Benefit-Cost Analyses of 10 Strategies for Salem's Climate Action Plan

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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.

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.
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

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

	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.

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	Low	$162,659,158	-	$405,331	$162,132,320	$121,508

				Value of Benefits by Stakeholder			
			Total Benefits	**City of Salem***	**Local Community**	**Participant**	**Global Society**
	Sidewalk Network	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
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

				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	Low	$5.30	X	X		

				Stakeholders			
	Strategy	Range / Cost Framing	Value	City of Salem	Local Community	Developers	Cherriots
	tree*)	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

<u>Description:</u> 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.

<u>Expected Benefit(s):</u> 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

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

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.

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.

[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)..."

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 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.

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

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.

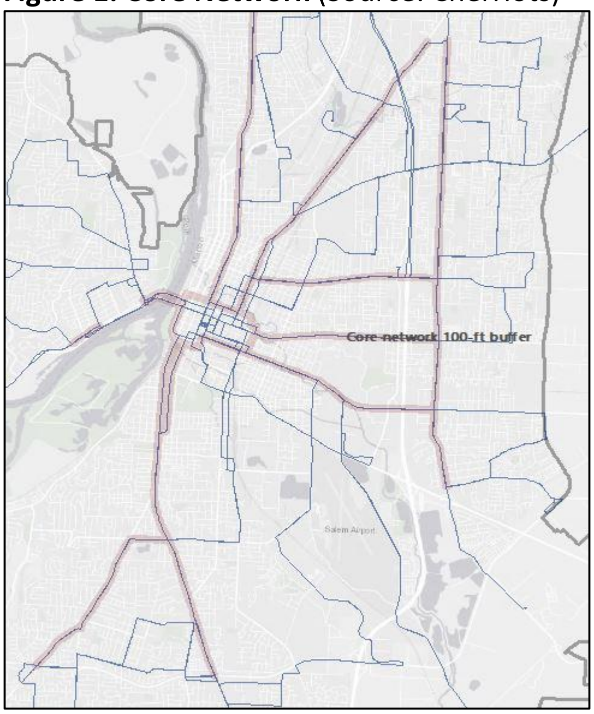
The two scenarios included in Table 12 show the costs when shared use transit lanes are implemented on all of the Core Network versus 25% of the Core Network, while holding benefits constant (see figure 1 for a map of the Core Network). While it is unclear the extent similar benefits could be achieved 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.

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

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

		Costs			
		Only costs borne by City		**Total Costs including property owner maintenance**	
Increase Tree Canopy		**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

Strategy	Equity impact
	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.
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

Strategy	Equity impact
	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.
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	Much like the previous strategy on EV charging, this strategy is

Strategy	Equity impact
Construction	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.

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

Strategy	Assumptions
	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.)
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

Strategy	Assumptions
	● 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
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
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	● 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

Strategy	Assumptions
Accessible to Renters	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 ⅕ as effective.
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

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.
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- 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*
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- 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*
- City of Portland. (n.d.). About the Rose Lane Project. https://www.portland.gov/transportation/rose-lanes/about-rose-lanes
- Harmon, B. 2021. GHG Emissions Modeling for City of Salem Climate Action Plan. Personal interview.

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- Lane Transit District. (n.d.). Business Access & Transit Lanes (BAT Lanes). https://www.ltd.org/business-access-transit-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
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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
- City of Salem. (2019). Salem 2019 Tree Reports.
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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.
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- Implementation Practices. *National Renewable Energy Laboratory Technical Report, https://www.nrel.gov/docs/fy12osti/51296.pd*f

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

Strategy	Inputs	Activities	Outputs	Short-term Outcomes	Intermediate Outcomes	Long-Term Outcomes	Impact
	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
Support energy efficiency and weatherization 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	Increased financial well-being -	Increased resiliency

Strategy	Inputs	Activities	Outputs	Short-term Outcomes	Intermediate Outcomes	Long-Term Outcomes	Impact
					to property owners	reduced household cost burden	
Energy Efficiency benchmarking 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		
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

Strategy	Inputs	Activities	Outputs	Short-term Outcomes	Intermediate Outcomes	Long-Term Outcomes	Impact
							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	Increased quality of life	▪ Reduce internal VMT by

Strategy	Inputs	Activities	Outputs	Short-term Outcomes	Intermediate Outcomes	Long-Term Outcomes	Impact
					personal vehicle use		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	
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

Strategy	Inputs	Activities	Outputs	Short-term Outcomes	Intermediate Outcomes	Long-Term Outcomes	Impact
	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
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

Strategy	Inputs	Activities	Outputs	Short-term Outcomes	Intermediate Outcomes	Long-Term Outcomes	Impact
	Bus riders					Reduced mortalities and injuries from road related incidents	
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

Strategy	Inputs	Activities	Outputs	Short-term Outcomes	Intermediate Outcomes	Long-Term Outcomes	Impact
							Reduced noise and improve local air quality
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		

Strategy	Inputs	Activities	Outputs	Short-term Outcomes	Intermediate Outcomes	Long-Term Outcomes	Impact
					technologies for consumer electronics) (Floater et al., 2016)		
	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:**
Solar-ready new construction	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.

Date	Interviewees	Strategy(s) Discussed	Topic(s)	Additional Contacts	Meeting Takeaways
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.
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	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

Date	Interviewees	Strategy(s) Discussed	Topic(s)	Additional Contacts	Meeting Takeaways
				Lynette Brown <lbrown@salemhousingor.com>	capacity issues across organizations and necessity of framing the city's role in BCA.
				Jimmy Jones at Energy Trust	
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.
5.21.21	Rob Romanek (City of Salem), Devin Doring (City of Salem)	Sidewalk network	GIS modeling	Joe Flake, sidewalk/street inspector who tracks sidewalks and enhancement in Excel and GIS	Planning out and building a comprehensive bike network should be a broadly framed strategy. Discussed getting useful info out of TSP data, AI derived layers from imagery for sidewalks, ArcGIS online, ESRI software, and Geoworks app.
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

Date	Interviewees	Strategy(s) Discussed	Topic(s)	Additional Contacts	Meeting Takeaways
					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

Date	Interviewees	Strategy(s) Discussed	Topic(s)	Additional Contacts	Meeting Takeaways
					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.
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.

Date	Interviewees	Strategy(s) Discussed	Topic(s)	Additional Contacts	Meeting Takeaways
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	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.)
				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	

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.

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			

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
	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

LOE	Study	Relevant Finding	Strategy
	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
	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

LOE	Study	Relevant Finding	Strategy
	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
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
	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

LOE	Study	Relevant Finding	Strategy
	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
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
	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

LOE	Study	Relevant Finding	Strategy
	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

LOE	Study	Relevant Finding	Strategy
	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
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

LOE	Study	Relevant Finding	Strategy
	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

LOE	Study	Relevant Finding	Strategy
	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
	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
	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	Create bus lanes

LOE	Study	Relevant Finding	Strategy
		$142,000 per mile.	
	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

Resource	Theme	Link
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
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

Resource	Theme	Link
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
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

Resource	Theme	Link
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