



A. Acknowledgements and implementation partners

The City of Milwaukie wishes to thank the following community members, organizations, partners, and staff for their contributions in developing this Climate Action Plan:

City of Milwaukie

- Mark Gamba, Mayor
- Peter Passarelli, Public Works Director and Project Manager for the Climate Action Plan
- Ann Ober, City Manager
- Tristan Sewell, Climate Action Plan intern
- David Levitan, Senior Planner
- Blanca Marston, Administrative Specialist
- Additional staff listed in workshop attendee lists below

Climate Action Plan Committee (CAPC)

- Shane Abma, City Council Liaison
- Vince Alvarez, Community Member
- Brooke Berglund, Government Affairs, PGE, Milwaukie
- Linda Blue, Community Member
- Shanna Brownstein, NW Natural
- Patricia Cronin, Community Member
- Eric Corey Freed, Community Member
- David Dugan, Large Employer
- Mark Hilton, Community Member
- Jonathan Hutchinson, North Clackamas School District
- Kathy Hyzy, Community Member
- Britt McConn, Community Member
- Eben Polk, Clackamas County
- Scott Stewart, Large Employer
- Andy Taylor, Community Member
- Yelena Voznyuk, Community Member

Implementation partner workshop participants

Materials Purchasing, Use and Recovery

- Kelly Stewart, Clackamas County
- Elaine Blatt, Oregon DEQ Materials Management
- Simon Love, Oregon DEQ Materials Management
- Sara Eddie, The ReBuilding Center
- Kelly Tucker, City of Milwaukie
- Reba Crocker, City of Milwaukie
- Vince Alvarez, CAPC Member



- Angie Thompson, Exceed Enterprises

Building Energy Sourcing and Efficiency

- Melinda Shumaker, North Clackamas School District
- Damien Farwell, City of Milwaukie
- Vince Alvarez, CAPC Member
- Garrett Harris, Portland General Electric
- Brooke Berglund, Portland General Electric, CAPC Member
- Mark Hilton, CAPC Member
- Eric Corey Freed, CAPC Member
- Jeni Hall, Energy Trust of Oregon
- Jay Ward, Energy Trust of Oregon
- Anthony Roy, Earth Advantage
- Stacy Baram, Portland Energy Conservation, Inc.
- Shanna Brownstein, NW Natural, CAPC Member

Vehicle Fleets and Fuels

- Mark Gamba, Mayor of Milwaukie
- Damien Farwell, City of Milwaukie
- Vic Foley, City of Milwaukie
- Greg Platt, Platt Auto Group
- Shanna Brownstein, NW Natural
- Rick Durst, Durst Energy LLC
- Vince Alvarez, CAPC Member
- John Isaacs, Uber
- Catherine Teebay, Forth
- Duke Castle, Lake Oswego Sustainability Network

Land Use and Transportation Planning

- Mark Gamba, Mayor of Milwaukie
- Vince Alvarez, CAPC Member
- Denny Egner, City of Milwaukie
- David Levitan, City of Milwaukie
- Leila Aman, City of Milwaukie
- Pat Jewett, Oregon Walks
- Roger Kainu, Oregon Department of Energy
- Troy Gagliano, PGE
- Mary Moerlins, NW Natural
- Karen Buehrig, Clackamas County
- Eric Corey Freed, CAPC Member



Natural Resources

- Daniel Newberry, Johnson Creek Watershed Council
- Terry Gibson, North Clackamas Urban Watershed Council (Mt Scott/Kellogg Creek)
- Chuck Eaton, City of Milwaukie
- Vincent Alvarez, CAPC Member
- Ronelle Sears, City of Milwaukie
- Shane Hart, City of Milwaukie
- Julian Lawrence, City of Milwaukie
- Tonia Williamson, North Clackamas Parks and Recreation District
- Matt Glazewski, Clackamas County Water Environment Services
- Rebecca Geisen, Regional Water Providers Consortium
- Don Simenson, City of Milwaukie

Public Health and Emergency Preparedness

- Portland Energy Conservation, Inc.
- Vince Alvarez, CAPC Member
- Kathy Hyzy, CAPC Member
- Jay Wilson, Clackamas County
- Gregg Ramirez, Clackamas Fire District 1
- Damien Farwell, City of Milwaukie
- Josh Keeling, PGE
- Mark Dye, Milwaukie Police Department



B. Glossary

Action - a project, technology, activity or program that is meant to achieve greenhouse gas emission reductions, adaptations and other community benefits

Adaptation - actions and efforts directed to increasing community and operational functionality and resiliency to extreme events or during prolonged economic, environmental and social system changes due to climate change

Carbon Dioxide Equivalent – unit for comparing the relative potency of effect of other greenhouse gases using carbon dioxide as the standard unit of measure - 1, referred to as CO₂e. Ex. Methane is 34, CO₂ is 1

Carbon Footprint – the amount of greenhouse gases that can be attributed to the activities and processes of an organization, differentiating between owned and supply chain emission sources and boundaries. Methodologies vary but are aligning over time.

Carbon intensity - the amount of greenhouse gases emitted per unit of energy consumed

Climate – the prevailing weather conditions in a geographic area over an extended period

Co-Benefits – the discrete, additional community benefits beyond emissions reductions (mitigates and adapts in one action, leverages existing efforts, revenue generation or cost avoidance, health and safety, opportunity for social equity, community support, economic development of a cluster etc.)

Consumption-Based Greenhouse Gas Inventory - local, sector-based emissions, in addition to emissions that are generated during production and delivery of imported goods, energy and food consumed within the Eugene community, and exclude sector-based emissions from local production that are exported.

Cost Effectiveness – marginal cost or savings compared to the business-as-usual scenario divided by metric tons of carbon dioxide equivalent mitigation potential over the lifespan of the action.

Goal – the aim or result of action meant to reduce or eliminate GHG emissions for a community, city operations or for any set of strategies or specific action. Goals tend to be set for longer terms and wider boundaries.

Greenhouse gases (GHGs) – are the gases in the atmosphere that contribute to the greenhouse effect in the atmosphere. The Kyoto Protocol defined 6 greenhouse gases including carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydro fluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF₆), and nitrogen trifluoride (NF₃). Increased



concentration of these gases (e.g., carbon dioxide, methane, nitrous oxide) are emitted into the atmosphere by human activity and natural phenomena.

GHG inventory – like a carbon footprint, a GHG inventory measures anthropogenic (human-made) greenhouse gas resulting from the activities within a defined boundary – such as operational control of an organization; a City’s geographic boundary; or lifecycle impacts of a particular product or project.

Indicator/metric – a unit or standard of measure to gauge performance

Mitigation – actions directed toward reducing greenhouse gas emissions that contribute to climate change and the extent to which we experience significant changes in weather, food, water, human health, etc.

Mitigation Potential – average annual achievable Scope 1 and Scope 2 reductions of carbon dioxide from fossil fuel combustion or anthropogenic process emissions.

Parts Per Million (PPM) – the concentration of a gas, generally carbon dioxide, in the air. Climate modeling is based off different concentrations of carbon dioxide in the atmosphere. As of 2017, the average global CO₂e is ~406. Pre-Industrial concentrations of CO₂e were ~280.

Sector-Based Greenhouse Gas Inventory - local emissions from energy use by homes, businesses, and vehicles as well as emissions from landfilling solid waste and wastewater treatment.

Sequestration – the biological capture of a material or gas, general referenced to carbon dioxide within an ecosystem or living system (e.g., ocean, soil, tree). Ex. Plants sequester carbon in wood and soil. Mechanical systems aim to inject CO₂ into underground reservoirs or embody CO₂ in minerals such as chalk and other inert elements.

Strategy – a policy or plan of action to achieve a goal. A strategy could encompass many actions or just one.

Target – a goal on a shorter timeframe for a specific action or strategy.

Weather – the state of the atmosphere in a discrete time and location, measuring aspects such as temperature, humidity and precipitation



C. Building on a foundation: Climate action we have taken thus far

In expectation of adopting the Climate Action Plan (CAP), which will achieve one of City Council's three goals for 2018, City Council directed more resources towards achieving climate-related items called out in the Vision Action Plan and the CAP. This work will require a dedicated staff person, as well as some smaller allocations for developing metrics and tracking the City's carbon footprint—both of which are included in the budget.

This budget and work plan expresses the City's commitment to leading the way on energy efficiency and renewables. The City's Ledding Library project is already blazing the path on building efficiency by using 1/6 of the energy the current building consumes and integrating the city's first solar installation. Buildings under construction in downtown will also include significant energy-efficiency measures to comply with a new bonus requirement that buildings achieve a green building standard to secure development of a fifth floor.

Council's goal also plans for the increased focus the City has placed on tree management and improving Milwaukie's total tree canopy. To achieve this, the City has shifted existing resources to increase the number of staff maintaining Milwaukie's natural areas and existing urban forest.

Other actions taken to date related to climate preparedness, mitigation and resilience include:

Strategic Energy Management: The City is enrolled in Energy Trust's Strategic Energy Management (SEM) Program. The SEM program is designed to teach businesses and governments how to integrate energy management practices into their operations. Energy Trust provides training, access to experts, context, and examples of best practices. The staff then examines energy usage and cross references use with weather data to identify potential issues. The City's Facilities Division of Public Works investigates any anomalies and makes improvements to the systems.

Ameresco Contract: The City of Milwaukie used an Energy Savings Performance Contract (ESPC) contract with Ameresco to identify and implement energy saving improvements, while managing risks inherent in such projects. The Facilities Division of Public Works worked with Ameresco to fund a contract to replace HVAC controls and lighting in City facilities.

Electric vehicle purchases and PGE "Electric Avenue": During the last budget cycle the City purchased three Nissan Leaf cars to replace administrative vehicles. Milwaukie has installed a new public charging station and a fleet charging station. Milwaukie was selected to be the sight of a PGE "Electric Avenue" charging station at the intersection of Jackson and McLoughlin Blvd. Milwaukie, due to its compact geographic size, is well suited to plug in electric vehicles.



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Solarize Milwaukie Program: The Solarize Milwaukie program successfully provided education to local homeowners, directed residents to local solar installers, and reduced cost to those participating in the program. Sunlight Solar Energy was the sole solar installation company to service the program. In partnership with the company, Milwaukie hosted a number of solar workshops where residents could ask questions directly to local officials, representatives from Solar Oregon, and solar installers. As a result, fourteen solar systems were installed in 2017.

SAFE Program: The Safe Access For Everyone (SAFE) program is a plan to improve safety and access throughout the city and includes a funding mechanism to complete the proposed improvements. It was developed over the course of a year by the City of Milwaukie, Public Safety Advisory Committee (PSAC), Citizen Utility Advisory Board (CUAB), and City Council. In March 2018, Milwaukie City Council authorized \$21 million in bonds to construct numerous sidewalks and paving projects between 2019 and 2021. These bonds will fund the first of three phases that will construct 27.9 miles of sidewalks, four miles of bike lanes and 900 ADA ramps over the next several years.

Green Energy Purchase: The City of Milwaukie is currently purchasing approximately 76.7% of its electricity through PGE's Clean Wind Tariff.



D. Milwaukie superactions from the Community Vision

- 1 Make Milwaukie a Model of Resiliency, Environmental Stewardship and Disaster-Preparedness
- 2 Continually Improve our Transportation System so that it Provides Safety and Connectivity for All Users
- 3 Create Complete Neighborhoods that Offer a Range of Housing Types and Amenities and Enhance Local Identity and Character
- 4 Support Local Businesses and Entrepreneurship through Training, Programs and Partnerships
- 5 Cultivate a Sense of Community, Culture, and Belonging by Encouraging Public Involvement, Diversity, Equity, and Inclusion



F. Progress metrics

Building energy and efficiency

Mitigation or adaptation?	Action	Measuring progress
Mitigation	Work with PGE to become net zero electricity by 2035	<ul style="list-style-type: none"> <input type="checkbox"/> City and PGE initiate by: development of "Path to Net Zero" program <input type="checkbox"/> Evaluate progress: emissions reductions from electricity over time - percent complete <input type="checkbox"/> Complete: Milwaukie's emissions from electricity are net zero
Mitigation	Engage Northwest Natural to develop strategy for being net zero by 2040	<ul style="list-style-type: none"> <input type="checkbox"/> City and Northwest Natural initiate by: developing program for reducing emissions <input type="checkbox"/> Evaluate progress: emissions reductions from gas over time - percent complete <input type="checkbox"/> Complete: Milwaukie's emissions from natural gas are net zero
Mitigation	Adopt a commercial and residential building energy score program based on City of Portland's	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: hiring staff to develop energy score program <input type="checkbox"/> Evaluate progress: implementation of program across the city – number and percentage of homes that have been rated <input type="checkbox"/> Complete: program fully implemented (every building has been touched by the program)
Mitigation	Advocate for more energy efficiency state building codes	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: developing advocacy plan <input type="checkbox"/> Evaluate progress: number of hours/dollars dedicated to lobbying every three years <input type="checkbox"/> Complete: State Building codes meet or exceed Milwaukie's objectives
Mitigation	Incentivize property owners to encourage multifamily energy efficiency upgrades	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: creating program and securing funding <input type="checkbox"/> Evaluate progress: number and percentage of multifamily complexes and units implementing energy efficiency upgrades <input type="checkbox"/> Complete: all units have been updated
Mitigation	Develop community solar project	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: development of community solar project <input type="checkbox"/> Evaluate progress: facility complete and program underway



		<ul style="list-style-type: none"> <input type="checkbox"/> Evaluate progress: full subscription for each facility <input type="checkbox"/> Complete: determine demand for further facilities and repeat
Mitigation	Work with PGE on demand repose programs	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: development with PGE of program <input type="checkbox"/> Evaluate progress: number and percentage of load that is subscribed to demand response program <input type="checkbox"/> Complete: all customers have either deliberately opted into the program or opted out
Adaptation	Implement solar, battery storage and micro-grids for resilience in weather events	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: planning process <input type="checkbox"/> Evaluate progress: total planned / installed microgrid capacity (MW) <input type="checkbox"/> Evaluate progress: microgrids serving emergency command center <input type="checkbox"/> Complete: microgrids serving all essential service centers

Vehicle fleets and fuels

Mitigation or adaptation?	Action	Measuring progress
Mitigation	Incentivize workplace charging in parking lots	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: develops program and determines funding <input type="checkbox"/> Evaluate progress: number and percentage of Employers with EV charging <input type="checkbox"/> Evaluate progress: ratio of employer provided parking spaces with EV charging to spaces without charging <input type="checkbox"/> Complete: all employer parking spaces provide charging access
Mitigation	Support outreach efforts to encourage shift to EVs	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: creating education program <input type="checkbox"/> Evaluate progress: annual number of outreach events and running total <input type="checkbox"/> Evaluate progress: number of households or organizations that receive education materials annually <input type="checkbox"/> Evaluate progress: total visits to events <input type="checkbox"/> Complete: all vehicles in the community are EVs
Mitigation	Create program to install electric vehicle charging infrastructure at multi-family complexes	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: developing program and securing funding <input type="checkbox"/> Evaluate progress: number of multifamily complexes with any EV charging



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		<ul style="list-style-type: none"> <input type="checkbox"/> Evaluate progress: percentage of multifamily complexes with any EV charging. <input type="checkbox"/> Evaluate progress: ratio of charging stations to dwelling units. <input type="checkbox"/> Complete: all parking spaces provide charging access
Mitigation	Convert diesel-powered heavy fleet vehicles to low carbon fuels	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: ongoing purchase of low-carbon fuels <input type="checkbox"/> Evaluate progress: percentage of gallonage that is "low carbon" fuel. <input type="checkbox"/> Complete: 100% use of low carbon fuels
Mitigation	Optimize light duty fleet and replace least efficient vehicles with most efficient vehicles	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: setting policy or purchasing pattern <input type="checkbox"/> Evaluate progress: total number of vehicles. <input type="checkbox"/> Evaluate progress: percentage decrease in number of vehicles. <input type="checkbox"/> Evaluate progress: percentage of light duty vehicles replaced with hybrid or electric vehicle. <input type="checkbox"/> Complete: all light duty fleet is an electric vehicle charged with net zero electricity
Mitigation	Work with Clackamas County, Tri-Met and Metro to develop micro-transit from park-and-ride or light rail station to local destinations	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: establishing a working group that is focused on developing micro transit <input type="checkbox"/> Evaluate progress: plan for micro transit adopted <input type="checkbox"/> Evaluate progress: micro transit planned system is what percentage complete? <input type="checkbox"/> Complete: system as designed in fully operating
Mitigation	Work with school district, waste haulers and waste water agency on fleet transition	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: meeting with schools to review use of biogas or low carbon fuel, including electric and hydrogen <input type="checkbox"/> Evaluate progress: percentage of fleet vehicles operating in service of Milwaukie using alt fuels <input type="checkbox"/> Evaluate progress: percentage of fleet fuels coming from low carbon or zero emissions sources <input type="checkbox"/> Complete: All service vehicles in Milwaukie are using low carbon or no carbon fuels/energy



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Adaptation	Review location of fleet yard and fuel storage to examine flood vulnerability. Look at fuel movement during flood conditions and diversify fuel sources in terms of fuel transport into Milwaukie to prepare for climate event-related import challenges.	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: determining what the flood risk is to the yard and to the delivery of fuel <input type="checkbox"/> Evaluate progress: plan adopted to relocate fleet yard and understood by all parties <input type="checkbox"/> Evaluate progress: plan adopted to source fuel during flood or fire event <input type="checkbox"/> Complete: All relevant parties can follow plan and source fuel to maintain service to Milwaukie during events
Adaptation	Implement intergovernmental agreements or MOUs with other agencies for fleet support in emergencies (e.g. large-scale debris removal)	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: setting meetings with all local agency partners for the discussion of the potential plan <input type="checkbox"/> Evaluate progress: percentage complete of the plan <input type="checkbox"/> Complete: plan adopted and signed for in formal MOU

Land use and transportation planning

Mitigation or adaptation?	Action	Measuring progress
Mitigation	Partner with Metro and TriMet to increase transit service, particularly to underserved employment areas	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: identifying the employer need and meets with Metro and TriMet to determine process <input type="checkbox"/> Evaluate progress: plan in place for development and funding <input type="checkbox"/> Evaluate progress: percentage complete of employment areas served with adequate transit <input type="checkbox"/> Complete: All workplaces have adequate transit service nearby
Mitigation	Implement a Transportation Management Agency (TMA) with area partners	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: following formal process to establish the TMA <input type="checkbox"/> Evaluate progress: percentage complete of planning process <input type="checkbox"/> Evaluate progress: program established with funding and funding <input type="checkbox"/> Complete: TMA operating
Mitigation	Implement "EV ready" zoning regulations that affect buildings and multifamily housing	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: passing a zoning ordinance or establishing new zoning rules for new development



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		<ul style="list-style-type: none"> <input type="checkbox"/> Evaluate progress: number and percentage of new buildings that are “EV ready” <input type="checkbox"/> Complete: all new buildings are EV ready
Mitigation	Incentivize employers to encourage active transportation and transit	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: creating or identifying incentive program and funding <input type="checkbox"/> Evaluate progress: percentage of participating employers by total employee count <input type="checkbox"/> Evaluate progress: number and percentage of all employees using active transportation and transit <input type="checkbox"/> Complete: every workplace has a program
Mitigation	Continue to promote a “fee in lieu of” for areas outside of pedestrian corridors; redirect funds to corridors that do	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: already initiated <input type="checkbox"/> Evaluate progress: number and percentage of permits annually that use the fee in lieu <input type="checkbox"/> Evaluate progress: percentage of total active mode paths gaps/linear footage filled by this method. <input type="checkbox"/> Complete: All major pedestrian corridors have complete paths
Mitigation	Promote “neighborhood hubs” through Comprehensive Plan policies	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: already initiated via Comprehensive Plan process <input type="checkbox"/> Evaluate progress: percentage complete comprehensive plan <input type="checkbox"/> Evaluate progress: percentage complete of plan incorporated into development rules <input type="checkbox"/> Complete: all new development and major renovations are following Comprehensive Plan
Mitigation	Implement parking pricing in downtown	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: establishing of the rule or ordinance to do so <input type="checkbox"/> Evaluate progress: number and percentage of spaces metered <input type="checkbox"/> Complete: all parking spots are metered
Mitigation	Implement variable system development charges to encourage accessory dwelling unit development	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: establishing in rule/ordinance a sliding scale set of system development charges that correlates to square footage past baseline threshold <input type="checkbox"/> Evaluate progress: annual number of ADUs developed



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		<ul style="list-style-type: none"> <input type="checkbox"/> Complete: rule is standard operating procedure
Mitigation	Lower parking ratios near high capacity corridors	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: reviewing corridors for the reduction in parking ratios <input type="checkbox"/> Evaluate progress: percent complete ordinance development <input type="checkbox"/> Complete: Zoning ordinance is complete
Adaptation	Update flood plain maps with local group coordination and funding	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: organizing agency partner meeting with FEMA and developing delivery schedule <input type="checkbox"/> Evaluate progress: FEMA commits to delivery date certain <input type="checkbox"/> Evaluate progress: if FEMA's timeframe doesn't work for the partners – developing and hiring a consultant team to determine flood conditions in advance of FEMA work <input type="checkbox"/> Complete: accurate working flood map for planning use across agencies
Adaptation	Provide incentives to increase flood storage capacity	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: determining flood storage need, developing program and securing funding <input type="checkbox"/> Evaluate progress: percentage of needed flood storage enrolled in program (gallons/acre feet) <input type="checkbox"/> Complete: needed flood storage developed
Adaptation	Plan for future employment land considering flood risk and natural resources	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: educating employers on the risks of flooding for their property <input type="checkbox"/> Evaluate progress: number of employers with adequate flood mitigation protections in place <input type="checkbox"/> Evaluate progress: number and percentage of jobs in Milwaukie with adequate flood mitigation protections in place <input type="checkbox"/> Complete: all employer locations threatened by flooding have mitigation strategy in place to keep jobs local
Adaptation	Reclaim riparian areas for flood storage for safety and property protection	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: identifying properties that could not be protected in future floods with engineered solutions <input type="checkbox"/> Evaluate progress: number and percentage of property owners reached with this news <input type="checkbox"/> Evaluate progress: number and percentage of property owners that



		<p>negotiate a trade or purchase with the city for their existing threatened property</p> <ul style="list-style-type: none"> <input type="checkbox"/> Complete: all property owners have come to an agreement with the City or have signed a statement accepting responsibility for the property in the future with no claims on the City
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Materials use, purchasing and recovery

Mitigation /adaptation?	Action	Measuring progress
Mitigation	City to require deconstruction or delayed demolition period	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: planning an ordinance or zoning rule change. <input type="checkbox"/> Evaluate progress: number of tons of demolition material recovered <input type="checkbox"/> Evaluate progress: percentage of all demolition material that is recovered <input type="checkbox"/> Complete: ordinance or rule established
Mitigation	Promote the repair of equipment and materials and buy used and durable before purchasing new	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: establishing a purchasing policy that encourages repair versus replacement and buying used and durable <input type="checkbox"/> Evaluate progress: number of items slated for replacement that were repaired instead <input type="checkbox"/> Evaluate progress: estimated dollar saving by repairing or buying used and durable compared to replacement with new item <input type="checkbox"/> Complete: policy becomes standard operating procedure
Mitigation	Provide education and outreach to avoid edible food waste	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: outreach campaign with periodic updates to remind households <input type="checkbox"/> Evaluate progress: percentage of households reached with educational materials. <input type="checkbox"/> Evaluate progress: short tons of edible food waste to landfill reduced from ODEQ Solid Waste Composition Study. <input type="checkbox"/> Evaluate progress: number of increased donations to foodbanks after education efforts <input type="checkbox"/> Complete: food waste to landfill in waste composition study drops below 1%
Mitigation	Public Works to use less impactful pavement alternatives	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: establishing procurement policy and specifications for lower carbon pavement



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		<ul style="list-style-type: none"> <input type="checkbox"/> Evaluate progress: tons and percentage of substitute concrete materials for Portland cement. <input type="checkbox"/> Evaluate progress: tons and percentage of reclaimed asphalt pavement as substitute for virgin binder <input type="checkbox"/> Evaluate progress: percentage of asphalt paving using warm mix asphalt <input type="checkbox"/> Complete: all paving uses lower carbon mixes as standard operating procedures
Mitigation	Promote existing food waste composting services	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: outreach to households periodically to remind them to use existing yard and food waste curbside collection bins <input type="checkbox"/> Evaluate progress: number and percentage of households reached with educational materials <input type="checkbox"/> Evaluate progress: short tons of food waste composted annually <input type="checkbox"/> Complete: food waste to landfill in waste composition study drops below 1%
Mitigation	Use mulch and compost in landscaping	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: establishing policy or practice of using mulch and compost in landscaping to augment soil, reduce watering and decrease need for pesticides <input type="checkbox"/> Evaluate progress: tons of compost used each year <input type="checkbox"/> Complete: standard operating procedure in all relevant landscape areas
Mitigation	Showcase materials management practices with a demonstration project	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: building Ledding library and developing interpretive signage <input type="checkbox"/> Complete: Interpretive signage present in updated Ledding library

Natural resources

Mitigation /adaptation /sequestration?	Action	Measuring progress
Sequestration	Increase tree canopy coverage to 40% by 2040	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: identifying locations for placement <input type="checkbox"/> Evaluate progress: number of trees planted, and percentage of canopy cover developed



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		<ul style="list-style-type: none"> <input type="checkbox"/> Complete: 40 percent canopy is planted and maintained with all removed trees replaced
Adaptation	Work with the Tree Board to develop a tree planting program focused on shielding low income neighborhoods from heat	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: identifying locations for placement with low income areas prioritized <input type="checkbox"/> Evaluate progress: percentage of lower income area trees planted <input type="checkbox"/> Complete: low income areas are fully planted for shade provision
Adaptation	Review intergovernmental water agreements	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: reviewing agreements and naming concerns or things to change <input type="checkbox"/> Evaluate progress: Engagement of partners <input type="checkbox"/> Complete: Changes made to agreements
Adaptation	Update stormwater masterplan	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: running stormwater update process <input type="checkbox"/> Evaluate progress: future conditions are adequately studied and characterized <input type="checkbox"/> Evaluate progress: factors and methods are updated to accommodate future conditions <input type="checkbox"/> Complete: plan is ready for implementation
Adaptation	Identify sewer and waterways vulnerable to flooding	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: updating FEMA flood maps and updating stormwater master plan to determine risks <input type="checkbox"/> Evaluate progress: percentage complete for plan update <input type="checkbox"/> Complete: Sewer and waterways identified and prioritized for engineering and construction
Adaptation	Adjust code to require on-site stormwater storage and water filtration before release that meets future conditions	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: updating stormwater master plan <input type="checkbox"/> Complete: code updates reflect future conditions
Adaptation	Introduce more monitoring stations to protect drinking water wells	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: determining areas to monitor <input type="checkbox"/> Evaluate progress: RFP for well equipment or service contract <input type="checkbox"/> Evaluate progress: number of baseline stations <p>Number of additional stations established</p>



		<ul style="list-style-type: none"> <input type="checkbox"/> Complete: all needed areas are monitored regularly
Adaptation	Develop a potable/drinkable water re-use plan	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: developing a plan for re-use of high priority used water sources and needs <input type="checkbox"/> Evaluate progress: agreements complete with large sources to participate <input type="checkbox"/> Evaluate progress: percent complete planning for major water sources to reach major water consumers <input type="checkbox"/> Complete: used water major sources are connected to major water consumers via installed pipes

Public health and emergency preparedness

Mitigation /adaptation /sequestration?	Action	Measuring progress
Adaptation	Work with the Federal Emergency Management Agency (FEMA) to update flood plain maps	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: organizing agency partner meeting with FEMA and developing delivery schedule <input type="checkbox"/> Evaluate progress: FEMA commits to delivery date certain <input type="checkbox"/> Evaluate progress: if FEMA's timeframe doesn't work for the partners – developing and hiring a consultant team to determine flood conditions in advance of FEMA work <input type="checkbox"/> Complete: accurate working flood map for planning use across agencies
Adaptation	Work with partners to support community outreach about how to reduce fire and flood risk	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: conversation with partners to develop outreach and education plan <input type="checkbox"/> Evaluate progress: number and or percentage of households and organization reached with information <input type="checkbox"/> Complete: all households and organizations are reached within a 3-year time frame. Repeat
Adaptation	Plan for cooling and air quality relief centers	<ul style="list-style-type: none"> <input type="checkbox"/> City initiates by: planning process to develop cooling and air quality relief centers with agency and community partners <input type="checkbox"/> Evaluate progress: facilities identified for each neighborhood



CITY OF MILWAUKIE Climate Action Plan



		<ul style="list-style-type: none"><input type="checkbox"/> Evaluate progress: number and percentage of facilities with equipment installed<input type="checkbox"/> Complete: implements cooling and air relief centers systems operating and in emergency command structure
Adaptation	Promote more sophisticated home air filtration systems	<ul style="list-style-type: none"><input type="checkbox"/> City initiates by: conversation with stakeholders, including property owners, HVAC companies, home equipment vendors and developers<input type="checkbox"/> Evaluate progress: number and percentage of buildings retrofitted<input type="checkbox"/> Evaluate progress: number of households participating in buying standalone equipment<input type="checkbox"/> Complete: all buildings and households have equipment
Adaptation	Develop public-facing flood and fire risk zone maps and implement signage on streets to raise awareness	<ul style="list-style-type: none"><input type="checkbox"/> City initiates by: determining areas needing flood and fire risk zone maps/signs<input type="checkbox"/> Evaluate progress: number and percentage of signs installed<input type="checkbox"/> Evaluate progress: City makes maps available to the public<input type="checkbox"/> Complete: all signs installed, all households provided with maps



Technical Memo: Milwaukie Climate Action Plan (CAP) Policy Authority and Direction

To: Peter Passarelli, City of Milwaukie

From: Justin Overdevest, Associate justin.overdevest@goodcompany.com

Joshua Proudfoot, Principal, joshua.proudfoot@goodcompany.com

Date: January 2018

1. POLICIES THAT SUPPORT CLIMATE ACTION PLAN

In our review, we assessed 30 plans for mission, goals, and the accompanying quantitative and qualitative information in the plans that align with the chapters of Milwaukie's CAP. These 30 plans come from: 10 City of Milwaukie, 10 community and regional partners, and 10 state and federal level plans. The table on the next page outlines these plans and how they relate to the CAP.

For each of these plans, we included the key statements and areas that relate to the CAP. We recommend *actively* managing the accompanying Excel spreadsheet (each plan in a separate worksheet tab) as policies and regulations change at the City and other organizations.

Some of these documents connect important vision and overarching practices (Milwaukie All Aboard) while others are focused on specific comprehensive policies or select ideas (Transportation System Plan, Water Master Plan). Select plans convey key messages that directly connect to the Milwaukie CAP intent and can be effective in demonstrating existing effort and strategy. The following plans stand out for their general connection to the CAP and/or for highlighting important information about specific CAP chapters:

- Local plans: *Milwaukie Community Vision – All Aboard* (comprehensive), *Milwaukie Downtown and Riverfront Land Use Framework Plan* (land use and transportation).
- Regional plans and partners: *Portland General Electric (PGE) Integrated Resource Plan (IRP)* (building energy sourcing and efficiency), *Clackamas County Sustainability Policy* (comprehensive), *Clackamas County Natural Hazards Mitigation Plan* (public health and emergency preparedness), *Regional Water Providers Consortium Strategic Plan* (natural resources, public health and emergency preparedness, resilience).
- State and federal plans: *Oregon Health Authority's Oregon Climate and Health Resilience Plan* (public health and emergency preparedness), *Oregon Renewable Portfolio Standard (RPS)* (building energy sourcing and efficiency), *Oregon SB 263 Recovery Goals* (materials, purchasing, use and recovery), *Oregon Clean Fuels Program* (vehicle fleet and fuels).

Examples of external efforts and plans that will result in GHG reductions for Milwaukie:

Building energy sourcing and efficiency: The PGE IRP outlines changes in demand (energy efficiency), state policy effects (e.g., Renewable Portfolio Standard), and predicted physical impacts of climate change on Oregonians and PGE operations (e.g., water supply for hydro generation).

Vehicle fleet and fuels: The *Oregon Clean Fuels Program* outlines the gasoline and diesel reductions anticipated on an annual basis for this statewide program while the federal *CAFE* standards outline thresholds for improvements in fuel economy.

Materials, purchasing, use and recovery: *Oregon SB 263* increased recovery goals, set recovery rates, expanded education, among other elements to make progress under the *DEQ 2050 Materials Management Vision*.



LOCAL, REGIONAL AND STATE POLICIES RELEVANT TO CAP CHAPTERS

	Materials Purchasing, Use and Recovery	Building Energy Sourcing and Efficiency	Vehicle Fleet and Fuels	Land Use and Transportation Planning	Natural Resources	Public Health and Emergency Preparedness	Resilience
City Specific							
Milwaukie Community Vision	X	X		X	X	X	X
Comprehensive Plan	X	X	X	X	X	X	X
Milwaukie Vision Statement				X		X	
Central Milwaukie Land Use and Transportation Plan	X			X	X	X	
Milwaukie Downtown and Riverfront Land Use Framework Plan				X	X	X	
Transportation System Plan			X	X		X	
Water Master Plan				X	X	X	X
Wastewater Master Plan					X	X	X
Stormwater Master Plan				X	X	X	X
Park Plans: - Robert Kronberg Nature Park Master Plan - Bowman-Brae Park Master Plan - Balfour Park Master Plan				X	X	X	
Community and Regional Partners							
Clackamas County Sustainability Policy	X	X	X	X	X	X	X
Clackamas County Natural Hazards Mitigation Plan		X		X	X	X	X
North Clackamas Parks Recreation District - North Side Master Plan					X		X
North Clackamas SD#12		X					
Portland General Electric Integrated Resource Plan		X	X	X			X
Energy Trust of Oregon Strategic Plan & Annual Report		X				X	
Metro Climate Smart Strategy & Implementation		X		X		X	
Metro 2018 Regional Transportation Plan							
Oregon DEQ Materials Management Vision	X						
Regional Water Providers Consortium Strategic Plan					X	X	X
State and Federal Level							
Oregon Renewable Portfolio Standard (RPS)		X					
State of Oregon - Biennial Energy Plan	X	X		X			
Oregon 10 Year Energy Plan	X	X	X	X			
Oregon Statewide Planning Goals		X	X	X	X	X	X
State of Oregon - GHG Goals	X	X		X	X	X	
Climate and Health Resilience Plan						X	X
Oregon SB 263 Recovery Goals	X						
Senate Bill 1547 Oregon Clean Electricity & Coal Transition Plan		X				X	
Oregon Clean Fuels Program			X				
Federal CAFE Standards			X				



2. KEY GAPS

- **Bases covered, albeit with quantifiable gaps:** The plans that we reviewed cover each of the CAP chapters; however, most of the plans do not have quantifiable goals or specific metrics that structure accountability. For instance, public health and emergency preparedness is a topic covered by most of the plans. However, the reference to individual and community health is broad in context, rather than having explicit goals or approaches to achieving such community wellbeing.
- **Opportunity for specific policies to detail action:** Some aspects, such as land use and transportation planning or natural resources, are represented by more policies and plans than vehicle fleets and fuels; materials purchasing, use and recovery; and building energy and efficiency. These gaps indicate the opportunity to develop specific policies, such as a purchasing policy for vehicle fleets and fuels, to elevate this CAP aspect. Also, certain CAP topics, such as building energy and efficiency, may not show up as often as others but are included in detailed plans. For example, PGE's IRP effectively addresses this topic while sharing important climate data and information that is essential in understanding climate adaptation, in addition to climate mitigation.
- **Some plans are not regulatory documents:** Plans such as *Milwaukie Downtown and Riverfront Land Use Framework Plan*, while effective in describing potential action, do not require compliance, and therefore, these plan elements could be adopted in specific regulatory or administrative language to ensure they are enacted.

3. POTENTIAL OPPORTUNITIES

- **Economic development and growth:** A thriving economy is a fundamental part of the City's mission. It is important that the public understands that economic growth does not necessarily mean an increase in GHG emissions. The manner in which growth occurs will dictate the associated emissions with those activities.
- **Clackamas County:** The County has recently reaffirmed its commitment and efforts to climate change in July 2017 and may prove to be a helpful stakeholder and partner in the City of Milwaukie's CAP process.

Examples of Key Information on Resilience and Climate Adaptation from External Plans:

As part of our assessment, we also evaluated existing plans and policies for their descriptions on how to make Milwaukie's infrastructure, as well as natural and human systems, more resilient in the face of changing climatic conditions and the increased stresses (i.e. prolonged changes to extreme weather events – affecting public health, local/regional economy, and quality of life). Ten of the 29 plans addressed this in some part but two plans stood out for comprehensively directing potential actions on how to develop a more resilient community:

Public health and emergency preparedness: The *Oregon Climate Health and Resilience Plan* outlines specific public health risks and risk reduction opportunities for Oregon residents in the face of climate change.

Natural hazards: The *Clackamas County Natural Hazards Mitigation Plan* provides a comprehensive look at the prioritized list of community vulnerabilities and affected populations. Vulnerabilities, such as the Cascadia earthquake, winter storm, flood, and wildfire, are ranked based on the probable severity and impacts.

Water supply and quality: The *Regional Water Providers Consortium Strategic Plan* is a collaborative effort in the Portland metropolitan region to plan and manage water issues. This high level strategic effort published in 2012 identifies threats to water supply and water quality due to climate change as well as strategic actions to manage future water needs, emergency preparedness and build better regional partnerships.



Emissions Reduction Potential for Planned Climate Action

Date: June 20th, 2018, Updated July 12th, 2018.

INTRODUCTION

The City of Milwaukie convened a series of six workshops with implementation partner organizations and other local experts to discuss and prioritize best mitigation and adaptation practices for community climate action. Three of the workshops focused on greenhouse gas (GHG) mitigation strategies and actions, while two of the workshops focused on climate adaptation strategies and one focused on both. The following sections provide additional information on the actions prioritized in the mitigation workshops, which included the following topic areas:

- Building Energy Sourcing and Efficiency
- Fleets and Fuels
- Land Use and Transportation Planning
- Material Purchasing, Use, and Recovery

Each workshop consisted of the following components:

Review of Best Management Practices

Good Company reviewed peer community climate action plans and related documents to summarize the best management practices (BMPs) being used around the U.S. to reduce climate pollution. The intent of this research was to identify potential actions with: (1) significant mitigation potential, (2) commercial availability; (3) successful implementation, and (4) offers community co-benefits (e.g., air quality, local jobs).

BMP Review and Discussion

Local experts and community implementation partners reviewed and discussed the BMPs actions for opportunities and risks and applicability based on local context. The groups prioritized actions for further assessment. The prioritized actions were then analyzed for mitigation potential and cost effectiveness.

Assessment and Comparison of Potential Actions

The City's 2016 Community Greenhouse Gas Inventory and BMP research were used as primary data to model GHG and fossil fuel reductions. These were processed to estimate marginal capital and operational costs and energy reductions for specific actions. The primary unit of analysis is \$ per metric tonne of carbon dioxide equivalent reduced (all GHGs normalized to CO₂ as the base unit of one). Calculation values and assumptions are summarized in the Appendices.



SUMMARY OF RESULTS

The prioritized actions, if implemented, would get the community of Milwaukie to approximately 33% of its existing carbon footprint. While this likely will fall well short of the goal to go beyond carbon neutral to carbon negative – it does represent a substantial set of first steps. If the City revisits its planning efforts in a few years, a “second wave” of actions could be initiated to take the community much further. In Figure 1 – the first orange block of emissions reductions results from the implementation of existing policies such as the Renewable Portfolio Standard for electricity sold in Oregon, the Clean Fuels Program for liquid fuels and the Montreal protocol for the reduction of climate intense refrigerants. The second orange block shows the scale of the prioritized actions. Figure 2 shows more detail for the same actions.

Figure 1: Milwaukie’s 2016 emissions and the reduction potential of existing and planned actions. Business as Usual (BAU) refers to the reductions that will come from existing state and federal policy implementation. *Note this does not include scaling the reduction of household emissions.*

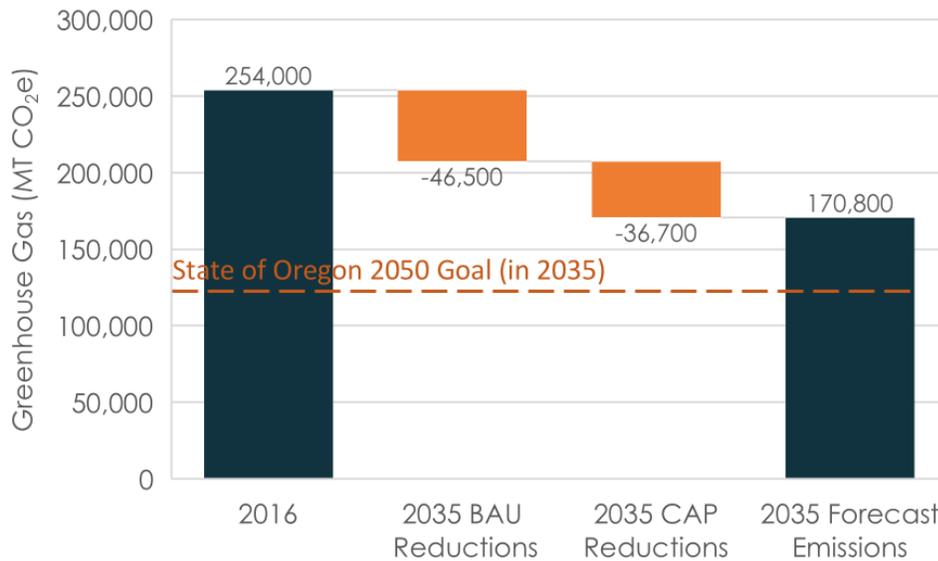
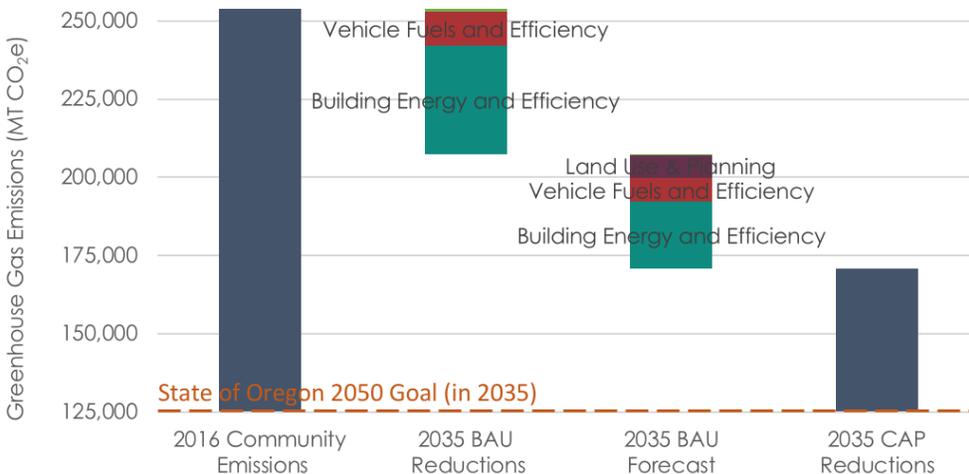


Figure 2: Details of Business-as-Usual (BAU) and Climate Action Plan emissions reductions. *Note this does not include scaling the reduction of household emissions. Also note that Materials mitigations are included below as a turquoise bar but are too slim to label.*



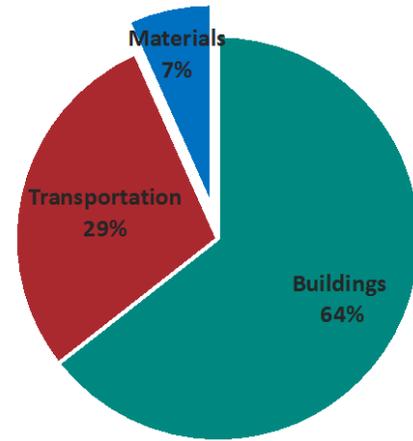


DETAILED RESULTS

Materials Purchasing, Use, and Recovery

Description of Prioritized Actions

The following sections provide a description of the action prioritized during the Materials workshop. It's important to note that material mitigation actions with implementation partner technical experts.



Promote the repair of equipment and materials and buy used and durable before purchasing new

City staff will work with County partners to host repair fair events, promote local repair and used goods vendors, and provide educational outreach on the connections between consumption of materials goods and climate pollution. Oregon Department of Environmental Quality (ODEQ) has developed systems to measure a [household](#) and [community](#) consumption-based emissions and guidance on the most effective strategies to reduce these emissions. Clackamas County has existing educational materials that could be utilized by City staff and can support the City to host repair events. This action should be implemented in City operations as well as in the community-at-large.

City to provide education and outreach to avoid edible food waste

One of the most cost-effective strategies to reduce GHG emissions, is to avoid wasting of edible food from households, restaurants, grocery stores, farms, food processors, etc. Reducing food waste saves money, reduces the overall demand for food (and related consumption-based emissions), and reduces local landfill emissions by diverting materials from the waste stream. According to ReFED's¹ report *The Roadmap to Reduce U.S. Food Waste*, one of the most effective strategies to reduce emissions is consumer education campaigns. ODEQ also supports this action and has developed its [Strategy for Preventing the Wasting of Food](#) and is in the process of conducting in-depth research to better understand the causes of waste, collect reliable data on wasted edible food, and assess shifts in waste prevention behaviors or levels of awareness. City staff will work with County partners to utilize existing consumer education resources to be targeted toward fairs and festivals, farmers markets, schools and other events.

City to showcase materials management practices with a demonstration project

The City will host a demonstration of best materials management practices in construction and operations with the renovation of the Ledding Library. These practices could include implementing a deconstruction plan; utilizing environmental product disclosures in material selections; identifying opportunities to reuse and incorporate reclaimed materials; selection of durable roofing material; purchase of used or highly durable furniture; and limit the use of carpet.

¹ ReFED is a collaboration of business, nonprofit, foundation, and government leaders committed to reducing food waste in the United States. ReFED seeks to unlock new philanthropic and investment capital, along with technology, business, and policy innovation, which is projected to catalyze tens of thousands of new jobs, recover billions of meals annually for the hungry, and reduce national water use and greenhouse gas emissions.



City Public Works to use less impactful pavement alternatives

City Public Works will request environmental product disclosures (EPD) from project bidders for cement and concrete products to be used in projects to allow for comparison of climate impacts of various products and mixes. The City will evaluate the potential to increase the use of lower-carbon substitutes for Portland cement for appropriate applications.

City to use mulch and compost in landscaping

The State of Oregon is focused on diverting food waste from landfill disposal into higher-and-better uses including anaerobic digestion and composting. The City will do its part to close the loop and utilize the soil amendment products from these treatment options. Treating food waste via AD or composting reduces landfill emissions, but more importantly reduces the need for conventional fertilizers and increases solid carbon storage.

City staff and partners to promote existing food waste composting services

The State of Oregon is focused on diverting food waste from landfill disposal into higher-and-better uses. The existing haulers in Milwaukie operate a curbside food waste collection system. The City should promote and educate residents of the importance of using this program.

Emissions Reduction Potential and Cost Effectiveness of Actions

The actions found to be most cost effective are those that reduce waste at the source and displace the need to purchase additional goods. See Table 1. Education programs to reduce edible food waste are the most effective. These education programs would require Milwaukie staff time, but staff cost is far outweighed by the financial and GHG value of the food. Likewise, actions that encourage the repair and reuse of consumer goods will require staff time for coordination of repair fairs and marketing local repair and thrift and consignment shops is far outweighed by the value (\$) and emissions) of extending the lifespan of good and avoiding the need for new replacements.

2016 Material GHG Emissions

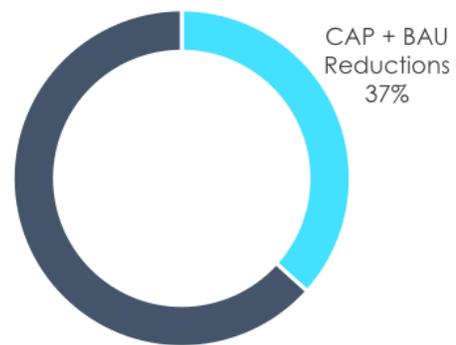


Figure 4

Milwaukie residents and businesses are already able to compost food waste. These programs have not been promoted to reach maximum potential, but the cost to dispose of compostable materials at Metro transfer stations is much less than landfill disposal of those same materials. Composting also avoids fugitive methane emissions from landfills; reduces emissions from material transportation; and produces a product (compost) that when applied to the soil, stores carbon.

The largest potential for emissions reductions is for building deconstruction, but unfortunately this action is also the least cost effective. Deconstruction is more labor and time intensive than mechanical deconstruction and is roughly twice the cost, but material reuse avoids the need for new materials.

Table 1: Emission reduction potential and cost-effectiveness for materials-related actions. *Note that a negative number in "Marginal Cost Effectiveness" implies savings over time.*



CITY OF MILWAUKIE Climate Action Plan

Strategy	Action	Emissions Reduction versus 2016 Emissions (MT CO ₂ e)	Marginal Cost Effectiveness (\$ / -1 MT CO ₂ e)
Strategy 1: Food Waste Avoidance and Recovery			
	City staff to provide community education around food waste and prevention	500	-\$1,000
	City staff and to promote existing residential commercial food waste composting opportunities and use mulch and compost in operations	300	-\$300
Strategy 2: Building Material Recovery and Reuse			
	Showcase best practices through a City demonstration project at Ledding Library	Not scalable without design plans	
	City to require deconstruction and / or delay property demolition	1,400	\$225
	City Public Works to use less impactful pavement alternatives, as appropriate	100	\$35
Strategy 3: Consumer Goods Repair, Reuse, and Lifespan Extension			
	City to work with county partners to host neighborhood repair events and promote local repair businesses	600	-\$150
Material-related Subtotal (does not include BAU actions):		2,300	
BAU Existing Policy Reductions:		1,000	
CAP+ BAU Reductions as a % of 2016 Baseline Material Emissions:		37%	

For each set of actions, the co-benefits were assessed according to this rubric:

Co-benefits	Co-benefit Scoring Criteria		
	1	2	3
1. Addresses Milwaukie Superactions	Action addresses 1 Superactions	Action addresses 2-3 Superactions	Action addresses 4-5 Superactions
2. Opportunity for Social Equity	Serves some but not all	Serves all equally	Addresses inequities
3. Mitigates and Adapts in One Action	Does only one	Does one better than the other	Does both well
4. Revenue Generation or Cost Avoidance	Action is a net cost	Action is roughly break even	Action is a net profit or decreased cost
5. Leverages Existing Efforts	Needs funding and/or policy approval	Existing plans support	Already planned or underway
6. Community Support	Less than 25%	25-50% likely to support	Over 50% likely to support



Table 1A: Co-benefits of materials related actions.

Materials Purchasing, Use and Recovery		Average of Apples and Oranges	1. Addresses Milwaukie Vision Superactions	2. Opportunity for Social Equity	3. Mitigates and Adapts in One Action	4. Revenue Generation or Cost Avoidance	5. Leverages Existing Efforts	6. Community Support
Action #	Mitigation							
M-1	Repair/replace prior to purchasing or construction via fixt fairs	2.0	1	1	3	3	1	3
M-2	Education around food waste and prevention Multi-family Fairs and festivals Test kitchens Farmers markets Community challenges/pledge Commercial focus	2.7	2	2	3	3	3	3
M-3	Showcase best practices and promote sustainable	2.0	2	1	2	2	3	2
M-4	Use less impactful cement alternatives	1.8	1	2	1	2	2	3
M-5	Require deconstruction and/or expand timeframe for demolition processes for a period of time to encourage deconstruction	2.0	2	2	2	3	1	2
M-6	Educate residents to use curbside greenwaste for food scraps to go to Portland - Biogas generation	1.8	1	2	2	1	2	3
Adaptation								
A-1	Use mulch and compost in City landscaping and implement a compost for street leaves - to residential distribution system	2.5	1	2	3	2	3	3

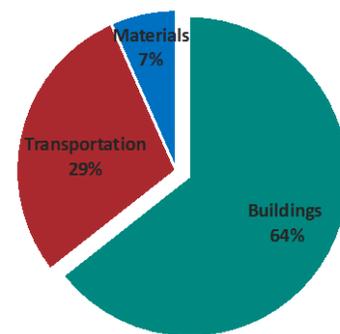
Buildings Energy Sourcing and Efficiency

Description of Prioritized Actions

The following sections describe the Building-related actions prioritized from the workshop with implementation partner technical experts.

City to advocate for ever more efficient state building energy codes

City staff and elected officials work with partner agencies to implement a net-zero energy code by 2025. Beginning in 2018, Oregon updated its *residential* building code. A *commercial* code update will be implemented in 2019. According to Oregon Department of Energy staff – the recent residential update and next year’s commercial update are expected to reduce energy use from new buildings by 8% relative to previous code. ODOE staff also indicated that net-zero energy codes could be implemented in Oregon as early as the mid-2020s. These codes will reduce energy use by buildings built in 2018 and beyond versus previous building codes.



City to adopt a commercial and residential building energy score program



City staff and elected officials works with partners to develop and implement a residential and commercial disclosure program within the next 5-years. This program would require that the owner assess their building's energy efficiency and identify areas for improvement prior to listing the property for sale. This information will provide additional information to buyers to compare energy use between properties. An example of this is the City of Portland's [Home Energy Score](#) and the European Union's 2010 [Energy Performance of Buildings Directive](#). Milwaukie staff time would be required to develop and implement such a program, but the process could leverage Portland's development process and programmatic resources.

City to implement a Property Assessment for Clean Energy Program (PACE)

City staff and elected officials works with partners to develop and implement a PACE financing program within the next 5-years. PACE financing may be used to install clean energy, renewable energy, water conservation and seismic resiliency improvements for commercial, industrial and multifamily buildings. The purpose of PACE financing is to reduce the financial barriers for building resiliency projects by eliminating an up-front cash investment and provides loans up to 100% of the cost of upgrades. The loan follows the building, not the owner and automatically transfers upon sale. A collaboration between Multnomah County, Prosper Portland, and Energy Trust of Oregon resulted in the [PropertyFit](#) program – Oregon's first PACE program in 2018. Milwaukie staff time would be required to develop and implement such a program, but the process could leverage PropertyFit development process and programmatic resources.

Revise City regulations to encourage multifamily energy efficiency upgrades

The City of Milwaukie passes an ordinance to address the issue of “split incentives” in rental housing within the next 5-years. Rental properties are notoriously difficult when it comes to energy efficiency because the owners of these properties do not typically pay the energy bills, while those who pay the bills do not want to invest in upgraded equipment in spaces where they live for a limited duration. The City of Boulder recently addressed this issue in a policy called [SmartRegs](#) that requires that all long-term licensed rental properties to meet minimum efficiency standards.

City to support development of a Clackamas County Sustainability Plan

Clackamas County developed its first sustainability plan in 2008. The City will support the County in updating this plan and working to align the goals and actions with Milwaukie's climate action plan.

City to develop Community Solar Project Hosted at a City Facility

The City could install a 300-kW solar photovoltaic system at one of its facilities on SE Johnson Creek Boulevard. The output of this system could be purchased by Milwaukie residents that are not able to install an owned system at their home or business.

Community-at-large to develop distributed energy systems

Distributed energy systems can take a variety of forms, but this action focuses on community-at-large installation of rooftop solar PV. Other distributed systems could include a biomass or natural gas combined heat and power system or integrating energy storage (such as batteries) with local solar PV generation. This action focuses on net-metered solar PV for a number of reasons. First, no development plans for other types of distributed energy systems were identified during the CAP process. Second, the City of Milwaukie City Council set a [5-year goal](#) in 2016 to triple the solar PV generation capacity to 2.2 MW (about 300 new rooftop units) by 2021. The City of Milwaukie also ran a pilot [Solarize Milwaukie](#), which utilized the power of bulk purchasing to lower upfront system



costs. Third, Portland General Electric conducted a comprehensive Market Study to quantify the number of cost-effective solar PV installations in its service territory which provides data to estimate the number of systems and generation for the Milwaukie Community.

Emissions Reduction Potential and Cost Effectiveness of Actions

Table 2 presents the emissions reduction potential and marginal cost effectiveness for the building-related actions. Installation of solar PV systems was found to be the most cost-effective strategy – resulting in a negative cost, or a financial savings over the system lifespan. While it is true that solar PV systems can have a long payback period – as long as 20 years – these systems operate for up to 30 years or more – meaning 10 years or more of free electricity once the system has been paid for. Solar is a great option for some homes and businesses, but not all locations are the same and therefore this strategy is limited to an estimate of achievable potential for the Milwaukie community.

2016 Building Emissions

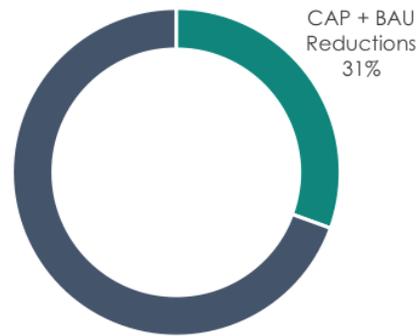


Figure 5

Energy efficiency provides significant additional mitigation potential. “Cost-effective” energy efficiency potential is included in the business-as-usual forecast and is not included in the table below. Energy Trust of Oregon is in charge of implementing the lowest cost energy efficiency upgrades up to the current price of power. The actions prioritized for Milwaukie’s climate action plan seek to go beyond only the lowest cost or “cost-effective” options. “Cost effective” is defined as less than the cost of adding power generation at the current retail rate for power. If a cost of carbon were added to power, the definition of “Cost effective” would change. Currently, the most cost-effective way to do this is by implementing more stringent State of Oregon Building Codes. These code changes won’t require significant City staff resources and will result in significant energy savings on homes built after 2018.

To address energy efficiency in existing buildings, workshop participants selected three actions to drive efficiency improvements – energy scores for residential and commercial buildings, PACE financing program, and addressing issues in multi-family rental properties. Emissions savings from these actions are significant, but the emissions reductions will be more expensive. These actions will require City staff time to develop and administer the programs and energy efficiency measures will also be more expensive.



CITY OF MILWAUKIE Climate Action Plan

Table 2: Emission reduction potential and cost-effectiveness for building-related actions. *Note that a negative number in "Marginal Cost Effectiveness" implies savings over time.*

Strategy	Action	Emissions Reduction versus 2016 Emissions (MT CO ₂ e)	Marginal Cost Effectiveness (\$ / -1 MT CO ₂ e)
Strategy 1: Energy Efficiency			
	Utilize existing ETO programs to install cost-effective energy efficiency (*represents existing BAU policy, but presented here for scale)	22,300	-\$150 to \$0
	City staff to advocate for updated building energy codes at the state level	3,300	\$3
	City to adopt a commercial and residential building energy score program	5,800	
	City to implement a Property Assessment for Clean Energy Program		\$1 - \$200
	Revise City regulations to encourage multifamily energy efficiency upgrades	1,800	
Strategy 2: Energy Sourcing			
	Community solar project at City facility (Commercial - 300 kW system)	100	-\$100
	City to support community installation of solar PV systems		
	Residential Systems (4 kW)	1,800	-\$60
	Commercial Systems (100 kW)	4,300	-\$75
Strategy 3: Regional Planning Coordination			
	Develop a comprehensive sustainability plan for Clackamas County	Emissions are not scalable prior to plan development	
Building-related Subtotal (does not include BAU actions):		17,100	
BAU Existing Policy Reductions:		34,500	
CAP + BAU Reductions as a % of 2016 Baseline Material Emissions:		31%	

Table 2A: Co-benefits of building energy related actions.

Building Energy Sourcing and Efficiency			Average of Apples and Oranges	1. Addresses Milwaukie Vision Superactions	2. Opportunity for Social Equity	3. Mitigates and Adapts in One Action	4. Revenue Generation or Cost Avoidance	5. Leverages Existing Efforts	6. Community Support
Action #	Mitigation								
M-1	Community solar project for those without rooftop exposure	2.7	3	3	3	3	1	3	
M-2	Advocate for, participate in code updates at the state level (energy as well as seismic)	2.5	3	2	3	2	2	3	
M-3	Implement a comprehensive sustainability plan for Clackamas County	2.3	3	2	3	1	2	3	
M-4	Adopt a commercial and residential disclosure program of energy scores	2.0	2	2	3	2	1	2	
M-5	Implement the FACE (Property Assessment for Clean Energy) program in Milwaukie	2.2	2	2	3	3	1	2	
M-6	Create distributed energy systems (rooftop solar)	2.3	3	2	3	3	1	2	
M-7	Multifamily energy efficiency (equity)	3.0	3	3	3	3	3	3	
Action #	Adaptation								
A-1	Solar, battery storage, and micro-grids for resilience in weather events	1.7	2	3	1	1	1	2	



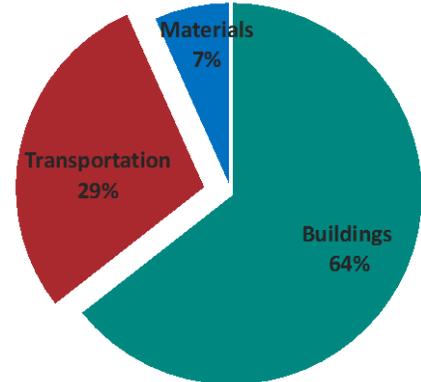
Vehicle Fleets and Fuels

Description of Prioritized Actions

The following sections provide a description of the action prioritized during the Vehicle Fleet and Fuels workshop with implementation partner technical experts.

For City of Milwaukie’s light fleet, identify and replace least efficient vehicles with most efficient vehicles

City staff have already begun to identify and replace vehicles that are underutilized. Milwaukie’s fleet department has saved 450 gallons of fuel by replacing vehicles with more efficient versions. Further efforts to electrify the light vehicle fleet and adopt practices that will increase overall fleet efficiency. Electric vehicles and charging infrastructure, combined with electricity from renewable and other low-carbon generation sources, is the City’s largest opportunity to significantly increase vehicle and equipment energy efficiency and substitute a low-carbon fuel for gasoline. The opportunities for the city’s fleet, given changes that have already been adopted, transitioning police cruisers to EVs as those models become widely available (earlier to mid-2020s) and hybrid vehicles to EVs when replacement timelines are conducive. EV technology is market-ready and cost competitive for mid-sized sedans and similar circumstances for different model classes are predicted to arrive by 2025. EVs should then be substituted for gasoline vehicles as soon as technologically and financially viable. The timeline and prioritization for vehicle replacement will depend on the replacing vehicles in an order that most appropriately maximizes GHG reductions and reduces the capital cost constraints for Milwaukie. The [2017 City of Portland Electric Vehicle Strategy](#), outlines effective strategies to displace internal combustion engine (ICE) vehicles for electric vehicles including charging infrastructure, fleets, personal vehicles and shared mobility, innovation and information, and economic development.



For City of Milwaukie’s light fleet, align and justify fleet use with true needs

This action will reduce the overall size of the fleet to the most suitable number of vehicles to meet the needs of the City. Recently, Milwaukie’s fleet has reduced the fleet number and size of vehicles by increased sharing of vehicles in the department and ensuring the right vehicle for the task. In 2017, Milwaukie’s fleet department sold eight pieces of surplus equipment for a total value of \$16,000 and in 2018 the department anticipates selling 20 vehicles and equipment for a total of \$90,000. Part of these effort will be to right-size the fleet to ensure that the types of vehicles owned and operated meet the uses needed but also reduce emissions overall. For instance, most vehicles could be electric for in-City and regional daily travel, but a certain percentage may be needed for longer distance, less frequent work travel – indicating a hybrid vehicle. One potential strategy that could be useful in right-sizing the fleet and identifying additional potential for use cases is deploying telematics. Telematics refers to equipment that allows collection of vehicle operational data such as fuel use, maintenance, utilization, idling, location, routing or mapping of trips, emissions, braking patterns and speed. These telematic units on the vehicles and equipment show the greatest potential opportunities to reduce fleet size, fuel use, unnecessary maintenance and implement opportunities to right-size vehicles and conduct driver training to reduce fleet costs.



For City of Milwaukie's heavy-duty fleet, target diesel fleet for conversion to low carbon fuels

Rather than replacing the heavy-duty vehicle fleet, as the prior action identifies, this action will transition the heavy-duty fleet to lower carbon fuels to decrease the intensity of these vehicles. Renewable and biodiesel offers the potential to almost fully replace conventional diesel fossil fuel with a fuel made from low-carbon, plant-based feedstocks that are certified in Oregon's Clean Fuels Program. Specifying ODEQ certified, lower-carbon fuels is essential to avoid purchasing fuels with lifecycle emissions greater than conventional B5 diesel fuel. The City will work with local and regional partners to identify and secure additional supply of low carbon 99% blend of renewable diesel (R99) or use cooking oil biodiesel (B99) as soon as possible to substitute for 100% of the City's current diesel use. The R99 or B99 will be certified as a low-carbon fuel in Oregon's Clean Fuels Program.

Partner with the school district, waste haulers, and waste water agency on fleet transition

The City can leverage partnerships with local partners particularly North Clackamas School District, Waste Management, and Water Environment Service (WES) to develop Renewable Natural Gas for operating fleets. Waste Management has already transitioned its fleet of trucks to compressed natural gas (CNG) that serve City of Milwaukie. While the fleets could still pursue the Renewable Natural Gas from other sources, WES has already committed the surplus gas to a combined heat and power system onsite.

Bulk purchasing of EVs

This action would seek to leverage bulk purchasing to reduce the upfront cost of EVs. Oregon's Department of Administration Services (DAS) is a good resource. Brian King, Fleet and Parking Services Manager, and Kelly Mann, State Procurement Analyst, both with DAS can be a helpful conduit for information related to bulk purchasing and identifying current changes to programs and incentive structures. Price agreements allow for purchases by state agencies including the Oregon Cooperative Procurement Program (ORCPP). Currently, there are no formal incentives for public agencies for EV purchases, however, DAS has had experiences working with dealers that share the federal tax credit based on their level of tax burden. Also the details of the state of Oregon's [zero emission vehicle rebate program](#) are forthcoming and will identify the rebate amount and the low and moderate income thresholds for households interested in purchasing a vehicle.

Incentivize multi-family complexes to install EV charging infrastructure

This action seeks to incentivize EV parking and charging infrastructure for new multi-family construction projects to more effectively offer on-site charging options. The City of Portland has mandated that all new parking lots have 5% of spaces that are charger ready. Given the predicted timing and adoption of EVs it is worthwhile to install charging conduit into all parking spots because it is a relatively low cost during *new* construction. However, this cost is substantially more when it comes as a retrofit, costing at a minimum \$500 per space in addition to the Level 2 charger. PGE's team, particularly Aaron Milano, are a valuable resource that are interested in assisting the City to install more EV charging stations.

Incentivize workplace charging in parking lots



While most EV owners are going to charge at home due to convenience and cheaper electricity prices at night, some EV owners that do not have access to off-street parking and the functionality of charging at their residence. Parking lot charging, whether workplace or public parking charging will become a more important as the transition to EVs continues. Many workplaces are installing EV charging stations as a low-cost benefit to their employees and as a recruitment tool. Milwaukie has the benefit of partnering with PGE and learning from its experience with Electric Avenue.

Outreach efforts to encourage shift to EV

The City has a few strong partners and outlets to encourage the community to make an EV their next vehicle purchase. [Forth](#), based in Portland, offers ride and drive events and is also actively engaging underserved communities. PGE is supportive of this effort and is installing quick charging infrastructure, Electric Avenue an “electric gas station” in Milwaukie. In Portland, a similar station allows the community to observe and talk to drivers about their experience. Milwaukie, can further assist in education and outreach efforts by providing information through farmers’ markets and business organizations. Milwaukie can also partner to co-host education and outreach events.

Micro-transit from park-and-ride or light rail station to local destinations

This action is meant to provide an additional layer to transportation options and solve the challenge of last-mile connections, by transporting people from major transit stations to their final destination. In recent years, electric vehicles coupled with autonomous technology have advanced. Companies such as [EasyMile](#) (and others emerging) are manufacturing micro-transit EV buses that can transport up to 15 passengers that can be used for regular route patterns (similar to bus route) or on demand routes (similar to Uber, Lyft, or taxi) to reduce the use of SOVs.

Emissions Reduction Potential and Cost Effectiveness of Actions

Table 3 presents the emissions reduction potential and marginal cost effectiveness for the Fleet and Fuels-related actions.

The shift to individual ownership and fleet use of EVs demonstrates the most cost-effective strategy for reducing community GHGs. At a high level, the transition to EVs is anticipated to be 10% by 2035 based on Metro’s Climate Smart modeling. For the purposes of comparison, 50% and 100% transition to EVs was modeled for the CAP. The shift in the individual ownership and use of EVs for transportation will require several CAP actions to support the transition from internal combustion engine vehicles (ICE) to EVs. EVs are on par or save money compared to ICE vehicles and will only become more cost competitive as more models start to enter the market in the next few years.

2016 Transportation Emissions

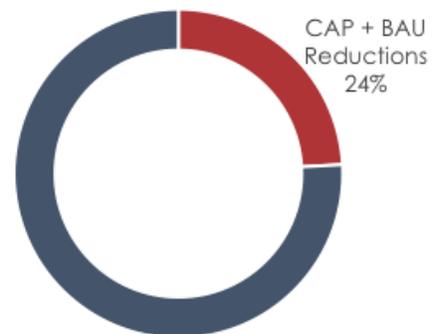


Figure 6

For Milwaukie’s own fleet, the greatest opportunity for GHG reductions are in transitioning the police fleet to EVs when those models become available and continuing the efforts of Milwaukie’s fleet department to right size vehicles and transition to EVs as models for specific uses (e.g., class 3-4 truck) become available. In the near term, using R99 renewable diesel or used cooking oil biodiesel



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B99 from low-carbon sources is a good strategy for offsetting current diesel fuel usage in vehicles that have low to moderate use, and EV replacement is not possible or cost effective.

Table 3: Emission reduction potential and cost-effectiveness for vehicle and fuel-related actions. Note that a negative number in "Marginal Cost Effectiveness" implies savings over time.

Strategy	Action	Emissions Reduction versus 2016 Emissions (MT CO ₂ e)	Marginal Cost Effectiveness (\$ / -1 MT CO ₂ e)
Strategy 1: Vehicle Efficiency			
	Identify and replace City's least efficient light-duty vehicles with most efficient vehicles	200	-\$40
	Align and justify light-duty fleet use with actual service needs	10	-\$325
Strategy 2: EV Transition and Vehicle Fuels			
	Incentivize workplace and multi-family EV charging	500	\$25
	Implement "EVready" building codes or zoning regulations. Opportunities could include: 1) Providing incentives through zoning, 2) Implementing public area requirements	2,500	\$3
	Public outreach to encourage shift to EV	4,000	-\$175
	Partner with waste haulers, school districts and wastewater on fleet transition		Data unavailable
	Target City's heavy duty diesel fleet for conversion to low carbon fuels	100	\$58
Material-related CAP Subtotal (does not include BAU actions):		7,310	
BAU Existing Policy Reduction Subtotal:		11,000	
CAP + BAU as % of 2016 Baseline Transportation Emissions:		24%	

Table 3A: Co-benefits of fleets and fuels related actions.

Vehicle Fleet and Fuels		Average of Apples and Oranges	1. Addresses Milwaukee Vision Superactions	2. Opportunity for Social Equity	3. Mitigates and Adapts in One Action	4. Revenue Generation or Cost Avoidance	5. Leverages Existing Efforts	6. Community Support
Action # Mitigation - Agency								
MA-1	(Light fleet) Identify and replace least efficient vehicles with most efficient vehicles	2.3	1	2	2	3	3	3
MA-2	(Heavy duty fleet) Target diesel fleet for conversion to low carbon fuels	2.3	1	2	2	3	3	3
MA-2	(Light fleet) Align and justify fleet use with true needs							
MA-3	Partner with waste haulers, to use Portland Biotas as available	2.5	2	2	2	3	3	3
MA-4	Bulk purchasing of EVs	2.3	1	2	2	3	3	3
Action # Mitigation - Community								
MC-1	Incentivize multi-family complexes to install EV charging infrastructure	2.0	2	3	2	1	1	3
MC-2	Incentivize workplace charging in parking lots	2.2	3	2	2	2	1	3
MC-3	Outreach efforts to encourage shift to EV - "Idle and drive" events - Information sharing through farmers' markets, business organizations	2.5	3	2	2	2	3	3
MC-4	Micro-transit from park-and-ride or light rail station to home or work	2.2	3	3	2	1	1	3
Action # Adaptation								
A-1	Review location of fleet yard and fuel storage to examine flood vulnerability. Look at fuel movement during flood conditions and diversify fuel sources in terms of fuel transport into Milwaukee to prepare for climate event-related import challenges.	1.7	1	2	1	2	1	3
A-2	Implement intergovernmental agreements or MOUs with other agencies for fleet support in emergencies (e.g. large scale debris removal)	2.2	2	2	1	2	3	3



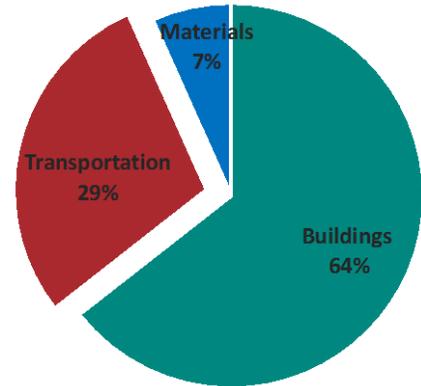
Land Use and Transportation Planning

Description of Prioritized Actions

The following sections describe the Land Use and Transportation Planning actions prioritized during the workshop with implementation partner technical experts.

Implement a Transportation Management Agency (TMA) with area partners to create a better vision for transit serving Milwaukie and Clackamas County communities

This action is directed as a coalition and partnership effort that will serve as the foundation to implement future climate action. Milwaukie will coordinate with Clackamas County, Metro, TriMet, as well as neighboring communities. PGE will also serve as a partner as it relates to net zero plan components (e.g., electric vehicles, last mile connection via EV micro-transit). The following plans and partner staff will contribute to the formation and integration with partners. [Metro’s Climate Smart Strategy](#) has a number of the needed strategies and actions to address decarbonization of the transportation sector. This document served as an important reference in scaling the types of actions that Milwaukie is interested in adopting.



Implement “EV ready” building codes or zoning regulations

This action provides the building code or zoning regulations that can more easily integrate EVs into new buildings in Milwaukie. Some of the opportunities include providing incentives through zoning and implementing public area requirements for EV charging stations that can accommodate residents and businesses. The City of Portland has also adopted this action as a method for facilitating greater adoption of EVs. Note that many new vehicles have a standard 3 prong outlet for charging the vehicles over night.

Lower parking ratios near high capacity corridors

City staff and elected officials will continue to develop and implement the mechanisms to reduce parking ratios in high capacity corridors to increase housing density with lower parking requirements. Currently, staff is conducting a study via [Rick Williams Consulting](#) and the lessons learned in this study will indicate the potential locations and timing of designated current parking areas as new multi-family construction. This action will most likely take a number of years to implement effectively.

Implement variable system development charges (consider square footage, etc.) to encourage ADU development

City staff will consider altering the permitting cost structure and system development charges (SDCs) for accessible dwelling units (ADUs) in order to incentivize greater adoption. In 2010, the City of Portland [implemented favorable ADU changes](#) by waiving the SDCs for ADUs for three years (which was extended an additional three years) and increased the maximum allowance for square footage of ADUs from 33% to 75% (but capped at 800 ft²). Portland also offers a [zero-interest loan program](#) for ADUs up to \$80,000. These changes resulted in 30 ADUs being constructed annually to 200 ADUs annually. As Oregon DEQ has identified via its life-cycle materials and energy use research, ADUs are an effective approach to GHG reduction as they



consume less energy and require fewer building materials to construct. Additionally, ADUs more fully utilize existing land that might not otherwise be accessible to development, displacing the need for greenfield development. ADU occupants tend to use multi-modal transportation rather than driving single occupancy vehicles and also have less room for buying or keeping objects.

Partner with Metro and TriMet to increase bus service, particularly to underserved employment areas

City planning staff will continue to coordinate with Metro and TriMet partners to provide additional service. Greater options for bus travel to Milwaukie residents, particularly areas of the community that are not well served by bus service currently can lead to the reduction of individual SOV trips. TriMet is currently conducting a community survey to direct future changes to bus operations including increasing bus service, expanding service areas, additional service hours, reliability, safety, capital improvements, and fares. Milwaukie will continue to participate in TriMet's [HB 2017 transit committee](#).

Incentivize employers to encourage active transportation

This action will direct efforts to engaging local employers to encourage more active transportation options, particularly bicycling and walking. By shifting to more active transportation options, vehicle miles traveled (VMT) in single occupancy vehicles decreases but this transition also has public health benefits due to increased levels of exercise and decreased stress. For Milwaukie, this action will target projects that can also implement infrastructure to ensure safe routes to industrial areas. Portland's Bureau of Transportation developed a brief [transportation toolkit](#) geared to employers to learn about the benefits of active transportation and multi-modal options for employees.

Implement parking pricing in downtown

This action focuses on implementing a price for parking in the downtown area in Milwaukie in order to encourage the adoption of alternative transportation modes. Milwaukie is currently conducting a parking study with a consultant to better understand the thresholds for current parking space usage by area. Implement parking pricing in downtown. This study is anticipated to be completed at the end of summer 2018 but parking pricing will largely depend on the occupancy rates and changes to use patterns that can lead to effective use of this strategy.

Continue to promote a "fee in lieu of" for areas outside of pedestrian corridors that do not need infrastructure improvements and redirect funds to corridors that do

One of the action ideas that emerged from the workshop was to promote further to homeowners and developers their ability to pay a fee in lieu of developing sidewalks on a street that does not have them. Rather, the moneys go to programs to fill critical gaps in high use pedestrian and bike paths.

Promote "neighborhood hubs" through Comprehensive Plan policies

One of the initiatives Milwaukie is embracing is the development of neighborhood hubs that can serve as centers to reduce the distance for communities to reach work and everyday services like grocery stores, restaurants, and community active spaces. These hubs can serve the function of reducing trip times and modes of transportation, making a neighborhood more walkable or bikeable, but also serve a social function, allowing for greater community engagement and cohesion. The



Comprehensive Plan and vision process led to the community’s interest in this action area and will serve as one of the areas that also assists the CAP process and implementation.

Emissions Reduction Potential and Cost Effectiveness of Actions

Table 4 presents the emissions reduction potential and marginal cost effectiveness for the Land Use and Transportation Planning-related actions.

Development of smaller axillary dwelling units and other smaller housing was found to be the most cost-effective strategy – resulting in a savings per GHG reduction - as well as the strategy with the greatest emissions reduction potential. The financial and emissions reductions are a combination of reduced construction costs, reduced material use and shorter construction times compared to average single-family homes in addition to the lifecycle energy cost and emissions savings.

The cost effectiveness of the other actions on Table 4 is based on cost and savings estimates associated with implementation of the Climate Smart Strategy which is based on the 2014

Regional Transportation Plan. Cost data is not available for each strategy included in the plan therefore total costs and savings are applied to each action. Mitigation potential is greatest for expansion of transit services followed by parking pricing; development of bike and pedestrian infrastructure; and development of neighborhood hubs – all of which have very similar reduction potentials.

Table 4: Emission reduction potential and cost-effectiveness for land use and transportation planning-related actions. *Note that a negative number in “Marginal Cost Effectiveness” implies savings over time.*

2016 Transportation Emissions

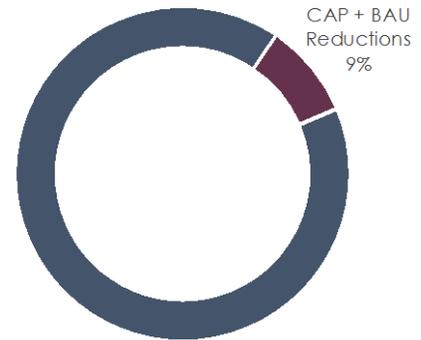


Figure 7



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Strategy	Action	Emissions Reduction versus 2016 Emissions (MT CO ₂ e)	Marginal Cost Effectiveness (\$ / -1 MT CO ₂ e)
Strategy 1: Support Transit and Multi-Modal Transportation			
	Implement a Regional Transportation Agency with Clackamas County	Supports reductions in other Actions	
	Partner with Metro and Trimet to increase bus service, particularly to underserved employment areas (e.g. micro-transit from major stations)	3,900	\$190 ¹
	Work with partner organizations to complete bicycle and pedestrian gaps and to promote new connections options to residents.	700	\$190 ¹
	Implement a "fee in lieu of" for areas outside of pedestrian corridors that do not need infrastructure improvements and redirect funds to corridors that do		
	Implement parking pricing in downtown	800	Not scalable
Strategy 2: Increase Urban Density			
	Implement variable system development charges (consider square footage, etc.) to encourage ADUs.	1,000	-\$1,000
	Promote "neighborhood hubs" through Comprehensive Plan policies	600	\$190 ¹
Land Use & Planning -related CAP Subtotal (does not include BAU actions):		7,000	
BAU Existing Policy Reduction Subtotal:		0	
CAP + BAU as % of 2016 Baseline Transportation Emissions:		9%	

Note 1: Data to support the cost effectiveness calculations are not available for each individual action. Cost effectiveness here is calculated based on Metro's projected costs and savings for implementation of the Climate Smart Strategy for the region. Costs will vary for specific projects and actions.

Table 4A: Co-benefits of fleets and fuels related actions for land use and transportation planning-related actions.



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		Average of Apples and Oranges	1. Addresses Milwaukie Vision Superactions	2. Opportunity for Social Equity	3. Mitigates and Adapts in One Action	4. Revenue Generation or Cost Avoidance	5. Leverages Existing Efforts	6. Community Support
Action #	Community - Mitigation							
M-1	Implement a Transportation Management Agency (TMA) combined with Work with Clackamas County to create a better vision for transit serving Clackamas County communities	2.5	3	3	3	2	1	3
M-2 (from Fleet & Fuels)	Implement "EV ready" building codes or zoning regulations. Opportunities could include: • Providing incentives through zoning • Implementing public area requirements	1.8	2	2	2	2	1	2
M-3	Lower parking ratios near high capacity corridors	2.2	2	2	2	2	3	2
M-4	Implement variable system development charges (consider square footage, etc.) to encourage ADUs	2.2	2	3	3	2	1	2
M-5	Partner with Metro and TriMet to increase bus service, particularly to underserved employment areas (e.g. micro-transit from major transit stations)	2.5	3	3	2	2	2	3
M-6	Building infrastructure near employers to encourage active transportation (bike and ped)	2.8	3	3	3	2	3	3
M-7	Implement parking pricing in downtown	1.7	2	1	2	3	1	1
M-8	Expand a "fee in lieu of" to direct funding to corridors where improvements provide more connectivity (Safe Program)	2.2	2	1	2	3	3	2
M-9	Promote "neighborhood hubs" through Comprehensive Plan policies	2.5	2	2	3	2	3	3
Action #	Adaptation							
A-1	Update flood plain maps with local group coordination/funding	1.8	1	2	1	3	1	3
A-2	Acquire flooded or flood-prone properties for flood storage (Reclaim riparian areas)	2.0	1	2	1	3	2	3
A-3	Plan for future employment land considering flood risk, natural resources	2.0	1	2	1	3	2	3
A-4	Provide incentives to increase flood storage capacity	2.0	1	2	1	3	2	3



Public Health and Emergency Preparedness- Adaptation Co-Benefits Only

Public Health and Emergency Preparedness		Average of Apples and Oranges	1. Addresses Milwaukie Vision Superactions	2. Opportunity for Social Equity	3. Mitigates and Adapts in One Action	4. Revenue Generation or Cost Avoidance	5. Leverages Existing Efforts	6. Community Support
Adaptation								
A-1	Work with FEMA on consultation related to flood plain analysis Note: this is a top priority identified in the Land Use and Transportation Planning and Natural Resources	2.3	1	3	1	3	3	3
A-2	Identify plans for cooling and air quality relief centers • Align with flood sheltering plans	2.3	2	3	1	2	3	3
A-3	Incentive or promote more sophisticated home air filtration systems • Through building codes • Incentives • Community bulk buy	2.2	2	3	1	3	2	2
Community - Mitigation								
M-1	Explore creative options for right-sizing first responder response	2.3	1	3	2	3	2	3
M-2	Fund/support community outreach through the fire department	2.3	2	3	2	2	2	3

Natural Resources – Adaptation Co-Benefits Only

Natural Resources		Average of Apples and Oranges	1. Addresses Milwaukie Vision Superactions	2. Opportunity for Social Equity	3. Mitigates and Adapts in One Action	4. Revenue Generation or Cost Avoidance	5. Leverages Existing Efforts	6. Community Support
Adaptation - Stormwater								
A-1	Code adjustment to require clean, on-site filtration and develop larger storage ("stormwater gutters under parking lot," "end of road network" and creekside bank widening/storage) • Must consider infiltration/filtration as well	2.0	1	2	2	2	2	3
A-2	Develop new stormwater master plan • Public acceptance/buy-in important • Should consider up-stream impacts and partner with other municipalities	2.3	2	3	2	2	2	3
A-3	Identify sewer and water mains most vulnerable to flooding	2.2	1	2	2	2	3	3
Adaptation - Drinking Water								
A-4	Well head protection • Introduce more monitoring facilities	1.7	1	2	1	1	2	3
A-5	Review water sourcing agreements • Determine need for a fire management plan for drinking water (Other community's losing their water and using Milwaukie wellfields)	1.8	1	2	1	2	2	3
A-6	Develop a long-term potable re-use plan	2.0	1	2	2	3	2	2
Adaptation - Tree Canopy								
A-7	Develop Program with Tree Board (consolidated from below) • Increase canopy coverage • Integrate canopy planning with street planning efforts • Integrate canopy planning with building codes • Multi-family tree requirements • Mitigate development impacts (replacing mature trees with new plantings not sufficient)	2.8	2	3	3	3	3	3



Appendix A – Material Data and Assumptions

Action Description	Data and Assumptions used in Calculations
City Public Works to use less impactful pavement alternatives, as appropriate	<ul style="list-style-type: none"> • Baseline concrete mixes use 100% Portland cement • Action concrete mixes use 85% Portland cement and 15% blast furnace slag (BFS) • Baseline asphalt mixes are assumed to use 0% RAP • Action asphalt RAP mixes are assumed to use 30% RAP • Action asphalt RAP greenhouse gas values are based on values from Environmental Protection Agency's Waste Reduction Model (EPA WARM) • Action concrete SCM greenhouse gas values are based on National Ready Mix Concrete Association Environmental Product Disclosures • Action asphalt 30% RAP mix is assumed to not increase materials costs based on City of Eugene and Knife River reporting on recent material pricing. Note 1 - Material prices are subject to significant change over time. • Action concrete 15% BFS mix is assumed to not increase materials costs based on City of Eugene and Knife River reporting recent materials pricing. Note - Material prices are subject to significant change over time.
City staff to provide community education around food waste and prevention	<ul style="list-style-type: none"> • Action assumes a 10% reduction in food waste from 2016 baseline, or roughly 125 short tons per year • Action cost assumes 1 full time employee at fully loaded cost of \$100,000 per year. • Action cost assumes the value of the avoided food waste a \$2.50 per pound based on ReFed Road Map Report (pg. 5) • Baseline and Action greenhouse gas emissions calculated using EPA WARM set using Landfill and Source Reduction management scenarios
City staff and to promote existing residential commercial food waste composting opportunities and use mulch and compost in operations	<ul style="list-style-type: none"> • Action assumes a 25% reduction in landfilled food waste to composting from a 2016 baseline. • Action assumes \$0 additional marginal capital cost for residential disposal. System is already established. Additional marginal cost for commercial food waste data is not available and therefore not included. • Actions assumes a Metro transfer station fee of \$96 per ton for landfilled materials and \$64 per ton for composted materials
City to require deconstruction and / or delay property demolition	<ul style="list-style-type: none"> • It is assumed that recovered materials will be primarily dimensional lumber and metal goods based on City of Portland case studies. • Recoverable materials quantities were estimated using ODEQ's waste composition study (1,000 ton of wood and 100 tons of metal annually) • Baseline and Action emissions are based on values from Environmental Protection Agency's Waste Reduction Model (EPA WARM) • It is assumed that the Baseline cost of mechanical deconstruction is \$7,500 and Action deconstruction is \$15,000 • Action includes a cost savings for avoided tip fees of \$96 per ton
City to require deconstruction and / or delay property demolition	<ul style="list-style-type: none"> • It is assumed that recovered materials will be primarily dimensional lumber and metal goods based on City of Portland case studies. • Recoverable materials quantities were estimated using ODEQ's waste composition study (1,000 ton of wood and 100 tons of metal annually) • Baseline and Action emissions are based on values from Environmental Protection Agency's Waste Reduction Model (EPA WARM) • It is assumed that the Baseline cost of mechanical deconstruction is \$7,500 and Action deconstruction is \$15,000 • Action includes a cost savings for avoided tip fees of \$96 per ton
City to work with county partners to host neighborhood repair events and promote local repair businesses	<ul style="list-style-type: none"> • Action assumes 0.5 full time employee for program staffing • Cost effectiveness for waste prevention, which includes repair and reuse, presented in Oregon's Cost of Carbon Abatement Curves found the cost effectiveness of waste prevention at -\$272 / MT CO2e. This value was adjusted with FTE cost. • ODEQ literature review found that programs of this type reduce BAU emissions by 0.7% annually. Action emissions reductions were calculated based on 0.7% of Milwaukie's 2016 emissions for clothing, furniture, and other goods.
Showcase best practices through a City demonstration project at Ledding Library	<ul style="list-style-type: none"> • Data was not available to scale this action



Appendix B – Building Data and Assumptions

Action Description	Data and Assumptions used in Calculations
City staff to advocate for updated building energy codes at the state level	<ul style="list-style-type: none"> • 10% of 1 full time employee staff annual time for 1 year (~200 hours) to participate in meetings • 1 FTE cost assumed to be equal to \$100,000 per year • Marginal capital costs are assumed to be \$0 as building codes are required • Marginal energy savings are assumed to be \$0 as building codes are required • Baseline greenhouse gas emissions are based on 2016 residential and commercial energy use • Action greenhouse gas emissions are based on an estimate of 8% savings by Oregon Department of Energy staff for 2018 residential and 2019 commercial building code updates • Action greenhouse gas emissions are based on an assumption of a net zero residential energy code in 2025 and that a net-zero energy code is equivalent to net zero emissions
City to adopt a commercial and residential building energy score	<ul style="list-style-type: none"> • 50% of 1 FTE for 2 years to develop and implement the programs • 1 FTE cost assumed to be equal to \$100,000 per year • Marginal energy costs are based on Energy Trust of Oregon's range of levelized costs for energy. For electricity achievable electric efficiency measures have a cost of between \$87 and \$115 per MWh. For natural gas achievable measures have a cost of between \$1.06 and \$2 per therm. • Baseline GHG emissions are based on Milwaukie's 2016 community GHG inventory. • Action GHG emissions are based on ETO's estimate of achievable efficiency potential to 2035 in their service area down-scaled by retail electricity deliveries.
City to implement a Property Assessment for Clean Energy Program	<ul style="list-style-type: none"> • 50% of 1 FTE for 2 years to develop and implement the programs • 1 FTE cost assumed to be equal to \$100,000 per year • Marginal energy costs are based on Energy Trust of Oregon's range of levelized costs for energy. For electricity achievable electric efficiency measures have a cost of between \$87 and \$115 per MWh. For natural gas achievable measures have a cost of between \$1.06 and \$2 per therm. • Baseline GHG emissions are based on Milwaukie's 2016 community GHG inventory. • Action GHG emissions are based on ETO's estimate of achievable efficiency potential to 2035 in their service area down-scaled by retail electricity deliveries.
Revise City regulations to encourage multifamily energy efficiency upgrades	<ul style="list-style-type: none"> • 10% of 1 FTE for 2 years to develop and implement the program • 1 FTE cost assumed to be equal to \$100,000 per year • Marginal energy costs are based on Energy Trust of Oregon's range of levelized costs for energy. For electricity achievable electric efficiency measures have a cost of between \$87 and \$115 per MWh. For natural gas achievable measures have a cost of between \$1.06 and \$2 per therm. • Baseline GHG emissions are based on Milwaukie's 2016 community GHG inventory. • Action GHG emissions are based on ETO's estimate of achievable efficiency potential for multi-family to 2035 in ETO's service area down-scaled by retail electricity deliveries.
Community solar project at City facility (Commercial - 300 kW system)	<ul style="list-style-type: none"> • Assumes site location as 6101 SE Johnson Creek Blvd and that PV solar would be installed at multiple buildings • Total system capacity is estimated at 280 kW using Mapdwell Solar System™ Portland • System lifespan is assumed to be 30 years • Total system first cost is estimated at \$500,000 • Annual revenue is estimated at \$34,000 • Annual electric output is estimated at 300,000 kWh per year • PGE Market Assessment for achievable solar potential was downscaled by retail sales for Milwaukie • Emissions reductions are calculated using PGE's 2016 emissions factor • System lifespan is assumed to be 30 years • Annual panel degradation rate assumed to be 0.5% • Average residential system size assumed at 4 kW and commercial at 100 kW • Year 1 residential electric output is 4,500 kWh and commercial is 110,000 kWh. Calculated with PVwatts • Total system first cost is aligned with 2016 values from PGE's study \$3.40 per watt for residential and \$2.40 per watt for small commercial • Year 1 energy costs are assumed to be \$0.10 for residential and \$0.09 for commercial. • Energy costs are escalated at 3% annually
City to support community installation of solar PV systems	<ul style="list-style-type: none"> • PGE Market Assessment for achievable solar potential was downscaled by retail sales for Milwaukie • Emissions reductions are calculated using PGE's 2016 emissions factor • System lifespan is assumed to be 30 years • Annual panel degradation rate assumed to be 0.5% • Average residential system size assumed at 4 kW and commercial at 100 kW • Year 1 residential electric output is 4,500 kWh and commercial is 110,000 kWh. Calculated with PVwatts • Total system first cost is aligned with 2016 values from PGE's study \$3.40 per watt for residential and \$2.40 per watt for small commercial • Year 1 energy costs are assumed to be \$0.10 for residential and \$0.09 for commercial. • Energy costs are escalated at 3% annually
Develop a comprehensive sustainability plan for Clackamas County	<ul style="list-style-type: none"> • Data was not available to scale this action



Appendix C – Fleets and Fuels Data and Assumptions

Action Description	Data and Assumptions used in Calculations
<p>For City of Milwaukie’s light fleet, identify and replace least efficient vehicles with most efficient vehicles</p>	<ul style="list-style-type: none"> • Baseline conditions uses last 12 months (2017-2018) of vehicle fuel consumption ~26,000 gallons and ~250,000 miles. • Baseline fuel type is assumed to be 100% gasoline and alternative fuel type is assumed to be 100% PGE retail electricity • Action assumes EV uses 57 kWh per 100 miles (adjusted for idle time) and 32 kWh / 100 miles under normal operating conditions. • Action assumes BEV maintenance cost of \$0.125 / mile and gasoline ICE maintenance cost of \$0.137 / mile • Action assumes transition of 40 ICE vehicles in the lighter class of vehicles • Action assumes a \$3.00 gasoline price and \$0.09 electricity price • Action assumes GHG emissions for gasoline based on Argonne National Lab, AFLEET tool. • Action assumes GHG emissions for Scope 2 electricity emissions based on Oregon DEQ’s emissions factor.
<p>For City of Milwaukie’s light fleet, align and justify fleet use with true needs</p>	<ul style="list-style-type: none"> • Baseline conditions of Milwaukie’s fleet data includes annual mileage and fuel use for last 12 months (2017-2018). • Action assumes Milwaukie’s most efficient vehicle is substituted for 10% of annual vehicle mileage for all other passenger vehicles, light-duty trucks, medium-duty trucks. • Action assumes no right sizing changes are made for heavy duty vehicles as it is assumed these vehicles are only used when there is no other alternative. • Action assumes no additional capital costs for EVs. • Action assumes fuel savings are calculated based on a fuel cost of \$3.30 per gallon.
<p>For City of Milwaukie’s heavy duty fleet, target diesel fleet for conversion to low carbon fuels</p>	<ul style="list-style-type: none"> • Baseline conditions accounts for diesel fuel being used in current volumes of usage ~8,300 gallons per year based on past 12 months (2017-2018). • Action assumes a substitution of diesel fuel with 100% low-carbon sourced renewable diesel (R99). • Action assumes working with local and state partners to contract a supply of ODEQ certified renewable diesel (R99) for 100% of the City’s current diesel use. • Action assumes renewable diesel prices have a \$0.60 premium over conventional diesel. • Action assumes fuel heat contents and emissions factors from Argonne’s AFLEET tool.
<p>Incentivize multi-family complexes to install EV charging infrastructure</p>	<ul style="list-style-type: none"> • Baseline conditions accounts for Milwaukie’s 2016 Community GHG Emissions for on-road travel using gasoline. • Action assumes the installation of EV chargers at new multi-use parking structures in Milwaukie. • Action assumes that Milwaukie matches City of Portland’s approach of requiring that 5% of parking spaces be equipped with EV chargers (all other parking spaces could be wired and charger ready). In addition to 5% of spaces, 50% of parking spaces was modeled as a point of reference for cost and GHG mitigation potential. • Action assumes costs are estimated based on a first cost of \$2,000 / charger for Level 2 public chargers (equipment and installation). • Action calculates the difference between the carbon intensity of gasoline versus NWPP electricity. • Action assumes that 1,380 multi-family units will be built by 2035 based on the Milwaukie housing survey.
<p>Incentivize workplace charging in parking lots</p>	<ul style="list-style-type: none"> • Baseline conditions accounts for Milwaukie’s 2016 Community GHG Emissions for on-road travel using gasoline. • Action assumes the installation of EV chargers at workplace parking lots at 15% and 50% penetration. • Action assumes that between 345 and 2,298 parking spaces are installed with Level 2 EV chargers , based on 15% and 50%. • Action assumes the average commute distance is assumed to be 15 miles. • Action assumes costs are estimated based on a first cost of \$2,000 / charger for Level 2 public chargers (equipment and installation).
<p>Outreach efforts to encourage shift to EV</p>	<ul style="list-style-type: none"> • Data was not available to scale this action
<p>Micro-Transit and Last Mile Connection</p>	<ul style="list-style-type: none"> • Data was not available to scale this action



Appendix D – Land Use / Planning Data and Assumptions

Note: These actions were downscaled using GHG and cost data from Metro’s Climate Smart GreenSTEP modeling.²

Action Description	Data and Assumptions used in Calculations
Implement a Regional Transportation Agency with Clackamas County	<ul style="list-style-type: none"> Supports reductions on other CAP and future actions
Partner with Metro and Trimet to increase bus service, particularly to underserved employment areas (e.g. micro-transit from major stations)	<ul style="list-style-type: none"> Transit revenue miles per capita will increase from 0.8x to 1.4x 2016 baseline transportation emissions equal 2.4 MT CO₂e / person. Based on 2016 Milwaukie GHG inventory Percentage of workers participating in employer commuter programs increases by 10% between 2016 and 2035. Metro estimates regional system improvement costs for transit through 2035 equal \$7.2 billion. This cost is downscaled per capita for Milwaukie to about \$4,000,000 annually. Percentage of households participating in targeted marketing increases by 15% between 2016 and 2035. Additional transit service reduces per capita emissions 17% from baseline. Based on Metro Climate Smart Modeling - Phase 1 Sensitivity Analysis.
Work with partner organizations to complete bicycle and pedestrian gaps and to promote new connections options to residents.	<ul style="list-style-type: none"> 2016 baseline transportation emissions equal 2.4 MT CO₂e / person. Based on 2016 Milwaukie GHG inventory Percentage of workers participating in employer commuter programs increases by 10% between 2016 and 2035. Metro estimates regional system improvement costs for transit through 2035 equal \$900 million. This cost is downscaled per capita for Milwaukie to about \$500,000 annually. Percentage of households participating in targeted marketing increases by 15% between 2016 and 2035. Percent of drive alone trips that shift to bikes increases by 8% from 2016 to 2035. Emissions are reduced by 4% per capita. Based on Metro Climate Smart Modeling - Phase 1 Sensitivity Analysis.
Implement a “fee in lieu of” for areas outside of pedestrian corridors that do not need infrastructure improvements and redirect funds to corridors that do	<ul style="list-style-type: none"> Scaling calculations for this action combined with Bike and Pedestrian action above. Bike / ped reductions are increased by 15% to account for “fee in lieu of”. This assumption is meant to account for the benefits of additional money available to make bike / ped upgrades
Implement variable system development charges (consider square footage, etc.) to encourage ADUs.	<ul style="list-style-type: none"> Assumes Milwaukie needs an additional 1,068 housing units by 2036. Based on City of Milwaukie’s HOUSING AND RESIDENTIAL LAND NEEDS ASSESSMENT. Assumes new housing is built with 30% less square footage than existing baseline housing. ODEQ found that decreasing a homes area by 30% (2,300 to 1,600 square feet) reduced lifecycle energy use by 15%. Assumes a building cost of \$150 per square foot Residential electricity cost is \$0.10 per kWh Residential natural gas cost is \$1.10 per therm
Promote “neighborhood hubs” through Comprehensive Plan policies	<ul style="list-style-type: none"> Percent of households living in walkable, mixed-use areas increases by 11% between 2016 and 2035. Percentage of workers participating in employer commuter programs increases by 20% between 2016 and 2035. Percentage of households participating in targeted marketing increases by 40% between 2016 and 2035. Percent of drive alone trips that shift to bikes increases by 11% from 2016 to 2035. Data to support the cost effectiveness calculations are not available for each individual action. Cost effectiveness here is calculated based on Metro’s projected costs and savings for implementation of the Climate Smart Strategy for the region.
Implement parking pricing in downtown	<ul style="list-style-type: none"> Percentage of employees paying to park increased by 17% between 2016 and 2035 Percentage of non-work tripics paying to park increases by 22% between 2016 and 2035 Emissions are reduced by 5% per capita. Based on Metro Climate Smart Modeling - Phase 1 Sensitivity Analysis. Data to support the cost effectiveness calculations are not available for each individual action. Cost effectiveness here is calculated based on Metro’s projected costs and savings for implementation of the Climate Smart Strategy for the region.

² See Summary of Key Scenario Analysis Inputs and Outputs and Phase 1 Sensitivity Analysis. Downloaded 3/2018 at <https://www.oregonmetro.gov/sites/default/files/2015/05/29/Metro-GreenSTEP-inputoutput-201501130.pdf> and https://www.oregonmetro.gov/sites/default/files/2015/05/29/phase_1_all_sensitivity_analysis_memo_062712.pdf