



Meeting #11 Agenda

July 23, 2020, 12-2:00PM

Remote Meeting link:

<https://us02web.zoom.us/j/83381668220?pwd=RzJYVmVCY1h3WkthVIM5SXBlVndkdz09>

Meeting ID: 833 8166 8220

Password: 726236

Call-in option: + 1 253 215 8782

			Estimated*
1.	Introductions & Project Updates		10 min
2.	Communitywide Action List & Scenario Results ➤ Attachment: Final scenario analysis	Presentation	15 min
3.	Implementation Strategy ➤ Attachment: Draft Implementation Strategy	Discussion	40 min
4.	Monitoring Framework ➤ Attachment: Draft Monitoring Framework	Discussion	20 min
Next Steps			
5.	➤ Public Outreach update ➤ Appoint subcommittee to discuss Phase III work	Discussion	15 min
6.	Jurisdiction Updates on Early & Ongoing Actions ➤ If time allows	Discussion	10 min
7.	Public Comments		10 min

*The times listed above are estimates. Items may not take the time allotted, and the meeting may adjourn early if all business has been completed.

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- Distributing obscene content.
- Engaging in illegal activity or encouragement of illegal activity.
- Promoting, fostering or perpetuating discrimination on the basis of creed, color, age, religion, gender, gender identification, marital status, status with regard to public



assistance, national origin, physical or mental disability or sexual orientation information that may tend to compromise the safety or security of the public or public systems.

- Threatening or intimidating language, containing cyber bullying.
- Otherwise engaging in disruptive behavior that is unrelated to the content of the meeting.

Next TCMP Steering Committee Meeting

TBD: August 27 or September 24, 2020, 12-2 pm

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MEMO

Subject: Scenario Analysis Tool User's Guide
From: Roel Hammerschlag
To: Allison Osterberg, Thurston Regional Planning Council
Date: July 6, 2020
Doc. no.: TH-015(d)

Introduction

The Scenario Analysis Tool permits the Thurston Regional Planning Council (TRPC) and other Thurston Climate Mitigation Plan (TCMP) partners to test impacts of hypothetical climate policies on the future. A user of the Scenario Analysis Tool can posit future reductions in twenty-five strategy metrics related to the Thurston County economy, and receive instant visual feedback regarding the associated greenhouse gas (GHG) reductions. (Figure 1)

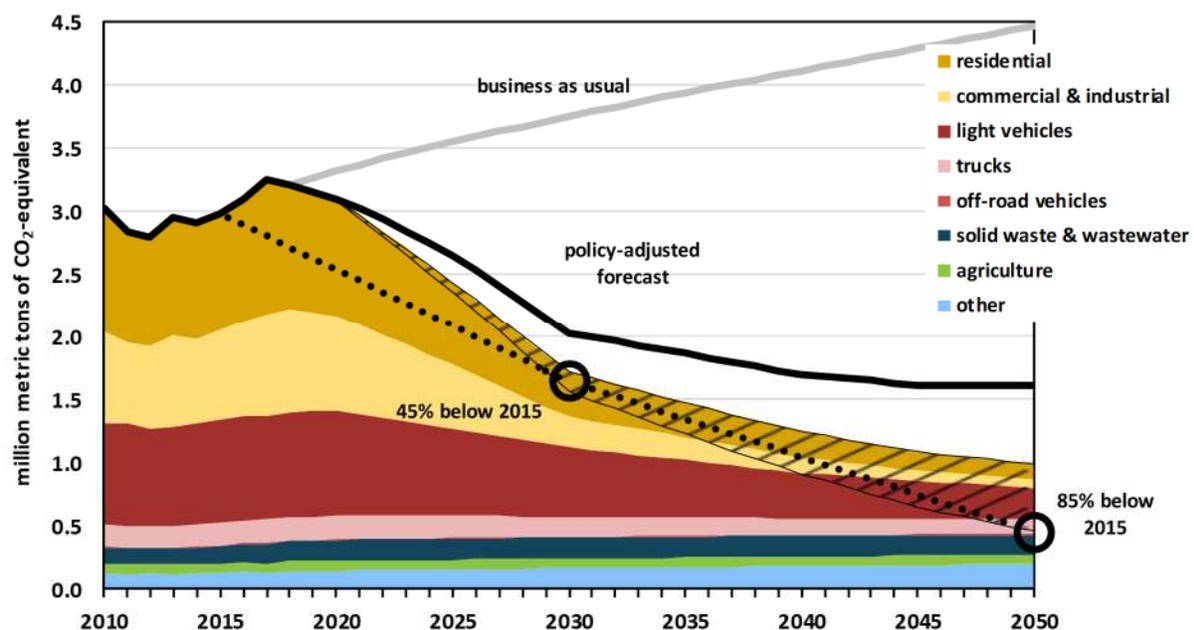


Figure 1 – Sample output of the Scenario Analysis Tool. Data from 2010-2018 are actuals as reported in the Thurston County GHG inventory; data from 2019-2050 are forecast. The crosshatched area indicates potential reductions associated with user input values for carbon sequestration projects or GHG offsets.

This memo is divided into three sections:

User Guide	p. 2
Methodology	p. 5
Case Study	p. 11

The *User Guide* provides “get started” level, practical guidance for appropriate and easy use of the tool. *Methodology* describes in detail how the user’s activity level inputs are translated into GHG emissions outputs. Many readers may want to skip this section, and instead utilize the case study as further guidance toward successful use. *Case Study* applies the tool to proposed TCMP Assessed Actions generated by a collaboration between TRPC, the Climate Advisory Workgroup and the consultant, as of May 15, 2020.

User Guide

Spreadsheet Structure and User Dashboard

The Scenario Analysis Tool is coded in Microsoft Excel 2019, and includes nine tabs ‘cover’, ‘dashboard’, ‘engine’, ‘ref’, ‘preprocessing’, ‘definitions’, ‘units’, ‘change log’ and ‘cites’. All substantive computations occur on the tab ‘engine’, but the user can effectively use the tool working entirely with the user dashboard on tab ‘dashboard’. The dashboard places the primary inputs and outputs in a single visual field. (Figure 2)

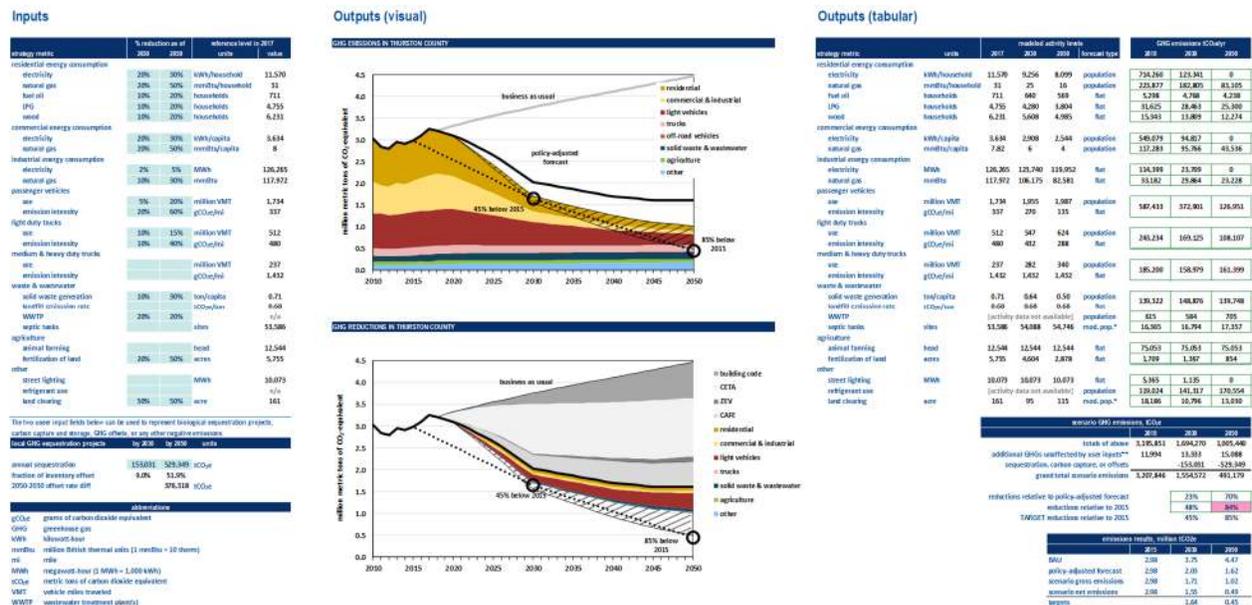


Figure 2 – Major features of the Scenario Analysis Tool’s user dashboard. The tabular area on the left edge provides fields for user input (light blue shaded cells) and a key to abbreviations used in the calculator. The center area includes visual output detailing a forecast of the Thurston County GHG inventory in the upper graphic, and anticipated GHG reductions due to state and federal policies (grey) and TCMP strategies (colors) in the lower graphic. The tabular area on the right forecasts changes to activity metrics and GHG emissions

Graphical Output

The primary feature of the dashboard is the output graphic. The graphic includes the following five components:

- **Business-as-usual (BAU):** The upward-sloping, grey line; this is the first of two reference scenarios. This represents the emissions we would expect if energy and climate policies remain fixed as they were during the 2010-2018 timeframe, and population grows following current, state forecasts.
- **Policy-adjusted forecast:** The thick, black line; this is the second of two reference scenarios. The policy-adjusted forecast adjusts BAU downward according to the impacts of future energy code components of state building code, the Clean Energy Transition Act (CETA), and anticipated increases to vehicle fuel economies. The vast majority of difference between BAU and the policy-adjusted forecast is due to CETA.
- **Targets pathway:** The downward-sloping, dotted black line. The two open circles represent the two GHG reduction targets: 45% below 2015 by 2030, and 85% below 2015 by 2050, following the interlocal agreement for a regional climate mitigation plan.¹ The dotted black line is a piecewise-linear pathway from actual emissions in 2015 to 2030 target emissions; and to 2050 target emissions. The linear pathway is for visual reference; the interlocal agreement only specifies the two targets, not the pathway.
- **Scenario emissions:** The solid colored areas. Each area represents the emissions from a different sector of the economy. From top to bottom these sectors are: residential buildings (dark yellow), commercial & industrial buildings (light yellow), transportation (red), solid waste & wastewater (blue); agriculture (green); and miscellaneous (grey). The top of the stack of shaded areas represents total emissions. Emissions from 2010 to 2018 are actuals, emissions from 2019 to 2050 are projections.
- **Sequestration:** The crosshatched area along the top of the scenario emissions stack. These represent the user's input of biological sequestration projects, carbon capture and storage, GHG offsets or other negative emissions. If negative emissions are allowed toward target achievement, then the net outcome of the user's inputs should be read as the pathway of the underside of the sequestration wedge.

It can be a point of confusion that the targets pathway references calendar year 2015, but that the transition from actual data to projections is between calendar years 2018 and 2019. The emissions targets were legally specified relative to a baseline emissions year, 2015, to make them definitive. In contrast, the projected emissions are computed by whatever method is most accurate, maximizing the use of historical actuals. Since actuals were available through calendar year 2018, we began the estimates as of 2019 to maximize precision of the tool. This does not affect the computed emission targets in any way.

¹ Thurston County et al., "Interlocal Agreement between Thurston County, The City of Lacey, the City of Olympia, the City of Tumwater, and the Thurston Regional Planning Council for a Regional Climate Mitigation Plan," 2018.

Tabular Output

Tabular outputs are available on the right-hand side of the dashboard, labeled “OUTPUT: GHG emissions by strategy metric” in Figure 2. Each cell in this region of the dashboard reports absolute emissions in the last measured year 2018, as well as in the two target years 2030 and 2050. Even though the user inputs a fractional *reduction*, the tool outputs absolute *emissions*. As the user’s input reductions increase, the output emissions decrease.

The emissions reported for each strategy metric are non-overlapping, and add to create the same total as the top of the scenario emissions stack in the graphic. The three such totals for 2018, 2030 and 2050 can be found below the strategy metric-specific outputs in cells ‘dashboard’!X42:Z42.

Below the total GHG outputs, the percentage reductions achieved in 2030 and 2050 appear in pink cells ‘dashboard’!Y45:Z45, which can be compared to their respective numeric targets in cells ‘dashboard’!Y46:Z46.

Input

Reductions to Strategy Metrics

The user can alter scenario emissions by adjusting the twenty-five pairs of 2030 and 2050 strategy metric reductions. In Figure 2, these are the light blue-shaded cells indicated with “INPUT: reductions to strategy metrics”. If you leave any of these cells blank, then the tool assumes the emissions are equal to those under the policy-adjusted forecast. In most cases where you input a value for 2030, the policy prescription will imply an equal or more aggressive reduction be input for 2050. The only exception would be for cases where you expect a policy to sunset, followed by a rollback of consumer behavior or infrastructure.

Think of each strategy metric either as an average activity level or as a total activity level. Average activity level if the units listed for the strategy metric are a ratio, total activity level if the units are not a ratio. The first and third strategy metrics offer examples of the two cases.

The first strategy metric is residential electricity consumption, measured in units *kWh/household*. Since these units are a ratio, the metric assesses the degree to which your proposed bundle of policies can reduce the average electricity per household. For example, if your policy bundle reduces electricity consumption by 20% in 10% of all homes, then the average reduction per household is $10\% \times 20\% = 2\%$.

The third strategy metric, residential fuel oil consumption, is measured in units *households*. Since these units are not a ratio, they assess the degree to which your policy can reduce the total number of households that are using fuel oil.

Other Inputs

Below the graphical output, there are two additional input fields for negative GHG emissions achieved in 2030 and 2050, respectively. For each of the two years, input the negative emissions expected *in that year*, in metric tons of CO₂-equivalent. Unlike the strategy metrics, where the Scenario Analysis Tool automatically computes GHG emissions from your percentage reductions, in the case of the two negative emissions fields you must compute the GHG emissions exogenous to the calculator.

Two 'engine' tab of the tool offers two additional inputs for advanced control of the calculator's behavior. First, at cell 'engine'!G68 you can control the slope of the BAU reference scenario (and hence all the other time series outputs) by choosing an alternate population forecast. This is not recommended, since the central population forecast is TRPC's only formally adopted forecast.

Second, the "exclude heavy-duty trucks" checkbox at cell 'engine'!E83 allows the user to remove heavy-duty truck emissions from the analysis. Most heavy-duty truck emissions in Thurston County are due to Interstate 5 through-traffic, which is out of the partner jurisdictions' control.

Methodology

Step 1: Generate a BAU forecast

For each inventory category, the Scenario Analysis Tool creates a Business As Usual (BAU) forecast of GHG emissions from 2019 through 2050. The BAU forecast represents the anticipated growth of GHG emissions in each inventory category, under the assumption that policies remain identical to those nominally in place during the 2010-2018 period covered by the existing time series of Thurston County GHG inventories.

Each inventory category forecast is based on the calendar year 2018 emissions level. Most inventory categories are assumed to increase proportionally to county population, such that emissions in a future year are equal to the emissions in 2018 multiplied by the ratio of population in the future year and population in 2018. The remaining inventory categories are assumed to remain fixed at the 2018 level. (Table 1)

population-based forecast	flat forecast
residential electricity	industrial electricity
commercial electricity	outdoor lighting
residential fossil gas	industrial fossil gas
commercial fossil gas	off-road vehicles
passenger vehicles	septic systems
light duty trucks	enteric fermentation
medium & heavy duty trucks	manure management
motorcycles	agricultural soil management
solid waste methane	
solid waste process	
solid waste transportation	
composting	
Budd inlet WWTP	
other WWTP	
ODS substitutes	
residential land conversion	

Table 1 – Thurston County greenhouse gas inventory categories grouped by their forecasting treatment in the Scenario Analysis Tool.

Future populations are drawn from TRPC’s adopted forecast,² which is computed through forecast year 2040. Population projections from 2041 through 2050 are linear interpolations based on the forecast years 2031 through 2040.

Step 2: Apply future policy impacts

Next, inventory categories affected by anticipated changes to Washington State Building Energy Code,³ the Clean Energy Transformation Act,⁴ or average vehicle fuel economy are adjusted downward according to the corresponding legal requirements. (Table 2)

affected by building code	affected by CETA	affected by vehicle fuel economy
residential electricity	residential electricity	passenger vehicles
commercial electricity	commercial electricity	light duty trucks
residential fossil gas	industrial electricity	medium & heavy duty trucks
commercial fossil gas	outdoor lighting	

Table 2 – Thurston County greenhouse gas inventory categories affected by policy adjustments in the Scenario Analysis Tool.

Impact of Washington State Building Energy Code is described with a linearized policy model. The GHG emission rate from new buildings follow a linear pathway from their rate in 2018, to zero as of 2031 per the prescription in state law. From 2031 through 2050, the GHG emission

² <https://www.trpc.org/236/Population-Employment-Forecasting>

³ RCW 19.27A.020(2)(a)

⁴ 2019 SB 5116

rate from new buildings remains zero. We assume average building life to be 40 years, so that each year 1/40 of the forecast building stock is modeled to be replaced by new stock. The new stock then emits GHGs at whichever rate is ascribed by the linearized policy model at the time of its construction, for the duration of its 40-year life.

The Clean Energy Transformation Act impacts electricity emission factors, which have an instantaneous impact on the emissions forecast, unlike the Building Energy Code. CETA requires elimination of coal-fired electricity before January 1, 2026; limits emitting resources to 20% or less of generation as of January 1, 2030; and requires complete decarbonization as of January 1, 2045. The scenario analysis tool represents these policy requirements with three linear ramps. The first, 2018-2026 ramp begins with Puget Sound Energy's (PSE's) actual mix of coal and gas as of 2018,⁵ and ends with the coal fraction entirely replaced with gas as 2026. The second, 2026-2030 ramp ends with gas making up exactly 20% of PSE's mix as of 2030. The third, 2030-2045 ramp ends with zero fossil fuel emissions as of 2045. After 2045, PSE emissions stay fixed at zero. This approach is based on the conservative assumption that the "alternative compliance options" required by CETA during 2030-2044 do not offset the remaining fossil fuel emissions.

The impacts of vehicle fuel economy changes are applied according to forecasts developed by TRPC⁶ (Table 3).

	2015	2017	2030	2040	2050
cars (gCO_{2e}/mi)	443	425	309	246	235
cars (deflator)		1.000	.727	.579	.553
trucks (gCO_{2e}/mi)	596	570	403	351	339
trucks (deflator)		1.000	.707	.616	.594

Table 3 – Actual (2015) and forecast (2030, 2040 and 2050) vehicle emission intensities provided by TRPC, and emissions deflators computed for the Scenario Analysis Tool. The emission intensities in 2017 were computed by linear interpolation between the TRPC-provided values for 2015 and 2030.

TRPC forecasts of vehicle emission intensity were developed from an amalgam of primary sources. For each vehicle category, the Scenario Analysis Tool computes the emission intensity as of 2017 by linear interpolation between TRPC-provided categories, and assigns an emissions deflator value of 1.0 to this 2018 reference intensity. (2018 is the last year of historical

⁵ Department of Commerce, "Washington State Electric Utility Fuel Mix Disclosure Reports for Calendar Year 2018" (Washington State, November 7, 2019), <https://www.commerce.wa.gov/growing-the-economy/energy/fuel-mix-disclosure/>.

⁶ TRPC 2013 Household Travel Survey (miles driven by vehicle model year and fuel type); Puget Sound Regional Planning Council Lifetime mileage-weighted average CO₂ equivalent emissions factors for model years 1990-2020, by vehicle type, <https://www.trpc.org/317/Household-Travel-Survey>.

emissions data in the tool.) The calculator then assigns deflator values for each vehicle category proportional to TRPC's projected emissions intensity pathway, from 2019 through 2050.

Expert input from Climate Advisory Workgroup members indicated that Washington's Zero Emissions Vehicle requirement would result in 7% of vehicle sales being EVs by 2025. The model assumes a linear ramp in sales share to 7% by 2025, and then a fixed sales share of 7% thereafter. The statewide, light vehicle fleet gradually accumulates EVs throughout the model timespan. Based on an assumed, average vehicle life of ten years, the light vehicle fleet is approximately 17% EVs by the model horizon of 2050.

Step 3: Compute deflator curves

In the dashboard, the user inputs fractional reductions in each strategy metric anticipated as of 2030 and 2050. For each strategy metric the Scenario Analysis Tool builds a deflator curve consisting of two linear ramps, the first from 2020 to 2030, and the second from 2030 to 2050. The value of each deflator curve begins at 1 in 2020, decreases to 1 minus the user's input 2030 reduction in 2030, and then decreases to 1 minus the user's input 2050 reduction in 2050.

It is in this step that the crosswalk between strategy metrics and inventory categories is executed. (Table 4)

strategy metric	inventory category(ies)
residential electricity	residential electricity
residential fossil gas	residential fossil gas
residential fuel oil	residential fuel oil
residential LPG	residential LPG
residential wood	residential wood
commercial electricity	commercial electricity
commercial fossil gas	commercial fossil gas
industrial electricity	industrial electricity
industrial fossil gas	industrial fossil gas
passenger vehicle use	passenger vehicles
passenger vehicle EF	
light duty truck use	light duty trucks
light duty truck EF	
heavy duty truck use	medium & heavy duty trucks
heavy duty truck EF	
solid waste generation	methane emissions, solid waste process, solid waste transportation
landfill emission rate	methane emissions
wastewater treatment plants	Budd Inlet WWTP, other WWTP
septic tanks	septic systems
animal farming	enteric fermentation, manure management
fertilization of land	agricultural soil management
street lighting	outdoor lighting
refrigerant use	ozone depleting substitutes
land clearing	residential land conversion

Table 4 – Inventory categories, by which strategy metrics impact them. The strategy metrics appear in the same order in which they appear on the Scenario Analysis Tool dashboard.

There are three inventory categories that are unaffected by dashboard inputs, and for which no deflator curves are computed. These three inventory categories are: *motorcycles*, *off-road vehicles*, and *composting*.

Step 4: Apply deflator curves to the policy-adjusted forecast

The policy-adjusted forecast for each inventory category created in Step 2, is multiplied by its respective deflator curve computed in Step 3. Inventory categories having no deflator curve are left unchanged.

Step 5: Compute GHG offset forecast

The dashboard inputs for GHG offsets are converted to a 2020-2050 time series, beginning at zero in 2020, with a linear increase to the user's input value for 2030, followed by a linear increase to the user's input value for 2050.

Step 6: Roll up inventory categories into sectors

Finally, the 27 inventory categories are rolled up into six sectors: residential buildings, commercial & industrial buildings, transportation, solid waste & wastewater, agriculture, and other in preparation for graphing and tabular output on the dashboard. (Table 5)

sector	contains inventory categories
residential	residential electricity residential fossil gas residential fuel oil residential LPG residential wood
commercial & industrial	commercial electricity commercial fossil gas industrial electricity industrial fossil gas
transportation	passenger vehicles light duty trucks medium & heavy duty trucks motorcycles off-road vehicles
solid waste & wastewater	methane emissions process emissions solid waste transport composting Budd Inlet WWTP other WWTP septic systems
agriculture	enteric fermentation manure management agricultural soil management
other	streetlighting ODS substitutes residential land conversion

Table 5 – Assignment of inventory categories to sectors (for graphical output in the Scenario Analysis Tool dashboard).

Case Study

The delivered version TH-010(q) of the Scenario Analysis Tool contains Cascadia Consulting Group / Hammerschlag LLC estimates for reductions in fourteen of the strategy metrics, in cells 'dashboard'!P5:Q36. These are our estimates of strategy metric reductions associated with aggressive deployment of all 71 TCMP Assessed Actions as documented in file <TCMP_draft priority climate actions_20200515.pdf>.⁷

We (Cascadia Consulting Group / Hammerschlag LLC) estimated the strategy metric reductions by collecting, for each strategy metric, the subset of TCMP Assessed Actions that would impact the strategy metric, and estimating based on professional experience the expected reduction under the condition that all actions in the subset are deployed. In each instance we considered the potential assuming full support of relevant municipal, county and state governments. In the case of voluntary measures we assumed widespread consumer or customer interest, but limited by normal economic circumstances. We took into account interactions among each subgroup of actions so that their effect was considered in concert, not simply a sum of the effects if each one were deployed singly.

Residential Sector

strategy metric	contributing actions	reductions	
		2030	2050
residential electricity	B1.1 residential energy performance ratings B1.2 residential energy audits B1.4 rental housing EE incentives B1.5 property tax credit B1.6 rental housing EE baseline B3.5 green building tracking B4.5 permitting incentives B4.6 EE tax exemptions B4.7 land use incentives B4.9 permit counter technical assistance B4.11 grid-connected appliances B4.12 multifamily submetering B5.5 solSmart B5.8 solar-ready B5.10 group purchasing G1.7 social research T1.2 middle-density housing T1.3 Eco districts	20%	30%
residential fossil gas	B1.1 residential energy performance ratings B1.2 residential energy audits B1.4 rental housing EE incentives B1.5 property tax credit B1.6 rental housing EE baseline B3.5 green building tracking B4.5 permitting incentives B4.6 EE tax exemptions	20%	50%

⁷ Received from Allison Osterberg via email, 2020-05-15.

strategy metric	contributing actions	reductions	
		2030	2050
	B4.7 land use incentives		
	B4.9 permit counter technical assistance		
	B4.12 multifamily submetering		
	B6.1 natural gas to electric conversions		
	B6.2 electric appliances in new construction		
	B6.4 natural gas ban		
	G1.7 social research		
	T1.2 middle-density housing		
	T1.3 Eco districts		
residential fuel oil	B1.1 residential energy performance ratings	10%	20%
	B1.2 residential energy audits		
	B1.4 rental housing EE incentives		
	B1.5 property tax credit		
	B1.6 rental housing EE baseline		
	B4.5 permitting incentives		
	G1.7 social research		
residential LPG	B1.1 residential energy performance ratings	10%	20%
	B1.2 residential energy audits		
	B1.4 rental housing EE incentives		
	B1.5 property tax credit		
	B1.6 rental housing EE baseline		
	B4.5 permitting incentives		
	B6.2 electric appliances in new construction		
G1.7 social research			
residential wood	B1.1 residential energy performance ratings	10%	20%
	B1.2 residential energy audits		
	B1.4 rental housing EE incentives		
	B4.5 permitting incentives		
	G1.7 social research		

The *residential electricity* and *residential fossil gas* strategy metrics share the majority of their contributing actions, specifically:

B1.1 residential energy performance ratings	B4.6 EE tax exemptions
B1.2 residential energy audits	B4.7 land use incentives
B1.4 rental housing EE incentives	B4.9 permit counter technical assistance
B1.5 property tax credit	B4.12 multifamily submetering
B1.6 rental housing EE baseline	G1.7 social research
B3.5 green building tracking	T1.2 middle-density housing
B4.5 permitting incentives	T1.3 Eco districts

All of these actions either provide an opportunity to act on both electric and fossil gas energy simultaneously or independently, or they affect the building shell in which case both types of energy consumption are likely to be reduced. Our higher estimate of reduction in 2050 for *residential fossil gas*, reflects the likely substitution of heat pumps for fossil gas furnaces in response to (a) the various efficiency incentives included for both strategy metrics and (b) contributing action B6.1 *fossil gas to electric conversions*.

Residential fuel oil, *residential LPG* and *residential wood* achieve lower reductions, because utilities have far less ability to bring incentive programs for these three fuels to homes.

Comparing Policies for New Buildings vs. Existing Buildings

The Scenario Analysis Tool estimates stock of new buildings vs. existing buildings by assuming a 40-year average building lifetime. So for a policy affecting new buildings, even if it goes into force immediately in 2020, then as of 2030 75% of buildings will be those that existed today, and even by the model horizon of 2050, 25% of buildings will be those that existed today, and therefore unaffected by the new buildings policy. Of course, the longer that implementation of a buildings policy is delayed, the higher these fractions of extant buildings will be in 2050 and especially 2030.

Among the residential buildings actions, those targeted specifically at new buildings are:

B4.5 permitting incentives
B4.6 EE tax exemptions
B4.7 land use incentives

B4.9 permit counter technical assistance
B4.12 multifamily submetering

In our 2030 estimates, these five incentives make no substantive contributions to the 20% reductions estimated for 2030 in residential electricity and residential fossil gas, due to the dominance of existing building stock expected (especially after considering some lag between Thurston Climate Mitigation Plan release and eventual deployment of the policies). By 2050 however, these policies are making substantial contributions to our estimates of the policy bundle impacts to residential electricity (30% reduction total) and residential fossil gas (50% reduction total).

Contribution of Local Renewable Energy Production

Local renewable energy production is supported by the actions:

B5.5 solSmart
B5.8 solar-ready

B5.10 group purchasing

Local renewable energy production is input into the Scenario Analysis Tool as a reduction in demand for grid electricity. Hence these actions are included in the policy bundles that affect strategy metrics *residential electricity* and *commercial electricity* (and, in the case of B5.8 solar-ready, *industrial electricity*).

All three actions provide infrastructure support, but with neither a portfolio standard nor financial incentives. Furthermore, *B5.8 solar-ready* impacts new buildings only (see discussion above). So, the local renewable production actions' contributions to our reduction estimates are small. Strategy metrics *residential electricity* and *commercial electricity* are ratio metrics, so the impact of each action needs to consider penetration into the market as well as the impact at each household. For example, if each household in a *B5.10 group purchasing* collective purchases sufficient panels to displace 30% of its electricity consumption, and as of 2030 5% of all households join collectives, then the reduction to utility electric demand will be $5\% \times 30\% = 1.5\%$.

Commercial and Industrial Sectors

strategy metric	contributing actions	reductions	
		2030	2050
commercial electricity	B2.1 commercial energy benchmarking & disclosure B2.3 LED lighting B2.6 cool roofs B2.8 performance standard B3.1 energy education B3.4 exemplary buildings B3.5 green building tracking B4.4 green public buildings B4.5 permitting incentives B4.6 EE tax exemptions B4.7 land use incentives B4.9 permit counter technical assistance B5.3 public building solar B5.5 solSmart B5.8 solar-ready B5.10 group purchasing T1.3 Eco districts	20%	30%
commercial fossil gas	B2.1 commercial energy benchmarking & disclosure B2.8 performance standard B3.1 energy education B3.4 exemplary buildings B3.5 green building tracking B4.4 green public buildings B4.5 permitting incentives B4.6 EE tax exemptions B4.7 land use incentives B4.9 permit counter technical assistance B4.11 grid-connected appliances B6.1 natural gas to electric conversions B6.4 natural gas ban T1.3 Eco districts	20%	50%
industrial electricity	B3.1 energy education B4.11 grid-connected appliances B5.8 solar-ready	2%	5%
industrial fossil gas	B3.1 energy education B6.4 natural gas ban	10%	30%

As in the residential sector, electricity and fossil gas are equally susceptible to many of the proposed actions. The commercial sector has historically responded with less elasticity to energy efficiency incentives than the residential sector, which is the primary reason for our somewhat lower estimates here.

Industrial sector emissions are a combination of typical, building HVAC and lighting energy similar to the predominant drivers in commercial sector emissions, but then combined with industrial process loads such as fans, motors, and process heat. In Thurston County industrial

sector emissions are relatively small; for example its natural gas combustion emissions, at 7,800 tCO₂e in 2017, are less than 0.3% of the county's 3 million tCO₂e inventory.

Transportation Sector

strategy metric	contributing actions	reductions	
		2030	2050
passenger vehicle use	G1.7 social research T1.1 coordinated long term planning- future infill T1.2 middle-density housing T1.3 Eco districts T1.4 20-minute neighborhoods T1.9 ADUs T1.11 land use efficiency T2.2 congestion mitigation T2.17 teleworking/flex work T4.1 increase transit T4.3 rural transit T4.4 fareless system/youth ride free T4.10 rider education/benefits T4.15 promote transit benefits T5.1 walk/bike infrastructure T5.2 barriers to transportation alternatives T5.4 school drop-off alternative modes T5.11 car-free zones T5.13 telecommuting infrastructure	5%	20%
passenger vehicle EF	G1.7 social research T2.4 vehicle efficiency outreach T3.1 EV parking new construction T3.2 free EV parking T3.5 EV ready building code T3.7 EV integration T3.10 convert to EV fleets T3.11 EV education T3.14 EV mass purchase discounts T3.15 EV purchase incentives	20%	60%
light duty truck use	T1.3 Eco districts T1.11 land use efficiency T2.2 congestion mitigation	5%	10%
light duty truck EF	T3.10 convert to EV fleets	5%	20%
medium & heavy truck use	<i>consultant's reduction target</i>		20%
medium & heavy truck EF	<i>consultant's reduction target</i>		10%

TCMP Assessed Actions approaches to transportation are generally aggressive, and especially take into account the importance of urban form. Vehicle use is famously inelastic, so our 2050 estimate of a 20% reduction in VMT per capita reflects very aggressive policymaking in this arena, matching the contributing actions.

Even though the EV policies proposed to affect the strategy metric *passenger vehicle EF* are perhaps not as comprehensive, they still result in relatively large reduction estimates because they are strongly enabled by the increasing availability and dropping prices of electric vehicles on the national and international market.

In the interests of increasing the potential to meet the particularly challenging 2050 TCMP target, we are also offering two *consultant's reduction targets* for medium and heavy trucks in 2050. Use and emission factor associated with medium and heavy trucks are not targeted by any of the TCMP proposed strategies but, especially in the long term, they can be modestly affected by municipal policy. Use can decrease as a consequence of dense urban design: attention to commercial product delivery within urban planning measures like T1.3 *Eco districts* or T1.11 *land use efficiency* would be effective levers for impacting truck use. Emission factor can also be impacted, by creating regulatory requirements for the types of vehicles permitted to service selected areas or eco districts.

New Emissions from EVs

Adoption of EVs plays substantially into our reduction estimates for strategy metric *passenger vehicle EF*. Though EVs do genuinely displace tailpipe emissions from gasoline and diesel fuel, that displacement is mitigated by new, stack emissions from the power plants that supply the additional electricity demand.

The Scenario Analysis Tool uses simple calculator-style methodologies that do not lend themselves to introduction of a new energy resource (electricity) into a specific sector (transportation) through replacement. This means that scenarios that feature large penetration of EVs into the vehicle market may underestimate the gross emissions inventory. We find this bias to be acceptably limited in scope, because CETA is driving electric emissions factor to zero on a timeline at least as fast as most imaginable forecasts for substantial displacement of conventional vehicles by EVs. Indeed, new emissions from EVs can only impact 2030 target achievement since the 2050 target comes after CETA's 2045 deadline for complete decarbonization.

Mode Shift vs Urban Planning

“Mode shift” is the professional term of art for getting people out of their cars. Alternatives to cars include buses, trains, bicycles, walking and telecommuting. Mode shift also includes shifting people from driving alone to carpooling. When viewed in isolation, mode shift as a GHG reduction policy is a method for minimizing the emission factors associated with fixed needs for travel.

Urban planning, on the other hand, can reduce the needs or distances for travel to begin with. Besides simply cutting GHGs due to shorter trip lengths, urban planning induces additional mode shifts by more thoroughly mixing use (placing residences closer to workplaces and

shopping districts); increasing density; favoring walking & biking (“complete streets”); clustering development around transit trunk lines such as train tracks; and other methods.

It is our professional experience that isolated mode shift programs often require significant costs or subsidies to encourage participation. Urban planning, on the other hand, seems to induce more significant change with little direct financial cost to the responsible government (though there may be indirect costs). Hence, we weight the reductions achievable with the TCMP Assessed Actions package strongly toward 2050 versus 2030, to reflect the slower penetration but higher effectiveness of the urban planning policies included.

Solid Waste & Wastewater Sector

strategy metric	contributing actions	reductions	
		2030	2050
solid waste generation	G1.7 social research W4.4 waste audits W4.10 waste less food program	10%	30%
landfill emission rate	aggressive landfill gas recovery & destruction	50%	50%
wastewater treatment plants	W1.1 municipal energy efficiency W3.1 nitrous oxide capture	20%	20%

Solid waste (landfilled waste) generation has been strongly targeted by municipal policy for decades. The TCMP Assessed Actions in this sector are relatively indirect and do not have a lot of power to reach beyond the substantial voluntary participation in recycling and composting already occurring. This limits our estimates for impacts in this strategy metric. That said, the bulk of methane generation from typical, municipal solid waste arises from food waste, which is already a primary target of municipal waste diversion programs. We estimate that roughly one-third of the methane commitment associated with Thurston County solid waste still comes from food. Successful, complete diversion of this stream to composting could reduce solid waste emissions at least 30%.

Wastewater treatment plants are receiving substantial design & improvements attention in Thurston County, so we model ambitious reductions in their associated emissions deployed in the near future, but no additional plant improvements after 2030.

Agriculture Sector

strategy metric	contributing actions	reductions	
		2030	2050
fertilization of land	A1.2 nutrient management A2.1 regenerative agriculture	20%	50%

Thurston County includes both successful examples of and strong advocacy for progressive farming techniques that can reduce GHG emissions associated with chemical fertilizers. The two proposed actions relating to fertilization of land are likely to be embraced strongly, and will have a receptive audience. Hence we assigned relatively ambitious reductions to this strategy metric.

Land Use and Sequestration

strategy metric	contributing actions	reductions or tCO ₂ e seq.	
		2030	2050
sequestration	A5.1 reforestation & afforestation program	153,000	529,000
	A6.5 municipally-controlled canopy	tCO ₂ e	tCO ₂ e
	A6.9 tree canopy preservation		
	G4.3 other emission sources and sinks		

Sequestration is not technically a strategy metric in the Scenario Analysis Tool, but the user dashboard allows input of net sequestration estimates for 2030 and 2050, respectively. We are offering values of 153,000 tCO₂e and 529,000 tCO₂e for the two years, based on afforestation of 8% of Thurston County’s land area (about 37,000 acres) and conversion of about 30% of Thurston County’s agricultural land from conventional to regenerative agriculture. Regenerative agriculture enhances soil health by increasing soil organic carbon levels while ensuring appropriate carbon to nitrogen ratios, and increases carbon sequestration by maximizing plant productivity. The 8% afforestation goal stretches the limit of what is available, but once again we are trying to push boundaries for the sake of achieving the TCMP partners’ targets.

Result

Implementing all estimated strategy metric reductions described above produces final Scenario Analysis Tool output as shown in Figure 3.

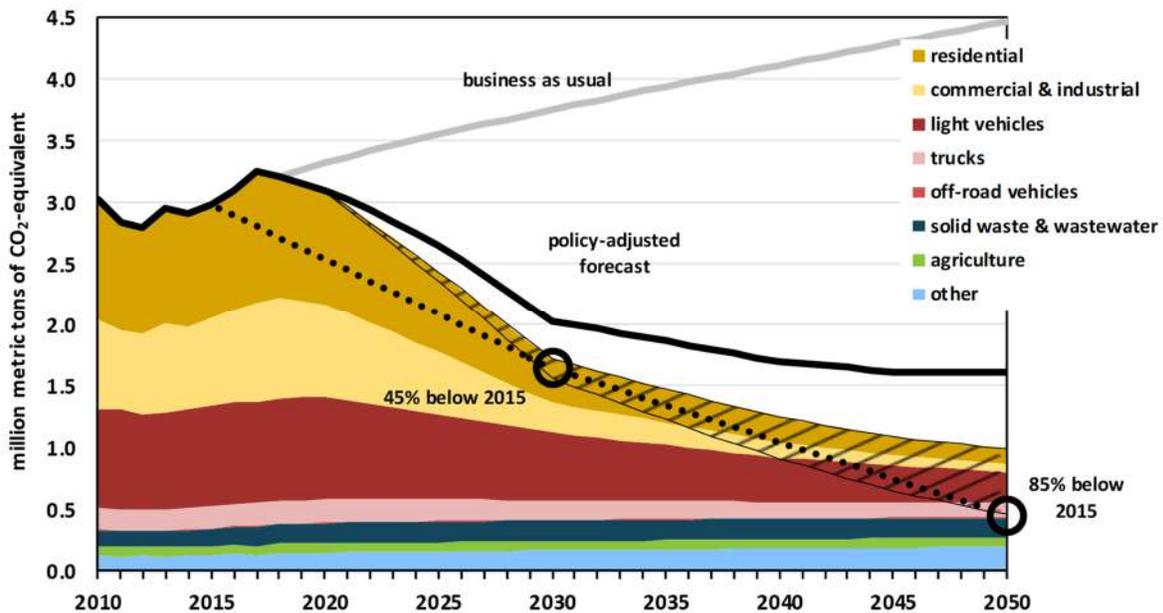


Figure 3 – Scenario Analysis Tool output under the Case Study assumptions and reduction estimates.

The impacts of state, federal and TCMP policies can also be visualized as reductions (rather than the resulting, absolute emissions), per Figure 4.

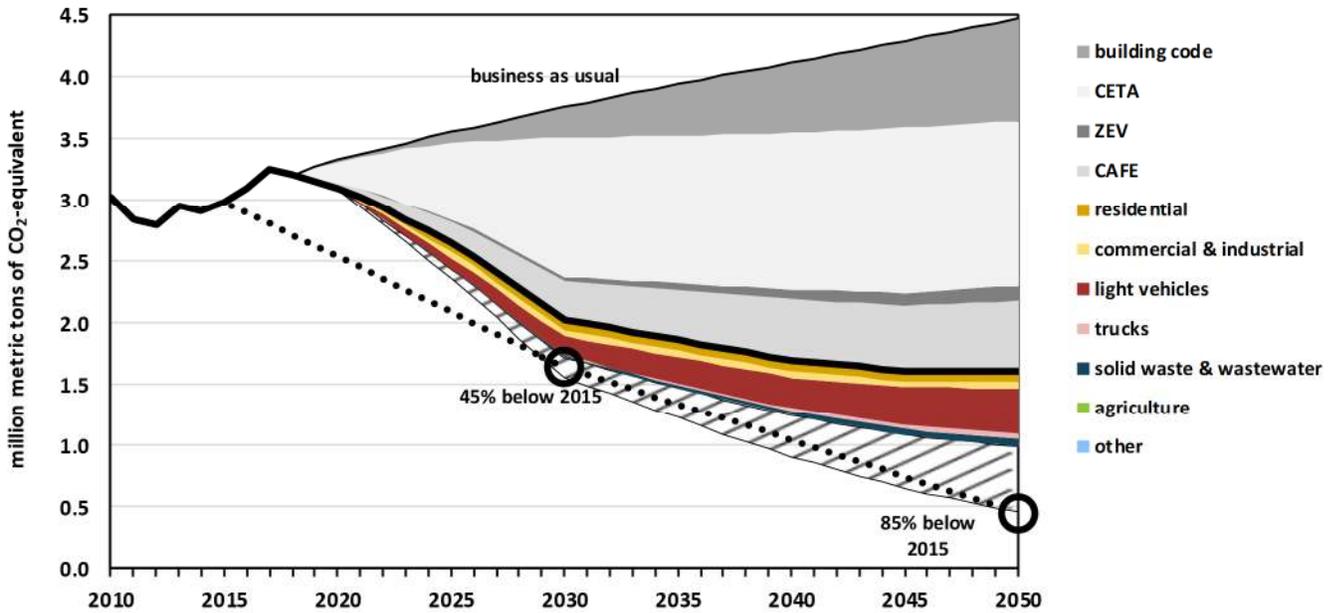


Figure 4 – GHG reductions caused by federal and state (grey-shaded) and TCMP (colors) policies. The cross-hatched area is additional reduction associated with sequestration in forest and soils.

It is clear from Figure 4 that that CETA plays a critical role in achieving the 2030 target, by bringing the policy-adjusted forecast strongly downward. For both target years, state (building code, CETA and ZEV) and federal (CAFE) policies play a significant role in suppressing emissions far enough that the TCMP strategies can bridge the difference to the TCMP targets.

Target achievement requires not just aggressive GHG reduction, but also aggressive sequestration. The gross emissions (the top of the stack of solid-colored areas) exceeds the targets; sequestration is represented by the cross-hatched overlay, and the net emissions appear as the lower edge of the cross-hatched overlay. This lower edge passes through or below the centers of the target circles, as desired. The results are presented numerically in Figure 5.

emissions results, million tCO ₂ e			
	2015	2030	2050
BAU	2.98	3.75	4.47
policy-adjusted forecast	2.98	2.03	1.62
scenario gross emissions	2.98	1.72	0.99
scenario net emissions	2.98	1.57	0.46
targets		1.64	0.45

Figure 5 – Scenario Analysis Tool output under the Case Study assumptions and reduction estimates.

These results represent only one scenario for achieving the targets. The Scenario Analysis Tool is designed to be transparent and accessible, so that TCMP partners can model alternative scenarios that may be more achievable in the political, economic and physical contexts of

Thurston County and its communities. We encourage the project partners to experiment with the tool and find the best path forward to achieving their GHG reduction goals.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Roel', with a large, sweeping flourish above it.

Roel Hammerschlag, Principal
Hammerschlag LLC

representing:

Hammerschlag LLC / Cascadia Consulting Group

Implementation Strategy

July 23, 2020 – Steering Committee Review

Overview

The Thurston Climate Mitigation Plan will include an implementation strategy for each of the four partner jurisdictions (Thurston County, Lacey, Olympia, and Tumwater) that identifies actions and next steps needed to achieve the 2030 and 2050 greenhouse gas emission reduction targets. This implementation strategy draws from the list of communitywide actions assessed as part of the scenario analysis completed in May 2020.

Implementation Approaches

Staff from the four partner jurisdictions grouped actions into four general approaches: legislative agenda, regionally coordinated, individual jurisdictions, and supporting partner.

Legislative Agenda

Over the course of the planning effort, it became clear that one of the most powerful actions available to local governments will be to use their shared influence to advocate for changes at the state level.

- **G5.5 - legislative agenda.** Prioritize combating climate change in the municipality’s legislative agenda each year. Instruct municipal lobbyist to track and report on climate bills, and to advocate for those bills that will help reduce local emissions. Work with other cities to add this to the AWC priorities.

The following priority actions require action by the state legislature to create additional authority or make other changes to state law before action can occur at the local level. The partner jurisdictions will work together to advocate for such changes as part of their climate legislative agenda:

Establish authority for new tax incentives. Local jurisdictions can track properties receiving such incentives, once they are authorized.

- **B1.4 - rental housing EE incentives.** Provide property tax breaks for landlords who install energy conservation measures in rental housing.
- **B1.5 - property tax credit.** Create a property tax credit for property owners who participate in energy efficiency.
- **B4.6 - energy efficiency tax exemptions.** Create a local property tax reduction or credit for new buildings that meet an energy efficiency performance standard.

Enable authority in instances of property sales, lease, rent.

- **B1.1 - residential energy performance ratings.** Require energy performance ratings and disclosures for homes at time of sale, lease, or rent so that owners, tenants, and prospective buyers are informed before making purchasing or rental decisions.

- **B1.2 - residential energy audits.** Develop and adopt policies that require residential properties to undertake an energy audit at the time of sale or during a substantial remodel. Work with financial institutions to develop mortgage products that incorporate audited energy efficiency recommendations.
- **B1.6 - rental housing EE baseline.** Pass an ordinance to require rental units to meet baseline levels of energy efficiency and make more stringent over time.
- **B2.1 - commercial energy benchmarking & disclosure.** Require energy performance ratings for commercial structures be disclosed so that owners, tenants, and prospective buyers are informed before making purchasing or rental decisions.

Changes to state building/energy code.

- **B2.8 - performance standard.** Set energy efficiency performance standards for commercial buildings with gross floor areas smaller than 50,000 square feet.
- **B4.11 - grid-connected appliances.** Require smart appliances in new construction, especially water heaters that control timing of demand.
- **B4.12 - multifamily submetering.** Require submetering for new multifamily buildings so residents can track energy use.
- **B6.2 - electric appliances in new construction.** Require electric appliances in new construction.
- **G5.2 – solar-ready building code.** State-level amendments to the state building code requiring solar-ready construction.
- **B6.4 - natural gas ban.** Ban all new natural gas connections in new buildings.

Regionally Coordinated

The following actions would build on existing or new partnerships to develop a shared approach.

- What would regional coordination mean for these actions?

Expand an Existing Regional Program

- **T4.10 - rider education/benefits.** Maintain and expand a regional online page that lists all the mode shift education efforts and employer benefits opportunities (Thurston Here-To-There). Include a comments section for suggestions to further transit education and ridership.
 - *Thurston Here to There:* <https://www.trpc.org/922/Thurston-Here-to-There>
- **T4.15 - promote transit benefits.** Work with employers and transit agencies to develop ways to incentivize employee ridership (ex. rebates for employees who give up use of employer parking facilities).
 - *Commute Trip Reduction Program:* <https://www.trpc.org/602/Supporting-Strategies>
- **T5.1 - walk/bike infrastructure.** Coordinate cities of Thurston Counties Master Bicycle and Pedestrian plans into a large regional plan to expand walking and biking infrastructure, including separated and protected opportunities. Coordinate efforts to maximize funding mechanisms and opportunities.
 - Build off *Individual City Plans, and the Regional Trails Plan:* <https://www.trpc.org/309/Thurston-Regional-Trails-Plan>
- **T5.2 - barriers to transportation alternatives.** Develop a regional inventory to identify gaps in connectivity for safe cycling and walking. Then develop a strategy to prioritize projects and a plan for funding.
 - Build off of *State of the Transportation System:* <https://www.trpc.org/820/State-of-Our-Transportation-System>
- **G4.1 - emissions inventory.** Prepare and publish an annual emissions inventory that tracks greenhouse gas emissions by jurisdiction and source category. Review and update emissions inventory methodology as necessary to address improvements to data or methodologies, improve consistency, incorporate changes to state or federal policies, or report on issues of local interest.

- Currently produced annually by *Thurston Climate Action Team*:
<https://thurstonclimateaction.org/2020/07/13/tracking-our-carbon-footprint/>
- **G4.2 - performance measures.** Develop community GHG reduction goals and performance measures. Regularly update and publicize for community to track their progress.
 - *Sustainable Thurston Carbon Neutrality Targets*: <https://www.trpc.org/689/Becoming-Carbon-Neutral>
- **W4.10 - waste less food program.** Expand Thurston County's "Waste Less Food" program.
 - *Thurston County Solid Waste, Waste Less Food*:
<https://www.co.thurston.wa.us/solidwaste/Wastedfood/food-home.html>

Develop a New Regional Program

- **B3.5 - green building tracking.** Develop data methodology to monitor use and impacts of green building incentives, to inform future incentives and develop recommendations for policy or programs.
- **B4.5 - permitting incentives.** Offer streamlined permitting, lower fees, or other incentives for projects that meet green building certification standards.
- **T1.11 - land use efficiency.** Set integrated goals to consider network efficiency in land use decisions, including how density in certain areas supports transit, increases efficiency of utility service, and other support facilities. Consider VMT in identifying locations for large employment facilities.
- **T4.3 - rural transit.** Identify and implement first/last mile solutions for rural ridership (engage rural home owners associations for representation and feedback). Present this plan to TRPC with direction to explore pilot programs and secure funding sources.
- **T5.13 - telecommuting infrastructure.** Develop grants and provide financial resources for installation of infrastructure necessary to support telecommuting.
- **A5.1 - reforestation & afforestation program.** Develop a coordinated reforestation/afforestation program. Begin by identifying priority areas where reforestation and afforestation may have carbon reduction benefits.
- **G1.7 - social research and behavior change campaigns.** Work with higher education institutions to research effective behavior change through marketing and educate. Use this information in developing campaigns to reduce high emissions GHGs.
- **G4.3 - other emission sources and sinks.** Expand sources and sectors in future emissions inventories to inform future regulatory policy to reduce GHG emissions.
- **G4.4 - vulnerable populations.** Develop a data and monitoring mechanism that is specific to marginalized groups and their needs related to climate change and climate reality (e.g., access to transportation, access to A/C, proximity to cooling centers) and develop a plan to address these vulnerabilities with solutions that help reduce GHG emissions.
- **G4.6 - social cost of carbon.** Develop and adopt policies that require the use of a "social cost of carbon measure" in zoning, development, construction, and transportation decisions.

Develop Model Regional Standard or Code to be Adopted by Individual Jurisdictions

- **B4.4 - green public buildings.** Require that new local government facilities (e.g., the new Olympia City Hall and LOTT building) demonstrate green building technologies and practices.
- **B4.7 - land use incentives.** Provide land use incentives (floor area ratio, density bonus, height bonus, parking reductions) for zero-net carbon buildings or other applications that dramatically increase energy efficiency.
- **T3.5 - EV ready building code.** Require all new residential construction be built EV ready. Create a simple and consistent residential charging station permitting process to reduce costs and time to development.

- **T3.1 - EV parking new construction.** Require large commercial and residential buildings to dedicate a percentage of parking spots for electric vehicle charging.

Individual Jurisdictions

These actions can be taken on by each jurisdiction through their various departments and work programs.

Invest in Capital Improvements

- **B5.3 - public building solar.** Install solar photovoltaics on all available and feasible municipal sites, including building rooftops, city hall, schools, police and fire stations, community centers, municipal water pump sites, and transit depots.

Expand an Existing Program

- **A6.5 - municipal canopy.** Maximize tree canopy on City-owned or City-controlled land, where appropriate in balance with other City goals.
- **B2.3 - LED lighting.** Install LED lighting in public-sector buildings and infrastructure.
- **T2.17 - teleworking/flex work.** Government agencies increase opportunities for employee teleworking options and staggering work days to reduce employees driving during peak traffic times.
- **T2.2 - congestion mitigation.** Develop congestion mitigation programs to increase transportation efficiency, reduce delay, and reduce emissions such as signalization coordination improvements along with application of speed harmonization techniques (ex. reevaluate speed limits, roundabouts vs signalized intersection, street connectivity). Added benefits are decrease idling time (pollution) and improve fuel efficiency (cost savings to driver).
- **T3.2 - free EV parking.** Allow free parking for all electric vehicles at local government buildings and in city centers to encourage the adoption of all electric vehicles. Increase cost of parking for Non-EV vehicles.
- **T3.10 - convert to EV fleets.** Set policies and timetable for electrification of municipal and other governmental fleets. Require replacement of public fleets with cleaner, energy-efficient vehicles to reduce long term fuel costs, improve air quality and reduce greenhouse gas emissions.
- **W1.1 - municipal energy efficiency.** Conduct efficiency improvements to municipal water and sewage treatment systems. Prioritize components that consume the most energy and have high GHG emissions.
- **W2.2 - water audits.** Conduct water audits of city and county facilities to determine prioritization of capital improvements.

Develop a New Program

- **B2.6 - cool roofs.** Create an incentive program for the installation of reflective roofs on commercial buildings to reduce building energy consumption and the urban heat island effect.
- **B4.9 - permit counter technical assistance.** Hire or contract with dedicated green building specialists to provide technical assistance through the permitting and development process.

Make a Regulatory/Code change

- **A6.9 - tree canopy preservation.** Develop a tree canopy ordinance that establishes a baseline for current urban canopy and sets goals for future canopy to increase cities' resilience. Combine direct cooling value (urban heat island mitigation) with carbon sequestration value when evaluating urban tree management.
- **B5.5 - solSmart.** Pursue SolSmart designations and adopt solar friendly practices.
- **B5.8 - solar-ready.** Amend local development code to require solar-ready construction for all building types.
- **T1.1 - coordinated long term planning- future infill.** Coordinate long-term plans with transit agencies to project where increased density would support more transit corridors. Then change zoning/density that would support new transit corridors and variety of household incomes. Promote long-term equity and

healthy communities by developing incentives such as density bonuses for development where a percentage of the units will be permanently affordable for household incomes.

- **T1.2 - middle-density housing.** Reevaluate and change zoning as needed to allow for a range of housing types to promote social economic integration of housing near the region's urban centers or moderate-density zones.
- **T1.3 - Eco districts.** Identify potential Eco districts to advance innovative district-scale urban development, sustainability, and neighborhood equity. Then make necessary code/zoning changes to support their development and set ambitious performance outcomes to ensure their long-term success.
- **T1.4 - 20-minute neighborhoods.** Increase the number of 20-minute neighborhoods (walkable environment, destinations that support a range of basic living needs and a residential density). Identify key infrastructure components needed to grow the number of 20-minute neighborhoods, then change zoning and codes if needed and coordinate with other jurisdictions to make public investments where necessary.
- **T1.9 - ADUs.** Amend codes to allow for attached and detached ADUs in urban residential areas.
- **T3.7 - EV integration.** Reevaluate regulations and make necessary changes to ensure charging stations are able to be permitted in locations where they are needed.
- **T5.11 - car-free zones.** Reevaluate long term plans and update to prioritize pedestrians and people riding bikes. Set goals for mode shift and plans on how to achieve those goals like developing car-free corridors in commercial and mixed-use areas to encourage mode shift.

Supporting Partner

These actions would be best led by a community partner organization, but with the support of the four local governments.

Intercity Transit

- **T4.1 - increase transit.** Increase local public transit routes/frequency with a focus on expanding transit service before and after traditional business hours and on weekends.
- **T4.4 - fareless system.** Maintain a fareless system for public transit.
- **T5.4 - school drop-off alternative modes.** Maintain and expand a walking/biking incentive program with safety education for families.

Thurston Conservation District

- **A1.2 - nutrient management.** Provide education and incentives (e.g., grants, loans, technical assistance) reduce nitrous oxide emissions when managing fertilizer.
- **A2.1 - regenerative agriculture.** Expand regenerative agricultural practices (ex. low-till, no-till education programs) among farmers that aim for a "whole farm" approach. Provide education on how to increase organic matter content and water retention in soils within urban and agricultural settings.

LOTT Clean Water Alliance

- **W3.1 - nitrous oxide capture.** Research and implement nitrous oxide mitigation strategies and strategies to avoid or reduce nitrous oxide emissions. Present findings and cost vs benefits analysis to policy makers to determine what changes should be made.

Other

– Who is the appropriate leading partner, and how would jurisdictions support them?

- **B3.1 - energy education.** Provide educational resources and technical assistance to industry professionals, building owners and managers on all aspects of energy efficient building design, retrofits, and operations for new and existing buildings.

- **B3.4 - exemplary buildings.** Create a Zero-Energy Building Challenge by partnering with public, private, non-profit and faith-based organizations. Facilitate rapid deployment and public awareness of high-profile demonstration buildings that use innovative energy efficiency and/or technology.
- **B5.10 - group purchasing.** Develop/support a city-sponsored group solar purchasing program.
- **B6.1 - natural gas to electric conversions.** Educate business owners and residents on the options for electric appliances and the benefit of pairing electrification with the installation of renewable energy. Create incentives to support fuel switching.
- **T2.4 - vehicle efficiency outreach.** Develop educational campaigns about benefits (reduced GHG emission, increase fuel efficiency, safety) of properly inflated tires, including signage at gas stations and local businesses and partnering with schools.
- **T3.11 - EV education.** Partner with environmental and other agencies to increase consumer awareness about EV options and incentives for use and purchase.
- **T3.14 - EV mass purchase discounts.** Create a group purchase program for residents to get deep discounts on EVs, other fuel efficient and alternative fuel vehicles.
- **T3.15 - EV purchase incentives.** Partner with car sale and lease dealerships to provide incentives for purchase of electric vehicles by Thurston County residents. Pilot with those neighborhoods, individuals with greatest VMT potential.
- **W4.4 - waste audits.** Provide waste audits for business owners and education on practices that decrease waste (ex. Compost, recycling, reuse).
- **W6.6 - supply chain.** Provide free technical assistance to local businesses in reducing the carbon intensity of their supply chains.

Timeframe

The timeframe identifies the estimated frame of time it will take for the action to be completed or substantially underway. It may also identify sequential actions that can't be started until other foundational work is complete.

Timeframe Options

- Ongoing
- Short term: 0-5 years
- Mid-term: 5-10 years
- Long term: 10+ years

Cost Estimates

The consultant team developed rough estimates of potential direct costs to the four partner jurisdictions to complete an action or get it substantially underway (ex. staff or other resources). These cost estimates are offered to show scale and relative magnitude of the costs involved with different actions, and are not exact. The estimates do not include broader costs to other potential partners or ongoing costs.

Cost Estimate Options

- Low (L): \$0-\$100,000
- Medium (M): \$100,000-\$1,000,000
- High (H): \$1,000,000

Sector	Action #	Action Short Name	Action Description	Approach	Primary Mechanism	Timeframe	Combined Total Cost Estimate	Total Cost Rationale
Buildings & Energy	B1.1	residential energy performance ratings	Require energy performance ratings and disclosures for homes at time of sale, lease, or rent so that owners, tenants, and prospective buyers are informed before making purchasing or rental decisions.	Legislative Agenda	Regulatory/code change	Short term (0- 5 years)	M	Policy will be low-cost, but developing programs and structures and conducting ongoing monitoring and evaluation will add costs.
Buildings & Energy	B1.2	residential energy audits	Develop and adopt policies that require residential properties to undertake an energy audit at the time of sale or during a substantial remodel. Work with financial institutions to develop mortgage products that incorporate audited energy efficiency recommendations.	Legislative Agenda	Regulatory/code change	Short term (0- 5 years)	M	Policy will be low-cost, but developing programs and structures and conducting ongoing monitoring and evaluation will add costs.
Buildings & Energy	B1.4	rental housing EE incentives	Provide property tax breaks for landlords who install energy conservation measures in rental housing.	Legislative Agenda	New program	Short term (0- 5 years)	L	Initial cost is low, but may result in less local tax revenue in the long-term.
Buildings & Energy	B1.5	property tax credit	Create a property tax credit for property owners who participate in energy efficiency.	Legislative Agenda	New program	Short term (0- 5 years)	L	Cost is low, but may result in less local tax revenue in the long-term.
Buildings & Energy	B1.6	rental housing EE baseline	Pass an ordinance to require rental units to meet baseline levels of energy efficiency and make more stringent over time.	Legislative Agenda	Regulatory/code change	Mid term (5-10 years)	M	Policy will be low-cost, but developing programs and structures and conducting ongoing monitoring and evaluation will add costs.
Buildings & Energy	B2.1	commercial energy benchmarking & disclosure	Require energy performance ratings for commercial structures be disclosed so that owners, tenants, and prospective buyers are informed before making purchasing or rental decisions.	Legislative Agenda	Regulatory/code change	Mid term (5-10 years)	M	Policy will be low-cost, but developing programs and structures and conducting ongoing monitoring and evaluation will add costs.

Buildings & Energy	B2.3	LED lighting	Install LED lighting in public-sector buildings and infrastructure (e.g., street lights, traffic signals).	Individual jurisdictions	Existing program	Ongoing	L	LEDs are increasingly inexpensive. Limited to only public sector buildings.
Buildings & Energy	B2.6	cool roofs	Create an incentive program for the installation of reflective roofs on commercial buildings to reduce building energy consumption and the urban heat island effect.	Individual jurisdictions	New program	Short term (0- 5 years)	M	Policy will be low-cost, but developing programs and structures and conducting ongoing monitoring and evaluation will add costs.
Buildings & Energy	B2.8	performance standard	Set energy efficiency performance standards for commercial buildings with gross floor areas smaller than 50,000 square feet.	Legislative Agenda	Regulatory/code change	Mid term (5-10 years)	M	Policy will be low-cost, but developing programs and structures and conducting ongoing monitoring and evaluation will add costs.
Buildings & Energy	B3.1	energy education	Provide educational resources and technical assistance to industry professionals, building owners and managers on all aspects of energy efficient building design, retrofits, and operations for new and existing buildings.	Supporting partner	Support of third party partner	Mid term (5-10 years)	M	Development of educational materials will be upfront costs. Technical assistance will be ongoing and will require staff/consultant time.
Buildings & Energy	B3.4	exemplary buildings	Create a Zero-Energy Building Challenge by partnering with public, private, non-profit and faith-based organizations. Facilitate rapid deployment and public awareness of high-profile demonstration buildings that use innovative energy efficiency and/or technology.	Supporting partner	Support of third party partner	Mid term (5-10 years)	L	Partnering with organizations should help lower jurisdiction costs. One-time cost for the challenge.
Buildings & Energy	B3.5	green building tracking	Develop data methodology to monitor use and impacts of green building incentives, to inform future incentives and develop recommendations for policy or programs.	Regionally coordinated	New program	Mid term (5-10 years)	L	Costs scale depending on how in depth the assessment would be. Assume this would start rudimentary.
Buildings & Energy	B4.4	green municipal buildings	Require that new local government facilities (e.g., the new Olympia City Hall and LOTT building) demonstrate green building technologies and practices.	Regionally coordinated	Capital improvement	Short term (0- 5 years)	M	Requirement will be low cost, but implementing improvements will cost more.

Buildings & Energy	B4.5	permitting incentives	Offer streamlined permitting, lower fees, or other incentives for projects that meet green building certification standards.	Regionally coordinated	Existing program	Short term (0- 5 years)	L	Will need resources to develop the program structure, but certification standards are already in existence so that should lower program development costs.
Buildings & Energy	B4.6	EE tax exemptions	Create a local property tax reduction or credit for new buildings that meet an energy efficiency performance standard.	Legislative Agenda	Regulatory/code change	Short term (0- 5 years)	M	Will take resources to determine standard and how to measure/enforce. May result in less local tax revenue in the long-term.
Buildings & Energy	B4.7	land use incentives	Provide land use incentives (floor area ratio, density bonus, height bonus, parking reductions) for zero-net carbon buildings or other applications that dramatically increase energy efficiency.	Regionally coordinated	Regulatory/code change	Short term (0- 5 years)	L	Program development will require initial costs. Ongoing costs should be incorporated into standard permitting/review processes. Likely low participation in the short-term due to stringent criteria.
Buildings & Energy	B4.9	permit counter technical assistance	Hire or contract with dedicated green building specialists to provide technical assistance through the permitting and development process.	Individual jurisdictions	New program	Mid term (5-10 years)	L	Cost will depend on whether jurisdiction subsidizes cost of technical assistance. Assume jurisdiction serves as liasion but not funder.
Buildings & Energy	B4.11	grid-connected appliances	Require smart appliances in new construction, especially water heaters that control timing of demand.	Legislative Agenda	Regulatory/code change	Short term (0- 5 years)	L	Upfront costs for policy development. Ongoing costs for monitoring, enforcement, and support. Cost of appliances would fall on property owner.
Buildings & Energy	B4.12	multifamily submetering	Require submetering for new multifamily buildings so residents can track energy use.	Legislative Agenda	Regulatory/code change	Short term (0- 5 years)	L	Upfront costs for policy development. Ongoing costs for monitoring, enforcement, and support. Cost of submetering would fall on property owner.
Buildings & Energy	B5.3	municipal building solar	Install solar photovoltaics on all available and feasible municipal sites, including building rooftops, city hall, schools, police and fire stations, community centers, municipal water pump sites, and transit depots.	Individual jurisdictions	Capital improvement	Mid term (5-10 years)	M	PVs are increasingly inexpensive, but the cost would fall entirely on the jurisdictions.

Buildings & Energy	B5.5	solSmart	Pursue SolSmart designations and adopt solar friendly practices.	Individual jurisdictions	Regulatory/code change	Mid term (5-10 years)	M	Depending on where jurisdictions are starting, could require introduction of new policies and programs.
Buildings & Energy	B5.8	solar-ready	Amend local development code to require solar-ready construction for all building types.	Individual jurisdictions	Regulatory/code change	Mid term (5-10 years)	L	Straightforward policy adjustment.
Buildings & Energy	B5.10	group purchasing	Develop/support a city-sponsored group solar purchasing program.	Supporting partner	New program	Long term (10+ years)	L	Already being developed and implemented by PSE (e.g., Green Direct) - could work with them to expand.
Buildings & Energy	B6.1	natural gas to electric conversions	Educate business owners and residents on the options for electric appliances and the benefit of pairing electrification with the installation of renewable energy. Create incentives to support fuel switching.	Supporting partner	New program	Mid term (5-10 years)	L	Depends on extent of education - low cost would include development of initial informational materials and collateral for events, City websites, etc.
Buildings & Energy	B6.2	electric appliances in new construction	Update municipal code to require electric appliances in new construction.	Legislative Agenda	Regulatory/code change	Mid term (5-10 years)	L	Straightforward policy adjustment.
Buildings & Energy	B6.4	natural gas ban	Ban all new natural gas connections in new buildings.	Legislative Agenda	Regulatory/code change	Mid term (5-10 years)	M	Will take time to do stakeholder outreach (contraversial issue) and develop policy that everyone can agree on (e.g., identifying exemptions).
Transportation & Land Use	T1.1	coordinated long term planning- future infill	Coordinate long-term plans with transit agencies to project where increased density would support more transit corridors. Then change zoning/density that would support new transit corridors and variety of household incomes. Promote long-term equity and healthy communities by developing incentives such as density bonuses for development where a percentage of the units will be permanently affordable for household incomes.	Individual jurisdictions	Regulatory/code change	Short term (0- 5 years)	M	Partnerships with transit agencies would require staff time. Incentive development and implementation will also require initial and ongoing resources.
Transportation & Land Use	T1.2	middle-density housing	Reevaluate and change zoning as needed to allow for a range of housing types to promote social economic integration of housing near the region's urban centers or moderate-density zones.	Individual jurisdictions	Regulatory/code change	Short term (0- 5 years)	M	Evaluation will take time and zoning adjustments will likely require some level of public and stakeholder engagement.

Transportation & Land Use	T1.3	Eco districts	Identify potential Eco districts to advance innovative district-scale urban development, sustainability, and neighborhood equity. Then make necessary code/zoning changes to support their development and set ambitious performance outcomes to ensure their long-term success.	Individual jurisdictions	Regulatory/code change	Mid term (5-10 years)	M	
Transportation & Land Use	T1.4	20-minute neighborhoods	Increase the number of 20-minute neighborhoods (walkable environment, destinations that support a range of basic living needs and a residential density). Identify key infrastructure components needed to grow the number of 20-minute neighborhoods, then change zoning and codes if needed and coordinate with other jurisdictions to make public investments where necessary.	Individual jurisdictions	Regulatory/code change	Mid term (5-10 years)	H	This is a large-scale action that requires both zoning/code adjustments and infrastructure investments.
Transportation & Land Use	T1.9	ADUs	Amend development codes to allow for attached and detached ADU's in urban residential areas.	Individual jurisdictions	Regulatory/code change	Short term (0- 5 years)	L	Straightforward policy adjustment, but will require some level of public engagement.
Transportation & Land Use	T1.11	land use efficiency	Set integrated goals to consider network efficiency in land use decisions, including how density in certain areas supports transit, increases efficiency of utility service, and other support facilities. Consider VMT in identifying locations for large employment facilities.	Regionally coordinated	New program	Short term (0- 5 years)	M	Will require some time for research and coordination with large employers.
Transportation & Land Use	T2.2	congestion mitigation	Develop congestion mitigation programs to increase transportation efficiency, reduce delay, and reduce emissions such as signalization coordination improvements along with application of speed harmonization techniques (ex. reevaluate speed limits, roundabouts vs signalized intersection, street connectivity). Added benefits are decrease idling time (pollution) and improve fuel efficiency (cost savings to driver).	Individual jurisdictions	Existing program	Ongoing	M	Large-scale study covering large land areas. Assume includes implementation of recommended congestion mitigation program.
Transportation & Land Use	T2.4	vehicle efficiency outreach	Develop educational campaigns about benefits (reduced GHG emission, increase fuel efficiency, safety) of properly inflated tires, including signage at gas stations and local businesses and partnering with schools.	Supporting partner	Support of third party partner	Short term (0- 5 years)	L	
Transportation & Land Use	T2.17	teleworking/flex work	Government agencies increase opportunities for employee teleworking options and staggering work days to reduce employees driving during peak traffic times.	Individual jurisdictions	Existing program	Ongoing	L	Time for working with large employers, partnering with co-working companies, etc.
Transportation & Land Use	T3.1	EV parking new construction	Require large commercial and residential buildings to dedicate a percentage of parking spots for electric vehicle charging.	Regionally coordinated	Regulatory/code change	Short term (0- 5 years)	L	Straightforward policy adjustment. May require some time to determine appropriate percentage.
Transportation & Land Use	T3.2	free EV parking	Allow free parking for all electric vehicles at local government buildings and in city centers to encourage the adoption of all electric vehicles. Increase cost of parking for Non-EV vehicles.	Individual jurisdictions	Existing program	Mid term (5-10 years)	L	Straightforward action - Jurisdictions have direct control.

Transportation & Land Use	T3.5	EV ready building code	Require all new residential construction be built EV ready. Create a simple and consistent residential charging station permitting process to reduce costs and time to development.	Regionally coordinated	Regulatory/code change	Short term (0- 5 years)	L	Straightforward - have other jurisdiction templates available for this.
Transportation & Land Use	T3.7	EV integration	Reevaluate regulations and make necessary changes to ensure charging stations are able to be permitted in locations where they are needed.	Individual jurisdictions	Regulatory/code change	Short term (0- 5 years)	L	May take some time for a study on this, but otherwise straightforward. May cost more if extensive public engagement is needed.
Transportation & Land Use	T3.10	convert to EV fleets	Set policies and timetable for electrification of municipal and other governmental fleets. Require replacement of public fleets with cleaner, energy-efficient vehicles to reduce long term fuel costs, improve air quality and reduce greenhouse gas emissions.	Individual jurisdictions	Existing program	Ongoing	M	Marginal cost of electric alternatives could require additional resources in the near-term as technologies develop.
Transportation & Land Use	T3.11	EV education	Partner with environmental and other agencies to increase consumer awareness about EV options and incentives for use and purchase.	Supporting partner	Support of third party partner	Short term (0- 5 years)	L	Partnership presents opportunity for cost sharing. Straightforward awareness building program.
Transportation & Land Use	T3.14	EV mass purchase discounts	Create a group purchase program for residents to get deep discounts on EVs, other fuel efficient and alternative fuel vehicles.	Supporting partner	New program	Mid term (5-10 years)	L	May take time and resources to identify partners and develop program. Once established, cost will be minimal to maintain.
Transportation & Land Use	T3.15	EV purchase discounts	Partner with car sale and lease dealerships to provide incentives for purchase of electric vehicles by Thurston County residents. Pilot with those neighborhoods, individuals with greatest VMT potential.	Supporting partner	New program	Mid term (5-10 years)	L	May take time and resources to identify partners and develop program. Once established, cost will be minimal to maintain.
Transportation & Land Use	T4.1	increase transit	Increase local public transit routes/frequency with a focus on expanding transit service before and after traditional business hours and on weekends.	Supporting partner	Support of third party partner	Mid term (5-10 years)	H	This is a large-scale action that can scale up depending on needs. Unclear to what extent transit agencies vs. jurisdictions would assume cost.
Transportation & Land Use	T4.3	rural transit	Identify and implement first/last mile solutions for rural ridership (engage rural home owners associations for representation and feedback). Present this plan to TRPC with direction to explore pilot programs and secure funding sources.	Regionally coordinated	New program	Long term (10+ years)	L	Cost will depend on identified solution.
Transportation & Land Use	T4.4	fareless system/youth ride free	Maintain a fareless system for public transit.	Supporting partner	Support of third party partner	Short term (0- 5 years)	H	Will result in reduced transit revenues. Will require substantial subsidies. Unclear to what extent jurisdiction vs. transit agency would incur cost.

Transportation & Land Use	T4.10	rider education/benefits	Maintain and expand a regional online page that lists all the mode shift education efforts and employer benefits opportunities (Thurston Here-To-There). Include a comments section for suggestions to further transit education and ridership.	Regionally coordinated	Existing program	Ongoing	L	
Transportation & Land Use	T4.15	promote transit benefits	Work with employers and transit agencies to develop ways to incentivize employee ridership (e.g., rebates for employees who give up use of employer parking facilities).	Regionally coordinated	Existing program	Ongoing	L	Assume incentive funding covered by employer, state, etc.
Transportation & Land Use	T5.1	walk/bike infrastructure	Coordinate cities of Thurston Counties Master Bicycle and Pedestrian plans into a large regional plan to expand walking and biking infrastructure, including separated and protected opportunities. Coordinate efforts to maximize funding mechanisms and opportunities.	Regionally coordinated	Existing program	Short term (0- 5 years)	M	Broader planning effort would require extensive public/stakeholder engagement and coordination.
Transportation & Land Use	T5.2	barriers to transportation alternatives	Develop a regional inventory to identify gaps in connectivity for safe cycling and walking. Then develop a strategy to prioritize projects and a plan for funding.	Regionally coordinated	Existing program	Ongoing	M	
Transportation & Land Use	T5.4	school drop-off alternative modes	Maintain and expand a walking/biking incentive program with safety education for families.	Supporting partner	Support of third party partner	Ongoing	L	Likely able to build on existing programs.
Transportation & Land Use	T5.11	car-free zones	Reevaluate long term plans and update to prioritize pedestrians and people riding bikes. Set goals for mode shift and plans on how to achieve those goals like developing car-free corridors in commercial and mixed use areas to encourage mode shift.	Individual jurisdictions	New program	Mid term (5-10 years)	M	Broader planning effort would require extensive public/stakeholder engagement and coordination.
Transportation & Land Use	T5.13	telecommuting infrastructure	Develop grants and provide financial resources for installation of infrastructure necessary to support telecommuting.	Regionally coordinated	New program	Long term (10+ years)	M	Depends on extent of financial resources and ability to identify other funders.
Water & Waste	W1.1	municipal energy efficiency	Conduct efficiency improvements to municipal water and sewage treatment systems. Prioritize components that consume the most energy and have high GHG emissions.	Individual jurisdictions	Existing program	Short term (0- 5 years)	M	Depends on what upgrades are needed.

Water & Waste	W2.2	water audits	Conduct water audits of city and county facilities to determine prioritization of capital improvements.	Individual jurisdictions	Existing program	Short term (0- 5 years)	L	Audits are straightforward. Does not include costs of implementing audit recommendations.
Water & Waste	W3.1	nitrous oxide capture	Research and implement nitrous oxide mitigation strategies and strategies to avoid or reduce nitrous oxide emissions. Present findings and cost vs benefits analysis to policy makers to determine what changes should be made.	Supporting partner	New program	Short term (0- 5 years)	L	
Water & Waste	W4.4	waste audits	Provide waste audits for business owners and education on practices that decrease waste (e.g., compost, recycling, reuse).	Supporting partner	Existing program	Short term (0- 5 years)	M	Cost will depend on scale of participation.
Water & Waste	W4.10	waste less food program	Expand Thurston County's "Waste Less Food" program.	Regionally coordinated	Existing program	Short term (0- 5 years)	L	Depends on extent of expansion.
Water & Waste	W6.6	supply chain	Provide free technical assistance to local businesses in reducing the carbon intensity of their supply chains.	Supporting partner	Support of third party partner	Mid term (5-10 years)	M	Will likely required contractors for expertise. Cost will depend on extent of participation.
Agriculture & Forests	A1.2	nutrient management	Provide education and incentives (e.g., grants, loans, technical assistance) reduce nitrous oxide emissions when managing fertilizer.	Supporting partner	Existing program	Ongoing	L	Could partner with extension offices for this.
Agriculture & Forests	A2.1	regenerative agriculture	Expand regenerative agricultural practices (ex. low-till, no-till education programs) among farmers that aim for a "whole farm" approach. Provide education on how to increase organic matter content and water retention in soils within urban and agricultural settings.	Supporting partner	Existing program	Mid term (5-10 years)	L	Could partner with extension offices for this.
Agriculture & Forests	A5.1	reforestation & afforestation program	Develop a coordinated reforestation/afforestation program. Begin by identifying priority areas where reforestation and afforestation may have carbon reduction benefits.	Regionally coordinated	New program	Mid term (5-10 years)	H	Not many other local government models to build from here - will likely take time to develop program and conduct study.

Agriculture & Forests	A6.5	municipal canopy	Maximize tree canopy on City-owned or City-controlled land, where appropriate in balance with other City goals.	Individual jurisdictions	Existing program	Mid term (5-10 years)	L	Straightforward - cost will depend on extent of existing tree canopy.
Agriculture & Forests	A6.9	tree canopy preservation	Develop a tree canopy ordinance that establishes a baseline for current urban canopy and sets goals for future canopy to increase cities' resilience. Combine direct cooling value (urban heat island mitigation) with carbon sequestration value when evaluating urban tree management.	Individual jurisdictions	Regulatory/code change	Short term (0- 5 years)	L	Can build on A5.1.
Cross-cutting	G1.7	social research and behavior change campaigns	Work with higher education institutions to research effective behavior change through marketing and educate. Use this information in developing campaigns to reduce high emissions GHGs.	Regionally coordinated	Support of third party partner	Short term (0- 5 years)	L	
Cross-cutting	G4.1	emissions inventory	Prepare and publish an annual emissions inventory that tracks greenhouse gas emissions by jurisdiction and source category. Review and update emissions inventory methodology as necessary to address improvements to data or methodologies, improve consistency, incorporate changes to state or federal policies, or report on issues of local interest.	Regionally coordinated	Existing program	Ongoing	M	While individual inventories are less expensive (\$20-\$50k), conducting them annually will add up over time.
Cross-cutting	G4.2	performance measures	Develop community GHG reduction goals and performance measures. Regularly update and publicize for community to track their progress.	Regionally coordinated	Existing program	Ongoing	L	Can build on G4.2.
Cross-cutting	G4.3	other emission sources and sinks	Expand sources and sectors in future emissions inventories to inform future regulatory policy to reduce GHG emissions. Connected to actions T1.5 and W6.1, and sequestration actions.	Regionally coordinated	New program	Short term (0- 5 years)	L	Can build on G4.2.
Cross-cutting	G4.4	vulnerable populations	Develop a data and monitoring mechanism that is specific to marginalized groups and their needs related to climate change and climate reality (e.g., access to transportation, access to A/C, proximity to cooling centers) and develop a plan to address these vulnerabilities with solutions that help reduce GHG emissions.	Regionally coordinated	New program	Mid term (5-10 years)	M	Study + plan - done well will also require stakeholder/public engagement with hard-to-reach communities.

Cross-cutting	G4.6	social cost of carbon	Develop and adopt policies that require the use of a "social cost of carbon measure" in zoning, development, construction, and transportation decisions.	Regionally coordinated	New program	Mid term (5-10 years)	L	City of Seattle has a model for this to build from.
Cross-cutting	G5.2	solar-ready building code	Add as a high priority to municipality's legislative agenda - State-level amendments to State building code requiring solar-ready construction. Work with other cities to add this to the Association of Washington Cities (AWC) priorities.	Legislative Agenda	Existing program	Short term (0- 5 years)	L	Build on B5.8
Cross-cutting	G5.5	legislative agenda	Prioritize combating climate change in the municipality's legislative agenda each year. Instruct municipal lobbyist to track and report on climate bills, and to advocate for those bills that will help reduce local emissions. Work with other cities to add this to the AWC priorities.	Legislative Agenda	Existing program	Short term (0- 5 years)	L	Can leverage ongoing partnerships.

Monitoring Framework

July 23, 2020 – Steering Committee Review

Overview

The final piece of the Thurston Climate Mitigation Plan is a monitoring framework to gauge accountability and track progress toward achieving the regional greenhouse gas emission targets.

Methodology

The monitoring framework includes three components:

- **A Greenhouse Gas Emissions Inventory** – The emissions inventory uses local data to estimate the relative contribution of emissions from different sectors, including energy in buildings, transportation, agriculture, and solid waste. Since 2010, the Thurston Climate Action Team (TCAT) has estimated annual community-wide greenhouse gas emissions within Thurston County using a nationally recognized protocol developed by the International Council of Local Environmental Initiatives (ICLEI). TCAT’s 2018 Inventory was used as the information foundation for the scenario analysis.
- **Key Performance Indicators** – quantitative metrics that indicate progress towards the goals and strategies of the plan. The key performance indicators include inputs to the Greenhouse Gas Emissions Inventory (ex., kilowatt hours of residential energy consumption), outputs from the Greenhouse Gas Emissions Inventory (ex., tons of greenhouse gas emissions from residential energy use), and supplemental indicators that address factors outside the emissions inventory (ex., number of public electric vehicle charging stations). Each indicator has a baseline value for the year 2010, and will have target values for 2030 and 2050 that can be used to track progress.
- **Action Progress** – qualitative updates on the status of individual actions included in the plan.

Reporting

One of the guiding principles identified at the start of the planning process was:

***Adaptive.** Consider both the short- and long-term impacts of climate change, regularly report on progress, and review and revise targets and approaches as needed to address emerging information about the timing and severity of climate impacts or the effectiveness of policies;*

As part of the Implementation of the Thurston Climate Mitigation Plan, reporting and revisions are recommended on the following schedule:

Annually

- Greenhouse Gas Emissions Inventory
- Key Performance Indicators – note: some indicators may be updated less frequently depending on data availability, aiming for every 3-5 years at a minimum.
- Priority Actions

Every 2 Years

- Minor updates to actions; set priority actions for next two-year cycle

Every 4-5 Years

- Substantial updates to strategies and actions

Every 8-10 Years

- Full review and update of the Thurston Climate Mitigation Plan

The Monitoring Program is anticipated to be managed by Thurston Regional Planning Council, or other entity identified in a Phase 3 Interlocal Agreement, with support from participating jurisdictions. Monitoring progress reports are anticipated to be presented to a future iteration of the Steering Committee, or other entity identified in a Phase 3 Interlocal Agreement, and communicated through an online dashboard viewable to the public.

Attachment:

- Draft Key Performance Indicators

Reporting Year (enter the current year): 2020

Focus Area	Strategies	KPI ID	KPI
Agriculture & Forests	Manage forests to sequester carbon.	AF1	Annual tree sequestration (MTCO _{2e})
Agriculture & Forests	Reduce emissions from agricultural practices.	AF2	Land fertilization (acres)
Agriculture & Forests	Reduce emissions from agricultural practices.	AF3	Animal farming (# of heads)
Agriculture & Forests	Reduce emissions from agricultural practices.	AF4	Agriculture GHG emissions (MTCO _{2e})
Agriculture & Forests	Reduce emissions from the urban landscape.	AF5	Percent tree canopy cover
Buildings & Energy	Convert to cleaner fuel sources.	BE1	Total residential natural gas consumption (MMBtu)
Buildings & Energy	Convert to cleaner fuel sources.	BE2	Per-household residential natural gas consumption (MMBtu/household)
Buildings & Energy	Convert to cleaner fuel sources.	BE2	Residential fuel oil consumption (households)
Buildings & Energy	Convert to cleaner fuel sources.	BE4	Residential LPG consumption (households)
Buildings & Energy	Convert to cleaner fuel sources.	BE5	Residential wood consumption (households)
Buildings & Energy	Convert to cleaner fuel sources.	BE6	Industrial natural gas consumption (MMBtu)
Buildings & Energy	Convert to cleaner fuel sources.	BE7	Commercial natural gas consumption (MMBtu)
Buildings & Energy	Convert to cleaner fuel sources.	BE8	Commercial natural gas GHG emissions (MTCO _{2e})
Buildings & Energy	Convert to cleaner fuel sources.	BE9	Industrial natural gas GHG emissions (MTCO _{2e})
Buildings & Energy	Convert to cleaner fuel sources.	BE10	Residential electricity GHG emissions (MTCO _{2e})
Buildings & Energy	Convert to cleaner fuel sources.	BE11	Residential natural gas GHG emissions
Buildings & Energy	Convert to cleaner fuel sources.	BE12	Residential fuel oil GHG emissions (MTCO _{2e})
Buildings & Energy	Convert to cleaner fuel sources.	BE13	Residential LPG GHG emissions (MTCO _{2e})
Buildings & Energy	Convert to cleaner fuel sources.	BE14	Residential wood GHG emissions (MTCO _{2e})
Buildings & Energy	Convert to cleaner fuel sources.	BE15	Total natural gas consumption (MMBtu)
Buildings & Energy	Convert to cleaner fuel sources.	BE16	Proportion of housing units with electric heating (%)
Buildings & Energy	Convert to cleaner fuel sources.	BE17	Total building energy GHG emissions (MTCO _{2e})
Buildings & Energy	Convert to cleaner fuel sources.	BE18	Electricity emissions factor (MTCO _{2e} /MWh)
Buildings & Energy	Convert to cleaner fuel sources.	BE19	Local green power purchases (kWh)
Buildings & Energy	Increase the production of local renewable energy.	BE20	Renewable electricity (% of total)
Buildings & Energy	Increase the production of local renewable energy.	BE21	Grid-supplied renewable electricity (MWh)
Buildings & Energy	Increase the production of local renewable energy.	BE22	Estimated local solar installations (#)
Buildings & Energy	Reduce energy use across building types.	BE23	Commercial electricity consumption (kWh)
Buildings & Energy	Reduce energy use across building types.	BE24	Per-sf commercial electricity consumption (kWh/sf)
Buildings & Energy	Reduce energy use across building types.	BE25	Commercial electricity GHG emissions (MTCO _{2e})
Buildings & Energy	Reduce energy use across building types.	BE26	Industrial electricity consumption (MWh)
Buildings & Energy	Reduce energy use across building types.	BE27	Industrial electricity GHG emissions (MTCO _{2e})
Buildings & Energy	Reduce energy use across building types.	BE28	Total energy consumption (MMBtu)
Buildings & Energy	Reduce energy use across building types.	BE29	Per-sf commercial energy use (MMBtu/sf)
Buildings & Energy	Reduce energy use across building types.	BE30	Energy-efficient buildings (# LEED certified)
Buildings & Energy	Reduce energy use across building types.	BE31	Percent of population with disproportionate energy/housing costs as a percentage of household income
Buildings & Energy	Reduce energy use in residential buildings.	BE32	Residential electricity consumption (KWh/household)
Buildings & Energy	Reduce energy use in residential buildings.	BE33	Residential energy use per capita (MMBtu/household)
Cross-Cutting	Conduct education and outreach across climate mitigation areas.	CC1	Community participation in TCMP events (# attendees)
Cross-Cutting	Enhance monitoring and evaluation of climate mitigation measures and outcomes.	CC2	Percent of actions that are completed or underway

Cross-Cutting	Enhance monitoring and evaluation of climate mitigation measures and outcomes.	CC3	New, local green jobs created, by demographic group (% or #, by demographic)
Transportation & Land Use	Increase adoption of electric vehicles.	TL1	Proportion of passenger vehicles that are electric (%)
Transportation & Land Use	Increase adoption of electric vehicles.	TL2	Electric vehicles (# registered)
Transportation & Land Use	Increase adoption of electric vehicles.	TL3	Number of public EV charging spots (#)
Transportation & Land Use	Increase efficiency of the transportation system.	TL4	Passenger/light duty vehicle carbon intensity (gCO ₂ e/mi)
Transportation & Land Use	Increase efficiency of the transportation system.	TL5	Passenger/light duty vehicle GHG emissions (MTCO ₂ e)
Transportation & Land Use	Increase efficiency of the transportation system.	TL6	Medium- & heavy-duty truck emission intensity (gCO ₂ e/mi)
Transportation & Land Use	Increase efficiency of the transportation system.	TL7	Medium- & heavy-duty truck GHG emissions (MTCO ₂ e)
Transportation & Land Use	Increase efficiency of the transportation system.	TL8	Transportation GHG emissions (MTCO ₂ e)
Transportation & Land Use	Increase the use of public transit.	TL9	Percent of population within 1/2 mile of transit
Transportation & Land Use	Increase the use of public transit.	TL10	Public transit ridership (passenger boardings)
Transportation & Land Use	Increase the use of public transit.	TL11	AllTransit Performance Score
Transportation & Land Use	Increase the use of public transit.	TL12	Percent of residents who live within 1/2 mile of public transit
Transportation & Land Use	Increase use of active forms of travel and more efficient commute modes.	TL13	Median household transportation costs as a percentage of median household income
Transportation & Land Use	Increase use of active forms of travel and more efficient commute modes.	TL14	Bike lanes (miles)
Transportation & Land Use	Increase use of active forms of travel and more efficient commute modes.	TL15	Sidewalks (miles)
Transportation & Land Use	Increase use of active forms of travel and more efficient commute modes.	TL16	Number of personal vehicles per capita
Transportation & Land Use	Increase use of active forms of travel and more efficient commute modes.	TL17	Percent of residents who commute to work by bike
Transportation & Land Use	Increase use of active forms of travel and more efficient commute modes.	TL18	Average Walk Score in Thurston County (out of 100)
Transportation & Land Use	Increase use of active forms of travel and more efficient commute modes.	TL19	Average Bike Score in Thurston County (out of 100)
Transportation & Land Use	Set land use policies that support increased density and efficient transportation networks.	TL20	Passenger/light-duty vehicle use (VMT)
Transportation & Land Use	Set land use policies that support increased density and efficient transportation networks.	TL21	Medium- & heavy-duty truck use (VMT)
Transportation & Land Use	Set land use policies that support increased density and efficient transportation networks.	TL22	Total vehicle miles traveled (VMT) in Thurston
Water & Waste	Divert more solid waste from landfills.	WW1	Per-capita solid waste generation (wet tons/capita)
Water & Waste	Divert more solid waste from landfills.	WW2	Solid waste GHG emissions (MTCO ₂ e)
Water & Waste	Divert more solid waste from landfills.	WW3	Total tons of waste disposed to landfill (wet tons)
Water & Waste	Divert more solid waste from landfills.	WW4	Organic waste disposed to landfill (wet tons)
Water & Waste	Divert more solid waste from landfills.	WW5	Waste diversion rate (weight of recycled and composted waste/total weight of waste)
Water & Waste	Divert more solid waste from landfills.	WW6	Proportion of disposed waste that is compostable (% , by weight)
Water & Waste	Reduce emissions from wastewater treatment operations.	WW7	Wastewater GHG emissions (MTCO ₂ e)
Water & Waste	Reduce emissions from wastewater treatment operations.	WW8	Septic tank GHG emissions (MTCO ₂ e)