expected value. The distribution of possible outcomes is not necessarily a normal distribution. As a result, while for some strategies the mid-point between high and low ratios is greater than 1 while the low end being less than 1, it is not possible to say the expected ratio is greater than 1. The size of the range and whether or not the range extends below 1 is the best indicator of a strategy worth pursuing.

Appendix 6

Details on the analysis of each strategy are included in Section VI. The particular scenario(s) included in Table 2 are those scenarios the strategy was intended for. Additional scenarios were developed to align with the literature base.

BOX 1: EXAMPLE OF HOW TO READ THE TABLE

For the first strategy, Charge for Parking, the results can be read as: Charging for parking is projected to have a benefit-cost ratio of between 4.95 and 8.81. That is, for every $1 invested in the strategy Charge for Parking, consisting of paid on-street parking in the downtown parking district, it is projected that between $4.95 and $8.81 in benefits will be generated.

Table 2: Benefit-Cost Ratios for each strategy - ordered from most to least cost-effective

	Range of Benefit-Cost Ratios	
Strategy	Low	High
Charge for Parking - Including revenue to City	4.95	8.81
Support Energy Efficiency and Weatherization of Existing Buildings - single family*	3.73	32.16
Support Energy Efficiency and Weatherization of Existing Buildings - multi-family	3.73	58.29
Connect Bikeways	1.17	8.10
Increase Tree Canopy - Cost to City only	0.50	69.91
Increase Tree Canopy - Cost including property owner maintenance	0.33	20.23
Complete Salem's Sidewalk Network – one side of street	0.51	2.92
Charge for Parking - excluding revenue to City	0.32	1.87
Complete Salem's Sidewalk Network - both sides of street	0.25	1.46
Energy Efficiency Benchmarking for Municipal Buildings	0.08	14.96
Solar-ready New Construction	0.08	4.28
Implement a Gas Tax	0.18	0.81
Make Home EV Charging Accessible to Renters - New construction	0.04	0.83
Make Home EV Charging Accessible to Renters - Retrofit	0.03	0.75
Create Bus Lanes - all of Core Network	0.04	0.43

*Some strategies were analyzed under multiple scenarios to account for the importance of the design of the strategy and the assumptions used. The specific scenario is denoted after the name of the strategy in the table. See Sections VI and Appendix A for details on these scenarios and further scenarios modeled.

A. Accounting for Stakeholders

When evaluating the benefits and costs of Climate Action Plan (CAP) strategies, it is important to determine *whose* benefits and costs are being evaluated. In the context of a CAP strategy, there are multiple perspectives that determine the scope of analysis. This analysis was developed to take a broad view of the social and environmental impacts, not just the financial impacts, and as a result, considers the impacts of multiple stakeholders beyond just the City of Salem government. While Table 2 shows the ratio of total benefits to total costs, Table 3 below shows the extent to which the total benefits estimated are allocated across four stakeholder groups:

1) City of Salem itself, which experiences revenue generation and cost savings from certain strategies.
2) Local community members who are directly or indirectly impacted by the strategy and who experience improved environments.
3) Participants who are directly engaging with the activities defined in the strategy (such as the pedestrian using the new sidewalk - see logic models on page x for more details) and may have financial and health benefit.;
4) The global society that is impacted by greenhouse gas emissions in various ways.

The logic models in Section VIII.B. also provide a detailed description of the types of outcomes that are linked to each strategy.

For each strategy, the total benefits are estimated along a range of values, from low to high. The summation of benefits received by each stakeholder for each strategy are the total benefits generated by each strategy. Cells that are blank note that no benefits were estimated for that stakeholder. They may or may not have contributed costs to the given strategy - see Table 4 for which stakeholders bore costs.

Table 3: Value of Benefits by Stakeholder

			Value of Benefits by Stakeholder				
			Total Benefits	City of Salem*	Local Community	Participant	Global Society
Transportation	Charge for Parking	Low	$7,905,789	$7,486,871	$398,984	-	$19,934
		High	$9,381,921	$7,553,368	$1,662,435	-	$166,119
	Implement a Gas Tax**	Low	$576,854	-	$237,900	$267,638	$71,316
		High	$2,646,191	-	$1,784,250	$267,638	$594,304
	Connect Bikeways (one route)	Low	$4,531,050	-	$1,245,680	$3,136,000	$149,370
		High	$21,197,431	-	$9,342,603	$10,610,082	$1,244,746
	Complete Salem's Sidewalk Network	Low	$162,659,158	-	$405,331	$162,132,320	$121,508
		High	$622,788,841	-	$61,772,414	$540,441,066	$20,575,361
	Create Bus Lanes	Low	$1,972,111	-	$813,317	$914,982	$243,812
		High	$9,046,630	-	$6,099,879	-	$2,031,768
	Make Home EV Charging Accessible to Renters (per household)	Low	$513	-	$144	$30	$339
		High	$12,079	-	$663	$119	$11,297

			Value of Benefits by Stakeholder				
			Total Benefits	City of Salem*	Local Community	Participant	Global Society
Land Use	Increase Tree Canopy - projected uptake (per household)	Low	$559	$289	$263	$8	-
		High	$11,806	$5,812	$5,250	$25	$11
Energy	Support Energy Efficiency and Weatherization of Existing Buildings (per household)	Low	$1,565	-	-	$1,564	$1
		High	$4,663	-	-	$4,653	$10
	Energy Efficiency Benchmarking for Municipal Buildings	Low	$83,472	$76,954	-	-	$6,518
		High	$8,004,859	$7,950,539	-	-	$54,321
	Solar-ready construction (per household)	Low	$168	-	-	$149	$19
		High	$8,138	-	-	$6,249	$1,890

*The City, while often not being assigned benefits, will in many cases receive benefits indirectly due to the gains made by local communities and strategy participants. For example, improved air quality for the local community from reduced vehicle miles traveled (VMT) may support increased property values which will lead to additional property taxes.
**The City does receive tax revenue from the gas tax, but for the purpose of this analysis, that value is not included here so as to isolate the social and environmental value created resulting from consumer behavior change. Revenue to the City is however included in the 'Charge for Parking' Strategy because there is a more substantial upfront and ongoing investment made directly by the City to generate that revenue.

In addition to the benefits estimated above, the costs accounted for with each strategy vary as well. Table 4 below outlines the total costs associated with each strategy either in aggregate or at the per unit level (distinguished in the table below), and notes the stakeholders who would bear costs. The focus of this analysis was on the cost borne by the City of Salem to deliver the strategy. As a result, those costs were the primary cost accounted for. However, for certain strategies where the cost borne by the City is small compared to the cost burden placed on other stakeholders, those costs are accounted for as well. The stakeholder columns in Table 4 are marked with an X if their respective cost was accounted for. The approach to estimating costs was also informed by the available evidence. This evidence determined the range of cost values (low-high) estimated either by the City or noted in external literature. And similarly, the evidence also detailed when different cost framings may be needed to showcase how costs would vary.

Table 4: Costs Included for Each Strategy

Appendix 6

				Stakeholders			
	Strategy	**Range / Cost Framing**	**Value**	**City of Salem**	**Local Community**	**Developers**	**Cherriots**
Transportation	Charge for Parking (downtown parking district)	Low	$1,064,935	X			
		High	$1,597,403	X			
	Gas Tax	Tax revenue	$3,261,826		X		
	Connect Bikeways (one route)	Low	$2,616,000	X			
		High	$3,866,000	X			
	Complete Sidewalk Network - both sides of street	Low	$426,646,523	X			
		High	$639,969,785	X			
	Complete Sidewalk Network - one side of street	Low	$213,323,262	X			
		High	$319,984,892	X			
	Create Bus Lanes (Core Network)	Low	$21,212,979	X			X
		High	$49,995,584	X			X
	Multi-family EV Charging Stations - New Construction (per building)	2 parking spaces	$27,850	X		X	
		12 parking spaces	$158,880	X		X	
	Multi-family EV Charging Stations - Retrofit (per building)	2 parking spaces	$34,930	X		X	
		12 parking spaces	$178,500	X		X	
Land Use	Tree Canopy (per tree*)	Low	$5.30	X	X		
		High	$1,118	X	X		
Energy	Solar-ready New Construction (per building)	Photovoltaic	$2,069	X		X	
		Solar Hot water	$1,900	X		X	
	Energy Audit - Single-family House (per household)	Low	$145	X			
		High	$420	X			
	Energy Audit - Multifamily unit (per household)	Low	$80	X			
		High	$420	X			
	Energy Benchmarking - Municipal Buildings	Low	$535,116	X			
		High	$1,010,585	X			

* Costs to the local community represent the average cost of tree maintenance once the City discontinues any maintenance.

VI. STRATEGY ANALYSIS FINDINGS

A. Benefit-Cost Ratios for Each Strategy

The following provides a brief description of the resulting benefit-cost ratio(s) estimated for each strategy. Further details on the specific costs and benefits of each strategy are included in Appendix A and resources used for developing estimates are found in Appendix E.

BOX 2: INTERPRETING THE RESULTS

Each of the following strategies has a range of benefit-cost ratios that were estimated. These take into account uncertainties around both the costs and the benefits estimated. The table below is the generic structure used to communicate these ranges of values. The columns showcase two cost scenarios, a low estimate (Low) and a high estimate (High), and likewise, the rows communicate two benefit scenarios, a low and high estimate. The cells in the middle are the resulting benefit-cost ratios arrived at by taking each benefit scenario and dividing it by each cost scenario. Appendix A details what the values of the benefits and costs were in each scenario.

This creates a small matrix of benefit-cost ratios which capture the range of all scenarios modeled, in this example ranging from 1 to 4 (the cell containing '1' being where costs are maximized and benefits are minimized, whereas '4' is where the reverse occurs as benefits are maximized and costs are minimized). As additional scenarios are added, there are additional benefit-cost ratios estimated. For each strategy, the extent additional scenarios are needed will vary as different framings may be useful to effectively understand the impact a given investment will make, or to understand how the type of investment may influence the perceived benefits.

Table 5: Sample Matrix

"Strategy Name"		Cost Scenarios	
		Low	High
Benefits Scenarios	Low	3	1
	High	4	2

Strategy: Charge for Parking

Description: Charge for city-controlled parking (starting with on-street parking) using a supply/demand model intended to reduce parking in the central business district to 70-80% of supply, particularly where alternative transportation modes are available. The benefit-cost analysis will focus on costs and benefits of charging for on-street parking in the downtown parking district.

Expected Benefit(s): This strategy is being considered because charging for parking would create a disincentive to driving, which would help to meet a target to reduce the emissions associated with vehicle miles traveled (VMT) within Salem. As an alternative to parking downtown, residents could instead take public transportation, bike, or walk.

Analysis: Benefit-cost ratios for this strategy range from 4.95 to 8.81 when including revenues to the City, and 0.32 to 1.87 when excluding revenues to the City. This strategy has received significant previous attention

within the City although due to logistical obstacles has been difficult to implement.[2] The findings of this analysis reiterate recommendations developed by previous third-party consultants: implementing paid parking in the downtown parking district has a promising return for the City. The figures in Table 6 show the strong financial and environmental argument for implementing paid parking when including City revenues. The strategy was also analyzed without including City revenues to assess the extent purely social and environmental benefits compare to the investment by the City to implement paid parking. The results become much more nuanced in this case, as it is unclear whether the strategy breaks even with this framing. This is because the size of revenues generated by the City are by far the largest benefit assessed and so their inclusion makes the benefit-cost ratio much greater than 1. Other elements of value creation included reduced congestion, reduced vehicle miles traveled (and resulting air, water, and noise benefits) and reduced GHG emissions.

Table 6: Benefit-Cost Ratios Based on the Range of Cost and Benefit Values

Charge for Parking		Costs	
		Low	High
Benefits - including revenue to the City	**Low**	7.42	4.95
	High	8.81	5.87
Benefits - excluding revenue to the City	**Low**	0.49	0.32
	High	1.87	1.25

Strategy: Support Energy Efficiency and Weatherization of Existing Buildings

Description: Develop and implement a program that helps residents and business owners weatherize and increase the efficiency of residential and commercial buildings, with a priority emphasis on properties with low-income renters, homeowners, and business owners. The benefit-cost analysis will focus on the city providing energy audits to single-family and multi-family units and connecting to funding and service providers after.

Expected Benefit(s): This strategy is being considered because energy efficiency and weatherization can reduce the emissions associated with power generation. This strategy also targets low-income Salem residents who would benefit most from the reduced energy bills and increased home comfort resulting from the strategy.

Analysis: Benefit-cost ratios for this strategy range from 3.73 - 58.29. Providing free energy audits to low income households in Salem is shown to be highly cost effective. The extent of cost effectiveness and the potentially high benefits shown in Table 7 are driven in large part by the extent that households, following the audit, pursue upgrades and retrofits. The upgrades and retrofits are the major value drivers in this case, although it is noted that the audit alone does not automatically signal energy upgrades will occur. As a result, connecting households to follow-on resources after their audit is an essential linkage needed to drive this benefit-cost ratio up.

When comparing benefit-cost ratios between single-family and multi-family dwellings, there is potential for a slightly higher ratio achieved in the case of multi-family dwellings due to potential increases in efficiency of conducting the audits - both through collectively addressing building-wide issues, smaller square footage of some multi-family units compared to single-family homes, and similarities between units in the same building.

2 See notes provided by subject matter experts on this topic and the feasibility limitations of the strategy included in [separate document].

Table 7: Benefit-Cost Ratios Based on the Range of Cost and Benefit Values

Support Energy Efficiency and Weatherization of Existing Buildings		Costs	
		Low	High
Benefits - Single-Family	Low	10.80	3.73
	High	32.16	11.10
Benefits - Multifamily	Low	19.57	3.73
	High	58.29	11.10

Strategy: Energy Efficiency Benchmarking for Municipal Buildings

Description: Develop a comprehensive approach to increasing energy efficiency in municipal buildings, including benchmarking, deep energy retrofits, policies to require energy efficient practices, and regular reporting. The benefit-cost analysis will focus on monitoring and benchmarking energy use of municipal buildings.

Expected Benefit(s): This strategy is being considered because benchmarking energy use can lead to changes in behavior that result in increased energy efficiency, reduced emissions from power generation, and reduced municipal utility bills.

Analysis: Benefit-cost ratios for this strategy range from 0.08 - 14.96. Much like the energy audits of the weatherization strategy, this strategy supports increased energy efficiency gains for municipal buildings due to energy tracking and benchmarking. However, energy benchmarking, while shown to lead to increased energy efficiency through simply tracking energy use over time, does not necessarily mean the investment in retrofits will occur. Retrofits are the leading driver of benefits creation in this strategy - particularly through increased worker productivity due to a more comfortable and customizable work environment. The variability in likelihood of pursuit of retrofits after benchmarking is why the range of benefit-cost ratios vary so dramatically. Benchmarking alone with no pursuit of retrofits as a result of the benchmarking is not cost effective in the case of Salem. This lack of cost effectiveness under the low-benefits scenario is driven in part by the additional staffing that the City has estimated to be needed to effectively implement this strategy, with 1 additional FTE likely needed.

Table 8: Benefit-Cost Ratios Based on the Range of Cost and Benefit Values

Energy Efficiency Benchmarking for Municipal Buildings		Costs	
		Low	High
Benefits	Low	0.16	0.08
	High	14.96	7.92

Strategy: Implement a Gas Tax

Description: Research the feasibility of implementing a gas tax. Revenue from this tax can fund connectivity and safety improvements to the city's transportation network and/or roadway maintenance and improvement projects. The benefit-cost analysis will focus on costs and benefits of a Salem gas tax, but does not take into account how revenue generated will be used.

Expected Benefit(s): This strategy is being considered because increasing the price of gasoline can reduce the amount of gasoline residents will buy, which would help to meet a target to reduce the emissions associated with vehicle miles traveled (VMT) within Salem. The strategy is also a potential source of additional revenue.

Analysis: Benefit-cost ratios for this strategy range from 0.18 - 0.81. Implementation of a gas tax is a strategy that was already being explored by Salem prior to this analysis. As a result, preliminary estimates of the tax revenue generated from the gas tax were developed by City staff. This analysis built on those results to estimate the extent to which the gas tax would change gasoline consumption behaviors. The evidence base was strong in finding that while the use of gasoline is inelastic (e.g. a 5% change in price leads change in demand of less than 5%), a gas tax would reduce gasoline consumption and correspondingly reduce vehicle miles traveled. The framing of the costs is what determines the extent to which the strategy has a positive benefit-cost ratio. The scenario in Table 9 notes that the tax revenue collected is a cost incurred by residents of Salem. As a result, the benefits generated from residents' change in behavior are weighted against the additional price paid for gasoline. In this framing, the benefit-cost ratio is slightly below 1. However, when considering the ratio by accounting for the cost borne by the City only, the ratio would likely increase. This scenario was not included here because it would not account for the bulk of the costs incurred - the additional spending by Salem residents. The administrative burden of implementing the gas tax is very low for the City itself, with much of the work being carried out at the State level, given the State collects the gas tax for municipalities and then distributes it to them. Passing a gas tax however may require significant public outreach spending on the part of the City. This figure is unclear at this time.

Of note, this analysis did not consider the potential benefits of the use of the gas tax revenue on transportation-related improvements. Calculating a BCA for the gas tax is a separate calculation from the BCA of transportation-related improvements. Other strategies analyzed (such as completing the sidewalk network, completing bikeways, creating bus lanes) are a few examples of the potential use of gas tax revenues. Within these examples there is a range of BCA's which provide a signal of the expected benefits from the use of gas tax revenue.

This BCA also does not control for the need of the gas tax revenue as an analysis of the City finances is not within the scope of analysis. Thus, it is unknown if other revenue sources could be used in place of the new gas tax and create similar benefits.

Table 9: Benefit-Cost Ratios Based on the Range of Cost and Benefit Values

Implement a Gas Tax		**Costs**
Benefits	**Low**	0.18
	High	0.81

Strategy: Connect Bikeways

Description: Prioritize and fund the City's planned comprehensive network of bikeways that connect major employment centers with areas of high density housing, essential services (schools, grocery stores, health care), and entertainment (restaurants, retail, event venues). The benefit-cost analysis will focus on a case study from the Kroc Center to the downtown area.

Expected Benefit(s): This strategy is being considered because increasing resident comfort and ease of bicycling in Salem can lead residents to substitute personal vehicle use for bicycling, which would help to meet a target to reduce the emissions associated with vehicle miles traveled (VMT) within Salem.

Analysis: Utilizing a case study for a bike route that runs from downtown Salem to the Kroc Center, the resulting benefit-cost ratios ranged from 1.17 to 8.10. In all scenarios the ratio was greater than 1, a strong signal for the benefit of this bike route. Variation in values here are driven in large part by the range of benefits that could be generated based on the resulting use of the bike route. While there is growing evidence around the increased rates of cycling due to additional bicycle facilities, the evidence is often highly varied and context-specific, resulting in less precise estimates for this case study. This is tied to variables of increased bicycle commuting, length of bicycle trip, likelihood of substituting between a car and a bicycle, and the social cost of carbon.

While this strategy was analyzed through a case study, rather than the more comprehensive language used in the original strategy description,[3] the findings are strong indicators of the potential value generated from a route that connects major destinations and is located near higher density zones. Benefit-cost ratios will change if bicycle facilities moved to other areas with fewer work and entertainment destinations and with fewer people nearby. Similarly, costs of completing bicycle networks can vary widely from route to route depending on the type of facilities needed, making route planning an important component of the bicycle network.

Table 10: Benefit-Cost Ratios Based on the Range of Cost and Benefit Values

Connect Bikeways		**Costs**	
		Low	**High**
Benefits	**Low**	1.73	1.17
	High	8.10	5.48

Strategy: Complete Salem's Sidewalk Network

Description: Complete Salem's sidewalk network throughout the city, with a priority emphasis on areas within a half-mile of a transit route and areas such as northeast Salem that have been historically neglected. The benefit-cost analysis will focus on the costs and benefits of completing the sidewalk network in Salem for those areas within a half-mile of bus stops (on major and minor arterials and collector streets).

Expected Benefit(s): This strategy is being considered because increased safety and accessibility to public transit would help to meet a target to reduce the emissions associated with vehicle miles traveled (VMT) within Salem. Safe and comfortable walking routes to bus stops also supports a goal to increase bus ridership within Salem.

Analysis: Benefit-cost ratios for this strategy range from 0.25 - 2.92 depending on the scenarios modeled. Building sidewalks can be an expensive undertaking and the scale of missing sidewalks within .5 miles of a bus stop in

3 "Plan and fund a comprehensive network of bikeways that connect major employment centers with areas of high density housing, essential services (schools, grocery stores, health care), and entertainment (restaurants, retail, event venues)..."

Salem is estimated to be approximately 56 miles by City staff (accounting for major and minor arterials and collector streets only).[4] Given this magnitude, benefits to justify the investment need to be substantial. Through this analysis, it was noted the sensitivity of certain variables and the extent to which they determine whether the benefit-cost ratio will be greater or less than 1. This includes the rate of substitution between walking, transit use and personal vehicle use and the implications from avoided vehicle miles traveled. In all cases however, the health benefits of additional walking shone through as the largest outcome and effectively allowed the strategy to break even when the physical health benefits were modeled optimistically. Given the importance of these variables, targeting of sidewalk investment should take into account the characteristics of people in the surrounding area. For example, communities at higher risk of heart disease and obesity would benefit more from additional walking. Thus the geographic targeting of investment serves as a signal for the extent to which health benefits and transit mode substitutions will occur.

Two scenarios are modeled in Table 11, effectively capturing how a change in costs of construction will vary from putting sidewalks on both sides of the street versus one side of the street. Due to uncertainties around how this may impact use of the sidewalks, the benefits are assumed to remain constant between the scenarios. This may prove to be optimistic until further evidence is developed.

Table 11: Benefit-Cost Ratios Based on the Range of Cost and Benefit Values

Complete Salem's Sidewalk Network		**Costs**			
		Both sides of street		**One side of street**	
		Low	**High**	**Low**	**High**
Benefits	**Low**	0.38	0.25	0.76	0.51
	High	1.46	0.97	2.92	1.95

Strategy: Create Bus Lanes

Description: Add shared use transit lanes[5] for specific corridors and consider creating bus-only lanes on select routes along the Core Network, such as Lancaster and River Rd/Broadway/Commercial Rd. The benefit-cost analysis will focus on costs and benefits of shared use transit lanes in the Core Network.

Expected Benefit(s): This strategy is being considered because reducing travel times on public transit would help to meet a target to reduce the emissions and support a goal of increasing bus ridership within Salem. Some new bus riders may be switching from personal vehicle use.

Analysis: The benefit-cost ratio for this strategy ranges from 0.04 - 1.71 depending on the scenario modeled and the locating of shared use transit lanes. Implementation and use of shared use transit lanes are growing in popularity, being used prominently in Portland (Rose Lanes), but also require a multi-stakeholder approach to implement successfully. The City would bear the cost of creating the lane while Cherriots would incur the cost of operating buses on those lanes. This strategy was noted for initially being considered a strategy that was less likely to be pursued in the near term. However, Cherriots staff modeled the cost and ridership implications of including shared use transit lanes (including signal prioritization) on all Core Network routes for the purpose of this analysis. When combining the increased ridership figures estimated by Cherriots (over 700,000 boardings per year) with the costs to develop and operate the lanes, it becomes clear that only under very strategic implementation of shared use transit lanes does it prove to have a positive benefit-cost ratio.

4 Sidewalk development near the edge of city limits will require coordination with adjacent jurisdictions.

5 Shared used transit lanes are defined as a right-side dedicated transit lane that accommodates right-turns for personal vehicles.

The two scenarios included in Table 12 show the costs when shared use transit lanes are implemented on all of the Core Network versus 25% of the Core Network, while holding benefits constant (see figure 1 for a map of the Core Network). While it is unclear the extent similar benefits could be achieved from a strategic implementation of shared use transit lanes, it is expected that certain sections of the Core Network provide the greatest impact on ridership. Future research and modeling will be required to understand how implementing shared use transit lanes in specific areas could boost the benefit-cost ratio.

Table 12: Benefit-Cost Ratios Based on the Range of Cost and Benefit Values

Create Bus Lanes		**Costs**			
		Assuming all of Core Network has BAT lanes		**Assuming costs reduced 75% from strategic placement of BAT lanes (as opposed to all of core network)**	
		Low	**High**	**Low**	**High**
Benefits	**Low**	0.09	0.04	0.37	0.16
	High	0.43	0.18	1.71	0.72

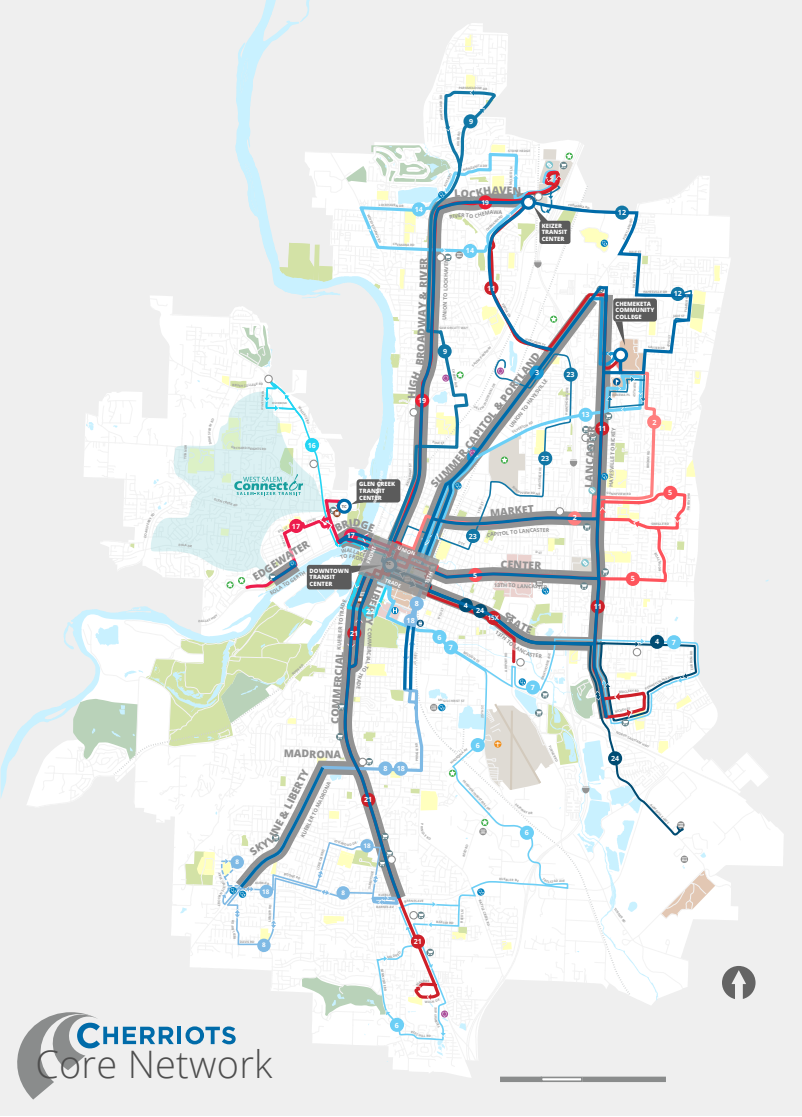

Figure 1: Core Network (Source: Cherriots)

Strategy: Increase Tree Canopy

Description: Provide a set of incentives to property owners (which includes residential properties as well as large property owners such as schools, employers, etc.) to support increased tree planting with particular emphasis on increasing coverage in underserved areas and neighborhoods. The benefit-cost analysis will review a range of incentive values to understand how people may respond to the size and type of the tree planting incentive provided by the City.

Expected Benefit(s): This strategy is under consideration because increasing tree canopy would help meet a target to reduce net emissions by increasing carbon sequestration within Salem. When planted in low canopy areas, the strategy can reduce stormwater runoff, summer temperatures, air conditioning use and associated emissions from power generation.

Analysis: The benefit-cost ratios for this strategy range from 0.25 - 1,476 based on the extent to which targeted households participate and whose costs are being accounted for. When the full cost of tree maintenance over the lifetime of the tree is included the ratio ranges from 0.25 - 20.23. This strategy was unique from the others in that the specifics of the strategy are not yet in place, but the strategy was included in the analysis to provide additional insights to the City as they look to develop a specific incentive program with a goal of increasing tree canopy in low canopy neighborhoods, particularly on private property. As a result, the research and interviews conducted for this strategy covered many types of tree programs, various types of incentives and a large body of research on the impact of trees in cities (see bibliography in Appendix E). This led to a wide range of cost estimates for what the value of an incentive may consist of, how it may be delivered (e.g. free tree, free maintenance, rebates on utility bills, etc.) and correspondingly a wide range of benefits based on the likelihood of target neighborhoods participating in the program and maintaining the trees for decades to come. The key takeaway from this initial assessment is the importance of effective targeting of the program and outreach activities.

When it is assumed that a household will participate in the program, the returns are very high - a testament to the value of trees. When however a program participation ratio is incorporated into the model, which controls for the proportion of people who actually participate, the benefit-cost ratios vary widely. This is because the likelihood of community members participating in a tree program is an area of very limited evidence. There are very few data points to suggest the size and structure of the most effective incentive and how much investment by the City would be needed per household to effectively incentivize planting a tree. As a result, the figures shown here create the bounds of outcomes that a tree program would fall within and the true value will be determined by the effectiveness of program targeting and delivery of services to those communities with the lowest amounts of tree canopy. If in practice the property owners who end up participating already have trees, the projected benefits will be reduced.

Table 13: Benefit-Cost Ratios Based on the Range of Cost and Benefit Values

Increase Tree Canopy		Costs			
		Only costs borne by City		Total Costs including property owner maintenance	
		Low	High	Low	High
Benefits	Low	70	0.50	0.96	0.25
	High	1,476	10.56	20.23	5.20

Strategy: Make Home EV Charging Accessible to Renters

Description: The City will require electric vehicle (EV) charging stations as part of the development of new multifamily residences (based on a 5-unit minimum) and incentivize the installation of EV charging stations at existing multifamily residences/complexes. The benefit-cost analysis will focus on the costs and benefits of installing EV charging stations at multi-family residences with 5 or more units.

Expected Benefit(s): This strategy is under consideration because increasing use of electric vehicles would help meet a target to reduce emissions from vehicle miles traveled (VMT). Targeting of charging stations to those residents least likely to otherwise consider purchasing an EV may support increased EV adoption.

Analysis: The benefit-cost ratio for this strategy ranges from 0.03 - 0.83. Projecting the benefits of requiring EV charging stations at multi-family dwellings is contingent on the likelihood that the increased availability and access to charging stations will lead to increased EV adoption. This is an area still in the early stages of research, as much of the evidence to date is correlative rather than causal. Still, we utilize the early estimates developed by the field to create bounds of the potential value created. For example, NYSERDA (2019) noted that a 10% increase in the number of DCFC charging stations (the fastest charging option) would lead to an increase in EV adoption of 8.4%. While this analysis uses the cost of Level 2 charging stations (a step down from DCFCs in charging speed), the availability of DCFC chargers is used as a proxy for how new access to convenient charging options can drive behavior change.

The results below show a clear divide in benefit-cost ratios based on the extent EVs are adopted. More nuanced views of each scenario show that implementing EV charging in new construction is slightly more cost effective than including it in a retrofit. And similarly, small cost efficiency gains are made when targeting larger multi-family dwellings that would have more EV chargers. Future research will help to refine these estimates. For now, we see the benefit-cost ratios tend to be under 1 regardless of the scenario or the level of optimism in the modeling.

Table 14: Benefit-Cost Ratios Based on the Range of Cost and Benefit Values

Make Home EV Charging Accessible to Renters		**Costs**			
		New Construction 2 EV chargers	**New Construction** 10 EV chargers	**Retrofit** 2 EV chargers	**Retrofit** 10 EV chargers
Benefits	**Low**	0.03	0.04	0.03	0.03
	High	0.82	0.83	0.69	0.75

This strategy is also impacted by House Bill 2180 within the State government of Oregon. Effective July 1, 2022, the bill requires amending "state building code to require that new construction of certain buildings include provisions for electrical service capacity for specified percentage of parking spaces." The code requires the qualifying buildings include, at minimum, capacity for 20 percent of vehicle parking spaces. It also notes that for multi-family dwellings, buildings must have at least 5 units subject to the requirement. This new code overlaps with the strategy analyzed here; however, the bill also allows municipalities to adopt a local percentage that exceeds the state building code - something Salem may consider based on this analysis. Further, the bill does not specify the type of charger to be installed. As mentioned, this analysis uses the Level 2 charger which while more expensive than a Level 1, provides faster charging and would have capacity to serve more tenants.

Also unique from the requirements of HB2180, this analysis considers the benefit-cost ratio of applying an EV charging requirement to existing buildings that would have to be retrofitted as opposed to just new construction. As mentioned, retrofitting comes at a slight additional cost compared to incorporating charging stations with

new construction.

Strategy: Solar-ready New Construction

Description: Require all new commercial and multifamily housing to be built solar-ready, meaning the buildings would have the electrical infrastructure ready for the building owner to install solar panels if they so choose. The benefit-cost analysis will focus on the costs and benefits of building for solar-ready - and the benefits from using either rooftop photovoltaics or solar water heating. Consideration will be given to incentives the City can provide to support adoption of solar.

Expected Benefit(s): This strategy is being considered because increasing the use of solar power would help meet a target to reduce emissions from power generation within Salem. The more a building is ready for either solar panels or solar water heaters to be installed, the more likely a building owner is to install the technology.

Analysis: The benefit-cost ratio for this strategy ranges from 0.08 - 4.28. Much like the increased access to EV charging stations, the requirement of solar-ready construction derives much of its potential benefits from the future use of solar energy. When the likelihood of adopting solar energy - either through photovoltaic panels or water heating - is increased, the benefits of requiring solar-ready construction are quickly realized. This is the key distinction between the low and high benefits scenario - a lower likelihood of solar adoption vs. a higher likelihood of solar adoption. As a result, when working with lower income households, the incentives to adopt solar energy are critical to realizing the long-term benefits of having solar-ready construction. Without those incentives in place, the argument for solar-readiness is weak.

Solar-ready requirements place additional costs on developers and create an additional point of inspection for the City to manage as part of construction. However, as the City is already conducting inspections across dozens of aspects of building construction, the inclusion of solar-ready will have minimal marginal cost to the City, and over time, as inspectors gain experience and training, the marginal cost will be further reduced. As a result, this BCA highlights the costs borne by the developer. Specific costs will vary by the size of the building being constructed and correspondingly, benefits will vary by the scale of solar technology installed on the building. For multi-family dwellings, the per unit benefits are assumed to be similar to that experienced in a single-family home.

This strategy is particularly timely as the State of Oregon has worked to implement a rule change to the code to require that all new residential structures be solar-ready as well. Developing this rule change required debate about the definition of 'solar-ready' as it can mean different things to different people. The rule change put into place defines it as: "a raceway running from near the electrical panel to either the attic or the roof and that that raceway be of metal construction." A raceway is an enclosed conduit that forms a pathway for electrical wiring. Copper wiring can be installed instead of the raceway. While this rule is specific to residential buildings, the full strategy being considered by the City of Salem includes commercial buildings as well. The specific benefits and costs of commercial buildings will become very specific to the size of the building and the size of the solar installation, but it is expected that any installation would consider economies of scale in their budgeting and thereby realize a benefit-cost ratio greater than 1.

Table 15: Benefit-Cost Ratios Based on the Range of Cost and Benefit Values

Solar-ready New Construction		**Costs**	
		Future use: Solar PV	**Future use: Solar water heater**
Benefits	**Low**	0.08	0.09
	High	3.93	4.28

B. Equity Impact Discussion

The following details how each strategy may impact social equity in the City of Salem, noting the often mixed impacts the various strategies can have.

Table 16: Description of equity impacts for each strategy

Strategy	Equity impact
Charge for Parking	Implementing paid parking has a strong positive net benefit argument when accounting for the revenues received by the City. Use of on-street parking downtown disaggregated by the income level, race/ethnicity, gender, disability status, among other groups, is not currently tracked. However, it is clear that an additional cost to go downtown will be most significant for the lowest income residents of Salem.
Support Energy Efficiency and Weatherization of Existing Buildings	This strategy is designed to explicitly serve households under 200% of the federal poverty line, in alignment with the current activities conducted by Mid-Willamette Community Action. As a result, the strategy is, by its nature, meant to address inequities in the quality of housing and the resulting disparities of home energy efficiencies. All projections included with this strategy should be viewed noting that they apply to low-income households only.
Energy Efficiency Benchmarking for Municipal Buildings	This strategy is limited in the extent it addresses equity, as its focus is on municipal buildings. However, increased recognition of energy efficiency and the potential implications for improvements in the work environment may benefit those staff members who are among the lower paid due to more labor intensive work, less public facing workspaces, etc. In this case then, improved energy efficiency can boost work productivity and workplace well-being most significantly for the lowest income segment of the City's staff.
Implement a Gas Tax	A gas tax by its nature is regressive (low-income tax payers pay a disproportionate share of the tax burden). However, the total cost of the gas tax on a per household level is estimated at $30 per year based on analysis by City staff. This figure is too small to conservatively project the extent to which this influences household cost burden and causes change in financial stress, although it is clear that these risks are going to be significantly more prominent for the lowest income members of the community who use personal vehicles. However, external research also highlights the proportional change in gas consumption that occurs as a result of a 5-cent gas tax. This means that households on average reduce their vehicle miles traveled in response to the gas tax which leads to both vehicle cost savings for those households that can afford not to make a trip somewhere (which will be weighted towards households that can work from home or avoid 'luxury' spending trips). Also important from an equity perspective is the air, water and noise reductions that occur from reduced vehicle miles traveled. The value of avoiding these negative aspects of vehicle use are most significant in urban settings and along highly traveled roadways, both of which are areas of potentially higher concentration of low income households. This signals a disproportionate positive benefit for low income households due to the reduced vehicle miles traveled as compared to the higher income households.

Appendix 6

Strategy	Equity impact
Connect Bikeways	Increased bicycle commuting would be one of the most important benefits of this strategy and is also a low-cost commuting alternative compared to personal vehicles. This outcome, however, would not apply to individuals who may have to move significant resources along with them as a part of their work such as tools, construction supplies, and other equipment. As a result, bicycle commuting is better aligned to jobs where the necessary supplies are on the job site and do not travel with the employee. For most knowledge-based workers this will be the case. Similarly, service sector and manufacturing where the required equipment is on site are potential bicycle commuters. Other jobs such as the trades, landscaping, large deliveries, etc. will still require a vehicle. In many cases, these job characteristics are also a signal of the income of the individual, such that knowledge workers, most likely to bicycle commute, are also higher income individuals. However, much like the gas tax analysis, the reduction in vehicle miles traveled can have a disproportionate impact on urban and heavily traveled roadways where there may be greater concentrations of low income households who then benefit from improved air quality, reduced noise, and improved water quality.
Complete Salem's Sidewalk Network	The ability to safely and comfortably access transit as well as move around the community on foot is most pressing for those individuals without a personal vehicle who will also tend to disproportionately be low income residents. Similarly, low income communities tend to suffer disproportionately high rates of heart disease, obesity and other chronic diseases that impact health outcomes and quality of life. As a result, while this strategy is very large in its scope, targeting sidewalk development in those communities that are at greatest risk and have lowest incomes will lead to the greater social return on investment.
Create Bus Lanes	Use of shared use transit lanes, based on the TBEST modeling tool used for this analysis, takes into account the socioeconomic status of communities the bus routes run. This can then serve as a signal for the likelihood of utilizing bus services and the types of trips the individual needs to make (whether that be commuting, running errands, etc.). While we do not have a defined breakdown of the projected income level, race/ethnicity, disability status, etc. of the additional riders projected from shared use transit lanes, it is clear that the growth in ridership will disproportionately draw on those community members who stand to gain the most in the near term such as those who face high transportations costs, high cost of personal vehicle use, limited access to personal vehicles, have limited working hours, etc. Reduced vehicle miles traveled in urban and heavily traveled roadways will, like other strategies, disproportionately benefit lower income households as well.
Increase Tree Canopy	For this strategy to maximize its potential benefits, it must be designed to target areas of Salem with low tree canopy, which also tend to be lower income areas. These are the households that will disproportionately benefit from additional tree cover - both directly from reduced energy expenditures and increased property values. These are also the households most likely to require a financial incentive to make the investment in having a tree. It is recommended that this strategy continue be implemented with an equity focus and exclusively target low canopy parts of the City.

Strategy	Equity impact
Make Home EV Charging Accessible to Renters	It is well recognized that EV adoption is most difficult for low income renters who are least likely to have EV charging stations at their place of residence. This is particularly important as an estimated 80% of EV charging takes place at home (Valderrama et al., 2019). However, provision of EV charging at multifamily dwellings creates a series of potential obstacles for property owners to track who is using the charging station, ensuring the correct tenant is being billed for the electricity used, and managing the availability of the charging stations particularly when there are more tenants with EVs than there are charging stations. What is clear however is that some investment is needed to even open the door to EV adoption for lower income renters. Given this strategy is focused on this population segment, equity impact is core to the strategy. Still, one of the leading outcomes of this strategy is reduced greenhouse gas emissions which while having a global impact, will manifest itself in Salem through increased summer electricity bills and increased vulnerability to severe weather events - two burdens felt most heavily by the lowest income residents.
Solar-ready New Construction	Much like the previous strategy on EV charging, this strategy is designed to promote solar adoption for residents of multi-family dwellings. The evidence base is still very early in its development however, which restricts the ability to isolate how inequities are addressed. Using assumptions around the increased likelihood of adopting solar energy due to the solar-ready dwelling, the potential energy savings would be targeted to lower income community members through this strategy. Similarly, benefits from reduced greenhouse gas emissions will disproportionately benefit the lowest income residents of Salem who face greater financial burden from high electricity bills and severe weather vulnerability than mid and high income residents.

C. Assumptions for each analysis

As with any benefit-cost analysis, assumptions are required to build the model to make the projection. Every model is incomplete, but the results of the analysis should provide insights into the likely cost effectiveness of each strategy given available data.

As each strategy is unique and covers different subjects, there are different assumptions required. For transparency, we detail each of those in the table below. Throughout each analysis however, a core set of assumptions was utilized for consistency. These included:

- Implementation year of each strategy is assumed to be present day - allowing for direct comparison across strategies without adjustment for when strategies may be implemented.
- All dollar values are communicated in 2021 figures.
- Net present value calculations are used to discount future costs and benefits back to present day values.
- Discount rate of 3% is used across strategies.
- Costs to develop and manage the CAP including staff and consultant time are not included.

Appendix 6

Table 17: Assumptions for each Strategy

Strategy	Assumptions
Charge for Parking	○• Projection is made over 5 years to avoid overlap with projected benefits of other strategies ○• Charging for parking would only occur on-street in the Downtown Parking District. Off-Street parking would remain free unlimited time parking for customers and permits for employees (no change until parking utilization rates support a change). ○• Parking Tax currently paid by businesses would be eliminated ○• Assumes 24 days per month for revenue ○• Revenues would need to contribute to: operating costs of parking technology, maintenance of parkades, most likely a set aside of funding for downtown marketing/cleaning, etc. ○• Per hour cost at $1.50 per hour (same as city-wide), does not include potential first 30 minutes free which has been discussed ○• This includes a 40% leakage rate which is our standard conservative leakage rate used for all new paid parking implementation phases ○• Costs cover up-front investment in technology and annual on-going maintenance and enforcement costs borne by the City
Support Energy Efficiency and Weatherization of Existing Buildings	○• Projection is made over 5 years to avoid overlap with projected benefits of other strategies ○• The city provides/covers the cost of one energy audit to households under 200% of federal poverty line ○• The city does not implement or pay for energy retrofits for that home but does connect the household to organizations and resources to support weatherization and retrofits ○• Projection is based on the average net benefits per unit that receives an energy audit paid for by the City ○• Receiving an energy audit leads to a 10-30 percentage point increase in likelihood of pursuing energy retrofits and weatherization upgrades.
Energy Efficiency Benchmarking in Municipal Buildings	○• Projection is made over 5 years to account for lag time in more energy efficient behaviors ○• All costs are borne by the City to implement energy monitoring and benchmarking tools ○• No assumption is made around the change in likelihood of pursuing retrofits following the energy monitoring ○• Projection includes all square footage managed by Facilities Services and which require custodial services (approximately 322,000 sq. ft.)
Implement a Gas Tax	○• Projection is made over 1 year and for the entire city. The short projection period helps to avoid risk of behavior shift leading to EV purchases which would become accounted for in another strategy as well as shifting gasoline prices. ○• For Salem, the forecast used is 4% of statewide population times the 1.6 billion gallons consumed in the State of Oregon to produce a conservative estimate of 65 million gallons purchased annually in the City. ○• Benefits projected cover the resulting behavior change by households in Salem due to the gas tax increase. ○• Modeled BCA is for gas tax of $0.05 per gallon which is in alignment with the existing evidence base. A similar ratio is expected for smaller gas tax values. ○• Costs are framed with the projected tax revenue being the cost borne by residents ○• This strategy includes designating spending of the tax revenue on transportation strategies that promote active transit and public transit use. The implications of this spending are not accounted for in this BCA so as to avoid overlap with other strategies addressed here (e.g. completing the sidewalk network, connecting bikeways, creating bus lanes, etc.)

Appendix 6

Strategy	Assumptions
Connect Bikeways	○• Projection made over 5 years to avoid overlap with projected benefits of other strategies ○• Projected additional rates of cycling and miles cycled is due to the case study route from the Kroc Center to Downtown ○• Scale of benefits is projected for the case study route only - findings are representative of other bike routes with similar cost structures and utility to residents (e.g. functionality as a commuter route, not just recreation) ○• All costs are borne by the City to develop the bike route
Complete Salem's Sidewalk Network	○• Projection made over 15 years ○• Projection is made over a longer period due to the long lifespan of sidewalks and the scale of investment, while also noting that many of the benefits isolated from this strategy have less risk of overlapping with other strategies. For example, increased access to sidewalks can lead to physical health gains (particularly in at-risk communities) that are not achieved via other strategies ○• Projection includes total benefits from completing all sidewalk in Salem within .5 miles from a bus stop (for major and minor arterials and collector streets only) ○• No change in population within the expanded sidewalk area is included ○• No change in bus routes is considered - only access to existing bus stops ○• Assume similar benefits are achieved whether the sidewalk is on both sides or one side of the street - this includes assuming pedestrians will cross to the side of the street where the sidewalk is utilized and cross back over as needed ○• All costs are borne by the City, but sidewalk development near the edge of city limits will require coordination with adjacent jurisdictions
Increase Tree Canopy	○• Value of incentive provided to property owner varies from price of a new seedling to price of a 4+ foot tree with 2 2 years of maintenance ○• Long-term survivorship of trees (20+ years) is approximately 40% in line with external evaluations such as that seen in Sacramento's shade tree program ○• Benefits of trees are assessed for the lifespan of the tree and modified by the expected survivorship rate ○• BCA includes a wide of range of effectiveness of outreach efforts to note the importance of well-targeted strategy although evidence on the effectiveness of targeting strategies for private property tree planting is limited ○• Projections are made for the average net benefit of a single tree without controlling for tree species ○• All costs are borne by the City and do not include costs borne by the property owner in subsequent years.
Make Home EV Charging Accessible to Renters	○• Projection is made over 10 years, in alignment with EV vehicle lifespan ○• Projection is made per household to avoid also projecting rate of new construction in Salem over the following 10 years ○• All costs are borne by developers, property owners and/or tenants assuming the marginal cost per building to the City for inspections is low ○• All charging stations are budgeted as Level 2 charging stations and assuming each charging station lasts the lifetime of one EV ○• There remain large uncertainties around the extent access to Level 2 charging stations at rental properties drive increased EV adoption. This analysis models the upper bound of increased EV adoption rates based on those rates seen for DCFC charging stations (the fastest charging stations), with the lower bound being approximately ○as effective.

Strategy	Assumptions
Solar-ready New Construction	○• Projection is made over 20 years to account for lifespan of solar installation ○• Projection is made on a per household basis ○• There remains large uncertainty around the extent building solar-ready will lead to use of solar energy options. This analysis uses the likelihood of investment in energy retrofits based on energy audits conducted as a proxy. For lower-income residents, additional incentives are very likely to be needed to support this adoption. ○• Costs are borne by the developer, property owners, and/or tenants assuming the marginal cost per building to City for inspections is low
Create Bus Lanes	○• Projection made over 5 years ○• Bus lanes in this analysis refer to shared use transit lanes ○• In certain cases, shared use transit lanes can also be shared by High Occupancy Vehicles (2 or 3 riders per car) ○• Shared use transit lane modeling was done in the TBEST model by Cherriots staff ○• The Cherriots Core Network streets were all assumed to have shared used transit lanes in this model ○• All transit routes that travel on a portion of the Cherriots Core Network streets were modeled as having an exclusive guideway and signal priority/preemption on these streets ○• The shared use transit lane model was a copy of the 2019 base year model with the above enhancements ○• No population or employment growth was assumed in order to do a direct comparison of what the expected growth in ridership would be, due to only the addition of shared use transit lanes and signal priority/preemption. ○• This exercise did not assume any growth in congestion due to the construction of the shared use transit lanes. Growth in congestion could further influence transit ridership and could create other impacts including increased idling for passenger vehicles ○• TBEST is not a micro-simulation traffic engineering model, but only works to predict ridership based on socio-economic data ○• 54 miles of shared use transit lanes on the Cherriots Core Network and the associated signal priority/preemption improvements yielded a 20 percent ridership increase solely to those improvements alone ○• Costs to the City assume striping and signing along all 54 miles of shared use transit lanes. Costs do not account for road widening that might be needed at certain intersections or in certain corridors where there is insufficient width to provide a dedicated shared use transit lane ○• Total costs also include the projected additional operating costs for Cherriots

VII. LIMITATIONS

Estimates for current and future costs and benefits are limited to the data that is available and the research base that exists around the given strategy. This is particularly important to note for this analysis as it takes special efforts to incorporate social and environmental value estimates which are dependent on the state of the secondary research. For some measures, extensive research and data exists within the City of Salem, including historic cost data. However, not all measures have readily available data to apply to benefit-cost calculations. Case studies are applied in these analyses as needed to create a representative view of the types of costs and benefits that could be expected. These case studies are built from the best available literature. However, in those cases where local data is limited, the resulting benefit-cost ratios may be less well-aligned to the current and future conditions within the City of Salem.

In these cases, a wide range of values are utilized to help depict the range of possible outcomes that could be experienced. As available, insights are included from the literature and the analysis to help inform the steps that can be taken to help ensure a greater benefit-cost ratio is achieved and to ensure there is an equity lens utilized with each decision. All those figures included in these analyses are subject to change as market conditions continually evolve, type of value created change, population growth, changes in fuel availability, residential and commercial development patterns, and new technologies come online.

Also of note, all strategies and their effects are intertwined. As time goes on the relationship between strategies becomes more and more influenced by the state of the other strategies as well. To help mitigate risk of double counting value creation, most strategies maintain a short time frame (typically 1-5 years although in cases of infrastructure, the lifetime of the infrastructure is used), helping to keep projections as independent from one another as feasible, while still providing insights of how the flow of benefits will look over time.

VIII. KEY TAKEAWAYS

Several concluding takeaways are noted from the analysis of the ten strategies.

- Top strategies in terms of cost-effectiveness include:
  - Charge for parking on-street in downtown Salem (when accounting for revenues to the City).
  - Support energy efficiency and weatherization for lower income households (including renters) and small business owners.
  - Support additional tree canopy in low canopy neighborhoods.
- Strategies that were least cost-effective include:
  - Make EV-charging accessible to renters.
  - Create shared use transit lanes on the Core Network.
  - Implement a gas tax in the City.
- Benefit-cost ratios that consider only the City's expenses tend to result in a net benefit - a ratio greater than 1. However, when incorporating the full scope of costs incurred by the multiple stakeholders, the net benefit of strategies is reduced and the design and targeting of the strategy become more important to achieve net benefits.
- Several strategies had benefit-cost ratios that are very sensitive to the modeling assumptions, meaning that there are a wide range of potential valuations that may occur as the existence and quality of evidence for the effectiveness of strategies varies considerably. When the evidence is weak, modeling assumptions are utilized (described in section V) to conservatively frame the bounds of the value projected. This often results in wide ranges of benefit-cost ratios, sometimes stretching from less than 1 to above 1, the distinction between a strategy that pays off and one that does not. Strategies where this is most apparent include:
  - Energy benchmarking for municipal buildings.
  - Complete Salem's sidewalk network within ½ mile of bus stops.
  - Create shared use transit lanes on the Core Network.
  - Require EV charging at multi-family units.
  - Require solar-ready new construction.
- Causal evidence for the effectiveness of strategies varies considerably. For multiple strategies, this is the most limiting factor for assessing the benefit-cost ratio as the proposed strategy is innovative and/or still in the early stages of implementation in other municipalities so there has not been time to evaluate its effectiveness.

- For those strategies pursued by the City of Salem it will be important to set up periodic evaluations to help track the true costs and benefits realized and to make adjustments in how the strategy is delivered.
- While this analysis has focused on the ratio of benefits and costs, it is also important to consider the scale of the costs and scale of the benefits. A strategy with a promising benefit-cost ratio, but for which the upfront cost required is high may not be feasible to implement depending on budget availability.

IX. AREAS FOR FUTURE RESEARCH

As described throughout this document, many strategies would benefit from additional research. This analysis has provided important signals of value propositions associated with each strategy, but the design and implementation of each strategy would benefit from additional assessment by City and partner organizations to fine tune the expected benefit-cost ratios. The following notes research topics for each strategy.

Charge for Parking:

- Conduct a follow-up to the 2018 third-party analysis to assess changes in the number of downtown visits by personal vehicles in 2021/2022 compared to 2018/2019.
- Assess the costs of expanding the parking fee to include downtown area parkades. This may include a discounted rate compared to on-street parking.

Complete Bikeways:

- Track changes in local bicycle route usage rates due to the addition of bike facilities. This may be through a periodic point-in-time measurement at sites just before the installation of a bike facility and in multiple time periods following the installation of the facility.
- Track bicycle route usage by purpose of trip (i.e. commuting, recreation, etc.). This may be through periodic, very brief surveys of riders using a new bike facility.

Tree Canopy:

- Measure survival rates of trees planted by private property owners who benefited from a City program which supported the tree being planted.
- Assess reasons for why residents/property owners in low canopy areas may not participate in an incentive program, the types of incentives preferred and the size of incentive that would influence their decision to get a tree.

Supporting Energy Efficiency and Weatherization:

- Partnering with Energy Trust of Oregon and Community Action, do follow ups on energy audits already conducted with low income households and property owners to assess the extent they had access to funds to cover an energy retrofit and the proportion of those who ended up getting the energy retrofit and the market value of the retrofit.

Implement a Gas Tax:

- Assess the uses of the expected tax revenue and the extent that revenue could not be realized elsewhere.
- Connect with other Oregon municipalities who have a gas tax to understand their experience, the results achieved, any difference between expectations and reality

- **Complete Sidewalk Network:**
  - Assess characteristics of residents in areas without sidewalks including rates of vehicle access, neighborhood health conditions (particularly rates of chronic diseases) when determining segments of the sidewalk to complete. Neighborhoods with low vehicle access and below average health should be prioritized for sidewalk segments as they are most likely to realize the largest benefits modeled.
- **Make Home EV Charging Accessible to Renters:**
  - Survey renters, with a focus on low-mid income renters, about their interest in EVs, perceived feasibility of having an EV, and their likelihood of making their next vehicle electric if they had reliable access to a charging station at their building.
- **Solar-ready New Construction:**
  - Survey property owners, tenants, and small business owners about their willingness to adopt solar if the building is solar-ready. How does being solar-ready increase the likelihood of installation solar panels? Does it alter the perception of utilizing solar energy?
- **Create Bus Lanes:**
  - Develop additional models of the shared use transit lanes to assess what parts of the Core Network are predicted to have the most significant impact on ridership. Targeting the implementation of shared use transit lanes will boost the likelihood of achieving a benefit-cost ratio above 1.
  - Assess how shared use transit lanes could alter Cherriots operating costs in the long-run. Does it boost fuel efficiency, lifespan of the bus, fuller buses that drive additional revenue? And likewise, assess how changing bus frequency at rush hour on the Core Network would pair with shared use transit lanes at prioritized segments.
- **Energy Efficiency Benchmarking in Municipal Buildings:**
  - Assess opportunities to boost staff comfort through energy retrofits. Staff comfort can increase productivity, the leading value driver of this strategy. Targeting facilities with the least favorable working conditions can create a quick return on investment.

X. APPENDICES

A. Detailed Costs and Benefits for each Strategy

The following section details the specific cost and benefit figures utilized for each strategy, which together form the benefit-cost ratios previously described. Cost tables look different for each strategy depending on multiple factors such as whether there are recurring costs associated with the strategy, if there are a range of estimates, and the different line items accounted for. The benefits tables are each structured very similarly with the left hand column being the different outcomes monetized for the strategy and the other columns noting the range of valuations attached to each outcome. Also listed are those resources that were specific to the strategy. Other resources with content that informed multiple strategies (e.g. social cost of carbon, impact of VMT, etc.) are included in the full bibliography in Appendix E.

Strategy: Charge for Parking

Table 18: Costs of Charging for Parking

Upfront Investment	Operations and Maintenance							
Year 0	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**NPV over 5 years (2021$)**	**Range (+/-) 20%**	
$782,792	$65,268	$98,568	$98,568	$98,568	$98,568	$1,331,169	$1,064,935	$1,597,403

Table 19: Benefits of Charging for Parking

Outcomes	Value	
	Low	**High**
Increased annual revenues to the city	$7,387,125	$7,387,125
Reduced VMT - air, noise, water benefits	$66,497	$498,730
Reduced VMT - avoided GHG emissions	$19,934	$166,119
Reduced congestion of roadways	$332,487	$1,163,704
Reduced roadway maintenance from reduced VMT	$99,746	$166,243
Total (excluding revenue to City)	**$518,664**	**$1,994,796**
Total (including revenue to City)	**$7,905,789**	**$9,381,921**

Strategy-specific resources:

- Harmon, B. 2021. GHG Emissions Modeling for City of Salem Climate Action Plan. Personal interview. Verdis Group
- Metropolitan Transportation Commission. (n.d.). MCT's VPP Parking Project Parking Policy Best Practice and Case Study Examples. https://parkingpolicy.com/supply-demand/
- Rick Williams Consulting. (2018). Downtown Salem 2018 Parking Report. *Prepared for City of Salem.*
- Seattle Department of Transportation. (2020). 2019 Paid Parking Study Report. http://www.seattle.gov/Documents/Departments/SDOT/ParkingProgram/PaidParking/FINAL_2019_PaidParkingStudy_Report.pdf
- Spears, S., Boarnet, M. G., & Handy, S. (2014). *Impacts of Parking Pricing and Parking Management on Passenger Vehicle Use and Greenhouse Gas Emissions. Policy, 9, 30.*
- Wahrgren, S. and Long. S. (2021). Estimating costs and revenues of paid parking system downtown. Personal interview. City of Salem

Strategy: Supporting Energy Efficiency and Weatherization

Table 20: Costs of Energy Audits

	Energy Audit Costs	
	Residential single-family ($ per house)	**Multi-family ($ per unit)**
Low	$145	$80
High	$420	$420

Table 21: Benefits of Energy Audits (per household)

Outcomes	**Value**	
	Low	**High**
Reduced GHG emissions from energy efficiency	$1.19	$9.92
Energy bill savings (from energy audit alone)	$20	$20
Increased likelihood of energy retrofit/weatherization	$130	$389
Increased likelihood of retrofit - non-energy benefits (low)	$1,415	$4,244
Total	**$1,565**	**$4,663**

Strategy-specific resources:

- Frondel, M., & Vance, C. (2012). Heterogeneity in the Effect of Home Energy Audits – Theory and Evidence. Ruhr Economic Papers, No. 335.
- Harmon, B. 2021. GHG Emissions Modeling for City of Salem Climate Action Plan. Personal interview. Verdis Group.
- Kontokosta, C.E., Spiegel-Feld, D. & Papadopoulos, S. (2020). The impact of mandatory energy audits on building energy use. Nat Energy 5, 309–316.
- Mid-Willamette Valley Community Action. (n.d.). Weatherization. https://mwvcaa.org/programs/weatherization/
- Mid-Willamette Valley Community Action. (2020). Weatherization Quarterly Data report: for Low-Income Home Energy Assistance Program (LIHEAP) and Oregon Energy Assistance Program (OEAP). State of Oregon.
- Schwartz, H. L., Curtright, A. E., Ogletree, C., Thornton, E., & Jonsson, L. (2018). Energy Efficiency as a Tool for Preservation of Affordable Rental Housing. RAND Corporation, Santa Monica, California.
- Taylor, N.W., Searcy, J.K., & Jones, P.H. (2019). Cost Savings from Energy Retrofits in Multifamily Buildings. https://www.macfound.org/media/files/hhm_brief_-_cost_savings_from_energy_retrofits_in_multifamily_buildings.pdf
- U.S. Department of Energy. (2018). Weatherization Works!. https://www.energy.gov/sites/prod/files/2018/03/f49/WAP-fact-sheet_final.pdf
- U.S. Department of Housing and Urban Development. (2011). Quantifying Energy Efficiency in Multifamily Rental Housing. https://www.huduser.gov/portal/publications/EM_Newsletter_Summer_2011_FNL.pdf

Strategy: Energy Efficiency Benchmarking for Municipal Buildings

Table 22: Costs of Energy Benchmarking

	Year 1	Year 2	Year 3	Year 4	Year 5	NPV of costs
Low	$277,900	$71,400	$72,828	$74,285	$75,770	$535,116
High	$506,100	$122,400	$124,848	$127,345	$129,892	$1,010,585

Table 23: Benefits of Energy Benchmarking in Municipal Buildings

Outcomes	Value	
	Low	High
Reduced utility expenditures from energy tracking	$76,954	$205,210
Reduced GHG emissions from reduced energy use	$6,518	$54,321
Increased work productivity (assuming likelihood of investment in retrofit)	$7,745,329	$7,745,329
Total	**$83,472**	**$8,004,859**

Strategy-specific resources:

- Facilities Services Division, City of Salem. (2020). Lighting and HVAC Project Incentives. City of Salem.
- Facilities Services Division, City of Salem. (2021). City Wide Building Square Footage Snapshot. City of Salem.
- Finance Department, City of Salem. (2019). Comprehensive Annual Financial Report.
- Hart, Z. (2015). The Benefits of Benchmarking Building Performance. IMT and Pacific Coast Collaborative.
- Harmon, B. 2021. GHG Emissions Modeling for City of Salem Climate Action Plan. Personal interview. Verdis Group.
- Seattle Office of Sustainability and Environment. (2017). Implementation of Energy Benchmarking, Disclosure, and Reporting Requirement. http://www.seattle.gov/Documents/Departments/OSE/DR2017.01EBRFinal.pdf
- Seattle Office of Sustainability and Environment. (2018). Seattle Energy Benchmarking Analysis Report. https://www.seattle.gov/Documents/Departments/OSE/Seattle%20Energy%20Benchmarking%20Analysis%202016%20for%20web.pdf
- Seiden, K., Luboff, J., Chwastyk, D., Merchant, E., Russell, R., Cooper, S., ... & Rode, M. (2015). New York City Benchmarking and Transparency Policy Impact Evaluation Report.

Strategy: Implement a Gas Tax

Table 24: Cost of Gas Tax

Cost borne by area residents	
Gas Tax (per gallon)	**Estimated Annual Cost to residents***
$0.03	$1,957,096
$0.04	$2,609,461
$0.05	$3,261,826
City's Operational Costs	Likely no more than $20,000 per year

*Other than the City's operational costs, the gas tax is generating additional revenues for the City. The costs borne by residents for each gas tax value are the revenue of the City.

Table 25: Benefits of Gas Tax

Outcomes	Value	
	Low	**High**
Reduced VMT - air, noise, water benefits	$237,900	$1,784,250
Reduced VMT - avoided GHG emissions	$71,316	$594,304
Reduced VMT - Reduced vehicle operating costs	$267,638	$267,638
Total	**$576,854**	**$2,646,191**

Strategy-specific resources:

- Barron, R., and Eggleston, J. (2021). Preliminary Gas Tax analysis for City of Salem. Personal Interview. City of Salem.
- Bento, A.M., Goulder, L.H., Jacobsen, M.R., & Von Haefen, R.H. (2009). Distributional and Efficiency Impacts of Increased US Gasoline Taxes. American Economic Review 2009, 99:3, 667–699.
- Harmon, B. 2021. GHG Emissions Modeling for City of Salem Climate Action Plan. Personal interview. Verdis Group.
- Li, Shanjun, Joshua Linn, and Erich J. Muehlegger. 2012. Gasoline Taxes and Consumer Behavior. HKS Faculty Research Working Paper Series RWP12-006, John F. Kennedy School of Government, Harvard University.
- Picker, L. (2004). The Effect of Gasoline Taxes on Work Effort. The National Bureau of Economic Research Digest, July 2004.

Strategy: Connect Bikeways

Table 26: Cost of Bikeway from Downtown to Kroc Center

Total construction costs	
Low	High
$2,616,000	$3,866,000

Table 27: Benefits of Bikeway from Downtown to Kroc Center

Outcomes	Value	
	Low	High
Improved physical health from increased physical activity	$2,491,361	$9,965,443
Reduced VMT - Reduced vehicle operating costs	$644,640	$644,640
Reduced VMT - air, noise, water benefits from reduced personal vehicle use	$1,245,680	$9,342,603
Reduced VMT - reduced GHG from reduced personal vehicle use	$149,369.53	$1,244,746.09
Total	**$4,531,050**	**$21,197,431**

Strategy-specific resources:

- Buehler, R. & Dill, J. (2016). Bikeway Networks: A Review of Effects on Cycling. Transport Reviews, 36:1, 9-27.
- City of Salem. (2020). Salem Transportation System Plan. *https://www.cityofsalem.net/CityDocuments/tsp-full.pdf*
- Harmon, B. 2021. GHG Emissions Modeling for City of Salem Climate Action Plan. Personal interview. Verdis Group.
- Litman, T. (2021). Evaluating Active Transport Benefits and Costs Guide to Valuing Walking and Cycling Improvements and Encouragement Programs. *https://vtpi.org/nmt-tdm.pdf*
- Schoner, J.E., & Levinson, D.M. (2015). The Missing Link Bicycle Infrastructure Networks and Ridership in 74 US Cities. https://nacto.org/wp-content/uploads/2015/10/Schoner-and-Levinson_Missing-Link_Bike-Infrastructure-and-Ridership.pdf
- Volker, J., Handy, S., Kendall, A., & Barbour, E. (2019). Quantifying Reductions in Vehicle Miles Traveled from New Bike Paths, Lanes, and Cycle Tracks. https://ww2.arb.ca.gov/sites/default/files/classic//cc/capandtrade/auctionproceeds/bicycle_facilities_technical_041519.pdf
- Warncke, J. et al. (2021B). Cost estimates for bikeway from Downtown Salem to the Kroc Center. Personal Interview. City of Salem.

Strategy: Complete Salem's Sidewalk Network

Table 28: Cost to complete sidewalk network within ½ mile of bus stops

	Sidewalk on both sides of street			Sidewalk on one side of street	
	Average	**Low**	**High**	**Low**	**High**
Cost per linear foot	$1,836.83	$1,400	$2,100	$700	$1,050
Cost per mile	$9,698,462	$7,392,000	$11,088,000	$3,696,000	$5,544,000
Total Cost	$559,769,381	$426,646,523	$639,969,785	$213,323,262	$319,984,892

Table 29: Benefits of completing sidewalk network

Outcomes	**Value**	
	Low	**High**
Reduced VMT from increased walking/transit use - air, noise, and water benefits	$405,331	$61,772,414
Reduced GHG from reduced VMT	$121,508	$20,575,361
Improved physical health from increased physical activity	$162,132,320	$540,441,066
Total	**$162,659,158**	**$622,788,841**

Strategy-specific resources:

- Bricka, S. (2019). Personal Travel in Oregon: A Snapshot of Daily Household Travel Patterns. Oregon Department of Transportation. Salem, OR.
- City of Salem. (2020). Salem Transportation System Plan. https://www.cityofsalem.net/CityDocuments/tsp-full.pdf
- Harmon, B. 2021. GHG Emissions Modeling for City of Salem Climate Action Plan. Personal interview. Verdis Group.
- Litman, T. (2021). Evaluating Active Transport Benefits and Costs Guide to Valuing Walking and Cycling Improvements and Encouragement Programs. https://vtpi.org/nmt-tdm.pdf
- Volker, J., Handy, S., Kendall, A & Barbour, E. (2019). Quantifying Reductions in Vehicle Miles Traveled from New Pedestrian Facilities. https://ww2.arb.ca.gov/sites/default/files/classic//cc/capandtrade/auctionproceeds/pedestrian_facilities_technical_041519.pdf
- Salem-Keizer Area Transportation Study Staff. (2020) SKATS Regional Sidewalk Inventory Documentation.
- Romanek, R. (2021). Estimating length of missing sidewalk in Salem within 1/2 mile of bus stops on major and minor arterials and collector streets. City of Salem.
- Warncke, J. et al. (2021C). Cost estimates for completing the sidewalk network. Personal Interview. City of Salem.

Strategy: Create Bus Lanes (Shared Use Transit Lanes)

Table 30: Costs of Shared Use Transit Lanes on Core Network

	Total - Year 0		Years 1-5	
	Low	**High**	**Low**	**High**
Conversion of existing lane (white striping and signage)	$8,100,000	$16,200,000		
Red paint for bus lane	$10,800,000	$32,400,000		
Red paint for bus lane - maintenance every year			$540,000	$1,620,000
Enforcement (per camera)	$650,000	$3,000,000		
Signal prioritization (per intersection)	$450,000	$1,200,000		
Cherriots additional operating cost (starting year 1)			$1,632,490	$1,632,490
Total (54 miles of shared use transit lanes)	**$11,900,000**	**$36,600,000**	**$2,172,490**	**$3,252,490**
NPV - Low	**$21,212,979**			
NPV - High	**$49,995,584**			

Table 31: Benefits of Shared Use Transit Lanes on Core Network

Outcomes	Value	
	Low	**High**
Reduced VMT - Reduced vehicle operating costs from increased bus ridership	$914,982	$914,982
Reduced VMT - air, noise, water benefits from increased bus ridership	$813,317	$6,099,879
Reduced VMT - reduced GHG from substituting personal vehicle use for bus transportation	$243,812	$2,031,768
Total	**$1,972,111**	**$9,046,630**

Strategy-specific resources:

- Building Healthy Places Network. (2019). From Outcomes to Impact: An Exploratory Model for Estimating the Health Returns of Comprehensive Community Development . *https://www.buildhealthyplaces.org/content/uploads/2019/11/Build-Healthy-Places-Network-From-Outcomes-to-Impact-An-Exploratory-Model-for-Estimating-the-Health-Returns-of-Comprehensive-Community-Development.pdf*
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Strategy: Increase Tree Canopy

Table 32: Costs of Tree Incentive Programs

	Low	High
Cost per tree	$4	$775
Outreach	$1	$10
Administration (for whole program)	$6,000	$50,000
Administration cost per tree	$3.00	$333
Total Cost to City per Tree	**$8.00**	**$1,118**
Average maintenance cost per tree (NPV)	$576	$1,151
Total Cost per Tree	**$584**	**$2,270**

Table 33: Benefits of Tree Incentive Programs assuming (per household)

Outcomes	Value	
	Low	High
Increased property value	$672	$3,725
Reduced stormwater runoff/erosion	$13,125	$13,125
Increased recycling of water	$15,750	$15,750
Improved air quality	$26,250	$26,250
Increased carbon sequestration	$6	$53
Increased energy savings from shade	$127	$127
Total	$55,930	$59,030

Strategy: Increase Tree Canopy - Based on program participation rates

Costs are the same as the above strategy. The benefits are refactored here to control for the range of likelihoods that program outreach leads to program participation. Benefits have a wide range of projected values due to the highly uncertain participation rates by target community members. Assuming the City bears a cost for every household reached, the more those households end up participating and planting a tree, the greater the average benefits per household.

Table 34: Benefits of Tree Incentive Program (per household)

Outcomes	Value	
	Low	High
Increased property value	$7	$745
Reduced stormwater runoff/erosion	$131	$2,625
Increased recycling of water	$158	$3,150
Improved air quality	$263	$5,250
Increased carbon sequestration	$0	$11
Increased energy savings from shade	$1.27	$25
Total	$559	$11,806

Strategy-specific resources:

- City of Portland. (2021). Treebate. https://www.portlandoregon.gov/bes/51399
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Strategy: Make Home EV Charging Accessible to Renters

Table 35: Cost of EV Charging Stations

		New Construction		Retrofit	
		Per Building	Per parking space	Per Building	Per parking space
Scenario A: 10 Parking Space Building, two PEV Parking Spaces	Charging infrastructure	$1,840		$7,420	
	Level 2 Chargers	$24,510		$24,510	
	Total	**$26,350**	$13,175	**$31,930**	$15,965
Scenario B: 60 Parking Space Building, 12 PEV Parking Spaces	Charging infrastructure	$10,320		$28,440	
	Level 2 Chargers	$147,060		$147,060	
	Total	**$157,380**	$13,115	**$175,500**	$14,625
City Administration (Citywide)		$30,000		$60,000	

Table 36: Benefits of EV Charging Stations (per household)

Outcomes	Value	
	Low	High
Reduced GHG from increased EV adoption	$339	$11,297
Reduced cost of vehicle from increased EV adoption	$30	$119
Increased local economic development from increased EV adoption	$9	$120
Aggregate environment, health, economic development benefits from increased EV adoption	$136	$543
Total	**$513**	**$12,079**

Strategy-specific resources:

- California Energy Commission. (n.d.) Multi-Unit Dwelling Electric Vehicle Charging. https://www.sandag.org/uploads/projectid/projectid_511_25855.pdf
- Currey, Ganson, Miller, Fesler. (2015). Vehicle-Miles Traveled (VMT) Impacts on the Environment, Human Health, and Fiscal Health. State Smart Transportation Initiative. https://ssti.us/wp-content/uploads/sites/1303/2015/06/Ganson-VMT-Impacts-on-the-Environment-Human-Health-and-Fiscal-Health-Working-Paper-1.pdf
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Strategy: Solar-ready Construction

Table 37: Costs of Solar-ready Construction

	Photovoltaic (PV) System			Solar Hot Water System		
	New Construction	Retrofit	Difference in investment	New Construction	Retrofit	Difference in investment
2011 ($)	$1,729	$4,373	$2,644	$1,588	$4,645	$3,057
2021 ($)	$2,069	$5,233	$3,164	$1,900	$5,559	$3,658
City Administration (Citywide)	$30,000	$60,000		$30,000	$60,000	

Table 38: Benefits of Solar-ready Construction (per household)

Outcomes	Value	
	Low	High
Increased likelihood of installing solar PV - GHG savings	$19	$1,890
Increased likelihood of installing solar PV - utility bill savings	$149	$6,249
Total	**$168**	**$8,138**

Strategy-specific resources:

- Energy Trust of Oregon. (2020). Plan Ahead: Build Solar Ready.
- Frondel, M., & Vance, C. (2012). Heterogeneity in the Effect of Home Energy Audits – Theory and Evidence. Ruhr Economic Papers, No. 335.
- Harmon, B. 2021. GHG Emissions Modeling for City of Salem Climate Action Plan. Personal interview. Verdis Group.
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- Implementation Practices. *National Renewable Energy Laboratory Technical Report, https://www.nrel.gov/docs/fy12osti/51296.pdf*

B. Logic Models for each Strategy

The following logic models serve as the mapping of inputs needed and activities conducted to generate impacts in the Salem community. The benefit-cost analysis was built from these models to quantify the costs (inputs) and the benefits (long-term outcomes and impacts) included in the logic models. As strategies are developed and implemented these logic models can be refined to track the necessary resources and activities as well as quickly communicate the types of outcomes and impacts expected.

Table 39: Logic Model Key

1. HOW TO READ IT	2. RELATIONSHIP BETWEEN COLUMNS	3. PURPOSE	4. IN COMPARISON TO WHAT
Reads from left to right, with each column collectively influencing the column to its right and being influenced by the column on its left.	Individual cells do not necessarily link directly to those immediately on their left or right, although these specific causal chains will be established in our next steps.	Connects 'Inputs', those resources required to begin, with the projected final 'Impact' resulting and attributed to the City of Salem.	Outcomes and Impact described in the logic model are assumed to be in comparison to the City of Salem not implementing the designated strategy.

Note: Climate impacts in the far left column are aligned to the goals modeled for reducing Salem's GHG emissions. Strategies analyzed here will not necessarily achieve those goals on their own but they will support the collective achievement of them.

Table 40: Logic Models of each Strategy

Strategy	Inputs	Activities	Outputs	Short-term Outcomes	Intermediate Outcomes	Long-Term Outcomes	Impact
Charge for Parking	Paid parking system technology	Parking enforcement	Peak occupancy rate	Increased revenues to the City	Reduced congestion downtown	Increased opportunity for city growth and downtown employment growth	**Climate:**
	City staff time	Permitting	Violation rate	Reduced use of street parking in paid parking area	Increased use of other modes of transit to go downtown - bus, bike, walk	Reduced VMT	⊷ Reduce internal VMT by 10% per capita
	Maintenance of parking technology	Cleaning of structures	# of parking spaces	Increased use of parkades	Reduced fuel consumption	Reduced GHG emissions	
	Enforcement	Processing of parking tickets etc	# of pay stations	Increased cost to individuals to park downtown	Risk of increased cost burden on those dependent on personal vehicles	Reduced air pollution	**Equity:**
		Court for parking citations.			Reduced trips downtown (potentially)	Improved physical health from increased physical activity and reduced risk of asthma	Reduced noise and improve local air quality

Appendix 6

Strategy	Inputs	Activities	Outputs	Short-term Outcomes	Intermediate Outcomes	Long-Term Outcomes	Impact
Support energy efficiency and weather-ization of existing buildings	Funding (often federal sources) to be passed on to existing organizations	Coordination with federal funding sources			Increased home energy efficiency		**Climate:**
	City staff to administer funding and program eligibility	Fundraising and fund allocation	# of homes serviced	Increased access to weatherization services - particularly for low-income residents	Reduced utility bills - cost savings to residents	Reduced GHG from reduced electricity consumption	⊷ Improve average building efficiency (5% "now", 10% by 2050)
	Partner organizations to deliver the upgrades	Gatekeeping program eligibility	# of people impacted	Increased funding support to existing organizations	Increased comfort in home		**Equity:**
		Partner orgs implement upgrades	Average number of upgrades made per house		Improved in home air quality	Reduced air quality health effects	Improved health
					Increased property values to property owners	Increased financial well-being - reduced household cost burden	Increased resiliency
Energy Efficiency bench-marking in municipal buildings	City staff time - at least one FTE				Improved air quality	Increased worker productivity	**Climate:**
	Low tech:		# of properties tracked	Increased awareness of energy use	Increased energy savings		⊷ Improve average building efficiency (5% "now", 10% by 2050)
	Utility bills from all properties managed	Collection of utility bills	Sq Ft of properties tracked	Increased awareness of energy saving options	Increased willingness to pay for green spaces	Reduced mortality rates from reduced fine particle pollution (4% reduction in SF)	
		Data entry and follow up	Average KwH per Sq Ft		Reduced energy bills		
	High tech:				Increased property values (in case the city ever wants to sell buildings...)		
	Hawkeye monitor for tracking everything used.	Data tracking, aggregation, cleaning, reporting, communicating			Increased local economic activity		

Appendix 6

Strategy	Inputs	Activities	Outputs	Short-term Outcomes	Intermediate Outcomes	Long-Term Outcomes	Impact
Implement a gas tax	State tax collection mechanism	Planning and Marketing:					**Climate:**
	City staff time for planning	Public engagement	# of gallons of gas purchased in Salem	Additional funding for the City	Reduced gasoline consumption	Reduced GHG	⊷ Quadruple bus ridership
	Contractors	Ballot measure conducted	$ of tax revenue	Increased cost of gasoline	Increased hours worked	Increased transit use	⊷ Reduce external commuter VMT by 40% per capita
	Funding	Determine size of gas tax	# of people impacted		Risk of increased cost burden on those dependent on personal vehicles	Reduced VMT	⊷ Reduce internal VMT by 10% per capita
	Fees with County to get measure on the ballot	Implementation:				Improved air quality / reduced pollution	**Equity:**
	Public engagement funding needed	State collects additional gas tax from gas stations in Salem city limits.					Improved health
		State distributes funding to City					Reduced noise and improve local air quality
Connect bikeways		Planning, stakeholder engagement, prioritizing, bidding for projects, construction.	# of miles of bike network added	Increased awareness of bicycling options		Improved physical health (reduced risk of cardiovascular disease, cancers, diabetes and obesity)	**Climate:**
	City staff time for planning		# of miles of bike network connected	Increased comfort bicycling	Increased likelihood of bicycling instead of personal vehicle use	Increased quality of life	⊷ Reduce internal VMT by 10% per capita
	Bicycle riders		# of miles of 'family friendly' bike route		Reduced consumer costs for vehicle maintenance, parking, taxes etc.	Reduced congestion - Increased productivity (reduced urban congestion and travel times)	**Equity:**
	Contractors		Projected # daily users	Reduced car dependency		Reduced VMT	Improved economic inclusion
	Funding		# of jobs supported in construction			Increased air quality	Improved health
						Reduced GHG emissions	

Appendix 6

Strategy	Inputs	Activities	Outputs	Short-term Outcomes	Intermediate Outcomes	Long-Term Outcomes	Impact
Complete Salem's sidewalk network		Planning, stakeholder engagement, prioritizing, bidding for projects, construction.	# of miles of sidewalk added	Improved ease of providing transit service (for Cherriots)		Reduced congestion - Increased productivity (reduced urban congestion and travel times)	**Climate:**
	City staff time for planning				Increased use of public transit	Reduced VMT	⊷ Reduce internal VMT by 10% per capita
	Contractors		# of people with access to transit routes	Increased access to public transit	Increased property values	Improved physical health (reduced risk of cardiovascular disease, cancers, diabetes and obesity)	⊷ Quadruple bus ridership
	Funding			Reduced car dependency		Reduced mortalities and injuries from road related incidents	**Equity:**
	City Residents		# of jobs supported in construction	Increased percentage of trips walking or cycling	Reduced consumer costs for vehicle maintenance, parking, taxesetc.	Improved air quality (reduced PMs, SO2, NOx, other pollutants)	Improved health
						Reduced GHG emissions	Improved economic inclusion

Appendix 6

Strategy	Inputs	Activities	Outputs	Short-term Outcomes	Intermediate Outcomes	Long-Term Outcomes	Impact
Create bus lanes			% of buses on time			Reduced VMT	**Climate:**
	Funding	Planning, stakeholder engagement, prioritizing, bidding for projects, construction.	# of routes impacted by investment	Reduced travel time on public transit	Increased use of public transit	Reduced congestion	⊷ Reduce internal VMT by 10% per capita
	Cherriots staff time for planning and use of bus lanes	Cherriots training, routing of service, publication of route changes and time changes	# of riders impacted by investment (baseline figure)		Improved air quality	Reduced GHG emissions	
	Contractors			Increased ridership	Reduced fuel use	Increased productivity and growth - employment growth in urban areas.	**Equity:**
	Paint and signage for streets			Reduced delays	Reduced noise pollution	Improved quality of life	Improved health
	City planning time			Reduced congestion		Reduced health impacts from air quality	Improved economic inclusion
	Bus riders					Reduced mortalities and injuries from road related incidents	

Appendix 6

Strategy	Inputs	Activities	Outputs	Short-term Outcomes	Intermediate Outcomes	Long-Term Outcomes	Impact
Increase tree canopy	Funding from City	Incentives:	# of trees planted in target areas	Increased knowledge of tree care options	Increased tree cover	Increased property values	
	City staff time for administration of funding	Subsidized trees – either reduced cost via city procurement or via a coupon to a local nursery	# of trees receiving appropriate care/ maintenance	Increased affordability of trees - particularly for low income areas	Increased # of trees	Increased carbon sequestration	**Climate:**
	Supply of trees	Delivery, and planting done for property owner	Total costs offset for property owners			Increased lifespan of streets	⊷ Maximize carbon sequestration
	Property owners	Tree selection advice/ consultation by staff or Friends of Trees				Reduced runoff and erosion	
		Yard sign recognition or some other public award/ recognition				Improved air quality -	**Equity:**
						Reduced soil erosion	Improved health
		Follow up tree care for 2-3 year establishment period				Reduction of extreme heat	Reduced financial stress
						Increased visual, noise, heat, and wind buffers.	Reduced climate change vulnerability
							Reduced noise and improve local air quality

Appendix 6

Strategy	Inputs	Activities	Outputs	Short-term Outcomes	Intermediate Outcomes	Long-Term Outcomes	Impact
Make home EV charging accessible to renters	Funding	Plan Development	# of charging stations	Increased access to home charging infrastructure	Improved air quality (reduced PMs, SO2, NOx, other pollutants)	Reduced premature deaths and health impacts from air pollution	**Climate:**
	Community Members	Expert Engagement	# of families with access	Increased purchase of EV vehicles	Reduced health costs associated with poor air quality - cost per VMT avoided	GHG emissions reductions	Double EV rate from current projection
	City Staff	Community Engagement	# of families using the charging stations	Increased electricity use	Energy security (reduced oil dependence and exposure to price volatility)	Reduced environmental noise	
	Property owners and residents	Strategy implementation	# of jobs supported	Reduced gasoline use	Increased number of EV vehicles in Salem	Quality of life	**Equity:**
	Utility companies	Funding coordination			Fuel saving and reduced maintenance costs	Increased local economic activity and tax revenue	Reduced long-term financial burden
	Charging infrastructure	Contracting for installations	# of new developments		Increased economic efficiency		Reduced climate change vulnerability
	Incremental vehicle cost and Tier 1, Tier 2 electricity cost		Violation rate of newly constructed multi-family dwelling	Increased job creation for charging station construction and installation (Levy et al., 2020)			Reduced noise and improve local air quality
					Technological spillovers (e.g. battery technologies for consumer electronics) (Floater et al., 2016)		

Appendix 6

Strategy	Inputs	Activities	Outputs	Short-term Outcomes	Intermediate Outcomes	Long-Term Outcomes	Impact
Solar-ready new construction	Unknown responsibility for enforcement	Expert Engagement	# of people impacted	Increased awareness of solar installation possibilities	Increased likelihood of installing solar energy	Reduced GHG emissions from use of other electricity sources	**Climate:**
	Developers	Community Engagement		Increased inspections (for city)		Utility bill savings	⊷ Maximize onsite renewables (offset 90% of electricity on new construction)
	Pass thru of increased construction costs to property buyers	Strategy implementation					**Equity:**
		Enforcement					Reduced long-term financial burden
							Reduced climate change vullnerability

C. Scoping Process and Interviews conducted

The scoping process entailed a series of interviews with subject matter experts. The table below outlines those interviews conducted and the key takeaways from them.

Table 41: Interviews conducted

Date	Interviewees	Strategy(s) Discussed	Topic(s)	Additional Contacts	Meeting Takeaways
6.10.21	Rob Romanek (City of Salem), Julie Warncke (City of Salem)	Sidewalk network, bike network, BAT lanes	Cost estimations, use of language for BAT lanes		Julie can get figures to compare to our cost data points for sidewalk stuff. Need to work with the case study aspect, and make sure that we go with a case study that is informative and useful going forward– think timeline and feasibility. Bus only lane wouldn't fly, but made some comparisons between Bike Boulevard and the vision for bikeway. Rob and Will to follow up with Ted about language and what's being modeled, will discuss and rethink approach to costs included and borne by the city after.
6.7.21	Jay Ward (Energy Trust of Oregon)	Energy efficiency and weatherization, solar-ready new construction	Energy Trust of Oregon's work	John Savage, CAP manager on task force Jay: Talk to Wendy, Portland benchmarking expert	Jay: ETO delivers through four programs: residential, commercial, industrial/ag, and renewables. We can't spend resources into consumer-owned territory (Salem Electric), and need to consider quantifiable NEBs. In diversity lens, 3 subcomponents are rural, low income, and communities of color. Jay recommends being wary of costliness of energy assessment, splitting up residential and commercial, and looking into reach code & Past Net Zero program.
6.1.21	Lea Wilson (City of Portland - Treebate)	Tree canopy incentive	Tree incentive program insights		Treebate is cheap compared to Friends of Trees, but hands off/low cost is a tradeoff for less community engagement. Also a good tool for equity geography. Goal is to be able to plant trees to do well on their own, low maintenance. We want to incentivize private property planning, the target audience is a single family.

Appendix 6

Date	Interviewees	Strategy(s) Discussed	Topic(s)	Additional Contacts	Meeting Takeaways
5.27.21	Whitney Dorer (Friends of trees)	Tree canopy incentive	Tree planting and maintenance costs	Lea Wilson– lea.wilson@ portlandoregon. gov Matt at Arbor Day Foundation, they have Alliance for Community Trees	Discussed the importance of considering health/social implications as well as economic ones. Giveaways for trees won't work, incentives are needed. Touched on pushing partners to think about private property, maintenance to have lots of interest from schools, potential to depave areas but concerns over sidewalk damage, and necessity of having a stronger long-term strategy.
5.26.21	Shelly Ehenger (City of Salem), Michael Brown (City of Salem)	Energy efficiency and weatherization	Scoping strategy	Ingrid Munoz Energy Educator Community Action Agency Weatherization Program Ingrid.Munoz@ mwvcaa.org Lynette Brown <lbrown@ salemhousingor. com> Jimmy Jones at Energy Trust	State legislature passed new bills requiring solar-ready and EV charging stations. Our overall goals: keep people from being homeless, start with energy efficiency before moving to solar and electric. Discussed capacity issues across organizations and necessity of framing the city's role in BCA.
5.25.21	Jim Schmidt (City of Salem), Luke Bergerson(City of Salem), Alisha Garner (City of Salem)	Energy efficiency for municipal buildings	Scoping strategy		Direct focus on municipal buildings will allow for analysis to be feasible. For strategy, we want to be able to capture data of the energy efficiency of each building and find ways to increase efficiency. Alisha shared a document that lists projects, facilities managed and square footage.
5.24.21	Bob Barron (City of Salem), Josh Eggelston (City of Salem)	Gas tax	Scoping strategy		Equity issues must be discussed for regressive tax, and voters must be considered. Consideration is needed so as to not disincentivize electric vehicles. City bears very low cost of managing gas tax.

Appendix 6

Date	Interviewees	Strategy(s) Discussed	Topic(s)	Additional Contacts	Meeting Takeaways
5.20.21	Chris French (Cherriots), Ted Stonecliffe (Cherriots)	BAT lanes, sidewalk network	Scoping TBEST modeling		Modeling needed for bus signal/transit priority. Discussed integration with other modes of carshare/transit network companies. Recognized need to define the metrics for what outcomes are being tracked. Ted is most interested in having BCA for BAT lanes.
5.19.21	Patricia Farrell (City of Salem), Deborah Topp (City of Salem)	Tree canopy incentive	Scoping strategy	Friends of Trees– Whitney Dorer	Deborah can give info on costs associated with the free Tree Program for streamside residence to use as a frame of reference. The bigger question is the administrative burden of the entirety of the incentive program.
5.12.21	Rebai Tamerhoulet (City of Salem), Ryan Zinc (City of Salem)	Energy efficiency benchmarking (no longer pursuing)	Scoping strategy	Rebai says that Sheri is the best contact for downtown matters, not just energy efficiency	We need to understand what additional reward, other than recognition, this program intends to provide. Gaps: no business license, no way to inspect existing buildings for energy use (property tax data only would work for getting inventory of buildings), tenant paying for energy instead of owner means lack of incentive to change
5.10.21	Patricia Feeny (Cherriots), Roxanne Beltz (Cherriots), Ian Davidson (Cherriots), Kiki Dohman (Cherriots), Chris French (Cherriots)	TDM (no longer pursuing), BAT lanes, Sidewalk network	Scoping strategy		With regards to the trip reduction ordinance, the challenges on the statewide level are who implements this, who checks up on employers, transportation options and number of employees, etc. Equity factor of transportation must be considered. Cherriots is working on signal prioritization and queue jump lanes.
5.10.21	Sheri Wahrgren (City of Salem), Sara Long (City of Salem)	Charge for Parking	Scoping strategy		Salem is trying to change its culture, but overall it is very vehicle dependent. Considered means of making the model more sustainable, and details such as parking capacity, parking time restrictions, availability of bus passes, and "covering hidy holes" where people park for long time periods.

Appendix 6

Date	Interviewees	Strategy(s) Discussed	Topic(s)	Additional Contacts	Meeting Takeaways
5.7.21	Julie Warncke (City of Salem), Mike Jaffe (MWVCOG)	Charge for Parking, TDM (no longer pursuing), bike network, sidewalk network, BAT lanes	Scoping strategies	Karen Williams of DEQ, picks members of rulemaking committee	Talked about urgency to know which entity is setting definitions for terminology that could be up for interpretation. Discussed and weighed charging for parking, trip reduction ordinance for Salem employees, connecting bikeways, connecting sidewalk network, and dedicated bus lanes.
5.5.21	Eunice Kim (City of Salem), Lisa Anderson-Ogilvie (City of Salem), Glenn Davis (City of Salem)	SDCS for walkable neighborhoods (no longer pursuing), EV charging, Setback requirements (no longer pursuing)	Scoping strategies	3 counselors: Anderson. Nordyke, and Gonzalez	Discussed the importance of language and scoping strategies. Talked about 3 main strategies: reform SDCs to support walkable mixed-use neighborhoods (ITE manual for nationwide standards), make home EV charging accessible to renters (financial incentive needed), and setback requirements
4.22.21	Eunice Kim (City of Salem), Julie Warncke (City of Salem)	All original strategies selected by Councilors	Scoping all strategies	Roxane Belt–Cherriots Trip Choice Ryan Zinc (on staff advisory group) Mike Jaffe (Brian's contact for discussing connecting bike/walkways) Chris French at Cherriots–best contact for talking about creating dedicated bus lanes	Strategies and ideal language were laid out and clarified. Concluded that more info specific to Salem was needed to combat evidence gaps (e.g. who is taking trips, who is employed, etc.)

D. Strategies removed from this Analysis

As a part of the scoping process of this analysis, strategies selected by City Councilors were then shared with subject matter experts to determine the feasibility of analyzing the given subject and the benefit of doing so given the existing activities of the City, State, and other organizations. This process led to the removal and replacement of four of the original strategies selected by Councilors. The table below includes the description of each and the reasoning behind their removal.

Table 42: Strategies removed from analysis

Strategy	Description	Rationale for Removal/Replacement of Strategy from Scope of Work
Trip reduction ordinance for Salem employers	Implement a trip reduction ordinance of Salem employers for the purposes of reducing single-occupancy VMT.	*Strategy is under development at the State level and overlaps with efforts underway and in development at Cherriots. Costs may not apply to the City of Salem either, but more so to Cherriots. Also, it may be more appropriate to model a scenario that would align with what the State is going to be putting forward later this year.*
Reform SDCs to support walkable, mixed use neighborhoods	Reform the City's system development charges (SDCs) to support and encourage development in walkable mixed-use neighborhoods. Reduce SDCs for infill development. Waive SDCs for affordable housing. Reduce transportation SDCs for mixed-use, multistory and developments that provide less or no parking. SDCs should be revised so that outlying areas pay the full cost of providing needed infrastructure. The City should also require new developments in outlying areas to have storm runoff catchment structures to mitigate the vast majority of increased runoff.	*The City is essentially already using SDCs to encourage mixed-use and compact development. City staff also noted that storm runoff is already addressed in our local plans and regulations through green stormwater infrastructure and flow control structures. While there is potential to look at the implications of changing how transportation SDCs are assessed and utilized, this value is based on a nationwide standard. Even with a significant rescoping of the strategy, a BCA does not appear of value.*
Remove setback requirements	Remove setback requirements to allow for more dense development, which in turn promotes walkable neighborhoods.	*With regard to mixed-use zones, the City code already has maximums, not minimums. If we assume it is intended to be applied more broadly, such as multi- and single-family residential zones, then there are both obstacles to having a manageable scope for this analysis and conflicts with other proposed CAP ideas, such as expanding the City's urban tree canopy cover. Going forward, as a part of Our Salem the City has a subcommittee of Councilors and Planning Commission members that are looking at six zoning options focused specifically on requiring denser development which may be positioned to better address this strategy and in a more comprehensive manner.*

Strategy	Description	Rationale for Removal/Replacement of Strategy from Scope of Work
Energy Efficiency benchmarking and reward system	Implement energy benchmarking and transparency policies in existing buildings with a publicly available "reward" system recognizing those who do well and a "recommendations" system that requires the property owners of lower-performing buildings to take action for improvement.	*The analysis is not feasible for this project due to limited data availability to inform what buildings would be included, their size and their baseline energy use. The strategy was instead repurposed to focus on municipal buildings only.*

E. Bibliography

The following section details the resources used to build the benefit and cost estimates noted in the body of this report.

Each resource in the bibliography is relevant to a given strategy or set of strategies. The following table clarifies the hierarchy of resource categorization used. The right hand column of the bibliography assigns each resource to one of the themes or sub-themes. This can be used to quickly search for those resources that were relevant to a particular strategy(s).

Table 43: Impact themes to categorize bibliography

	All strategies		
Impact Theme	**Energy**	**Development**	**Transportation Strategies**
Sub-Themes - aligned to Specific Strategies	Benchmarking energy use	Tree canopy	Multi-family EV charging stations
	Weatherization		Charge for parking
	Solar-ready New Construction		Create bus lanes
			Sidewalk network
			Bicycle network
			Gas tax

In addition to a breakdown of the theme of each resource, this analysis also categorizes each resource by its level of evidence of causality (if relevant). This is to sort resources by the strength of their causal argument, with levels of evidence of 1 or 2 being stronger studies compared to studies that are a 5 or 6. Whenever possible, studies with higher levels of evidence are utilized.

Appendix 6

Table 44: Levels of Evidence of Causality – Ranked from highest to lowest, 1 to 7

Levels of Evidence of Causality (1 is highest, 7 is lowest)	
1	Evidence from a systematic review or meta-analysis of all relevant RCTs (randomized controlled trial) or evidence-based clinical practice guidelines based on systematic reviews of RCTs or three or more RCTs of good quality that have similar results.
2	Evidence obtained from at least one well-designed RCT (e.g. large multi-site RCT).
3	Evidence obtained from well-designed controlled trials without randomization (i.e. quasi-experimental).
4	Evidence from well-designed case-control or cohort studies.
5	Evidence from systematic reviews of descriptive and qualitative studies (meta-synthesis).
6	Evidence from a single descriptive or qualitative study.
7	Evidence from the opinion of authorities, reports of expert committees and/or non-impact resources (e.g. census data).

In Table 45 specific sources referenced or whose figures were directly used, are included. Each study is ranked by its level of evidence and includes its relevant finding. This helps to communicate the relative strength of the findings estimated and used. Whenever possible, the highest level of evidence is utilized.

Table 45: Bibliography

LOE	Study	Relevant Finding	Strategy
Level 1: Meta-analysis of RCTs			
Level 2: Randomized Control Trials (RCTs)	Li, S., Linn. J., & Muehlegger, E.J. (2012). Gasoline Taxes and Consumer Behavior. *HKS Faculty Research Working Paper Series RWP12-006.*	Gas taxes result in a semi-elastic changes in gas consumption	Gas tax
Level 3: Quasi-experimental analyses			

Appendix 6

LOE	Study	Relevant Finding	Strategy
Level 4: Case Control/ Cohort Studies	Boarnet, M., Burinskiy, E., Deadrick, L., Gullen, D., & Ryu, N. (2017) The Economic Benefits of Vehicle Miles Traveled (VMT)-Reducing Placemaking: Synthesizing a New View. *A National Center for Sustainable Transportation Research Report*	Walkability can increase property values and business activity	Land Use
	Buehler, R. & Dill, J. (2016). Bikeway Networks: A Review of Effects on Cycling. *Transport Reviews, 36:1, 9-27.*	Each mile of bike lane is associated with about 1% increase in bike commuters	Bicycle Network
	Building Healthy Places Network. (2019). From Outcomes to Impact: An Exploratory Model for Estimating the Health Returns of Comprehensive Community Development . *https://www.buildhealthyplaces.org/content/uploads/2019/11/Build-Healthy-Places-Network-From-Outcomes-to-Impact-An-Exploratory-Model-for-Estimating-the-Health-Returns-of-Comprehensive-Community-Development.pdf*	Use of public transportation can save direct costs	Create bus lanes
	Carleton, T., & Greenstone, M. (2021). Updating the United States Government's Social Cost of Carbon. *University of Chicago, Becker Friedman Institute for Economics Working Paper No. 2021-04: 7.*	Social Cost of Carbon is estimated at over $125 per ton	All strategies
	City of Salem Public Works Department. (2014). City of Salem Community Forestry Strategic Plan. *https://www.cityofsalem.net/CityDocuments/community-forestry-strategic-plan-2014.pdf*	Trees provide a multitude of co-benefits	Tree canopy
	Dell, M., Jones, B.F., & Olken, B.A. (2012). Temperature Shocks and Economic Growth: Evidence from the Last Half Century. *American Economic Journal: Macroeconomics 2012, 4(3): 66–95.*	Higher temperatures reduce economic growth in poor countries	All strategies
	Escobedo, F.J., Adams, D.C., & Timilsina, N. (2015) Urban forest structure effects on property value. *Ecosystem Services, Volume 12, 209-217.*	Property values increases over $1500 per tree	Tree Canopy
	Frank, L., Sallis, J., Conway, T., Chapman, J., Saelens, B., & Bachman, W. (2006). Many Pathways from Land Use to Health: Associations between Neighborhood Walkability and Active Transportation, Body Mass Index, and Air Quality. *Journal of the American Planning Association. 72. 75-87.*	Increased walkability can increase physical activity and reduce VMTs	All strategies
	Harmon, B. 2021. GHG Emissions Modeling for City of Salem Climate Action Plan. Personal interview. Verdis Group.	The per unit reduction of CO2e varies by strategy and changes over time	All strategies
	Holland, S.P., Mansur, E.T., Muller, N.Z., & Yates, A.J. (2015). Environmental Benefits from Driving Electric Vehicles?. *National Bureau of Economic Research Working Paper 21291.*	The environmental benefit of EVs varied by the source of electricity	Multi-family EV charging stations

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LOE	Study	Relevant Finding	Strategy
Level 4: Case Control/ Cohort Studies	Iroz-Elardo N, Hamberg A, Main E, Haggerty B, Early-Alberts J, Cude C. (2014). Climate Smart Strategy Health Impact Assessment. *Oregon Health Authority.*	Reduced VMT can reduce morbidity	Transportation strategies
	Litman, T. (2021). Evaluating Active Transport Benefits and Costs Guide to Valuing Walking and Cycling Improvements and Encouragement Programs. *https://vtpi.org/nmt-tdm.pdf*	The benefits of active transport often outweigh the costs	Sidewalk network; Bicycle network
	Lustgarten, A. (2020) How Climate Change Is Contributing to Skyrocketing Rates of Infectious Disease. *https://www.propublica.org/article/climate-infectious-diseases*	Climate change can increase infectious disease	All strategies
	Malmgren, I. (2016). Quantifying the Societal Benefits of Electric Vehicles. *World Electric Vehicle Journal Vol. 8.*	EVs can save $1,500 over traditional vehicles	Multi-family EV charging stations
	Miller, H. J., Tribby, C. P., Brown, B. B., Smith, K. R., Werner, C. M., Wolf, J., Wilson, L. & Oliveira, M. G. (2015). Public transit generates new physical activity: Evidence from individual GPS and accelerometer data before and after light rail construction in a neighborhood of Salt Lake City, Utah, USA. *Health & Place, 36, 8–17.*	Use of transit is associated with increased physical activity	Create bus lanes
	New York State Energy Research and Development Authority (NYSERDA). (2019). Benefit-Cost Analysis of Electric Vehicle Deployment in New York State. *NYSERDA Report Number 19-07. nyserda.ny.gov/publications.*	EVs create a net societal benefit of over $700 each	Multi-family EV charging stations
	Oregon Health Authority (2015) Community Climate Choices Health Impact Assessment *https://www.oregonmetro.gov/sites/default/files/2015/05/29/Community_Choices_HIA_Summary.pdf*	Boosting active transportation can reduce mortality rates	All strategies
	Picker, L. (2004). The Effect of Gasoline Taxes on Work Effort. *The National Bureau of Economic Research Digest, July 2004.*	Gas tax can increase hours worked	Gas tax
	Schoner, J.E., & Levinson, D.M. (2015). The Missing Link Bicycle Infrastructure Networks and Ridership in 74 US Cities. *https://nacto.org/wp-content/uploads/2015/10/Schoner-and-Levinson_Missing-Link_Bike-Infrastructure-and-Ridership.pdf*	Increased bicycle facilities can increase bicycle ridership	Bicycle network
	Schwartz, H. L., Curtright, A. E., Ogletree, C., Thornton, E., & Jonsson, L. (2018). Energy Efficiency as a Tool for Preservation of Affordable Rental Housing. RAND Corporation, Santa Monica, California.	Cost savings from energy efficiency can support housing affordability	Weatherization
	Spears, S., Boarnet, M. G., & Handy, S. (2014). Impacts of Parking Pricing and Parking Management on Passenger Vehicle Use and Greenhouse Gas Emissions. *Policy, 9,* 30.	Charging for parking can reduce regional VMT by about 2%	Charge for parking

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LOE	Study	Relevant Finding	Strategy
Level 4: Case Control/ Cohort Studies	Stonecliffe, T. (2021). Estimating the increased ridership and Cherriots operating costs for shared use transit lanes on Core Network. Personal interview. Cherriots.	An estimated 713,944 additional rides per year are projected, a 20% increase in bus ridership.	Create bus lanes
	US EPA 2016. Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Value	The Social Cost of Carbon has a median value of approximately $50 per metric ton in 2021	All Strategies
	Volker, J., Handy, S., Kendall, A., & Barbour, E. (2019). Quantifying Reductions in Vehicle Miles Traveled from New Bike Paths, Lanes, and Cycle Tracks. *https://ww2.arb.ca.gov/sites/default/files/classic//cc/capandtrade/auctionproceeds/bicycle_facilities_technical_041519.pdf*	Cyclists are more likely to switch from transit than from personal vehicles	Bicycle network
	Volker, J., Handy, S., Kendall, A & Barbour, E. (2019). Quantifying Reductions in Vehicle Miles Traveled from New Pedestrian Facilities. *https://ww2.arb.ca.gov/sites/default/files/classic//cc/capandtrade/auctionproceeds/pedestrian_facilities_technical_041519.pdf*	Sidewalk coverage boosts likelihood and amount of walking by residents	Sidewalk network
	Wolf, K.L. (2015). Invest From the Ground Up! The Benefits and Economics of City Trees and Greening. *In: Johnston, M., and Percival, G. (eds.) Trees, People and the Built Environment II. Institute of Chartered Foresters: Edinburgh.*	Trees support increased property values	Tree Canopy
	Wolf, K.L. & Robbins, A.S.T. (2015). Metro nature, environmental health, and economic value. *Environmental Health Perspectives 123, 5:390-8.*	Tree provide many co-benefits	Tree Canopy

LOE	Study	Relevant Finding	Strategy
Level 5: Systematic Review of Descriptive Studies	Bento, A.M., Goulder, L.H., Jacobsen, M.R., & Von Haefen, R.H. (2009). Distributional and Efficiency Impacts of Increased US Gasoline Taxes. *American Economic Review 2009, 99:3, 667–699.*	Use of gas tax revenue determines the equity of the policy	Gas tax
	Bhattacharya, T., Mills, K. & Mulally, T. (2019). Active Transportation Transforms America The Case for Increased Public Investment in Walking and Biking Connectivity. *https://www.railstotrails.org/media/847675/activetransport_2019-report_finalreduced.pdf*	Financial and health benefits from active transportation are potentially very large	Transportation Strategies
	Boarnet, M.G., Bostic, R., Williams, D., Santiago-Bartolomei, R., Rodnyansky, S., & Eisenlohr, A. (2017). Affordable Housing in Transit-Oriented Developments: Impacts on Driving and Policy Approaches. *A National Center for Sustainable Transportation Research Report.*	No formal benefit-cost analysis of locating affordable housing near transit has been conducted.	Land Use
	Chapman, R., Keall, M., Howden-Chapman, P., Grams, M., Witten, K., Randal, E., & Woodward, A. (2018). A Cost Benefit Analysis of an Active Travel Intervention with Health and Carbon Emission Reduction Benefits. *International journal of environmental research and public health, 15(5), 962.*	Quality of evidence in active travel intervention is weak	Transportation Strategies

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LOE	Study	Relevant Finding	Strategy
Level 5: Systematic Review of Descriptive Studies	Nguyen, V.D., Roman, L.A., Locke, D.H., Mincey, S.K., Sanders, J.R., Fichman, E.S., Duran-Mitchell, M., & Tobing. S.L. (2017). Branching out to residential lands: Missions and strategies of five tree distribution programs in the U.S. *Urban Forestry & Urban Greening, Volume 22,24-35.*	Free tree giveaways are a more common incentive	Tree canopy
	Stern, N., & Stiglitz, J.E. (2021) The Social Cost of Carbon, Risk, Distribution, Market Failures: An Alternative Approach. *National Bureau of Economic Research Working Paper 28472.*	Social cost of carbon is likely above $100 per ton by 2030	All strategies

LOE	Study	Relevant Finding	Strategy
Level 6: Single Descriptive/ Qualitative Study	California Energy Commission. (n.d.) Multi-Unit Dwelling Electric Vehicle Charging. *https://www.sandag.org/uploads/projectid/projectid_511_25855.pdf*	Tracking electricity use by tenant is a challenge with EV charging in multi-family units	Multi-family EV charging stations
	City of Portland. (n.d.). About the Rose Lane Project. *https://www.portland.gov/transportation/rose-lanes/about-rose-lanes*	Rose lanes in Portland provide priority lanes to buses	Create bus lanes
	Energy Trust of Oregon. (2020). Plan Ahead: Build Solar Ready.	Energy savings per year from solar PV can amount to $800 per year on single family homes	Solar ready new construction
	Engel, H., Hensley, R., Knupfer, S., & Sahdev, S. (2018) Charging Ahead: Electric-Vehicle Infrastructure Demand. *https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/charging-ahead-electric-vehicle-infrastructure-demand#*	Lack of efficient charging stations are the top barrier for would be EV buyers	Multi-family EV charging stations
	Floater, G., Heeckt, C., Ulterino, M., Mackie, L., Rode, P., Bhardwaj, A., Carvalho, M., Gill, D., Bailey, T., & Huxley, R. (2016). Co-benefits of urban climate action: A framework for cities. *A working paper by the Economics of Green Cities Programme, LSE Cities, London School of Economics and Political Science*	There are numerous economic, social and environmental co-benefits from urban climate action	All strategies
	Frondel, M., & Vance, C. (2012). Heterogeneity in the Effect of Home Energy Audits – Theory and Evidence. *Ruhr Economic Papers, No. 335.*	Audit results can be a leading reason for pursuing retrofits	Weatherization
	Hart, Z. (2015). The Benefits of Benchmarking Building Performance. *IMT and Pacific Coast Collaborative.*	Benchmarking energy use can support reduced energy consumption	Benchmarking energy use
	Ko, Y., Lee, J.H., McPherson, E.G., & Roman, L.A. (2015), Long-term monitoring of Sacramento Shade program trees: *Tree survival, growth and energy-saving performance. Landscape and Urban Planning, Volume 143, 183-191.*	Long-term survivorship of trees from public program was 42%	Tree Canopy
	Kontokosta, C.E., Spiegel-Feld, D. & Papadopoulos, S. (2020). The impact of mandatory energy audits on building energy use. *Nat Energy 5, 309–316.*	Energy audits reduce energy use by 2.5% in multifamily units	Weatherization

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LOE	Study	Relevant Finding	Strategy
Level 6: Single Descriptive/ Qualitative Study	Levy, J., Riu, I. & Zoi, C. (2020) The Costs of EV Fast Charging Infrastructure and Economic Benefits to Rapid Scale-Up. *https://a.storyblok.com/f/78437/x/f28386ed92/2020-05-18_evgo-whitepaper_dcfc-cost-and-policy.pdf*	Charging costs vary by type of charger	Multi-family EV charging stations
	McPherson, E. G., Simpson, J. R., Peper, P. J., Gardner, S. L., Vargas, K. E., Maco, S. E., & Xiao, Q. (2006). Piedmont community tree guide: benefits, costs, and strategic planting. *Gen. Tech. Rep. PSW-GTR-200. Albany, CA: US Department of Agriculture, Forest Service, Pacific Southwest Research Station. 99 p, 200.*	Annualized maintenance costs for a tree are approximately $30	Tree Canopy
	Metropolitan Transportation Commission. (n.d.). MCT's VPP Parking Project Parking Policy Best Practice and Case Study Examples. *https://parkingpolicy.com/supply-demand/*	On-street parking must be much higher than off-street to achieve same occupancy	Charge for parking
	Nicholas, M. (2019). Estimating Electric Vehicle Charging Infrastructure Costs Across Major U.S. Metropolitan Areas. *The International Council on Clean Transportation Working Paper 2019-14.*	Installation costs of a level 2 charger are approximately $3,000	Multi-family EV charging stations
	Pike, E., Steuben, J., & Kamei, E. (2016). Plug-In Electric Vehicle Infrastructure Cost-Effectiveness Report for San Francisco. *A Report for the City and County of San Francisco by Energy Solutions on behalf of the PG&E Codes and Standards program.*	It is significantly cheaper to integrate EV infrastructure into new construction than retrorfitting	Multi-family EV charging stations
	PlanIT Geo, LLC. (2019). Urban Tree Canopy Assesment. *https://www.cityofsalem.net/citydocuments/tree-canopy-assessment-report-2019.pdf*	Trees in Salem provide air, water quality, and Carbon sequestration benefits	Tree canopy
	Rick Williams Consulting. (2018). Downtown Salem 2018 Parking Report. *Prepared for City of Salem.*	Paid parking on-street has been recommended to Salem	Charge for parking
	Salem-Keizer Area Transportation Study Staff. (2020) SKATS Regional Sidewalk Inventory Documentation.	Missing sidewalk in Salem City limits is about 97 miles	Sidewalk network
	Seattle Department of Transportation. (2020). 2019 Paid Parking Study Report. *http://www.seattle.gov/Documents/Departments/SDOT/ParkingProgram/PaidParking/FINAL_2019_PaidParkingStudy_Report.pdf*	Paid parking can create many benefits for society	Charge for parking
	Seattle Office of Sustainability and Environment. (2018). Seattle Energy Benchmarking Analysis Report. *https://www.seattle.gov/Documents/Departments/OSE/Seattle%20Energy%20Benchmarking%20Analysis%202016%20for%20web.pdf*	Seattle saw reduced energy use from benchmarking even as occupancy rates increased	Benchmarking energy use
	Seiden, K., Luboff, J., Chwastyk, D., Merchant, E., Russell, R., Cooper, S., ... & Rode, M. (2015). New York City Benchmarking and Transparency Policy Impact Evaluation Report.	Energy benchmarking in New York City lead to upwards of 8% energy savings over 5 years	Benchmarking energy use

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LOE	Study	Relevant Finding	Strategy
Level 6: Single Descriptive/ Qualitative Study	Taylor, N.W., Searcy, J.K., & Jones, P.H. (2019). Cost Savings from Energy Retrofits in Multifamily Buildings. https://www.macfound.org/media/files/hhm_brief_-_cost_savings_from_energy_retrofits_in_multifamily_buildings.pdf	Energy retrofits in multi-family units average $4,400	Weatherization
	U.S. Department of Energy. (2018). Weatherization Works!. *https://www.energy.gov/sites/prod/files/2018/03/f49/WAP-fact-sheet_final.pdf*	Weatherization per unit averages over $4,000 while creating almost $300 in annual energy savings	Weatherization
	U.S. Department of Housing and Urban Development. (2011). Quantifying Energy Efficiency in Multifamily Rental Housing. *https://www.huduser.gov/portal/publications/EM_Newsletter_Summer_2011_FNL.pdf*	Retrofits from weatherization result in 30% energy savings	Weatherization
	Watson, A., Giudice, L., Lisell, L., Doris, L., & Busche, S. (2012). Solar Ready: An Overview of Implementation Practices. *National Renewable Energy Laboratory Technical Report, https://www.nrel.gov/docs/fy12osti/51296.pdf*	Building solar-ready can save thousands in costs	Solar-ready New Construction
	Currey, Ganson, Miller, Fesler. (2015). Vehicle-Miles Traveled (VMT) Impacts on the Environment, Human Health, and Fiscal Health. State Smart Transportation Initiative. https://ssti.us/wp-content/uploads/sites/1303/2015/06/Ganson-VMT-Impacts-on-the-Environment-Human-Health-and-Fiscal-Health-Working-Paper-1.pdf	Per VMT, light vehicles emit 2.8 g of CO	Multi-family EV charging stations
	Valderrama, P., Boloor, M., Statler, A., Garcia, S. (2019). Electric Vehicle Charging 101. Natural Resources Defense Council. https://www.nrdc.org/experts/patricia-valderrama/electric-vehicle-charging-101	80% of EV charging is done at home	Multi-family EV charging stations
	Barron, R., and Eggelston, J. (2021). Preliminary Gas Tax analysis for City of Salem. Personal Interview. City of Salem.	A gas tax for Salem could generating $2-4 million of additional annual revenue	Gas tax
	Facilities Services Division, City of Salem. (2020). Lighting and HVAC Project Incentives. Personal Interview. City of Salem.	Energy retrofits save 30-70% of energy	Benchmarking energy use

LOE	Study	Relevant Finding	Strategy
Level 7: Expert Opinion or Non-impact statistic	Bricka, S. (2019). Personal Travel in Oregon: A Snapshot of Daily Household Travel Patterns. Oregon Department of Transportation. Salem, OR.	9% of trips on a typical day in Salem are walking trips	Sidewalk network
	California Air Resources Board. (2021) CALIFORNIA CAP-AND-TRADE PROGRAM: SUMMARY OF CALIFORNIA-QUEBEC JOINT AUCTION SETTLEMENT PRICES AND RESULTS	Carbon prices per metric ton in California have ranged from $15-18 over past 3 years	All Strategies

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LOE	Study	Relevant Finding	Strategy
Level 7: Expert Opinion or Non-impact statistic	Cascadia Partners. (2019). Community Greenhouse Gas Inventory. *https://www.cityofsalem.net/citydocuments/final-community-greenhouse-gas-inventory.pdf*	In 2016, Salem generated about 9.59 metric tons of CO2e per capita	All Strategies
	City of Salem. (2019). Salem 2019 Tree Reports.	Salem's tree canopy is improving	Tree Canopy
	City of Portland. (2021). Treebate. *https://www.portlandoregon.gov/bes/51399*	TreeBate in Portland provides credits annually to city utility bills	Tree Canopy
	Farrell, P. City of Salem - Permit Desk. (2021). Tree planting and maintenance cost. Personal Interview.	Cost of a tree planting and early maintenance is upwards of $800	Tree Canopy
	City of Salem. (2021). Our Salem Vision. *https://www.cityofsalem.net/CityDocuments/our-salem-vision-2021.pdf*	Salem envisions a livable, equitable, carbon neutral city	All Strategies
	City of Salem. (2020). Salem Transportation System Plan. *https://www.cityofsalem.net/CityDocuments/tsp-full.pdf*	Salem's transportation planning is extensive and closely related to climate action planning	Transportation Strategies
	City of Vancouver Washington. (2021). Treefund: Vancouver's Tree Refund Program. *https://www.cityofvancouver.us/publicworks/page/treefund*	Vancouver combines a subsidized tree purchase with a utility bill credit	Tree Canopy
	Dane, A., & Peterson, A. (2021). 6 Innovative Ways to Fund Climate Action and Equity in US Cities. *https://www.wri.org/insights/funding-models-climate-equity-cities-us*	Innovative use of taxes and bonds can support climate action funding	All Strategies
	Facilities Services Division, City of Salem. (2021). City Wide Building Square Footage Snapshot.	Salem Facilities Services manages over 600,000 square feet	Benchmarking energy use
	Finance Department, City of Salem. (2019). Comprehensive Annual Financial Report.	Number of staff working for the City of Salem	Benchmarking energy use
	Lane Transit District. (n.d.). Business Access & Transit Lanes (BAT Lanes). *https://www.ltd.org/business-access-transit-lanes/*	BAT lanes can boost bus efficiency	Create bus lanes
	Lockwood Research. (2017). Cherriots Community Survey Report. *https://www.cityofsalem.net/CityDocuments/salem-city-council-public-transit-committee-cherriots-community-survey-report-2017.pdf*	About 10% of Salem residents use transit	Create bus lanes
	Maus, J. (2019). Portland's Cheap and Easy Bus Lane Projects Are Working Well. *https://bikeportland.org/2019/11/26/portlands-cheap-and-easy-bus-lane-projects-are-working-quite-well-308032*	Bus lanes can be implemented relatively cheaply	Create bus lanes
	Mid-Willamette Valley Community Action. (n.d.). Weatherization. *https://mwvcaa.org/programs/weatherization/*	Reference for existing activities and income eligiblities in Mid-Willamette Valley	Weatherization

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LOE	Study	Relevant Finding	Strategy
Level 7: Expert Opinion or Non-impact statistic	Mid-Willamette Valley Community Action. (2020). Weatherization Quarterly Data report: for Low-Income Home Energy Assistance Program (LIHEAP) and Oregon Energy Assistance Program (OEAP). State of Oregon.	Weatherizing homes can save significant amounts of energy	Weatherization
	Oregon State Legislature - House Bill 2180. (2021). 81st OREGON LEGISLATIVE ASSEMBLY--2021 Regular Session. State of Oregon. https://olis.oregonlegislature.gov/liz/2021R1/Measures/Overview/HB2180	The State of Oregon will require new construction of multi-family dwellings (5+ units) to include conduit for charging stations	Multi-family EV charging stations
	Romanek, R. (2021). Estimating length of missing sidewalk in Salem within 1/2 mile of bus stops on major and minor arterials and collector streets. Personal Interview. City of Salem.	Over 50 miles of sidewalk is missing in Salem that would be within 1/2 mile of a bus stop	Sidewalk network
	Seattle Office of Sustainability and Environment. (2017). Implementation of Energy Benchmarking, Disclosure, and Reporting Requirement. *http://www.seattle.gov/Documents/Departments/OSE/DR2017.01EBRFinal.pdf*	Energy Star Portfolio manager can be used to track building energy use	Benchmarking energy use
	Teller, S. (2021). Free Tree Cost Report. *Clean Streams Initiative, City of Salem.*	Cost of free tree program for streamside trees	Tree Canopy
	Washington Metropolitan Area Transit Authority. (2014). What's a Transit "Walk Shed"?. *https://planitmetro.com/2014/06/10/whats-a-walk-shed-to-transit/*	Walk sheds can be used to determine area within walking distance to a bus stop	Create bus lanes
	Wahrgren, S. and Long. S. (2021). Estimating costs and revenues of paid parking system downtown. Personal Interview. City of Salem	Net revenues from implementing paid parking may be greater than $1.6 million per year for the City	Charge for parking
	Wahrgren, S. and Long. S. (2021). Estimating costs and revenues of paid parking system downtown. Personal Interview. City of Salem	Net revenues from implementing paid parking may be greater than $1.6 million per year for the City	Charge for parking
	Warncke, J. et al. (2021A). Cost estimates for shared use transit lanes on the Core Network. Personal Interview. City of Salem.	Costs to the City are estimated at $476,000 per mile, and maintenance every 10 years at $142,000 per mile.	Create bus lanes
	Warncke, J. et al. (2021B). Cost estimates for bikeway from Downtown Salem to the Kroc Center. Personal Interview. City of Salem.	Cost to complete the bikeway are estimated at $2,616,000 to $3,866,000	Bicycle network
	Warncke, J. et al. (2021C). Cost estimates for completing the sidewalk network. Personal Interview. City of Salem.	Cost of sidewalk construction is estimated at $1400 to $2100 per linear foot (assuming both sides of street).	Sidewalk network

F. Salem Resources provided by Subject Matter Experts

Ecotone has aggregated resources provided by subject matter experts in the table below. Many of these are cited in the full bibliography above. Others are complementary resources, providing insights about the Salem area, or were resources specific to strategies that were removed from the scope of this analysis. Those resources that do not have a publicly accessible web address are also housed in this folder.

Table 46: Resources from Subject Matter Experts

Resource	Theme	Link
Climate Smart Strategy: Healthy Impact Assessment	All Strategies	https://www.oregonmetro.gov/sites/default/files/2015/05/29/CSC-OHA-HealthImpactAssessment-ClimateSmartStrategy-092014.pdf
Climate Action Plan City of Salem Project Resources	All Strategies	https://salemclimateactionplan.com/project-resources
Salem, OR - Community Greenhouse Gas Inventory	All Strategies	https://www.cityofsalem.net/citydocuments/final-community-greenhouse-gas-inventory.pdf
Understanding Salem's Greenhouse Gas Emissions Inventories	All Strategies	https://www.cityofsalem.net/CityDocuments/Understanding-Salems-Greenhouse-Gas-Emssions.pdf
City of Salem, Oregon 2016 Consumption-Based Greenhouse Gas Inventory	All Strategies	https://www.cityofsalem.net/CityDocuments/Salem-2016-Consumption-Based-Greenhouse-Gas-Inventory.pdf
Climate Vulnerability Assessment Highlights	All Strategies	https://www.cityofsalem.net/CityDocuments/CAP-climate-vulnerability-assessment-highlights-final-2021-02-04.pdf
Salem Transportation System PlanAmended January 13, 2020	Transportation	https://www.cityofsalem.net/CityDocuments/tsp-full.pdf
City of Salem Community Forestry Strategic Plan	Tree Canopy	https://www.cityofsalem.net/CityDocuments/community-forestry-strategic-plan-2014.pdf
Our Salem Vision	All Strategies	https://www.cityofsalem.net/CityDocuments/our-salem-vision-2021.pdf
System Development Charge Methodology	Land Use	https://www.cityofsalem.net/CityDocuments/system-development-charges-methodology-report-2019.pdf
Administrative Rule - System Development Charges	Land Use	https://www.cityofsalem.net/citydocuments/administrative-rule-109-200-system-development-charges.pdf
Online GIS Regional Bike Facility Inventory	Bicycle Network	https://mwvcog.maps.arcgis.com/apps/View/index.html?appid=62c40ae83c6d45269f009e5d401e5916
Online GIS map of regional sidewalks and enhanced pedestrian crossings	Sidewalk network	https://mwvcog.maps.arcgis.com/apps/View/index.html?appid=4bfc02fc81b94ebbbce52228f4c54a7a

Appendix 6

Resource	Theme	Link
Transportation Projects in the Salem-Keizer Area	Transportation	https://gis-services-of-the-mwvcog-mwvcog.hub.arcgis.com/app/c5e5a36360bb4a738d70f35699f8be39
Department of Environmental Quality Rulemaking	All Strategies	https://www.oregon.gov/deq/Regulations/rulemaking/RuleDocuments/RulePlan.pdf
Transportation Demand Management Encyclopedia	Transportation	https://www.vtpi.org/tdm/tdm12.htm
Carpool Incentive Programs	Transportation	https://www.bestworkplaces.org/wp-content/uploads/2010/10/carpool_incentives_brief.pdf
EarthWISE case studies	Weatherization	https://www.co.marion.or.us/PW/ES/disposal/programs/earthwise/Pages/casestudies.aspx
Energy Trust of Oregon	Energy	https://www.energytrust.org/commercial/strategic-energy-management/
2017 ORSC Amendments Solar Readiness Requirements for New Residential Buildings	Solar-ready	https://www.oregon.gov/bcd/laws-rules/Documents/20201001-17orsc-solar-amendments-tr.pdf
2020 Progress toward diversity, equity and inclusion goals	Energy	https://energytrust.org/wp-content/uploads/2021/04/2020.DEI-Report.pdf
2020 Annual Report to the Oregon Public Utility Commission & Energy Trust Board of Directors	Energy	https://energytrust.org/wp-content/uploads/2021/04/2020.Energy-Trust-Annual-Report.pdf
Solar Within Reach	Solar-ready	https://energytrust.org/incentives/solar-within-reach/#tab-one
Solar for Your Home	Solar-ready	https://www.energytrust.org/incentives/solar-for-your-home/#tab-three
Plan Ahead Build Solar Ready	Solar-ready	https://energytrust.org/wp-content/uploads/2020/12/Solar-Ready-Brochure.pdf
HB2398 - Expanding Use of REACH Code	Energy	https://olis.oregonlegislature.gov/liz/2021R1/Downloads/MeasureDocument/HB2398/A-Engrossed
Weatherization Works!	Weatherization	https://www.energy.gov/sites/prod/files/2018/03/f49/WAP-fact-sheet_final.pdf
Energy Trust of Oregon. 2020 Annual report.	Energy	https://www.energytrust.org/2020-annual-report/
Energy Trust of Oregon. 2021-2022 Budget	Energy	https://www.energytrust.org/wp-content/uploads/2021/05/Amended_2021-22_Budget_Binder.pdf
Energy Trust of Oregon City Report: Salem	Energy	https://drive.google.com/file/d/1JFPoqB3t4ISGAy1ORUhUAq9GruqavnR5/view

Appendix 6

Resource	Theme	Link
HB 2165	Transportation	https://drive.google.com/file/d/1ZgESWSzF7Jgm6v7tWJ9IXl3asRxonS2m/view
HB 2180	Multi-family EV Charging Stations	https://drive.google.com/file/d/1pi8yovP8EaYl1liZvKrhtjrfnYIxC5sX/view
Capitol Mall Survey Analysis Report	Transportation	https://drive.google.com/file/d/175HO_6u7GPhYT3VMNUxoXS5AmMQnOWro/view?usp=sharing
City Wide Building SQFT Snapshot	Benchmarking energy use	https://drive.google.com/file/d/14mLBM_yNN3FDn_OEPnAw5eb_nzoHYA8c/view?usp=sharing
Downtown Salem 2018 Parking Report	Charge for parking	https://drive.google.com/file/d/1SsSG3bq5K7D-Aih-WNAxCuX2z7T7tT5i/view?usp=sharing
Free Tree Program Cost Report	Tree Canopy	https://drive.google.com/file/d/1DtvdGMuaF_Ne-5WT61JZMJK_ui-fEZ_h/view?usp=sharing
Lighting and HVAC Project Incentives	Benchmarking energy use	https://drive.google.com/file/d/1juLLqGGMIsFEjrCk-z_Rc9drc5WBVTHv/view?usp=sharing
Local Gas Tax	Gas Tax	https://drive.google.com/file/d/1aoMtyXtcn0uW4HchO4ejV_vN-maLF_cX/view?usp=sharing
Mid-Willamette Valley Demographics and Companies	All Strategies	https://drive.google.com/file/d/1PYvOjyDnRhS1Dxnz_KylU1EP4zRi8uji/view?usp=sharing
Safe Routes to School Solutions	Sidewalk network	https://drive.google.com/file/d/1SFcTTsbDUUGC9Qqwf7HxEvVjeDPgFCbK/view?usp=sharing
Salem 2019 Tree Reports	Tree Canopy	https://drive.google.com/file/d/1UbiUQFr3LrSDrwJ-ORNrZrh5JDmtF60X/view?usp=sharing
Salem Urban Tree Canopy Assessment	Tree Canopy	https://drive.google.com/file/d/1evNPwD2oLJgFT7QMW7FsCEiBuXxSCdAf/view?usp=sharing
Salem's Largest Private Employers	All Strategies	https://drive.google.com/file/d/1kyOzQK0r0dDqdo93PtfmFfip3cii535-/view?usp=sharing
SKATS Fund Summary 2003-2026	Transportation	https://drive.google.com/file/d/13pQwQafdKbIuUDw4DMgXodSdF_oz_Sbb/view?usp=sharing
SKATS Regional Sidewalk Inventory Documentation	Sidewalk network	https://drive.google.com/file/d/1x3Y-upW77uoPAE9IVK2x4sGiN_eWXXMt/view?usp=sharing
Weatherization Quarterly Data Report 7/19-6/20	Weatherization	https://drive.google.com/file/d/1BM3XHpk3pyaa-Vxzn-SL9uKJh2vGKHQD/view?usp=sharing
Weatherization Quarterly Data report: for Low-Income Home Energy Assistance Program (LIHEAP)	Weatherization	https://drive.google.com/file/d/1FNGrHZeU1LElO7z0XOfwPIWrUGuB8nZp/view?usp=sharing

G. Glossary

Common Terms in the Ecotone Analysis	
Discount Rate	The annual rate of reduction of the value of outcomes accrued in the future, designed to account for uncertainty and the time value of money when calculating a present value.
Effect Size	The change in the likelihood of a cost occurring given the program
Estimated Return	Present value of all monetized outcomes
External Data	Data not gathered by and/or studies not conducted by the program being analyzed
External Validity	The extent to which results of a given study are applicable across other contexts
Evidence Based	An approach to the program's work which is designed and based on existing research and applications
Evidence Informed	An approach to program's work which is designed with the knowledge and influence of existing research
Impact	The change in outcomes derived exclusively from the given program
Internal Data	Data gathered by the program itself
Internal Validity	The extent to which results of a given study are only applicable to the context of that study
Intermediate Outcome	The change resulting from the short-term outcome
Levels of Evidence of Causality	Level 1 = greatest level of evidence that there is a causal relationship between the variables, Level 7 = lowest level of evidence that there is a causal relationship between the variables
Logic Model	The planned methodology for accomplishing the desired change(s)
Long-term Outcome	The change resulting from the intermediate outcome
Marginal Cost	The effect size * the outcome cost. The average change in cost accrued.
Monetized Outcome	An outcome which has been linked to a cost occurring event, thereby placing a dollar value on the outcome
Net Present Value (NPV)	The aggregation of benefits and costs valued in the present day given an assumed time period and discount (interest) rate
Non-monetized Outcome	The change which is not or could not be linked, due to data quality, to a cost occurring event, thereby keeping the outcome from having a dollar value placed on it
Outcome	The resulting change occurring from the program's inputs and activities
Outcome Cost	The total cost of an event occurring
Output	The product from the inputs and activities of the program (e.g. number of people served)
Present Value (PV)	A single annuitized benefit or cost (depending on the outcome) valued in the present day given an assumed time period and discount rate
Short-term outcome	The initial change generated from the program
Trumping Rules	Selecting certain outcomes over others when they are interlinked to avoid double counting

APPENDIX 7

Salem Climate Action Plan
Outreach and Engagement Summary

November 2021

Introduction

Gathering perspectives and expertise from the Salem community was an essential part of creating a climate action plan tailored to the unique needs of the community. One of the key goals of the planning process was to develop climate action strategies and outcomes that advance equity in decision-making processes and overcome disparities within Salem. Engaging the Salem community is critical to achieving this goal. The City sought to conduct an open process in which all members of the community had opportunities to share their feedback throughout the development of the plan.

Due to COVID-19-related social gathering restrictions, much of the community engagement was conducted online, and additional efforts were made to engage those who did not have access to online opportunities. All virtual meetings were live streamed on the City's YouTube channel and recorded and posted on the project website for future viewing. Members of the Task Force were asked to also assist in outreach and share information with their networks.

The process of developing the Climate Action Plan was informed by three primary stakeholder groups.

Climate Action Plan Task Force

The Climate Action Plan Task Force consisted of a cross-section of community stakeholders representing sectors such as transportation, environmental advocacy, economic development, energy, education, communities of color, food supply, public health, homebuilders, and others. Thirty-three community representatives were chosen through a stakeholder mapping exercise and invited to serve on the Task Force by the Mayor. Three councilors also served on the Task Force: Councilor Andersen, Councilor Gonzalez, and Councilor Nordyke. The group met for six workshops (Figure 1).

Members of the Public

Throughout the Salem Climate Action Plan development process, the public provided input through online activities, community meetings, surveys, and by commenting on the draft plan. Public input from each phase of the process framed the next phase — feedback from the public was discussed by the project team and incorporated into the visioning, vulnerability assessment, strategy development phase, and finalization of the plan.

City Staff Advisors

City staff with subject matter expertise in various areas relating to the Climate Action Plan advised the project team. They participated in staff advisory group meetings and were available for advising on the City's previous work, particular subject matter areas, strategy development, and implementation planning.

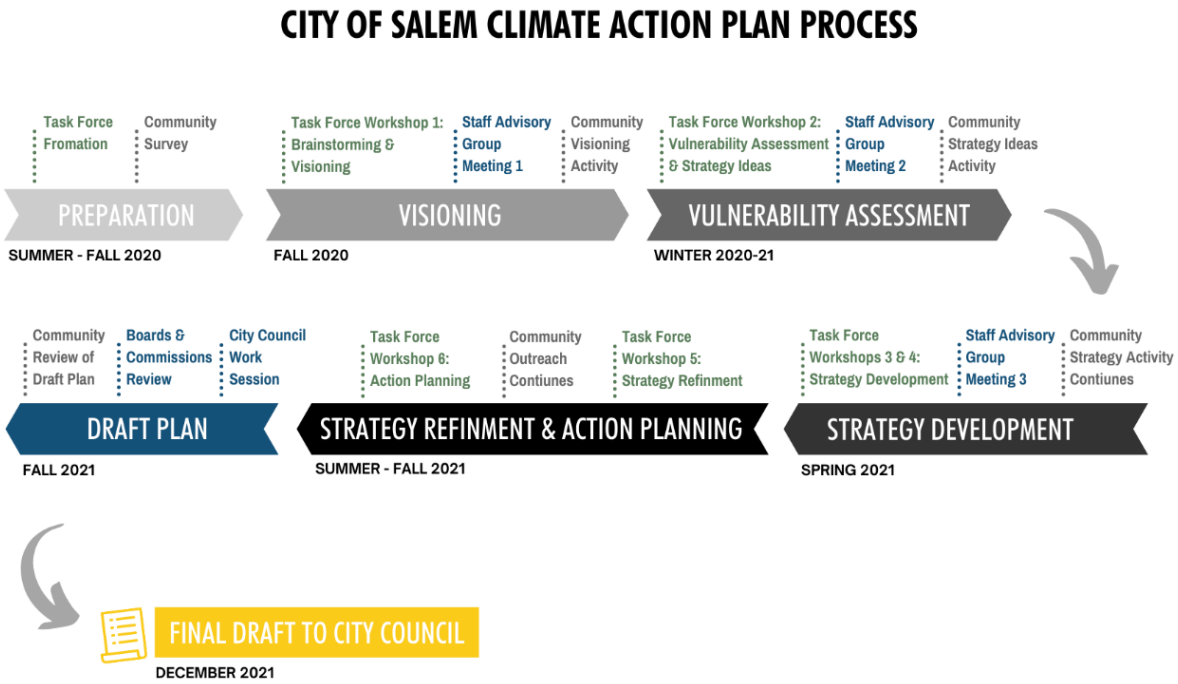

Figure 1: City of Salem Climate Action Plan process.

Salem Climate Action Plan Engagement Website

The project team used an online platform, EngagementHQ, to increase public engagement. The platform supported the use of a project outreach website, SalemClimateActionPlan.com, and provided a variety of tools that allowed community members to submit ideas, interact with one another, and to stay updated on the project progress through website updates and email notifications. The engagement website supplemented the project information available on the City's main website and served as a centralized hub for the public to learn about the project and share feedback. As the planning process progressed, the website was updated with relevant interactive activities and information from each phase of the project.

The site required registration to comment or participate in some activities. Public surveys were available on the site without registration. Information collected at registration included email address, username, password, and high-level demographic data (gender identity and race/ethnicity). The vendor for the engagement platform has found that registration is not generally a barrier to participation, but the project team was aware that some members of the public did not want to provide even basic personal information due to privacy concerns or other factors. Those participants were offered the option to call or email to share their input.

Website Engagement Activities

The table below summarizes the public activities available at the different stages of the project.

Title	Purpose	Date	Engaged Visitors*	Contributions**
Initial Community Survey	Understand community views on climate change, Salem characteristics, and plan process	October 21, 2021 to November 4, 2021	499	499
Envisioning a Resilient Salem	Identify a vision for a resilient Salem of 2050 and visionary ideas to become a carbon-neutral city	November 20, 2021 to December 11, 2021	44	221
Strategy Idea Brainstorming	Collect ideas for potential climate action strategies and gauge support for those ideas	January 8, 2021 to February 28, 2021	207	1,517
Strategy Idea Ranking	Provide a rough indication of whether initial ideas should be included in the plan	March 12 to 28, 2021	519	519
Strategy Development Feedback	Collect additional ideas and comments on proposed strategies	June 2, 2021 to October 3, 2021	~50	~1,250
Comment and Question Form	Gather comments and questions about the draft climate action plan	October 18, 2021 to November 5, 2021	255	308

*Engaged visitors have contributed to an engagement activity.
**Contributions include survey responses, an idea being shared, and someone liking or commenting on ideas from someone else.

Table 1: Summary of online public engagement activities and participation.

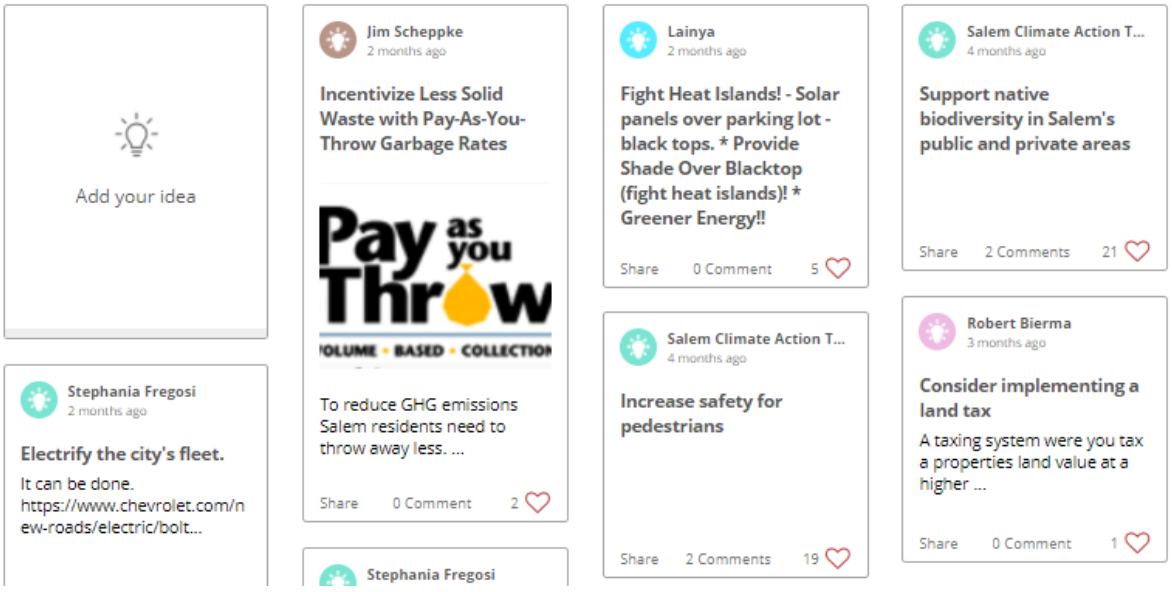

Figure 2: Interactive activity tool used to solicit community ideas and comments.

Public Review of Draft Plan

The Preliminary Draft Climate Action Plan was published in October 2021, and an online question and comment form was made available. In addition to the comment form, community members had the option to email or call the project team. After integrating community feedback, the Final Draft Climate Action Plan was published in November 2021.

Community Partnerships

An important part of the public outreach strategy was to engage those who are most impacted by climate change and are in greatest need of resources and tools to address climate impacts (i.e., frontline communities). To reach frontline communities, the project team sought to leverage relationships with community-based organizations and leaders with networks in communities that are harder to reach. Such partnerships were used to help advise on the best ways to connect with community members and provide channels through which to communicate.

Many members of the Task Force assisted the project team by sharing out information and opportunities for public engagement. This included targeted outreach to harder-to-reach segment of the community. In addition, Task Force members assisted in setting up meetings and presentations with various groups such as the Salem Keizer NAACP, Micronesian Islanders Community, Salem Leadership Foundation Community Partnership Teams, and the Salem Keizer Interfaith Network.

Outreach Activities

Outreach activities sought to inform community members, promote an understanding of the project and its purpose, and invite participation. Outreach highlighted the need for climate action, Salem's previous relevant work, and the City's motivation for taking on the project. Consistent efforts were made to describe the focus, timeline, and desired outcomes of the climate action plan and to invite public input. A variety of methods, tools, and channels were used to communicate with and receive feedback from the public.

In the summer of 2021, City staff ramped up outreach efforts and undertook a public engagement push to ensure that people in the community were informed about the project and aware of the opportunity to provide input.

A comprehensive listing of methods, tools, and activities is provided as follows.

Board and Commission Meetings

City staff provided presentations at the following City Boards and Commissions meetings.

Date	Audience
September 1, 2021	West Salem Redevelopment Advisory Board
September 8 ,2021	Citizens Advisory Traffic Commission
September 23, 2021	Downtown Advisory Board
October 7, 2021	North Gateway Urban Renewal Advisory Board
October 14, 2021	Salem Parks and Recreation Advisory Board
November 2, 2021	Salem Planning Commission
November 10, 2021	Salem Human Rights Commission

Table 2: Board and commission meeting dates.

Community Meetings

Task Force members and City staff presented information about the project, answered questions, and encouraged public involvement at the following community meetings.

Date	Audience	Presenter
December 10, 2020	South Gateway Neighborhood Association	Councilor Nordyke, Task Force member
January 3, 2021	1st United Methodist Church	Ken Bierly, Task Force member
January 12, 2021	North East Neighbors	Janet Lorenzen, Task Force member
January 28, 2021	Neighborhood Chairs	City staff
February 24, 2021	Marion County Solid Waste Management Advisory Council	City staff
March 4, 2021	Salem Chamber of Commerce	Councilor Nordyke, Task Force member; Tom Hoffert, Task Force member; City staff
April 22, 2021	American Association of University Women Salem Branch	City staff
June 1, 2021	Mid-Valley Association of Realtors	City staff
June 2, 2021	North Lancaster Neighborhood Association	City staff
June 7, 2021	Salem Keizer NAACP	City Staff
June 10, 2021	Faye Wright Neighborhood	City staff
June 15, 2021	Central Area Neighborhood Development Organization	City staff
June 21, 2021	West Salem Neighborhood Association	City staff
June 22, 2021	Lansing Neighborhood Association	City staff
June 24, 2021	Gen Z Forum with City Youth Outreach and Education Coordinator	City staff
June 24, 2021	Neighborhood Chairs	City staff
June 24, 2021	Gen Z Forum with City Youth Outreach and Education Coordinator	City staff
July 6, 2021	Southwest Association of Neighbors	City staff
July 14, 2021	Salem Leadership Foundation Community Partnership Team: North Neighborhoods (N2)	City staff
July 14, 2021	Morningside Neighborhood Association	City staff
July 15, 2021	Sunnyslope Neighborhoods Association	City staff
July 16, 2021	Cross-Cultural Friday Night – Enlace Cross-Cultural Community Development Project	City staff
July 20, 2021	North East Salem Community Association	City staff
July 21, 2021	Salem/Keizer Interfaith Network	City staff

Table 3: Summary of community meetings.

Date	Audience	Presenter
July 22, 2021	Salem Leadership Foundation Community Partnership Team: Edgewater Partnership	City staff
August 2, 2021	Salem-Keizer NAACP	City staff
August 5, 2021	East Lancaster Neighborhood Association	City staff
August 17, 2021	Salem Leadership Foundation Community Partnership Teams: South Salem Connect	City staff
August 18, 2021	Salem Area Chamber of Commerce/SEDCOR Economic Forum	City staff
August 19, 2021	Salem Leadership Foundation Community Partnership Teams: Community and Partners of East Salem (CaPES)	City staff
August 24, 2021	Southeast Salem Neighborhood Association	City staff
August 31, 2021	350 Salem OR	City staff
September 8, 2021	South Central Association of Neighbors	City staff
September 23, 2021	Neighborhood Chairs	City staff
November 4, 2021	Chamber of Commerce Policy Forum	Task Force Councilors and City staff

Continuation of Table 3: Summary of community meetings.

Community Events

At each of the following events, the City staffed an outreach table with information about the Climate Action Plan project. City staff discussed the project with community members, answered questions, and encouraged public involvement.

Date	Event
July 9-11, 2021	Marion County Fair
July 16-17, 2021	Mission Street Park Conservancy Plant Sale
July 20, 2021	National Night Out resource fair
August 20, 2021	Families & Children Summer Fun at the Park (at Northgate Park hosted by Hallman Neighborhood Family Council)
August 21, 2021	Micronesian Islanders Community event
September 25, 2021	Salem Saturday Market

Table 4: Community event dates.

Email Announcement

Emails were sent out through the engagement platform to registrants and subscribers to alert them of new content and to bring participants back to the site for each phase of the planning process. This feature was also used to send out periodic updates. A total of 20 emails were sent over the course of the project.

Radio Announcements

In the summer of 2021, City staff prepared and sent a series of public service announcements to local radio stations. Several stations aired each announcement on a weekly basis as part of existing contracts with the City of Salem. Each announcement was aired multiple times over the course of the week. To reach a broader audience, City staff asked other local stations to share the announcements in a similar manner. Each announcement included a project tagline, "Get Ready, Salem!", a topical message related to climate change mitigation or adaption, and a call to action to visit the project engagement website to share ideas. Twelve announcements were sent to each of the following radio stations.

- KBZY 1490 AM
- KMUZ Community Radio 100.7 & 88.5 FM
- KMWV Community Radio 98.3 FM
- KRYP El Rey 91.3 FM (Spanish-speaking radio station)
- KTUP Radio Poder 98.3 FM (Spanish-speaking radio station)

In the earlier phases of the project prior to the summer of 2021, several announcements were sent to KBZY and KMUZ Community Radio to advertise online engagement opportunities.

Radio Interviews

Task Force members and City staff had the opportunity to participate in radio interviews about the Climate Action Plan project.

Date	**Radio Station**	**Interviewee**
November 3, 2020	KMUZ Community Radio: Willamette Wake Up - Elephant in the Room	Casey Kopcho, Task Force member
December 1, 2020	KMUZ Community Radio: Willamette Wake Up - Elephant in the Room	Councilor Nordyke, Task Force member
March 18, 2021	KBZY: The Morning Team with Bob Buck	City staff
June 10, 2021	KMWV Community Radio: In Case You Missed It – With Salem Reporter	City staff
July 15, 2021	KBZY: The Morning Team with Bob Buck	City staff
August 3, 2021	KMUZ Community Radio: Willamette Wake Up - Elephant in the Room	City staff

Table 4: Summary of radio interviews.

Social Media

Announcements were posted on City social media accounts throughout the project. In the summer of 2021, a regular series of announcements were posted on a weekly basis similar to the radio announcements discussed above. Twelve weekly posts were made to each of the following social media accounts.

- www.facebook.com/CityOfSalemOR
- www.facebook.com/CiudaddeSalemOregon (content posted in Spanish)
- www.twitter.com/cityofsalem

Other Print and Digital Media

The following is a list of other channels used to for project outreach.

- Article is Smoke Signals, newspaper published by the Confederated Tribes of Grand Ronde
- Announcements in Salem Connection, weekly e-newsletter from the City
- Announcements in Clean Streams Newsletter, monthly e-newsletter from the City's Clean Streams, Clear Choices Initiative

Supporting Print and Visual Communication Tools

The following is a list of supporting communications tools prepared to support outreach activities.

- Project slide decks for community presentations
- Informational handout (one-page, content in English and Spanish)
- Frontline communities survey (one-page, English and Spanish versions)
- Rack card (English and Spanish versions)
- Poster (for tabling at community events)
- Bookmark/giveaway (for tabling at community events)
- Stickers

Accessibility

As mentioned, one of the key components of the project process was equitable public engagement, meaning that all Salem community members were given the opportunity to share their input and special efforts were made to engage those who have not traditionally been involved in civic processes.

To address language barriers, outreach and engagement materials were developed in both English and Spanish when possible and there was an option to translate the engagement website using a Google Translate tool. The City used its Spanish Facebook page to post updates and invite users to access the engagement site. City staff also co-hosted a multi-lingual community meeting with the Enlace Cross-Cultural Community Development Project.

Other methods of outreach were used to provide greater accessibility and invite further input, including the options to request a hard-copy survey by mail or call City staff to share feedback.

Appendix 8

CLIMATE ACTION PLAN STRATEGY LIST

NOVEMBER 2021

CLIMATE ACTION PLAN STRATEGY LIST

When thinking of strategies to reduce GHG emissions and increase resilience, it can be helpful to review Salem's climate-related threats. A review of Salem's projected climate impacts has shown an increased likelihood of extreme fire danger, warmer temperatures, changes to precipitation patterns, and increased risk of drought. These changes may bring with them increased risks to human health, greater demand for energy and water, and greater risk of flooding. At the same time, several non-climate stressors will intersect with these climate impacts: Salem's population is projected to grow 30% in the next 20 years, the current demand for affordable housing is expected to continue, and it may continue to be difficult for all Salem residents to find affordable and safe housing. A resilient community is one that has looked clearly at the intersections of its climate and non-climate risks and has made plans to avoid the worst and most costly impacts from these risks.

What follows is a list of 176 recommended strategies to reduce emissions and increase climate resilience in the City of Salem. Ideas in this list were initially generated by Salem community members and Climate Action Task Force members. The ideas then went through a detailed refinement process by a wide range of subject matter experts and consultants. Ideas were then shared with community members at in-person meetings and online, and refinements were made according to their feedback.

STRATEGIES ARE ORGANIZED INTO SEVEN SECTIONS:

1. Transportation & Land Use
2. Energy
3. Economic Development
4. Natural Resources
5. Community
6. Food System
7. Materials & Waste

The majority of Salem's GHG emissions come from the transportation and energy sectors. Therefore, strategies in these corresponding action areas are critically important for implementation if Salem is to achieve its GHG goals. Transportation and energy-related strategies also have great potential to positively impact public health, improve Salem's environmental quality, enhance the local economy, increase mobility choice for residents and visitors, and contribute to a

more equitable community. Strategies in the Natural Resources action area will help Salem sequester GHG emissions, provide protections to people from flooding, and increase residents' access to green spaces.

Though likely to have a relatively low impact on Salem's GHG emissions, strategies in the Economic Development section will help build the City's resilience to financial stressors at the individual and community levels. Strategies in the Community section are also more focused on building resilience in Salem, especially social resilience and trust. Many Community strategies aim to make City policies, practices, and outcomes more equitable. Strategies in the Food section include GHG-reducing strategies that emphasize local production and equity-building strategies that remove barriers to healthy, fresh, and local food. Finally, strategies in the Materials & Waste section will move Salem towards becoming a zero-waste, closed loop community with improved environmental quality and public health.

Most strategies designate the City of Salem as the Lead Agency, but many designate other community agencies like Cherriots, the energy utilities, and non-profit organizations. These agencies have co-developed these strategies in cooperation with one another.

Because of the interconnected nature of strategies that address climate change, co-benefits are identified for many of Salem's strategies. Strategies have also been evaluated in terms of their GHG reduction potential and projected cost. Groups responsible for implementing strategies are assigned in the Lead Agency column.

The strategies have been developed with the target of meeting Salem's greenhouse gas reduction goal, increasing Salem's ability to recover from disasters and emergency events, and increase equity and resilience across all sectors of the community. The strategies within this plan are non-regulatory and non-binding recommendations provided for the consideration of Salem City Council and other parties that have the authority to implement. The wording used to describe the strategies should not be taken to mean an outcome has been predetermined. Additionally, local, state, and federal regulatory or statutory requirements may exist that will impact the degree to which some strategies can be implemented.

SALEM'S EMISSIONS REDUCTION GOAL

BY 2035

SALEM'S **GREENHOUSE GAS EMISSIONS ARE REDUCED TO 50%** OF THE CITYWIDE GREENHOUSE GAS EMISSIONS FOR THE BASELINE YEAR OF 2016, AND

BY 2050

SALEM IS **CARBON NEUTRAL.**

Appendix 8

KEY

GHG REDUCTION POTENTIAL

This indicator is based on expert opinion and past experience. There is not a direct number attributed to the **High**, **Medium**, and **Low** tiers. In many cases, the actual GHG emissions saved or reduced is dependent on the level of investment and can vary significantly. These tiers should be used as a general guideline.

COST

$ = 0 - $200,000
$$ = $200,001 - $500,000
$$$ = $500,001 - $5,000,000
$$$$ = $5,000,001 and above

SUGGESTED TIMEFRAME

Timeframe to Begin
Short-Term (**S**) = Occurring now to next 2 years
Medium-Term (**M**) = Next 3-5 years
Long-Term (**L**) = Beyond the next 5 years

OBJECTIVE:

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe

CO-BENEFITS

Co-benefits are advantages to the community that any climate action strategy may have beyond reducing emissions. The strategies in this plan specifically take into account the following co-benefits:

Public Health refers to the protection of a community's health and the prevention of problems before they happen through educational programs, policies, services, and research. Strategies with the Public Health indicator have the potential to improve the physical and mental health of Salem's communities.

Environmental Quality is integrally connected to individual and community wellbeing and refers to the health of our air, water, and land. Strategies with the Environmental Quality indicator have the potential to improve the health of Salem's air, water, and land

Local Economy refers to employment opportunities and the production, buying, and selling of goods and services in Salem. Strategies with the Local Economy indicator are those that can contribute to the health or growth of Salem's economy by benefiting local businesses, encouraging entrepreneurship, creating jobs, and keeping money in Salem.

Mobility Choice is connected with public health and environmental quality and refers to Salem residents and visitors having access to multiple ways of moving throughout the city and not having to rely only on individual ownership of vehicles. Strategies with the Mobility Choice indicator have the potential to increase mobility choice by providing safe and convenient access to transportation options such as walking, biking, carpooling, taking public transit, and working from home.

Community Equity refers to efforts that rectify unequal access to opportunities and resources caused by historic and current systems of oppression and exclusion. An equitable community addresses disparities by providing varying levels of support to community members based on their needs in order to achieve fairness in outcomes. Advancing equity throughout all communities in Salem refers to both decision-making processes and the outcomes of those processes, including policies, practices, procedures, and legislation. Strategies with the Community Equity indicator have the potential to increase equity in Salem by addressing systems and practices that have historically disadvantaged groups of Salem residents and by maximizing benefits for frontline communities.

Appendix 8

The strategies within this plan are non-regulatory and non-binding recommendations provided for the consideration of Salem City Council and other parties that have the authority to implement. The wording used to describe the strategies should not be taken to mean an outcome has been predetermined. Additionally, local, state, and federal regulatory or statutory requirements may exist that will impact the degree to which some strategies can be implemented.

TRANSPORTATION & LAND USE — 42 STRATEGIES

VISION: Salem residents of all ages and ability will have access to safe, reliable, and affordable transportation options. Salem will have a multi-modal transportation system where everyone is able to choose the mode that works best for them.

GUIDING EQUITY PRINCIPLES: Prioritize actions and allocation of public funding that improve the safety of residents and increase active transportation choices in under-served neighborhoods. Intentionally engage residents in low-income neighborhoods during planning and decision-making phases to better understand the needs and priorities of specific areas in Salem.

OBJECTIVE 1: Increase safety of and access to active commute modes to reduce vehicle miles traveled (VMT)

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
TL01	Review the bike network in the Salem Transportation System Plan (TSP) to identify and prioritize E-W and N-S routes that connect major employment centers with areas of high density housing, essential services (schools, grocery stores, food pantries, health care), and entertainment (restaurants, retail, event venues). Priority emphasis should be placed on connecting underserved areas with essential services.	Low	$$	City		S
TL02	Select and improve the safety of bike access along key routes identified in TL01 with a goal to select and improve at least one key corridor every year.	Medium	$$$$	City		M
TL03	Complete Salem's sidewalk network throughout the city, with a priority emphasis on areas within a 1/4 mile of transit route. Assess safety levels of walking routes within 1/4 mile of bus stops and improve areas of greatest needs, such as northeast Salem that have been historically and currently neglected. Reference and revise Salem's sidewalk inventory as-needed.	Medium	$$$$	City		S
TL04	Repair existing sidewalks to increase safety and mobility, include assessment and improvement of lighting along sidewalks for safety.	Low	$$$$	City		S
TL05	Continue to use data and best practices to prioritize investment options on key corridors for the improvement of safety and access for people walking, biking, using mobility devices, and riding public transit.	Low	$	City		S
TL06	Develop mobility hubs at transit centers (e.g. space for ride-sharing/taxi, bike and car share, and other forms of transportation, as well as charging stations as needed), starting with current project to identify and fund construction of a mobility hub in South Salem.	Medium	$$$	Cherriots		S

Appendix 8

OBJECTIVE 2: Expand public transit infrastructure in Salem with a focus on equity-based access

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
TL07	Use technology to reduce travel time and increase ridership. Use data to identify and prioritize specific corridors for enhancing bus travel time through strategies such as queue jump lanes and signal prioritization.	Low	$$$	Cherriots		S
TL08	Increase bus service, e.g., a majority of routes should operate with at least 30 minute intervals until midnight, seven days a week. Work with City to communicate updated services through community partners and media outlets (e.g., both Spanish and English radio stations).	High	$$$$	Cherriots		S
TL09	As part of developing a Long Range Transit Plan, identify currently-underserved areas and determine opportunities for first expanding transit service to these currently-underserved areas. Place priority emphasis on increasing the connectivity between West Salem and key locations throughout the City. Transit expansion should also include increasing service to employment centers in outlying areas (e.g., Cordon Road/Mill Creek Corporate Center).	Medium	$$$	Cherriots		S
TL10	Collaborate with Cherriots to identify locations where shared use transit lanes (right turn/transit lanes) or bus-only lanes would improve transit services. Locations may include select routes along the Core Network, such as Lancaster and River Rd/Broadway/Commercial Rd.	Medium	$$$$	City		S
TL11	Conduct a feasibility study to understand the logistics (ownership, costs, benefits) of implementing an electric downtown circulator that stops at all the key downtown locations. Include considerations for adding a West Salem connection with the electric downtown circulator in the feasibility study.	Medium	$$	Cherriots		M
TL12	Amend City regulations so that where a transit stop is required, on-street parking shall be restricted in the area of the stop as defined by the Transit District in order to ensure unobstructed access by transit.	Low	$	City		S
TL13	Support Cherriots and other mobility partners to develop a single card and app for all mobility options in Salem (e.g., bus pass, bike and car share, parking).	Low	$	City		M
TL14	Support Cherriots Transportation Options Program to develop and implement comprehensive trip reduction options, including transit service (including ridesharing services) to/from areas outside the UGB and Salem.	Low	$$	City		S
TL15	Support supertransit network efforts to reduce external VMT by lobbying the State for intercity transit resources and improvements within the Willamette Valley, including optimizing the timing of trains to better support commuting to/from Salem.	Medium	$	City		S

Appendix 8

OBJECTIVE 2: Expand public transit infrastructure in Salem with a focus on equity-based access

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
TL16	Assess the feasibility of dedicating lanes for buses, emergency vehicles, and potentially streetcars over existing Willamette River bridges.	Low	$$	ODOT/City		L
TL17	Implement high-frequency buses (also called rapid bus services) along major routes (i.e., the Cherriots Core Network). Include the construction of pre-pay stations for riders. Consider using a portion of the I-5 corridor's shoulders for increased speed and reduced stops.	Low	$$$$	Cherriots		M

OBJECTIVE 3: Incentivize active commute modes

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
TL18	Partner with Cherriots Transportation Options Program to develop an active commuting program for City employees that can function as a model for other employers in Salem where employees receive support, resources, and incentives for actions such as: - Taking the bus to work through the Cherriots group bus pass program and/or pre-tax bus passes - Walking to/from work - Biking to/from work - Offering preferential parking spots for employees who carpool to/from work - Commuting to/from work in an EV, motorcycle, or other low-GHG emission mode - Accessing employer-sponsored emergency rides home - Working from home/telecommuting - Working flexible hours to reduce traffic congestion (i.e., employer can stagger work hours to reduce congestion) - Offering parking cash-outs to employees who choose not drive every day (or a specified number of days per month) in the form of financial incentives or paid time off - Providing online, real-time ride-matching services through the Get There Oregon tool	Low	$	City		S
TL19	Review and update the Salem Transportation System Plan (TSP) goals, policies, projects, and priorities to align with Our Salem, Climate Friendly and Equitable Communities Rulemaking, Statewide Transportation Strategy, and Oregon Bicycle and Pedestrian Safety Strategy Report in the areas of walking, bicycling, and transit use.	Low	$$	City		S

Appendix 8

OBJECTIVE 3: Incentivize active commute modes

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
TL20	Research the feasibility of implementing a gas tax. Revenue from this tax can fund connectivity and safety improvements to the city's transportation network and/or roadway maintenance and improvement projects. Consider limiting the allocation of funds to projects specific to repairing vehicular lanes and building out sidewalks and bikelanes in low income and neglected areas.	Medium	$	City		M
TL21	Follow the DEQ rule requiring commute trip reduction program for Salem employers with more than 100 employees. City role as employer will be informed by State rules and necessary adaptations at the City-level. DEQ will require designated employers to provide employees incentives to commute to work by means other than driving alone in fossil fueled vehicles.	Medium	$	DEQ/City		S
TL22	Work with Cherriots to promote Cherriots' ability to support transportation demand management (TDM) to businesses and organizations in Salem. Support from Cherriots includes: - Coaching a staff member within the business to set up and run a transportation program and train them to become Employee Transportation Coordinators (ETCs). - Creating and sending an employer newsletter to the ETCs that they can forward to their co-workers. - Providing ETCs with promotional information and marketing materials. - Hosting transportation fairs/brown bag lunch chats or on-site tabling to help promote their transportation program, provide personalized trip-planning assistance, and generally raise awareness about the impacts of single occupancy vehicular travel on the City's GHG goals. - Providing ETCs with information for new employees because one of the best times to try a new commute option is when an employee starts a new job. - Helping ETCs develop, launch, and analyze results from employee transportation surveys.	Low	$$	Cherriots		S
TL23	Collaborate with bike sharing non profits, such as Ride Salem, and mobility partners such as Cherriots, PGE, Salem Electric, and major employers to expand bike share stations, and electric bike charging stations with a priority emphasis on neglected areas of Salem.	Low	$	Ride Salem or other non-profit		S
TL24	Charge for city-controlled parking (starting with on-street parking) using a supply/demand model intended to reduce parking in the central business district to 70-80% of supply.	High	$$	City		S

OBJECTIVE 4: Increase adoption of and access to EVs and EV charging infrastructure

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
TL25	Support State-related initiatives to increase incentives for low and moderate income households in transitioning to EVS per HB 2165 (effective date 1/1/2022).	Medium	$$$$	PGE		S
TL26	Collaborate with PGE, Salem Electric, ODOT, and EV Charging Network, Network Charging Station Operators partners to expand city-wide EV charging capacity in alignment with the Oregon Transportation Electrification Infrastructure Needs Analysis. - Consider high impact locations such as along I-5 and in town at libraries, museums, shopping/ commercial areas, city parks, hospital, and high schools, colleges, and universities. - Identify areas for fast-charging EV hubs throughout the city. - Consider inclusion of right-of-way charging (e.g., pole charging or other roadside charging). - Identify opportunities to streamline permitting processes to build right-of-way charging stations, including the designation of an EV infrastructure permiting liaison within City government who can assist with and facilitate the permitting of EV charging stations throughout Salem. - Work with EV charging station operators (e.g. Blink) on City property to identify locations to upgrade and expand. - Identify opportunities to streamline permitting processes to build right-of-way charging stations, including the designation of an EV infrastructure permiting liaison within City government who can assist with and facilitate the permitting of EV charging stations throughout Salem. - Work with utility companies to determine demand and needs for power infrastructure.	Medium	$$$$	City/PGE		S
TL27	Incentivize the installation of EV charging stations at existing multifamily residences/complexes.	Medium	$$	City		S
TL28	Facilitate the provision of expanded electrical service capacity for charging electric vehicles in new developments with more than five parking spaces in accordance with HB 2180.	Medium	$	City		S
TL29	Amend City code to align with the proposed State rule from the Climate-Friendly and Equitable Communities Rulemaking regarding all major remodel and renovation projects to provide EV charging to existing parking garages or commercial buildings with more than 40 parking spots, and residential developments and mixed-use buildings with five or more parking spaces on a lot or parcel. Note: Adjustments to this strategy may be informed by updated Transportation Planning Rules and related administrative rules for Oregon as implemented through the Climate-Friendly and Equitable Communities rulemaking process.	Medium	$	City		M

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OBJECTIVE 4: Increase adoption of and access to EVs and EV charging infrastructure

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
TL30	Implement a City policy that transitions all City-owned fleet vehicles to EVs, with priority emphasis on first replacing gas-powered vehicles. Consider electrifying City fleet vehicles at a faster rate than community members to lead by example.	Low	$$$$	City		S
TL31	Transition public transit fleet to zero-emission fleet. Facilitate the sharing of lessons learned during transition and grant opportunities with major employers and organizations in Salem to assist their transition.	Medium	$$$	Cherriots		S
TL32	Plan for heavy duty and freight EV charging along the I-5 corridor using data, maps, and recommendations from the West Coast Clean Transit Initiative and align with the Oregon Transportation Electrification Infrastructure Needs Analysis.	Low	$	City/ODOT		M

OBJECTIVE 5: Reduce congestion and emissions from idling

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
TL33	Always consider implementing congestion-reducing strategies to reduce idling when making capital and operational decisions. Strategies may include: - Increasing roundabouts/traffic circles - On certain streets, replacing stop signs and traffic lights with yield signs, making yielding the default rather than stopping - Using flashing yellow lights to ease flow in the middle of the night - Consider priority areas for implementing no-idling zones, such as in front of schools	Medium	$$$$	City		S
TL34	Implement telecommuting and flexible work hour policies for City employees when appropriate to work assignments. Encourage other employers in Salem, such as State agencies, to adopt similar policies.	Medium	$	City		S

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OBJECTIVE 6: Increase safety for pedestrians/bicyclists

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
TL35	Improve pedestrian crossings with design elements such as: - Signalized pedestrian crossings - Pedestrian refuges, mid-street islands, curb extensions - "Pedestrian scrambles" at busy intersections. This stops traffic in all directions when Walk signal is activated so pedestrians can cross the intersection safely in any direction (including diagonally). - Painted crossings, raised crosswalk platforms, distinct materials to differentiate from street, lighting, overhead warning signs, and other high-visibility treatments - Increase the overall number of crossings	Low	$$$$	City/ODOT		S
TL36	Assess feasibility and impacts of developing a pedestrian mall or zone for people to walk and bike only. Consider impacts of closing one or more blocks to automobile traffic. If feasible and positively impactful, design a pilot project (e.g., close downtown streets one Sunday per month for one year or evaluate current closures of Winter/Maple on Saturdays), evaluate, and expand (potentially to the area bordered by Ferry, Front, Center (or beyond with road changes), and Church).	Low	$	City		M

OBJECTIVE 7: Increase density in city planning

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
TL37	Incentivize and promote dense and vertical development (residential and commercial) within a 1/4 mile of the existing and future core transit network.	Medium	$$$	City		S
TL38	Develop strategies to encourage infill or redevelopment of underutilized properties or campuses to share with major employers in Salem.	Low	$	City		S
TL39	Continue to minimize setback requirements to allow for more dense development, which in turn promotes walkable neighborhoods. Note: Align with Our Salem.	Medium	$	City		S
TL40	Amend City code to eliminate parking minimums throughout Salem, with priority focus along Cherriots' Core Network. Note: Align with Our Salem.	Medium	$	City		S

Appendix 8

OBJECTIVE 7: Increase density in city planning

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
TL41	Coordinate with long range transit plan to encourage the majority of new housing and employment developments to be built in walkable, compact mixed-use neighborhoods and in areas that are well served by transit. Incentivize (e.g., through higher heights and higher minimum density requirements) in high impact areas, such as the core transit network. Note: Adjustments to this strategy may be informed by updated Transportation Planning Rules and related administrative rules for Oregon as implemented through the Climate-Friendly and Equitable Communities rulemaking process.	Medium	$$	City		S
TL42	Reform the City's system development charges (SDCs) by 1)exempting development in walkable mixed-use neighborhoods in close-in areas (in and around downtown) and development within 1/4 mile walking distance of the core transit network from SDCs, and 2) setting SDCs for individual areas that reflect the actual cost of providing infrastructure needed to serve each area.	Low	$$$	City		M

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ENERGY — 38 STRATEGIES

VISION: Residential and commercial businesses are powered by clean and renewable energy and many buildings produce more energy than they consume on an annual basis.

GUIDING EQUITY PRINCIPLES: Implement strategies such that those responsible for the greatest amount of GHG emissions take the greatest action towards reducing emissions. In decision-making and implementation, elevate the perspective of those most affected by climate change. Use equity frameworks and criteria to evaluate and execute all strategies.

OBJECTIVE 1: Establish governance and funding structures to achieve net-zero emissions vision

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
EN01	Coordinate efforts to meet citywide goals for greenhouse gas reduction using a climate justice lens so that solutions are developed in an equitable way.	Low	$	City		S
EN02	Partner with PGE, Energy Trust of Oregon and EarthWise programs for energy benchmarking and transparency policies in existing buildings with a publicly available "reward" system recognizing those who do well and a "recommendations" system for property owners of lower-performing buildings to take action for improvement.	Low	$$	City		S
EN03	Review City legislation and administrative actions when new reports from the Oregon Global Warming Commission (OGWC) are published, determine opportunities and gaps, develop and implement plans to better align City legislation and administrative actions with OGWC recommendations.	Low	$	City		S
EN04	Begin reporting community greenhouse gas emissions on a regular basis using a reporting platform that aligns with the Global Covenant of Mayors Common Reporting Framework.	Low	$	City		M
EN05	Increase the use of existing renewable energy projects and energy-saving programs through the creation and funding of "Community Energy Advisors" in the city or at community-based organizations to provide one-stop shopping for energy services for all Salem residents, businesses, and organizations including organizing audits and energy retrofits; submitting and packaging applications; and being a central source of information about all incentives and programs available). Focus on underserved communities and collaborate with PGE and their contacts from community-based organizations. Work with the City to develop a website hub for resources.	Low	$$	ETO or local community-based organiza-tion(s)		M

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OBJECTIVE 1: Establish governance and funding structures to achieve net-zero emissions vision

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
EN06	Create a "Salem Clean Energy Fund" administered by a coalition of community-based organizations. Fund community energy advisors at community-based organizations to facilitate use of new and existing programs by underserved populations. These programs include: - Rebates on electric vehicles for income-qualified customers - Rooftop solar incentives for low- and moderate- income customers - Energy Trust conservation and renewable resource incentives and technical assistance - Low-income weatherization incentives - Healthy Home grants to repair and rehabilitate residences of low-income households and landlords	Low	$$$$	City		M
EN07	Hire a full time City Climate Action Plan Manager to implement Council plan priorities, track progress, establish and manage a CAP work group with agency/implementation/equity partners.	Low	$$	City		S
EN08	In coordination with PGE, Salem Electric, Energy Trust, and Salem business and community-based organizations, develop and submit a Community Resilient Renewables Investment Fund grant proposal to improve power system resiliency and reduce emissions in Salem through investments in solar and storage systems for homes and businesses, with a focus on underserved neighborhoods.	Medium	$	City/PGE/ Salem Electric/ ETO		S
EN09	Work with PGE and Salem organizations to design a Community Green Power Rate to serve Salem residents in PGE's service area for Council's consideration and submittal to the Oregon PUC.	High	$$	City/PGE		M
EN10	Advocate for a change to Energy Trust's fuel neutrality policy to allow focus on non fossil fuel energy incentives.	Medium	$	City		M
EN11	Create a Climate Champion Partnership Program in collaboration with major energy users in the city such as the state of Oregon, schools, colleges, businesses, and others. Climate Change Partners would commit to achieve Salem's emission reduction targets for their own buildings, fleets, and operations.	High	$$	City		L

Appendix 8

OBJECTIVE 2: Increase energy efficiency and electrification of all buildings

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
EN12	Develop a comprehensive approach to increasing energy efficiency in municipal buildings, including setting a goal for increased energy efficiency in all City-owned buildings, benchmarking, deep energy retrofits, policies to require energy efficient practices, and regular reporting.	Medium	$$	City		S
EN13	Promote incentives offered by the Energy Trust of Oregon to building owners and developers who install urban solar generation projects.	Medium	$	PGE/ETO		S
EN14	Collaborate with PGE, NW Natural, Salem Electric, Energy Trust of Oregon and Mid-Willamette Community Action Agency to develop and implement a program that helps residents and business owners weatherize and increase the efficiency of residential and commercial buildings, with a priority emphasis on properties with low-income renters, homeowners, and business owners. Such a program may include low-cost energy audits and energy modeling for homes and businesses. Include in the program a one-stop shop type of experience for residents and business owners to learn about current incentives, audits, retrofit opportunities, and any current offerings from the City, utility companies, or local businesses/organizations. Note: Utilize HB 2842 Healthy Homes program for funding.	High	$$	City/PGE/ Salem Electric/ NW Natural/ ETO		S
EN15	Promote programs from Energy Trust of Oregon that provide resources, support, and incentives for converting older single family homes, multifamily residences, and non-residential buildings to more efficient systems. Priority emphasis on low-income neighborhoods. Potentially collaborate with utility companies to develop an interest free-loan program to help homeowners and renters implement energy-saving strategies, such as subsidizing the cost of new electric heating/cooling pumps, and exchanging older light bulbs for more efficient ones.	Medium	$$	PGE/ETO		S
EN16	Collaborate with utility companies and Energy Trust of Oregon to ensure access to existing energy efficiency and demand response programs and to provide specific outreach and education programs for residents and business owners on how to: - Better insulate their spaces and buildings - Select high efficiency, e.g. double or triple-paned, windows - Select, install, and use smart meters - Sign up for utility demand response programs - Transition water heating and heating & cooling systems to all-electric - Purchase, install, and maintain onsite renewable energy systems - Achieve net-zero energy	Medium	$$	PGE/ Salem Electric/ NW Natural/ ETO		S

Appendix 8

OBJECTIVE 2: Increase energy efficiency and electrification of all buildings

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
EN17	Develop and implement a recognition program for business/commercial property owners and residents/homeowners who meet certain high-performance/high-efficiency standards for categories such as: - Insulation - Double or triple-paned windows - Smart meters - All-electric heating & cooling systems - Onsite renewable energy generation - Net-zero energy Connect this recognition program with demand response programs.	Medium	$	City		M
EN18	Incentivize the construction of smaller and more energy efficient houses. - Continue to allow attached housing and accessory dwelling units (ADUs) - Amend code to allow cluster and cottage developments in single-family areas.	Medium	$$$	City		S
EN19	Set a goal to increase number of businesses certified under Marion County's EarthWISE program.	Low	$	Marion County		S
EN20	Implement a City ordinance that requires a Home Energy Score be provided to prospective home buyers. Follow guidance from Home Energy Score programs established in other Oregon cities, including Portland and Milwaukie.	Low	$	City		M
EN21	Adopt mandatory home- and building-energy rating system requirements so that upon property sale, buildings (commercial and residential) are required to meet the energy rating system criteria. Work with non-profits and utilities to provide financial incentives when upgrading to new standards.	Medium	$$$	City		L
EN22	Adopt a stretch Net Zero energy building code or highly energy-efficient voluntary green energy standard for new homes and buildings and provide regulatory and financial incentives to builders and developers to build to the new standard.	Medium	$	City		M

Appendix 8

OBJECTIVE 3: Increase renewable energy generation and access						
Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
EN23	Incentivize and implement small-scale renewable energy solutions, including renewable-powered microgrids, neighborhood-based solar arrays, and rooftop solar installations on residential and commercial properties. City and PGE to work together on the siting of new systems to ensure the location of these resources also provide larger benefits across the entire grid. Potentially leverage funding available from HB2021 to install community-based renewable energy projects.	Medium	$$$$	PGE		M
EN24	Require all new commercial and multifamily housing to be built solar-ready where feasible, meaning the buildings would have the electrical infrastructure ready for the building owner to install solar panels if they so choose.	Medium	$	City		S
EN25	Work with PGE to install solar carports in City-owned parking lots.	Low	$$$	City		L
EN26	Work with PGE to implement a plan to increase renewable-powered microgrids and energy storage for critical sectors/buildings (e.g., hospitals) to improve resilience. Potentially leverage funding available from HB 2021 to install community-based renewable energy projects.	Low	$$$$	Critical sectors		M
EN27	Create a "Solar Salem" initiative with ETO, PGE, and Salem Electric to: 1. Accelerate investments by homes and businesses in solar generation and backup storage; 2. Develop community solar projects for rentals, multi-family housing, single-family housing, and commercial buildings.	Low	$$	City and utility companies		L
EN28	Work with PGE to evaluate local community solar array project at Salem's Wastewater Treatment plant (or other City-owned properties) and determine community support for such projects.	Low	$	City		M
EN29	Work with PGE, Salem Electric, and ETO to create a network of renewable-base microgrids throughout Salem.	Low	$$$	City		L
EN30	In collaboration with PGE, design and adopt a Communitywide Clean Energy Program to reach 100% clean and renewable electricity for residential and small commercial customers in Salem before 2035 per guidance and requirements associated with HB 2021.	High	$	PGE/City		S

Appendix 8

OBJECTIVE 4: Decrease reliance on fossil fuels

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
EN31	Implement policies to reduce natural gas usage, such as requiring all-electric new construction, prohibiting fossil fuel usage in new construction, and/or banning the use of gas and oil in residential appliances.	High	$$	City		M
EN32	Promote the incentives offered by Energy Trust of Oregon for new construction that is all-electric.	High	$	City		S
EN33	Encourage NW Natural and the Oregon Department of Energy to create an assessment of all potential renewable gas sources in the surrounding areas (e.g., Marion, Polk, and Yamhill Counties).	Low	$$$$	NW Natural		L
EN34	Develop voluntary (opt-in) green power rate program for PGE and NW Natural customers in Salem with an equitable pricing structure, following guidance about rate differentiation from HB 2475 and incorporating elements from PGE's existing green power program. Encourage/incentivize major users in the city to subscribe to the next phase of PGE's Green Future Impact program and encourage/incentivize residents and businesses to buy green power from PGE and NW Natural. With NW Natural, specifically consider and evaluate the potential for low carbon/RNG offerings for homes and businesses.	Medium	$$	PGE/NW Natural		S
EN35	Promote programs from the Energy Trust of Oregon that work with industrial and large commercial businesses to assess ability to switch or incorporate clean energy sources into their operations.	High	$	City/ETO		M
EN36	Implement an incentive program for residents and businesses to switch from natural gas appliances to all-electric models.	High	$$$$	ETO/Salem Electric/PGE		S
EN37	Develop and implement a plan to phase out combustion and two-stroke engines within the City limits. This would pertain to vehicles, lawnmowers, leaf blowers and other machinery. Potentially begin with phasing out City-owned combustion and two-stroke equipment (e.g., landscaping equipment such as leaf blowers and lawnmowers) to demonstrate leadership. Potentially collaborate with PGE on a tool exchange program.	Medium	$$$	City		M

OBJECTIVE 5: Protect electricity service in the face of extreme weather

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
EN38	Establish standard operating procedures that place new power lines underground as a way to protect electricity service during severe weather events like wildfire and storms. Potentially increase efficiency underground power line construction by coupling with transportation projects. Note: Rewording/removal may be needed pending further review by PGE. PGE is in the process of developing standard operating procedures around the installation of new power lines.	Low	$$$$	PGE		M

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ECONOMIC DEVELOPMENT — 8 STRATEGIES

VISION: Salem will have a thriving local community full of successful small businesses and guided by climate-smart policies that support economic and cultural opportunities for current and future generations. City government and businesses will have a healthy, collaborative relationship that provides sustainable economic development for Salem and the region.

GUIDING EQUITY PRINCIPLES: Cultivate affordable cost of living standards within Salem's economy. Ensure all residents have access to safe and affordable housing options.

OBJECTIVE 1: Strengthen the local economy

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
EC01	In partnership with LAUNCH Mid-Valley, the collaboration of partners working to support the growth of Salem area entrepreneurs, collaborate with the Chamber of Commerce, SEDCOR, local universities, and business leaders to develop, nurture and attract climate-smart entrepreneurship in Salem. Invest in a nation-wide marketing campaign (partnering with Travel Salem and the City of Salem's Cultural and Tourism Promotion Advisory Board).	Low	$	City		S
EC02	In partnership with the Willamette Workforce Partnership, SEDCOR, and Chemeketa Community College, identify strategies to increase job opportunities and develop workforce training programs with local businesses, organizations, and educational institutions that prepare residents of all ages and ability for climate-smart jobs and careers.	Low	$	City		M
EC03	Identify opportunities to improve the quality of life of workers in Salem through strategies such as child care, livable wages, transportation, health care, food accessibility and more. Implement strategies to make Salem a more desirable place to live and work.	Low	$$$	City		L
EC04	Work with businesses to identify and reduce risk, establish disaster plans and create business continuity plans.	Low	$	City		M
EC05	Explore the creation of a philanthropic fund to assist small businesses in recovering from and preparing for natural disasters.	Low	$	City		L

Appendix 8

OBJECTIVE 2: Increase the wellbeing of residents and employees through creative development projects						
Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
EC06	Encourage the development of housing near employment centers, so employees can choose to live closer to their workplaces. Identify opportunities to prioritize low-income neighborhoods.	Low	$	City		S

OBJECTIVE 3: Lead the way in transitioning Salem to a climate-smart future						
Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
EC07	Conduct a review of City financial assets/investments to determine extent of holdings in fossil fuel companies. Based on review, divest from fossil fuel holdings and provide options to employees for alternative investment strategies in climate-friendly financial portfolios.	Low	$	City		S
EC08	Develop a City-based program that promotes and incentivizes local businesses and organizations who improve their sustainability practices by participating in Marion County's EarthWISE program.	Low	$	City		M

Appendix 8

The strategies within this plan are non-regulatory and non-binding recommendations provided for the consideration of Salem City Council and other parties that have the authority to implement. The wording used to describe the strategies should not be taken to mean an outcome has been predetermined. Additionally, local, state, and federal regulatory or statutory requirements may exist that will impact the degree to which some strategies can be implemented.

NATURAL RESOURCES — 24 STRATEGIES

VISION: Salem's natural resources will provide benefits to all residents, including physical and psychological health benefits and natural resilience.

GUIDING EQUITY PRINCIPLES: Make green spaces and benefits of natural resources accessible to all Salem residents. Prioritize underserved areas and historically neglected neighborhoods when implementing strategies. Intentionally include residents of these areas and neighborhoods throughout planning and decision-making processes.

OBJECTIVE 1: Increase access to parks and green spaces

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
NR01	Continue to require open space in multifamily developments. Incentivize the inclusion of smaller, walkable parks/open space in new, large, subdivision developments.	Low	$	City		S
NR02	Add and maintain quality parks in NE Salem.	Low	$$$$	City		S

OBJECTIVE 2: Support native biodiversity in Salem's public and private areas

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
NR03	Continue to conserve, preserve, and expand Salem's green spaces and parks. Adopt management policies that reduce chemicals, increase biodiversity and build climate resilience.	Medium	$$$	City		S
NR04	Develop a policy that prioritizes native plantings on City-owned properties.	Low	$	City		S
NR05	Amend City code to require minimum 25-foot no-build zone within riparian corridor and require developers to plant trees/shrubs and native or ecologically well adapted vegetation to create a vegetated buffer (minimum 25 feet) within the existing riparian corridor on all new development.	Low	$	City		S

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OBJECTIVE 3: Expand the urban tree canopy

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
NR06	Create an Urban Tree Commission. The Commission would be charged with the following responsibilities: 1) provide oversight, guidance, and support to the Urban Forester by (a) adopting and recommending to City Council a decennial urban forest strategic plan to be prepared in conjunction with the tree canopy assessment [NOTE: city code provides for a decennial tree canopy assessment]; (b) review the Urban Forester's annual work plan; (c) ensuring that the city maintains and regularly update a list of approved street trees, a list of prohibited street trees, and a list of recommended landscape trees other than street trees. (2) Receive monthly reports from the Urban Forester. (3) Review and recommend to the City Council changes to the City's tree ordinances as needed; (4) Recommend rules and guidance to the City manager as needed to implement City tree ordinances. (5) Hear appeals of the Urban Forester's tree removal permit decisions. (6) Communicate with City entities, stakeholders, and general public about the importance of Salem's urban forest and the activities of the urban forestry program. Respond to inquires or requests from the City Council.	Low	$	City		L
NR07	Ensure adequate funding for the preservation and maintenance of existing City trees as well as the planting of replacement and additional trees.	Medium	$$$$	City		S
NR08	Ensure adequate planting strip space between roads and sidewalks to provide for buffer and tree health. Work with utility companies to ensure proper setbacks from powerlines.	Low	$	City		S
NR09	Amend City code to increase the amount of shade trees that must be planted in parking lots to increase the shading of impervious surfaces and reduce heat island effects. Note: Adjustments to this strategy may be informed by updated Transportation Planning Rules and related administrative rules for Oregon as implemented through the Climate-Friendly and Equitable Communities rulemaking process.	Low	$	City		S
NR10	Continue to increase community-wide tree canopy cover, with priority emphasis on increasing coverage in underserved areas and neighborhoods. Provide assistance to local institutions to increase their own tree coverage and create spaces such as urban forests, community gardens, and pollinator habitats.	Low	$$$	City		S
NR11	Provide a set of incentives to property owners (which includes residential properties as well as large property owners such as schools, employers, etc.) to support increased tree planting with particular emphasis on increasing coverage in underserved areas and neighborhoods.	Low	$$$	City		S
NR12	Amend City code to protect large canopy trees from removal and impacts of development wherever possible. Use professional best management practices to protect existing trees during construction. Inspect and enforce tree protection measures.	Medium	$$	City		S

Appendix 8

OBJECTIVE 3: Expand the urban tree canopy

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
NR13	Develop and implement an outreach and education program for property owners (residential and commercial) to raise awareness about the value of healthy trees to Salem residents and the city's GHG emissions reduction goal, how to care for trees on their property, how to select native or ecologically well-adapted species, and how to avoid power lines when planting and trimming trees. Include specific information about how property owners can select and site trees to help lower energy use and cost of heating/cooling. Consider including a "Call before you cut" public outreach campaign component to help residents and business owners understand how to best cut/trim their trees. Set a goal to at least maintain the current levels of urban tree canopy cover on private property.	Medium	$$	City		S
NR14	Prioritize the planting of climate-resilient trees. Note: Align with Our Salem policy.	Low	$	City		S

OBJECTIVE 4: Reduce runoff and impacts from flooding

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
NR15	Offer incentives/rebates to homeowners, businesses, and developers to install pervious surfaces with the goal of decreasing runoff and flooding.	Low	$$$$	City		M
NR16	Identify areas (e.g., underutilized parking lots, empty malls/commercial space) that can be "depaved" and converted to green space to increase biodiversity, access to green spaces, and reduce the urban heat island effect.	Low	$	City		M
NR17	Update and implement a comprehensive flood management plan that incorporates reduction in extent and impacts of increased impervious surfaces due to development. Note: Align with Oregon Implementation Plan for NFIP-ESA Integration.	Low	$	City		M

Appendix 8

OBJECTIVE 4: Reduce runoff and impacts from flooding

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
NR18	Assess feasibility and impacts of best practices for structural and non-structural flood management. Non-structural flood management could include a buyout for flood-prone properties.	Low	$	City		M
NR19	Identify land in the floodplain that can be acquired publicly or privately for restoration and flood mitigation. Develop a program for restoring these floodplains to prevent future damage from flooding.	Low	$$$	City		M
NR20	Promote water conservation to protect potable water supply and reduce impacts during drought through existing conservation programs and plans, such as the Clean Streams program, Drought Contingency Plan, Water Conservation and Management Plan, as well as any new initiatives.	Low	$	City		S

OBJECTIVE 5: Improve outreach to developers and property owners regarding benefits of protecting tree canopy for reducing stormwater runoff, protecting water quality, and reducing urban heat island effects

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
NR21	Compile and improve outreach materials to guide property owners in planting and habitat restoration of flood- prone properties and riparian areas with goal of increasing quality and quantity of native vegetative cover.	Low	$	City		S
NR22	Investigate adoption of a new floodplain/natural area zone in the Salem Revised Code. This new zone would provide protection for floodplains and natural areas from development.	Low	$	City		M
NR23	Inventory and adopt Statewide Planning Goal 5 goals and guidelines for natural resources, such as wetlands and riparian areas, following Oregon Land Conservation and Development process and OAR 660-016-0000. This process includes mapping and assessing the quality and quantity of each resource and determining ecological significance.	Low	$	City		S
NR24	Reduce flood risk and enhance carbon sequestration by enhancing natural floodplain functions such as slowing runoff, storing floodwater, recharging groundwater and providing fish and wildlife habitat on City-owned properties in the floodplain.	Low	$	City		M

Appendix 8

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COMMUNITY — 39 STRATEGIES

VISION: Salem will be an engaged community where members of diverse backgrounds collaborate to cohesively achieve climate goals and build a resilient city.

GUIDING EQUITY PRINCIPLES: Intentionally and thoughtfully engage historically excluded groups of people throughout future planning and implementation efforts related to climate action strategies. Build trust and reconcile relationships between residents and City government.

OBJECTIVE 1: Strengthen neighborhoods and communities to increase climate resilience

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
CM01	Create an environmental screening tool that identifies Salem neighborhood by census track that are disproportionately burdened by, and vulnerable to, urban heat islands, flooding, and multiple sources of pollution. Formalize the use of the screening tool in City planning efforts to prioritize the needs of the most vulnerable residents.	Low	$	City		S
CM02	Build on previous work by the City of Salem, analyze and map food deserts (areas that have limited access to affordable and nutritious food) in Salem; Partner with Marion Food Share to create and implement a plan to increase access to food.	Low	$$$	City		M
CM03	Incentivize the conversion of vacant buildings to housing, mixed-use with housing, or for housing for people experiencing homelessness. Prioritize low-income areas.	Low	$$$	City		M
CM04	Expand efforts to provide food distribution among residents who are experiencing food insecurity.	Low	$$$-$$$$	NGO		M
CM05	Consider developing a CERT-like program to include a community volunteer program that can provide childcare, food delivery, yard work, neighbor check-ins and assist with disaster response and recovery efforts.	Low	$	City		L
CM06	Engage faith communities, social service agencies, nonprofits and neighborhood associations in building neighborhood resilience.	Low	$$	City		S

Appendix 8

OBJECTIVE 1: Strengthen neighborhoods and communities to increase climate resilience

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
CM07	Create a network of neighborhood resilience hubs, indoor gathering places that can function as community centers, cooling centers, food distribution, places to access electricity during power outages, evacuation sites, day cares and community learning centers.	Low	$$$$	City		L
CM08	Build community cohesion by engaging with different communities to co-sponsor events that encourage cultural interaction.	Low	$	City		S
CM09	Establish targeted funding to fund specific community needs defined not only by geographic location, but also by "income, environmental burdens, number of investments," (State of Oregon Equity Blueprint) and other factors related to equity.	Low	$$$$	City		L
CM10	Identify funding opportunities (e.g., grants, dedicated project funds) to "to create an adequate budget for Community Based Organizations (CBOs) to build their general capacity to engage" with Salem's Climate Action Plan strategies.	Low	$$$	City		M
CM11	Support Oregon Health Authority efforts related to the Healthy Homes Program (established with HB 2842) to ensure Salem residents have adequate heating and cooling and can mitigate the impacts from mold and lead paint in their homes. Coordinate with local non-profits for implementation of supportive efforts.	Low	$	City		M

OBJECTIVE 2: Facilitate diverse participation and representation from Salem residents in City and community planning

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
CM12	Adopt considerations for City planning projects that measure the equity impacts of planning and infrastructure decisions. Two resources for developing criteria include: - State of Oregon's "Critical Thinking Tool for Identifying Most Impacted Communities" (State of Climate Equity Blueprint, Appendix B) - Portland/Multnomah County's "9 Equity Considerations" (Climate Action through Equity, pg. 12)	Low	$	City		M
CM13	Coordinate with existing community-based organizations to ensure equitable implementation of strategies from the Climate Action Plan.	Low	$	City		S
CM14	Increase the accessibility, diversity, and inclusivity of public meetings, including City Council meetings, through best practices and multiple modes of engagement (e.g., virtual and in-person attendance options, electronic/online and hard copy materials)	Low	$	City		S

OBJECTIVE 2: Facilitate diverse participation and representation from Salem residents in City and community planning

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
CM15	Seek input and representation from residents and community organizations about their specific needs and wants, incorporate input and feedback into planning and development for neighborhood hubs/ mixed-use projects in low-income and underserved communities.	Low	$	City		S
CM16	Compensate community participants for the time they spend providing needed input to planning processes. Compensation may include transportation vouchers, meals, and child care as needed to allow for participation from a broad range of voices.	Low	$	City		S
CM17	Assess the cultural effectiveness of City communications and messaging in languages other than English and determine opportunities for improvement. Improve the effectiveness of City communications and increase language accessibility through strategies such as creating and sharing videos and announcements in languages other than English commonly spoken by Salem residents.	Low	$$	City		S
CM18	Adopt accessible and inclusive engagement strategies and best practices, such as those described in the State of Oregon's Climate Equity Blueprint.	Low	$$$	City		S
CM19	Allow for more representation from renters in City decision-making groups that determine development policies and plans.	Low	$	City		S

OBJECTIVE 3: Continue collaborative relationships with Indigenous Peoples

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
CM20	Continue to work with indigenous communities, including but not limited to the Confederated Tribes of Grand Ronde, Confederated Tribes of Siletz Indians, and the Confederated Tribes of Warm Springs. Follow best practices for collaboration and decision-making, such as those described in the "Characterizing Tribal Cultural Landscapes Volume I: Project Framework" from the Bureau of Ocean Energy Management (BOEM) and existing MOUs.	Low	$	City		S
CM21	Collaborate with indigenous communities to develop and implement outreach and engagement programs to help residents cope with trauma associated with climate-related displacement.	Low	$	City		S
CM22	Collaborate with indigenous communities to reinstate their connection with the land within the City of Salem's jurisdiction, including facilitating traditional celebrations and other activities.	Low	$	City		S

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OBJECTIVE 4: Engage underserved populations in co-creating resilient solutions and create opportunities for communities to lead change

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
CM23	Identify environmental justice leaders from historically excluded communities who can play instrumental roles in identifying and implementing equitable strategies. Collaborate with these identified leaders and support as requested. As often as possible, the City should work as a partner with local communities and community-based organizations (CBOs).	Low	$	City		S
CM24	Engage residents in neighborhoods projected to be most impacted by climate change to understand local risks and develop strategies to increase resilience. Pursue and advance "opportunities that allow communities to identify their own needs, interests, and vision for the future" (State of Oregon Equity Blueprint)	Low	$$	City		S
CM25	Engage with local social service agencies and nonprofits to communicate with underserved populations about climate risks and resilience strategies.	Low	$	City		S
CM26	Work with existing community-based organizations to form a coalition and facilitate a process where residents and groups that have been typically excluded can identify issues and bring solutions to the City (e.g., through the City Budget Committee). Specifically collaborate with the Salem Leadership Foundation and their community action teams.	Low	$	City		S
CM27	Increase internet access for Salem residents who currently do not have reliable high-speed internet access.	Low	$$$$	City		S

OBJECTIVE 5: Increase City of Salem's internal capacity to better integrate and ensure equitable implementation of CAP strategies

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
CM28	Require City staff and departments to participate in ongoing intercultural competency training and workshops.	Low	$	City		S

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OBJECTIVE 5: Increase City of Salem's internal capacity to better integrate and ensure equitable implementation of CAP strategies

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
CM29	Hire at least one full-time staff member to coordinate all implementation efforts of Salem's CAP. This staff member will be tasked with coordinating inter-departmental collaborative efforts to ensure environmental justice (EJ) best practices are used during CAP implementation. Staff member will also ensure every City department's "policies and programs are aligned with Oregon's environmental justice statutes."	Low	$$$	City		S
CM30	Develop standards so that all future Climate Action Plan related goals are "SMARTIE - Strategic, Measurable, Ambitious, Realistic, Time-Bound, Inclusive, and Equitable."	Low	$	City		S

OBJECTIVE 6: Improve data collection and data sharing processes

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
CM31	Ensure all City and community maps are in one spot online for ease of access.	Low	$	City		S
CM32	Maintain DataSalem with relevant maps that show climate impacts and affected communities.	Low	$$	City		S
CM33	Develop and maintain data about Salem's population characteristics. Use DataSalem to establish a publicly accessible and authoritative hub of demographic information.	Low	$$	City		S
CM34	Partner with community-based organizations (CBOs) to ensure City data reflect the lived experiences of residents. Collaborate with CBOs to gather data and allow communities to collect "data questions and products in ways that are responsive to local and culturally-specific priorities" (State of Oregon Equity Blueprint). Coordinate efforts and collaborate with local universities for community-based climate research projects.	Low	$$	City		S
CM35	Incorporate citizen science methods of engaging communities "climate-specific projects to incorporate on-the-ground observations, lived experiences, and local perspectives" (State of Oregon Equity Blueprint).	Low	$$	City		S
CM36	Train City "staff and partners on how to use and integrate climate equity data" (State of Oregon Equity Blueprint). For example, Washington's King County offers a workshop for GIS practitioners on integrating Critical Race Theory (CRT) into their work.	Low	$	City		S

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OBJECTIVE 7: Create a community education and outreach program to implement the recommendations of the Climate Action Plan						
Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
CM37	Create a public engagement campaign to educate and create behavior change among Salem residents to reduce GHG emissions.	Low	$$	City		S
CM38	Collaborate with Salem-Keizer School District and local educational institutions to develop curricula and career programs focused on climate change and sustainability education.	Low	$	City		S
CM39	Using frames of community preparedness and resilience, create and implement public messaging that models and encourages conservation behaviors. Include ongoing prompts and reminders about climate vulnerabilities and how Salem residents can prepare.	Low	$$	City		S

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FOOD SYSTEM — 8 STRATEGIES

VISION: Salem will have a healthy, local food system with an abundant and accessible supply of food.

GUIDING EQUITY PRINCIPLES: Prioritize residents who do not currently have access to healthy foods and grocery stores during implementation of food-related strategies.

OBJECTIVE 1: Increase food access through expanded community gardens and farmers markets

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
FD01	Collaborate with Marion-Polk Food Share to incentivize community gardens in schools and neighborhoods, with priority emphasis on underserved communities.	Low	$	City		M
FD02	Allow agroforestry and urban farming on City-owned land. Work with property owners to plant gardens or pollinator habitat on vacant lots. Grow trees and annual crops with intercropping practices to increase biomass, organic matter, and sequester carbon. Consider Minto-Brown Park as a pilot project.	Medium	$$$	City		M
FD03	Collaborate with Salem Community Markets and neighborhood associations to have a farmer's market in every existing ward or neighborhood.	Low	$$	City		M
FD04	Allow and support production of plant-based food on private property.	Low	$	City		S

OBJECTIVE 2: Support and incentivize the growth of the local foods marketplace

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
FD05	Incentivize large, local institutions (e.g., businesses, schools and higher education institutions, hospitals) to commit to purchasing ingredients and products from local food producers, including community gardeners. Securing a reliable supply for local food producers will help stabilize their current production, encourage increased production and attract new producers to the market.	Low	$$$	City/NGO		L

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OBJECTIVE 2: Support and incentivize the growth of the local foods marketplace						
Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
FD06	Develop and implement a recognition program for local businesses who support/sell locally grown produce and locally manufactured food and beverage items. Support may include the direct purchasing of ingredients and products from local producers/community gardeners, as well as indirect purchasing support, such as providing transportation options to/from local community gardens.	Low	$$	City		M
FD07	Explore public and private partnerships that encourage cooperatives or other frameworks of social and economic support for local producers, including community gardeners.	Low	$	City/NGO		L

OBJECTIVE 2: Sequester carbon through local land management practices						
Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
FD08	Identify and support opportunities that increase carbon capture through soil sequestration, e.g. permaculture, cover cropping, biochar and other soil conservation practices on City-owned land.	Medium	$$	City		S

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MATERIALS & WASTE — 24 STRATEGIES

VISION: Salem will be a closed-loop community when it comes waste, first reducing waste at the source, then repairing and reusing materials, and impacts from disposal will be minimal.

GUIDING EQUITY PRINCIPLES: Ensure that waste disposal practices and requirements do not disproportionately affect low-income neighborhoods or historically marginalized communities.

OBJECTIVE 1: Establish data tracking and reporting processes

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
MW01	Calculate a baseline, track, and report a diversion rate for City of Salem using Marion County data.	Low	$$	City		S
MW02	Conduct regular waste audits to identify materials being sent to the landfill, to gain an understanding of contamination rates, and to identify diversion opportunities.	Low	$$	City		S

OBJECTIVE 2: Reduce waste at the source and facilitate a closed loop, circular economy

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
MW03	Continue reducing emissions and minimizing waste through current practices, including following State guidance on prioritizing sustainable products, limiting deliveries to two days per week, and facilitating electronic RFP/bid processes.	Low	$	City		S
MW04	Write and implement a sustainable purchasing policy for the City to be informed by best practices, reducing GHG emissions, limiting harmful chemicals, prioritizing local businesses, and ensuring safe and fair supply chains.	Low	$	City		S

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OBJECTIVE 2: Reduce waste at the source and facilitate a closed loop, circular economy

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
MW05	Develop more comprehensive sustainable specifications for City bidding/RFP processes.	Low	$	City		S
MW06	Develop lending libraries of things (ex. Thingery in Vancouver) to be located at neighborhood resilience hubs. Collaborate with public libraries and neighborhood associations.	Low	$$$	City		S
MW07	Collaborate with local and regional producers to recycle packaging, printing and writing paper and food serviceware at the end of life, i.e. support policies and practices related to extended producer responsibility per SB 582.	Low	$$$$	City		M
MW08	Implement and enforce a city-wide ban on non-essential single-use plastics and expanded polystyrene (EPS) products.	Low	$	City		M

OBJECTIVE 3: Set a goal to achieve zero waste (meaning at least 90% of waste is diverted from the landfill through waste reduction, reuse, recycling and composting) in municipal operations

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
MW09	Set goals and determine practices (e.g., using reusable materials over single-use items) to reduce waste at City-funded events, including all meetings and conferences.	Low	$	City		S
MW10	Create policies and procedures for waste reduction through purchasing and waste handling for City employees.	Low	$	City		S
MW11	Train custodial staff in waste diversion instructions.	Low	$	City		S
MW12	Analyze the waste generated from municipal operations to establish a baseline; track and report progress towards achieving the 90% diversion rate.	Low	$	City		S
MW13	Engage City employees in activities to encourage behavior change, like training, discussion, competitions, presentations, awards, etc.	Low	$	City		S
MW14	Establish a city-wide waste reduction education program.	Low	$	City		S

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OBJECTIVE 4: Reduce food waste to reduce GHG emissions

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
MW15	Implement an educational and outreach program for residents and businesses that raises awareness about how to reduce food waste at home and at work. Work with Marion County Environmental Services to develop and share information.	Low	$$	Marion County Environmental Services		M
MW16	Work with Marion Polk Foodshare and Salem Harvest to build on existing food recovery efforts/ programs to establish a comprehensive food bank/donation/recovery system throughout all of Salem. Bring catering companies, restaurants, and food services providers together with community services organizations so everyone can learn from each other about how to best serve the residents of Salem and reduce food waste.	Low	$$	Marion Polk Foodshare		M
MW17	Implement a convenient, city-wide composting program for residents, including both multi- and single-family residential properties. Identify existing multi-family food waste collection programs that are working and expand existing programs to service multi-family residences.	Medium	$$	City		L
MW18	Educate residents how to do backyard composting, and incentivize with coupons or gift certificates to local businesses. Work with Marion County Environmental Services to develop and share information.	Low	$	City		M
MW19	Work with local restaurants to identify their barriers to reducing food waste and composting. Work with Marion County Environmental Services to develop an educational program with incentives for implementing strategies for reducing food waste and diverting organic waste from the landfill.	Low	$$	City		M
MW20	Provide incentives to farms, food producers, retailers, and restaurants to divert excess food to organizations that can distribute the food to members of the community who are experiencing food insecurity.	Low	$	City		L

OBJECTIVE 5: Support sustainable material management through financial incentives

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
MW21	Explore incentives for residences and businesses that reduce food waste, including the use of a pay structure for municipal waste disposal services based on lower overall costs for lower rates of contamination.	Medium	$	City		L

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OBJECTIVE 6: Reduce air pollution from waste

Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
MW22	Explore how to send waste to landfill rather than Covanta plant.	Medium	$$	City		M

OBJECTIVE 7: Accelerate capture of all wastewater emissions

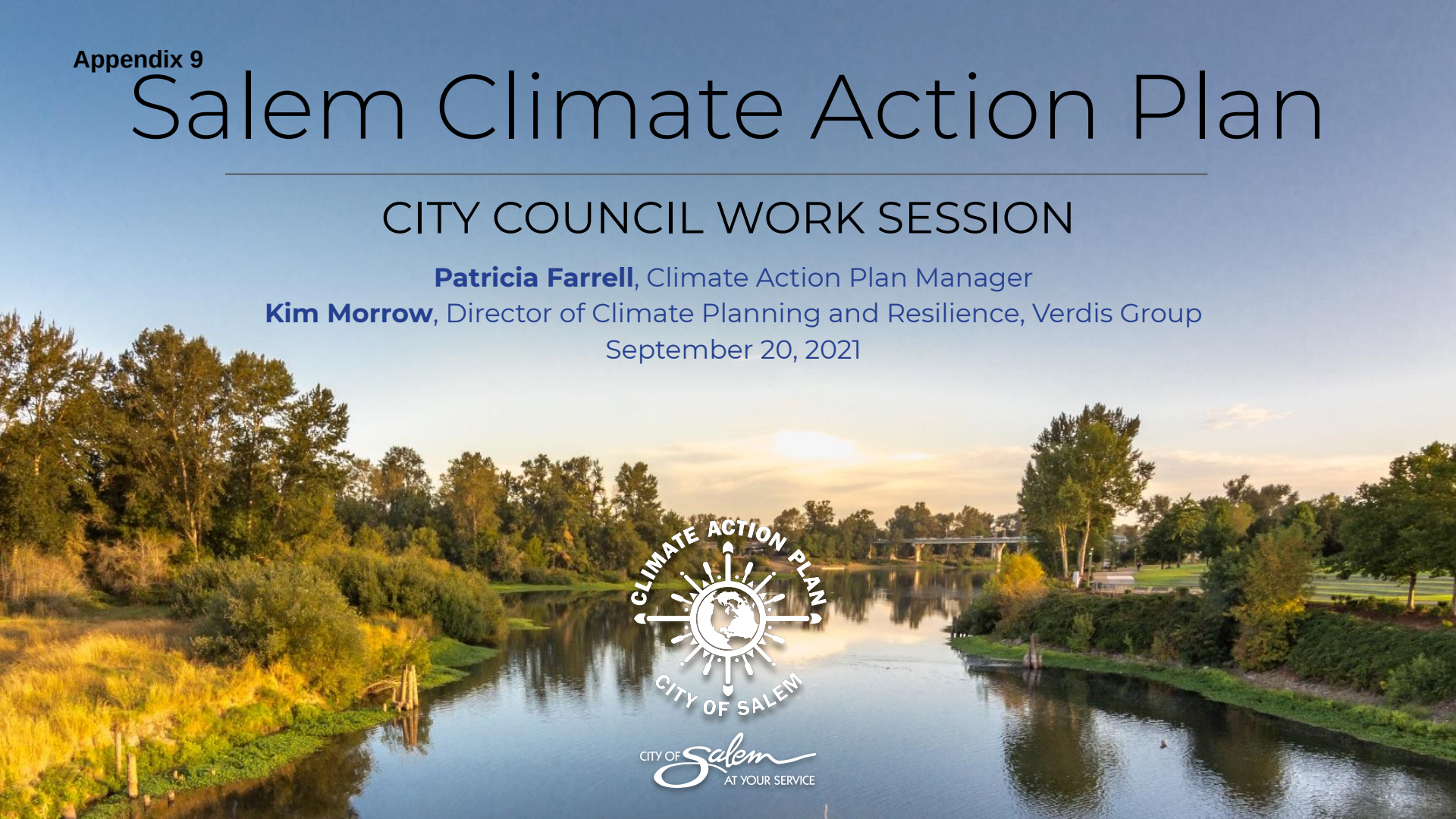
Code	Task	GHG Reduction Potential	Cost	Lead Agency	Co-Benefits	Suggested Timeframe
MW23	Enhance the capture of wastewater emissions for renewable natural gas (RNG) to be used for energy.	High	$$$$	City		L
MW24	Adopt improved water treatment methods that reduce the production of methane as they become available.	Low	$$	City		L

Appendix 9

Salem Climate Action Plan

CITY COUNCIL WORK SESSION

Patricia Farrell, Climate Action Plan Manager
Kim Morrow, Director of Climate Planning and Resilience, Verdis Group
September 20, 2021



Appendix 9

Project Context

What's at stake?

The changing climate impacts us in the form of:

- Floods
- Drought
- More extreme heat days (above 90˚F)
- Wildfires
- Hazardous air quality from wildfires
- Extreme winter events

Impacts of climate change are not experienced equally

“Human influence has warmed the climate at a rate that is unprecedented in at least the last 2000 years.” - Intergovernmental Panel on Climate Change, 2021.

50%

Reduce Salem's greenhouse gas emissions by 50% by 2035

0%

Become carbon neutral city by 2050

CLIMATE ACTION PLAN GOALS

In October 2020, City Council adopted the following goals as part of the Salem's Climate Action Plan:

1. By 2035, Salem's greenhouse gas emissions shall be reduced to 50% of the citywide greenhouse gas emissions from the baseline year of 2016, and
2. By 2050, Salem should be carbon neutral.

WHAT IS SALEM'S CLIMATE ACTION PLAN?

A plan to:

- Achieve Climate Action Plan Goals for reducing greenhouse gas emissions (mitigation)
- Help the Salem community prepare for climate change (adaptation / resiliency)
- Identify and recommend actions to prioritize for implementation
- Identify key partners for implementation

Appendix 9

Where are we in process?

Visioning

Fall 2020

Task Force Workshop #1
Nov. 18, 2020

Vulnerability Assessment

Winter 2021

Task Force Workshop #2
Jan. 13, 2021

Strategy Development

Winter-Spring 2021

Task Force Workshop #3
March 3, 2021

Task Force Workshop #4
April 7, 2021

Implementation Planning & Strategy Refinement

Summer-Fall 2021

Task Force Workshop #5
June 23, 2021

City Council Work Session
September 20, 2021

Task Force Workshop #6
Oct. 27, 2021

Finalization of Plan

Fall 2021

Boards & Commissions

City Council Public Hearing
Dec. 6, 2021

Appendix 9

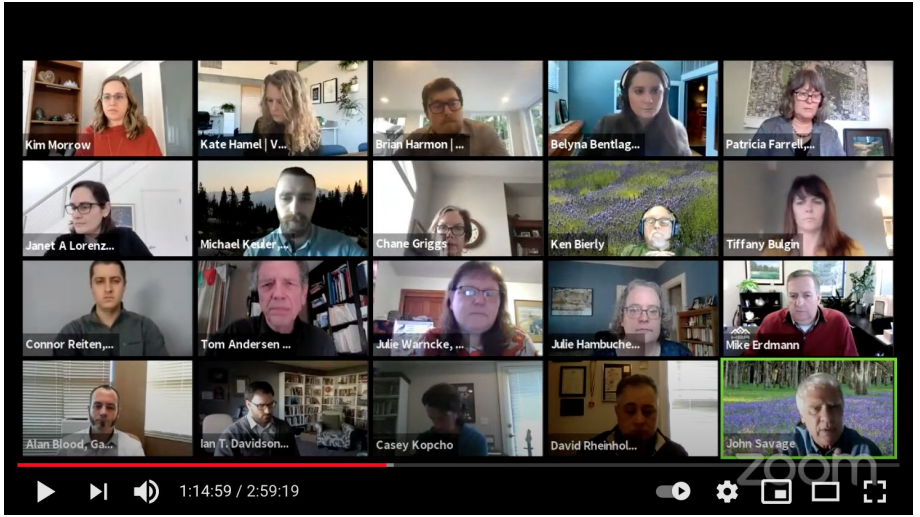
Public Engagement

Appendix 9

Climate Action Plan Task Force

Representatives from transportation, commercial, residential, environmental advocacy, economic development, energy, education, communities of color, food supply, public health, homebuilders, and others

- 33 community representatives
- 3 City councilors (Andersen, Gonzalez, & Nordyke)
- Plus 5 City staff



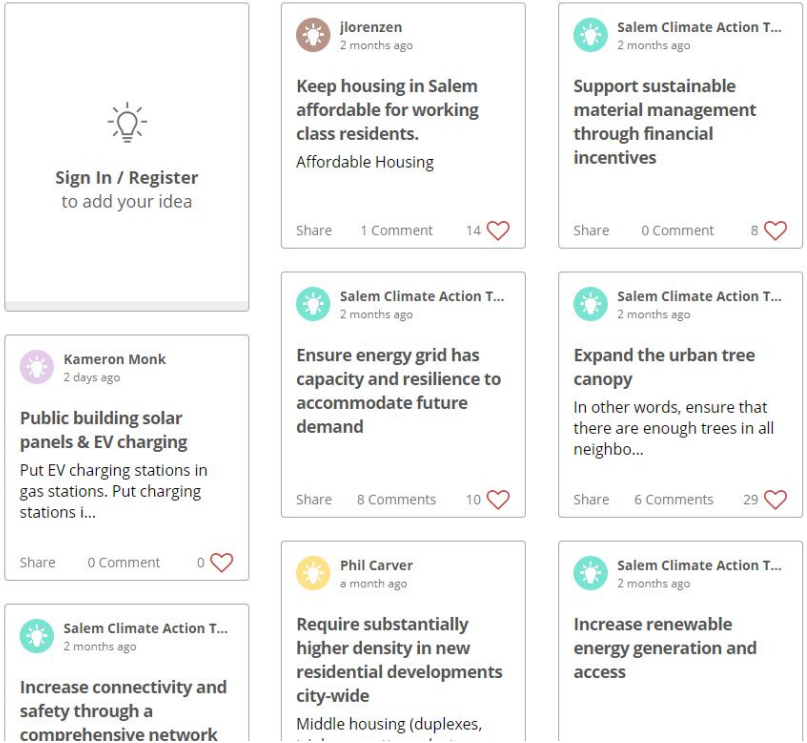
See Attachment 1 in Staff Report for full list of Task Force members.

Appendix 9

Community Participation

The following is a list of community participation/ opportunities:

- Initial community survey
- Envisioning a resilient Salem activity
- Strategy ideas brainstorming activity
- Strategy ideas ranking survey
- Strategy development feedback activity
- Surveys, focus groups, and meetings with targeted communities
- Review draft Climate Action Plan



SalemClimateActionPlan.com/Get-Involved

Appendix 9

Project Outreach

The following is a list of outreach strategies:

- Community presentations and forums (32)
- Presentations to City Boards and Commissions (6)
- Attending community events (6)
- Radio interviews (3)
- Weekly public services announcements over radio
- Weekly social media posts
- Salem Connection, City's weekly e-newsletter
- Distributing project handouts and surveys (English and Spanish) at community events
- Documenting and posting of all meeting materials, meeting recordings, and pertinent studies on project website

Appendix 9

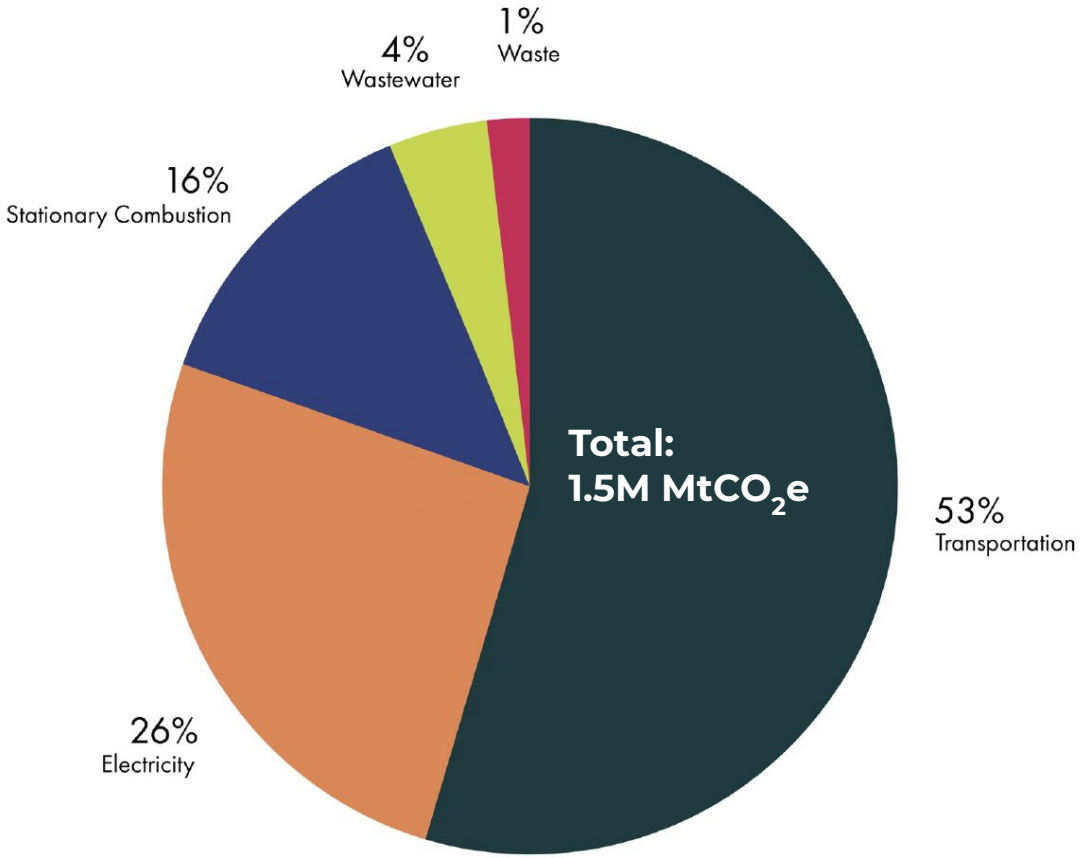
Salem's GHG Emissions Sources

Appendix 9

Where do Salem's Emissions Come From?

2016 SECTOR-BASED GREENHOUSE GAS INVENTORY

- Largest source of emissions is transportation
- Second-largest is electricity generation
- Third-largest is stationary combustion, i.e., natural gas usage



Appendix 9

Increasing Resilience, Reducing Emissions, and Building Equity

Appendix 9

ACTION AREAS

The strategies in the Climate Action Plan are organized around the following Action Areas:

1. Transportation & Land Use
2. Energy
3. Economic Development
4. Natural Resources
5. Community
6. Food System
7. Materials & Waste

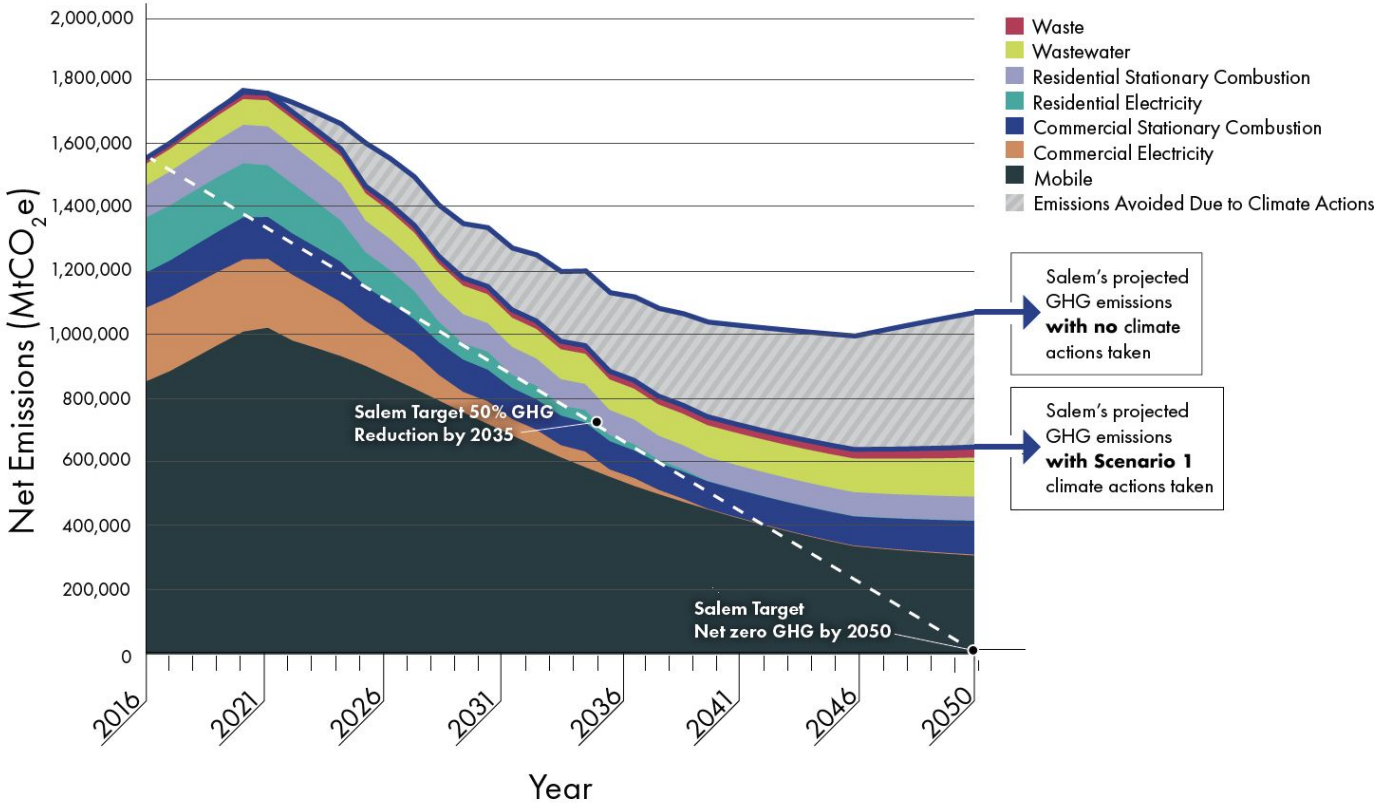
See Attachment 2 of Staff Report for a complete list of the strategies.

Appendix 9

Greenhouse Gas Emissions Forecasts

Appendix 9

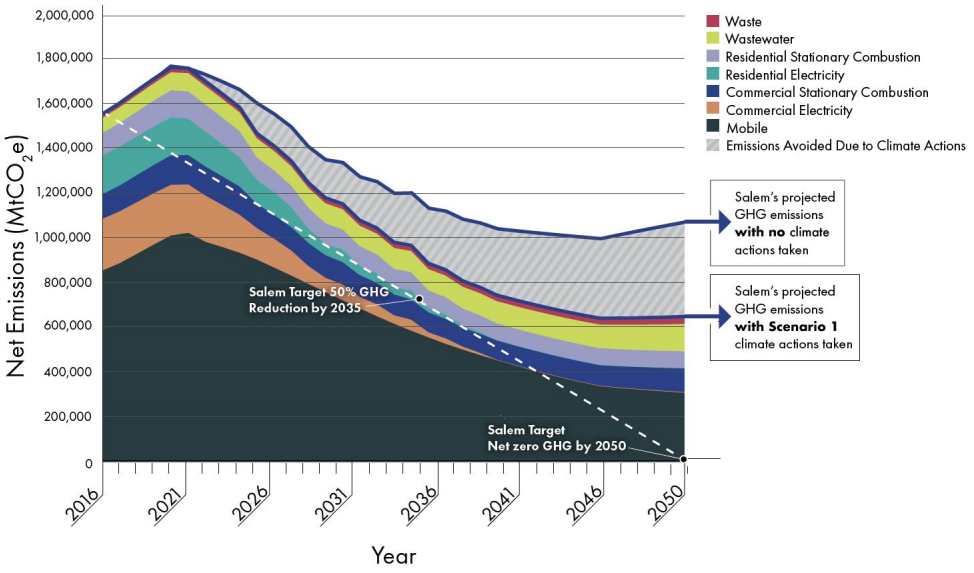
SCENARIO 1



Appendix 9

What is required to achieve Scenario 1?

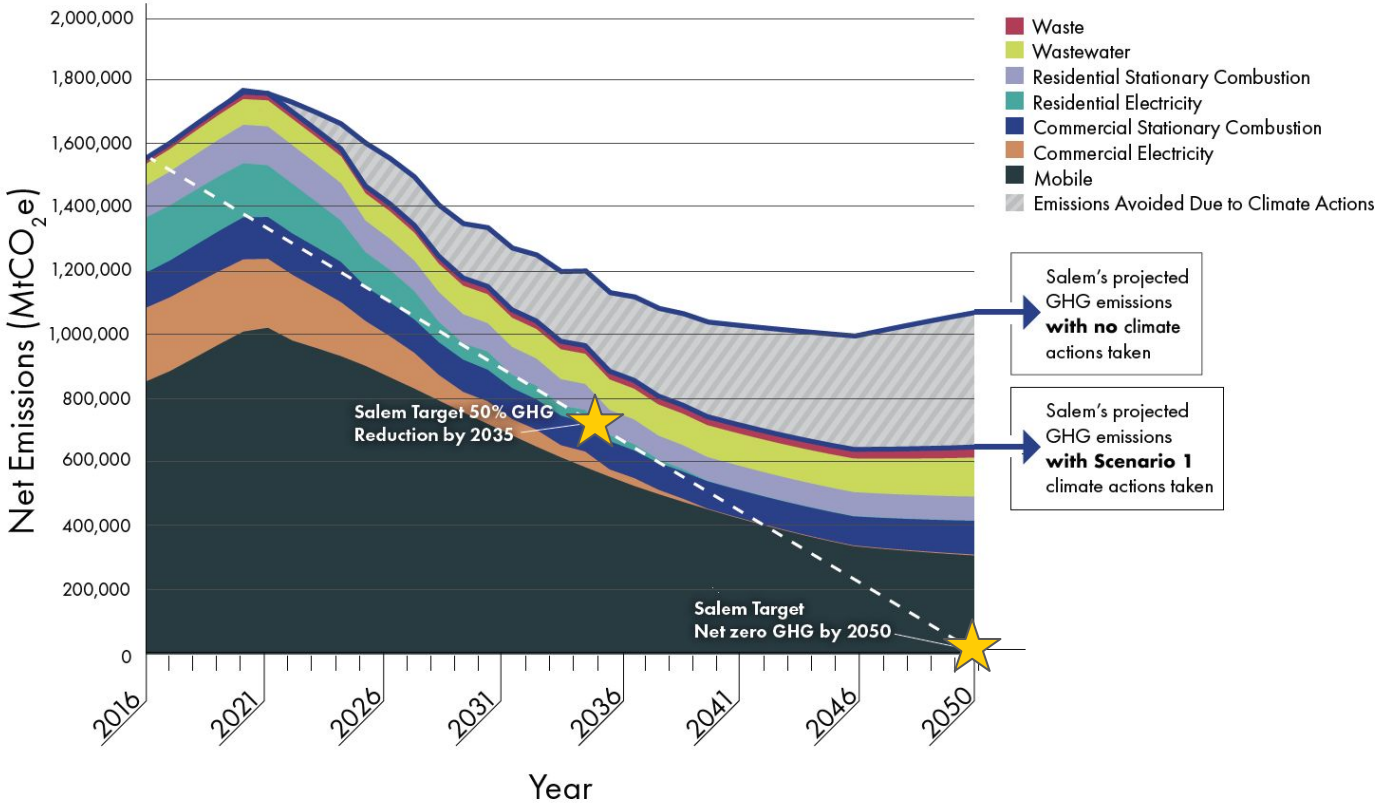
1. Double the rate of electric vehicle (EV) adoption
2. Quadruple the rate of transit ridership
3. Double the rate at which residents use biking and walking
4. Transition to a zero-emissions bus fleet
5. Reduce the amount of passenger vehicle traffic coming into and out of Salem by 40%
6. Reduce the amount of traffic within Salem by 10%
7. Halt all growth in natural gas emissions
8. Improve building efficiency by an average of 10% by 2050
9. Maximize onsite solar
10. Maximize carbon sequestration of plants and trees



Appendix 9

SCENARIO 1 RESULTS

- 40% net reduction in emissions by 2035
- 58% net reduction in emissions by 2050



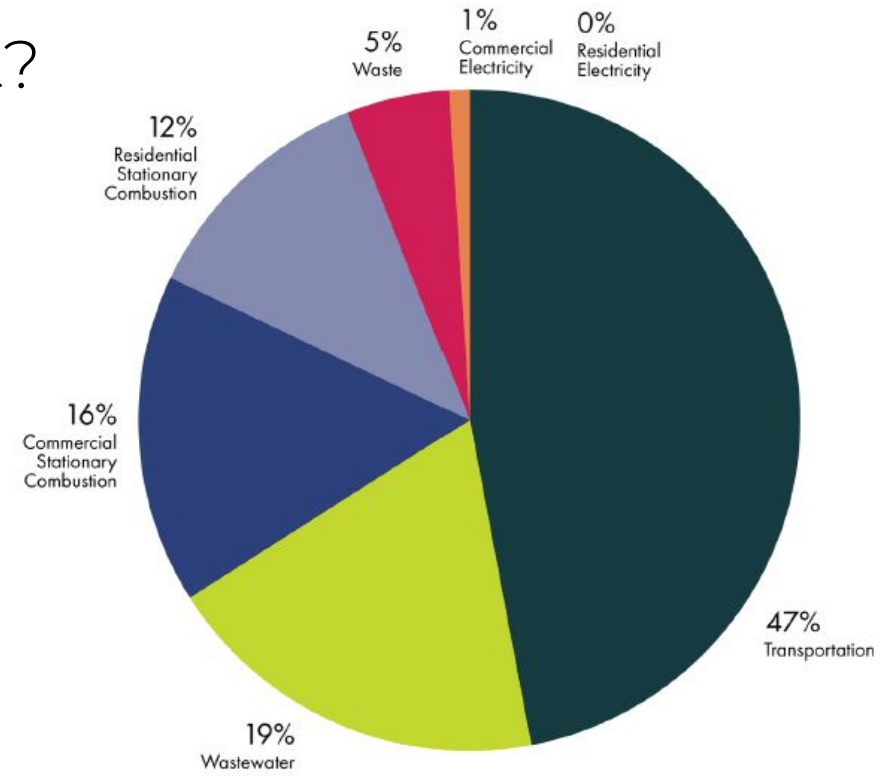
Appendix 9

Why wasn't the target met?

BREAKDOWN OF REMAINING GHG EMISSIONS IN 2050

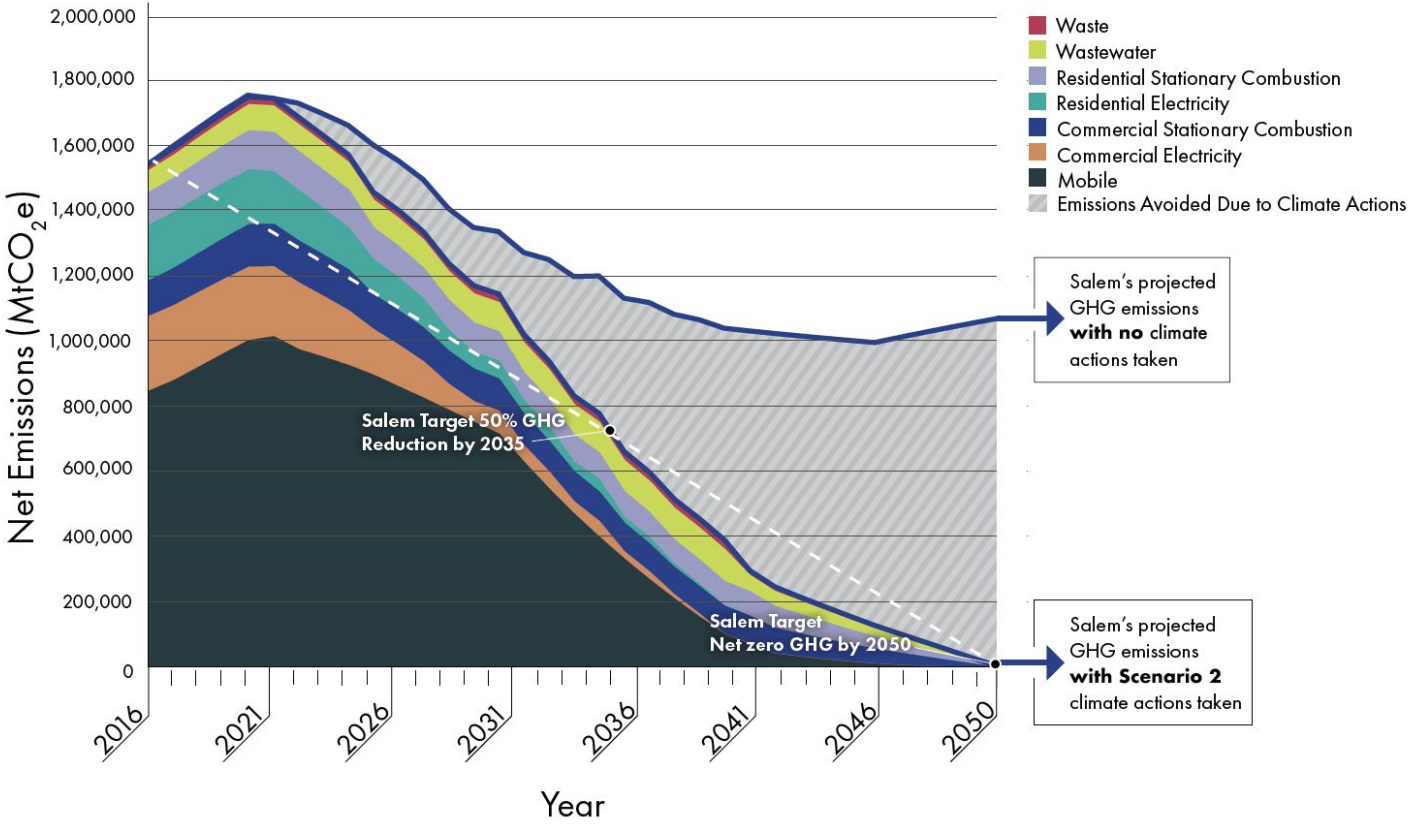
Several types of emissions will be challenging to eliminate.

- Transportation emissions from internal combustion engines will constitute nearly half of remaining emissions
- Natural gas emissions will constitute nearly one-third
- Wastewater will constitute 19%



Appendix 9

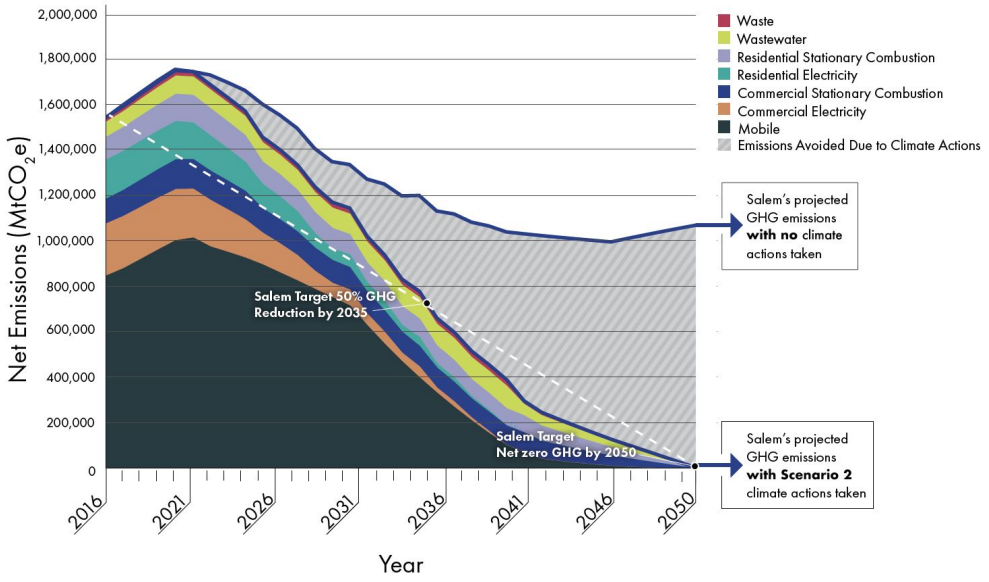
SCENARIO 2



Appendix 9

What is required to achieve Scenario 2?

11. Halt the entry of non-resident internal combustion engine traffic
12. Halt the entry of internal combustion engine heavy trucking
13. Halt internal combustion air traffic
14. Ensure a 100% renewables-only electricity grid
15. Remove all fossil fuel-derived natural gas systems in the built environment
16. Remove all other building fossil fuels (e.g. propane, diesel) in the built environment
17. Achieve zero waste through circular economy, compost, recycling
18. Capture all wastewater emissions
19. Halt all septic emissions by requiring locations on septic to join centralized wastewater treatment



Appendix 9

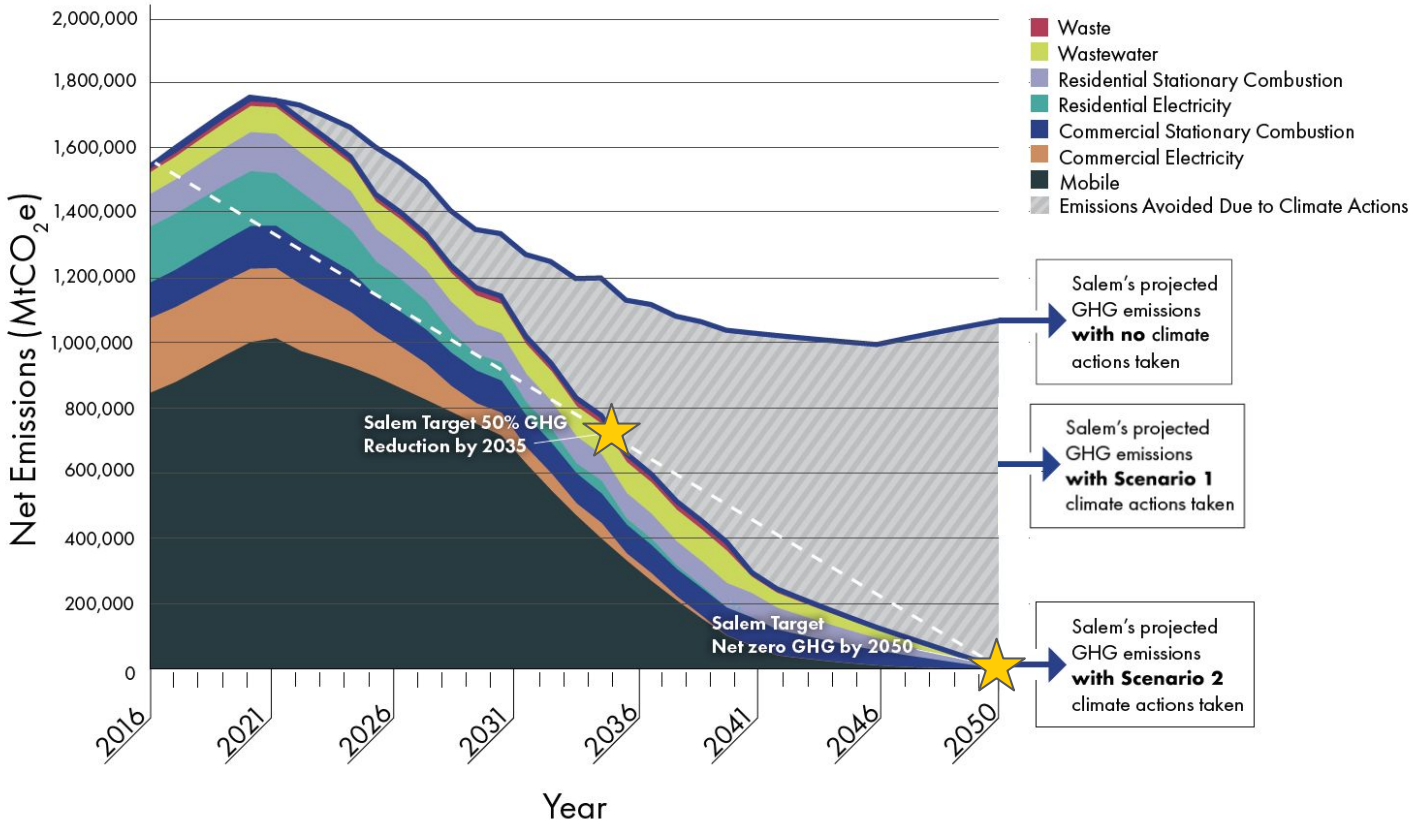
Assumptions Modeled in Scenario 2

1. Double the rate of electric vehicle (EV) adoption
2. Quadruple the rate of bus ridership
3. Double the rate at which residents use biking and walking
4. Transition to a zero-emissions bus fleet
5. Reduce the amount of passenger vehicle traffic coming into and out of Salem by 40%
6. Reduce the amount of traffic within Salem by 10%
7. Halt all growth in natural gas emissions
8. Improve building efficiency by an average of 10% by 2050
9. Maximize onsite solar
10. Maximize carbon sequestration of plants and trees
11. Halt the entry of non-resident internal combustion engine traffic
12. Halt the entry of internal combustion engine heavy trucking
13. Halt internal combustion air traffic
14. Ensure a 100% renewables-only electricity grid
15. Remove all fossil fuel-derived natural gas systems in the built environment
16. Remove all other building fossil fuels (e.g. propane, diesel) in the built environment
17. Achieve zero waste through circular economy, compost, recycling
18. Capture all wastewater emissions
19. Halt all septic emissions by requiring locations on septic to join centralized wastewater treatment

Appendix 9

SCENARIO 2 RESULTS

- 57% reduction in emissions by 2035
- Net zero emissions by 2050



Appendix 9

What about purchasing carbon offsets?

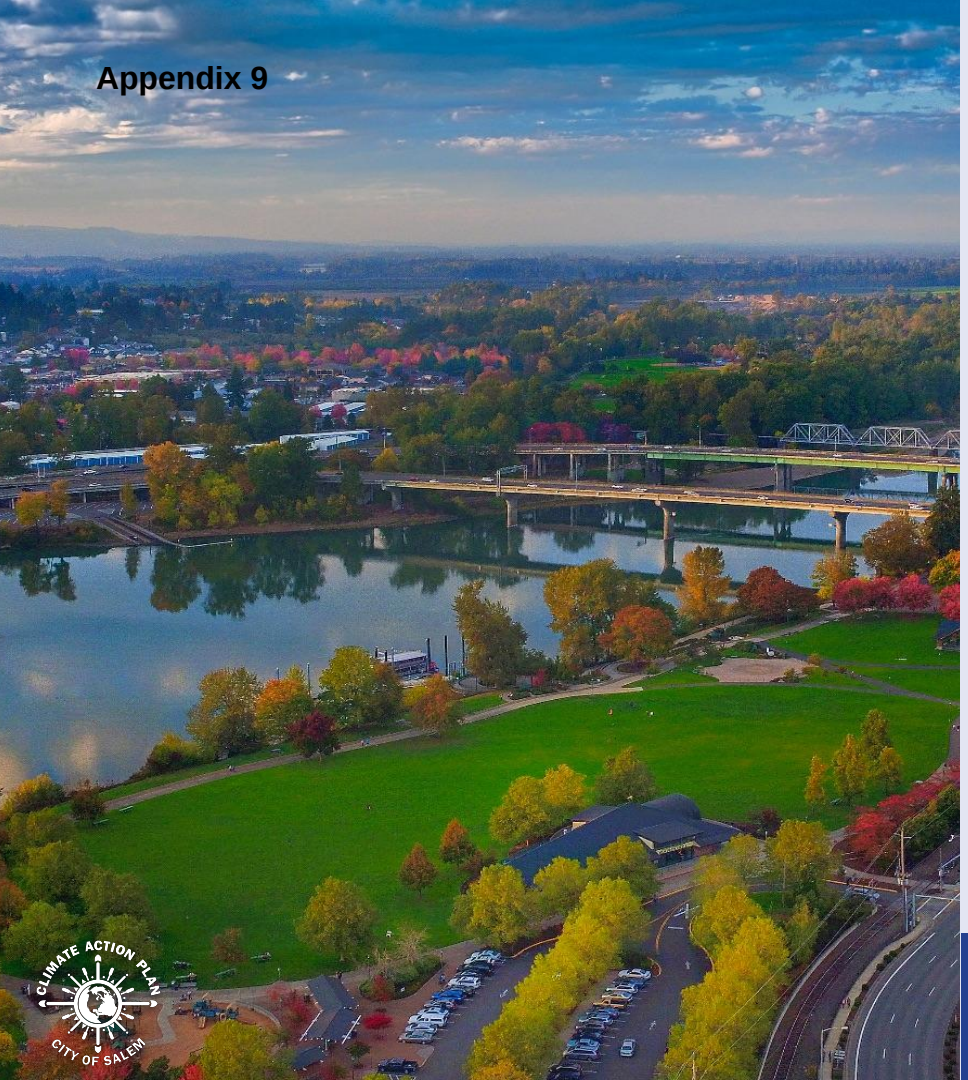
CARBON OFFSETS ARE ACTIONS TAKEN TO COMPENSATE FOR THE EMISSION OF GHGs

Neither scenario includes carbon offsets

- The cost of carbon offsets currently ranges from about $6 - $15 per $MtCO_2e$
- Scenario 1 shows close to 600,000 $MtCO_2e$ remaining in 2050
- It would cost the City $3.9M - $9.7M per year to offset that amount

Appendix 9

Keys to Implementation



Appendix 9

KEYS TO IMPLEMENTATION

The following strategies will be needed to ensure the success of the Climate Action Plan:

1. Hire an FTE coordinator to lead implementation and provide funding for the person and program
2. Establish a working group to guide community-wide implementation
3. Prioritize equity
4. Regularly communicate with Salem residents, businesses, and others
5. Track and report emissions at regular intervals
6. Update the Climate Action Plan every five years

Appendix 9

High-Impact GHG Reduction Strategies

Appendix 9

High-Impact GHG Reduction Strategies

ENERGY

The following strategies could have a high impact in reducing emissions.

- Create **energy benchmarking and transparency** policies and reward building owners who improve building energy efficiency.
- Develop a comprehensive program to help residents and business owners **weatherize buildings** and improve energy efficiency, with a priority emphasis on properties with low-income renters.
- Provide incentives for new construction that is **all-electric.**
- Implement an incentive program for residents and businesses to **switch from natural gas appliances** to all-electric models.
- Implement policies to **reduce natural gas usage**, such as requiring all-electric new construction, prohibiting fossil fuel usage in new construction, and/or banning the use of gas and oil in residential appliances.

Appendix 9

High-Impact GHG Reduction Strategies

TRANSPORTATION

The following strategies could have a high impact in reducing emissions.

- Expand **public transit** infrastructure in Salem with a focus on equity-based access.
- **Increase urban density** along the core transportation network.
- Incentivize Salem area employees to shift from driving alone to **using alternative forms of transportation**, including carpooling, walking, biking, and transit. Where possible, increase work from home options.
- **Charge for city-controlled parking** using a model intended to reduce parking in the central business district to 70-80% of supply.

Appendix 9

Where are we in process?

Visioning

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Jan. 13, 2021

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City Council Public Hearing
Dec. 6, 2021

Appendix 9

Council Discussion

Appendix 9


CLIMATE ACTION PLAN
CITY OF SALEM
in partnership with
verdis
GROUP

CITY OF SALEM

555 Liberty St SE
Salem, OR 97301

Staff Report

File #: 21-323
Version: 1

Date: 9/20/2021
Item #: 2.a.

TO: Mayor and City Council

THROUGH: Steve Powers, City Manager

FROM: Peter Fernandez, PE Public Works Director

SUBJECT:

Salem Climate Action Plan Work Session

Ward(s): All Wards
Councilor(s): All Councilors
Neighborhood(s): All Neighborhoods
Service Area(s): Safe Community; Welcoming and Livable Neighborhood; Good Governance; Natural Environment Stewardship

SUMMARY:

A City Council work session on the Salem Climate Action Plan is scheduled for September 20. To assist City Council in advance of the work session, this report summarzes the project approach, progress to date, and implementation strategies to meet the City's Greenhouse Gas reduction goals.

ISSUE:

Salem Climate Action Pla.

RECOMMENDATION:

Information only.

FACTS AND FINDINGS:

Salem began developing its Climate Action Plan (CAP) in August 2020. In October 2020 Council established two goals:

1. Reduce Salem's Greenhouse Gas (GHG) emissions 50% from 2016 levels by 2035; and

2. Be carbon neutral by 2050.

Verdis Group, a consulting firm specializing in climate action planning, was hired to assist in developing the CAP. A 33-member Task Force was established with a broad cross-community representation (Attachment 1). The Task Force has conducted five workshops that focused on vision, vulnerability, GHG forecast modeling, strategy development, and strategy priorities. The public has been engaged and informed throughout the process via online activities, public presentations, community events, radio interviews, public service announcements, and social media posts. Information was provided in both English and Spanish.

Salem is vulnerable to climate change impacts, including flooding, drought, excessive heat days (days with temperatures over 90 degrees Fahrenheit), and wildfires in the region. These impacts can cascade, disrupting transportation, agricultural production, food supplies, and public health.

People of color, residents living in poverty, seniors, children, and people who work or live outdoors are impacted disproportionately by extreme weather. The CAP includes guiding equity principles to assist with implementation across the community.

To reach the goals set by Council, the Task Force, consultants, and residents of our community worked together to develop a variety of strategies for both GHG reduction and community resilience. Over 170 strategies in seven different action categories have been proposed (Attachment 2). Action areas include transportation/land use, energy, natural resources, economic development, materials and waste, food, and community/equity. The drafted strategies are still open for refinement and new strategies may be added. Each strategy is qualitatively assessed for GHG reduction potential, cost, lead agency, co-benefits, and timeframe for implementation.

A detailed, triple bottom line (social, environmental, financial) benefit-cost analysis was undertaken for ten strategies that have the City as the lead implementation agency and have high GHG reduction impacts. These ten strategies were selected by the three Councilors serving on the Task Force. The analysis showed that three of the 10 strategies had a positive benefit-cost ratio. These strategies were increasing parking fees, improving building weatherization, and expanding the urban tree canopy (Attachment 3). The benefit-cost ratios of the other selected strategies were more nuanced due to variables such as rates of adoption by Salem residents.

The next step in developing Salem's CAP is to prioritize the strategies based on their impacts on reducing GHG emissions; the City's ability to undertake the actions as a municipal government; and the ability to fund and staff the actions. Many of the strategies rely on partnerships with other organizations, such as Cherriots, Portland General Electric, and Energy Trust of Oregon.

Implementing Salem's CAP has a long timeframe; therefore, it will be essential to actively monitor progress towards the goals. The CAP should be considered a roadmap toward a desired future. This roadmap will need to be updated and amended to address emerging technologies, as well as changing state and federal regulations and initiatives. Priorities for implementation may shift over time and the CAP should be adjusted to stay current and maintain progress.

Reducing GHG emissions will require many actions by the City, businesses, nonprofits, partner organizations, and residents. Based on recent GHG forecast modeling it will be difficult for the City to reach the 2035 and 2050 goals without making significant changes in regulations, policies, practices, and behavior.

BACKGROUND:

Work on the Salem CAP began in August 2020. To date, five Task Force workshops have been held, and a final, sixth workshop is planned for October 27. In October, the Task Force meeting will focus on plan implementation.

All Task Force meetings are recorded and materials from the meetings are posted on the project website under the heading "project resources" at:

<https://salemclimateactionplan.com/project-resources>.

Work on the Salem CAP is being closely coordinated with the Our Salem Comprehensive Plan update. Both plans will influence development and transportation patterns in the City, and both have the ability to reduce GHG emissions.

The goal is to present the final draft Climate Action Plan to Council on December 6 for approval.

Robert D. Chandler PhD, PE
Assistant Public Works Director

Attachments:

1. Salem Climate Action Plan Task Force Members
2. Proposed Strategies for Salem Climate Action Plan v.16
3. Benefit-Cost Analyses for Ten Climate Action Plan Strategies