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CLACKAMAS COUNTY

# CLIMATE ACTION PLAN

## IMPLEMENTATION GUIDE

Fall 2023



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SSG

CLACKAMAS COUNTY

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# Introduction

The Climate Action Plan (CAP) outlines Clackamas County's pathway to reach carbon neutrality by 2050. This implementation guide is designed to bring that pathway to life by providing information about the policies, programs, initiatives, and infrastructure investments needed in order for Clackamas County to:

- reduce emissions to meet the carbon-neutral target,
- create the necessary work plans, and
- conduct operational and feasibility studies.

This implementation guide focuses on actions Clackamas County can take as an organization, as well as actions that require county advocacy and education to support residents, businesses and partners as they take necessary actions. It is a snapshot of actions that align with the best practices and local context identified during the development of the CAP. Successfully reaching the target will require dedication and adaptive management.

# How the Implementation Guide is Organized

The key focus areas for Clackamas County's CAP align with the following nine distinct sectors identified by the consultant through technical modeling, reviews of best practices and local context, and engagement.

**A.** Active transportation

**B.** Clean heating

**C.** Building retrofits

**D.** New building performance

**E.** Low emissions vehicles

**F.** Transit

**G.** Energy generation

**H.** Waste and wastewater

**I.** Natural sequestration

The nine sectors provide an implementation structure, although there is overlap between the program, initiative, policy, and infrastructure recommendations in each sector. The actions are organized by sector with a recommended start and end date for each.

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These implementation actions will see their greatest returns in concert. Although adaptive management will be needed as technologies and conditions change, it is important to note that ***the plan will not generate the same outcome if only some actions are completed or if actions are taken out of order.***

This implementation guide is organized into the nine categories with the following detailed breakdown for each action:

1. **Action:** The title of the intended outcome
2. **Description:** A brief explanation of the action that needs to be taken, including targets (where relevant)
3. **CATF Target Outcome:** Targets proposed by the Community Advisory Task Force.
4. **Timing:** Needed start and completion dates for the action
5. **GHG Impact:** The cumulative greenhoues gas (GHG) emissions reduction effect of each action, compared to the business-as-planned scenario[1], rated based on the scale below:

| SCALE OF CUMULATIVE GHG EMISSIONS REDUCED | | | | |
|---|---|---|---|---|
| **FACILITATOR** | **LOW** | **MEDIUM** | **HIGH** | **TBI** |
| Facilitates the reduction of GHG emissions | <1,000 ktCO2e | 1,000-3,000 ktCO2e | >3,000 ktCO2e | To be investigated |

6. **Co-benefits:** Community benefits expected to occur as a result of implementing the CAP that go above and beyond the primary goal of reducing GHG emissions. The three co-benefits that stood out as most important to community members during public engagement — equity, employment and cost-effectiveness[2] — are described in the table below. Each action can be evaluated in part on the relative level of co-benefits it may create. Note that implementing the CAP will create co-benefits beyond these three, such as improved air quality and respiratory health, and reduced noise pollution.
7. **Costs:** Based on the upfront capital expenditure required to implement each action, above and beyond the Business-As-Planned practice, based on the scale below. Costs do not consider marginal abatement costs or the gain of the investment; these are referred to in the guide.

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[1] A BAP scenario projects the county's expected emissions levels with current policies and practices, and no additional policy or climate action intervention beyond what is currently planned. It includes projections for energy consumption, and emissions from transportation, industrial processes and other sources, and serves as a benchmark against which to measure effectiveness of emissions reduction efforts. Projections are based on locally available data including utility use, transportation and demographic data, population and employment forecasts, and take into consideration local, state and federal policy implications. The BAP is further explained in the CAP.

[2] Cost-effectiveness measures the relative efficiency of a policy, program, or intervention in achieving a specific outcome or set of outcomes by comparing the costs of different options and their respective outcomes to determine which one provides the best value for money. Cost-savings focuses on minimizing expenses without necessarily considering the outcomes or the impact on service delivery.

| COST SCALE | | | | |
|---|---|---|---|---|
| $ | $$ | $$$ | $$$$ | $$$$$ |
| <$1 million | $1 million - $100 million | $100 million - $500 million | $500 million – $1 billion | $1 billion + |

8. **Metrics:** The method and measurement unit for measuring the impact of the action taken. All metrics should be analyzed on an annual basis for those that are being actively implemented.

9. **Implementation Mechanism:** A brief description of the programs, initiatives, policies, and infrastructure required to implement each action, as shown in the following table.

| MECHANISM | DEFINITION |
|---|---|
| **Policy** | An official policy developed by the county and approved by the Board of County Commissioners |
| **Program** | An ongoing effort by the county, with staff and financing to support the effort |
| **Initiative** | A study or project with a specific focus that is undertaken by the county, private sector, not-for-profit sector, or other sectors, individually or collaboratively, that is implemented for a set time period |
| **Infrastructure** | Investment in physical infrastructure by the county or private sector, not-for-profit sector, or other sectors, individually or collaboratively |
| **Advocacy** | Speaking in favor of or recommending that another level of government, agency or community partner undertake an action, policy or program that reduces emissions that is within the control of that jurisdiction; or speaking against actions that will increase emissions |
| **Education** | A defined opportunity to target informative communications and materials to the public, community partners, and/or other governments related to the specific rationale and benefits of implementing climate actions |

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# The Implementation Guide

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# A. Active Transportation

Active transportation is the use of human-powered types of transportation, such as walking, cycling, and using a wheelchair or other mobility aid. It is a sustainable and healthy form of transportation that can reduce air pollution, traffic congestion, and dependence on fossil fuels. It is also often coupled with transit use as a part of what's known as "multi-modal" transportation -- using more than one way to travel and moving away from relying on single-occupancy vehicles. (Transit is a separate section in this implementation plan.) Electric bikes and scooters represent an emerging opportunity at the nexus of active transportation and low-emission vehicles, with the potential to make bikes and scooters viable tools for longer distances and more uses.

## Active Transportation Actions

| ACTION | DESCRIPTION | CATF TARGET OUTCOME | TIMING | GHG IMPACT | CO-BENEFITS | COST | METRICS |
|---|---|---|---|---|---|---|---|
| **SHIFT TRANSPORTATION FROM VEHICLES TO TRANSIT, ACTIVE TRANSPORTATION, AND CARPOOLING** | Overall:<br>• 57% drive alone<br>• 43% non-drive alone by 2040, made up of:<br>• 30% carpool (from 9%)<br>• 6% walk, bike or other means (from 4.2%)<br>• 7% transit (from 2.8%)<br>Urban Zones:<br>• 44% drive alone<br>• 56% do not drive alone, made up of:<br>• 36% carpool<br>• 12% walk, bike or other active means<br>• 8% transit | T3: Public transportation replaces a portion of fossil-fueled vehicle trips.<br>T6: The energy required to transport people is reduced.<br>T8: Active transportation replaces a portion of fossil-fueled vehicle trips. | Start: Immediately<br>Completion: 2040 | Medium | Equity: High<br>Employment: Medium<br>Cost Effectiveness: High | $$$ | Number of vehicle miles traveled (VMTs)* by active modes<br><br>***VMT: total annual miles of vehicle travel divided by the total population*** |

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# Active Transportation Implementation Mechanisms

| Implementation Mechanisms | |
|---|---|
| **ADVOCACY** | Advocate for the expansion of light rail and the completion of light rail loops, the expansion of transit connections to and within rural communities, and increasing equitable access to frequent transit in places that create the most access for the most people. |
| **ADVOCACY** | Advocate for the state to adopt "Commute Options" which would apply new rules for employers in urbanized areas regarding employer-based commute option programs that would reduce greenhouse gas emissions and improve air quality. |
| **EDUCATION** | Promote use and benefits of active transportation. Promote new routes and trails, and programs and initiatives such as the Safe Routes to School program. Host active transportation/trails days to share information and hand out promotional items such as bike bells. |
| **EDUCATION** | Use education, advocacy and promotional support to increase the number of employers that offer commute option programs and subsidized transit passes for their employees. |
| **INFRASTRUCTURE** | Partner with local transit providers to design and develop mobility hubs that include a transit stop or transfer station, EV charging, e-bike and e-scooter rentals and charging, a carshare pick-up and drop-off location, and a carpooling lot. |
| **INFRASTRUCTURE** | Fully implement the infrastructure outlined in the county's Active Transportation Plan, Bicycle Master Plan, and Pedestrian Master Plan and the recommendations resulting from the update outlined in the infrastructure recommendation on mobility hubs. |
| **INITIATIVE** | Incentivize (or require through site plan permitting) bike/micro mobility parking and storage for new and existing multi-unit and commercial developments. |
| **INITIATIVE** | Update the current Transportation System Plan, Active Transportation Plan, Bicycle Master Plan, and Pedestrian Master Plan with a focus on the following elements to increase active transportation rates:<br>• Increase connectivity/safe trail, bike lane and sidewalk connections, and connections to transit stops<br>• Increase uninterrupted, separated active transportation infrastructure<br>• Add multi-modal access points to residences and businesses<br>• Increase trail and sidewalk lighting<br>• Increase end-of-trip facilities |
| **INITIATIVE** | Promote locations (e.g. private businesses) that act as drop-off and pick-up sites for rideshare vehicles, carpooling and micro-mobility sharing services such as e-bikes and e-scooters. |
| **POLICY** | Lower and phase out parking minimum requirements for new and existing developments. |
| **PROGRAM** | Use county and other public parking facilities as a drop-off and pick-up location for rideshare vehicles, carpooling and micro-mobility sharing services such as e-bikes and e-scooters. |

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# B. Clean Heating

Clean heating refers to the use of energy sources that produce low or zero emissions to heat buildings and other structures such as solar thermal systems, geothermal systems, ground and air source heat pumps, electric (from renewable energy source) boilers, and renewable natural gas (RNG). Clean heating is considered a sustainable and environmentally friendly alternative to traditional fossil fuel-based heating systems, which can produce significant amounts of air pollution and greenhouse gas emissions.

## Clean Heating Actions

| ACTION | DESCRIPTION | CATF TARGET OUTCOME | TIMING | GHG IMPACT | CO-BENEFITS | COST | METRICS |
|---|---|---|---|---|---|---|---|
| **INCREASE NEW AND EXISTING RESIDENTIAL SPACE CLEAN HEATING AND COOLING** | 80% of new homes are electric by 2025 (assume 50% air / 50% ground source heat pumps).<br><br>80% of existing buildings' space heating and cooling needs are met by electric systems by 2040 (assume 90% air / 10% ground source heat pumps). | B3: Heating and cooling buildings requires less energy.<br><br>Switch to non-emitting energy sources. All energy is produced by net zero emissions means. | Start: Immediately<br><br>Completion: 2040 | Medium | Equity: Low<br>Employment: Medium<br>Cost Effectiveness: Low | $$$$$ | Number of systems replaced or installed |
| **INCREASE NEW AND EXISTING RESIDENTIAL CLEAN WATER HEATING** | 80% of water heating in new homes is electric by 2025; 100% by 2030.<br><br>95%[3] of existing buildings' water heating needs are met by electric systems by 2040, in line with the retrofit schedule. | No related Target Outcome | Start: Immediately<br><br>Completion: 2040 | Medium | Equity: Low<br>Employment: Low<br>Cost Effectiveness: Low | $$$$ | Number of systems replaced |

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[3] The other 5% can come from RNG.

| ACTION | DESCRIPTION | CATF TARGET OUTCOME | TIMING | GHG IMPACT | CO-BENEFITS | COST | METRICS |
|---|---|---|---|---|---|---|---|
| **INCREASE NEW AND EXISTING NON-RESIDENTIAL SPACE CLEAN HEATING AND COOLING** | 80% of new-buildings are electric by 2025. Assume 50% air / 50% ground source heat pumps.<br><br>80% of existing buildings' space heating and cooling needs are met by electric systems by 2040. Assume 90% air / 10% ground source heat pumps. | B3: Heating and cooling buildings requires less energy.<br><br>Switch to non-emitting energy sources. All energy is produced by net zero emissions means. | Start: Immediately<br><br>Completion: 2040 | Low | Equity: Low<br>Employment: Low Cost Effectiveness: High | $ | Number of systems replaced |
| **INCREASE NEW AND EXISTING NON-RESIDENTIAL CLEAN WATER HEATING** | 80% of water heating in new buildings is electric by 2025, 100% by 2030.<br><br>95[4]% of existing buildings' water heating needs are met by electric systems by 2040, in line with the retrofit schedule. | No related Target Outcome | Start: Immediately<br><br>Completion: 2040 | Low | Equity: Low<br>Employment: Low Cost Effectiveness: Low | $$$$ | Number of systems replaced |

## Clean Heating Implementation Mechanisms

| Implementation Mechanisms | |
|---|---|
| **ADVOCACY** | Advocate for electric water heating conversions to be added to retrofit and incentive programs offered to residents by non-county entities. |
| **ADVOCACY** | Advocate for heating and cooling system conversions, including RNG, to be added to retrofit and incentive programs offered to residents by non-county entities. |
| **EDUCATION** | Educate residents on the benefits of heat pumps, including efficient air conditioning during heat waves, and address misinformation about their reliability and uses. |
| **EDUCATION** | Educate residents on the benefits of electric water heating conversions. |
| **EDUCATION** | Promote Portland General Electric (PGE) incentives to save money by saving energy (https://portlandgeneral.com/save-money). |

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[4] The other 5% can come from RNG.

| Implementation Mechanisms | |
|---|---|
| **EDUCATION** | Promote PGE heat pump incentives and on-bill financing programs for heat pumps, and upcoming state heat pump incentive program(s). |
| **PROGRAM** | Promote retrofits and incentives available to low-income households, as described in the education items above. |
| **PROGRAM** | Make space heating and cooling system conversions eligible under Property Assessed Clean Energy (PACE) program retrofits and other county-hosted incentive and rebate programs. |
| **PROGRAM** | Make water heater conversions eligible under Property Assessed Clean Energy (PACE) program retrofits and other county-hosted incentive and rebate programs. |
| **PROGRAM** | Provide incentives for the installation of heat pumps in new buildings. |

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# C. Building Retrofits

Low-carbon building retrofits refer to the process of upgrading existing buildings to reduce the amount of energy required to heat and power the building and thereby reduce their carbon emissions. This can include a wide range of measures such as:

- Insulating walls, floors and roofs to reduce heat loss and improve thermal comfort
- Installing high-efficiency heating and cooling systems
- Replacing older windows with more energy efficient ones
- Upgrading lighting to LED or other energy efficient options
- Installing solar panels and other renewable energy systems

Retrofitting buildings presents a significant opportunity to reduce energy consumption and GHG emissions and create local jobs. It is most cost-effective to decarbonize buildings by maximizing energy efficiency prior to adding renewables. Many programs currently retrofit one building at a time; however, in order to achieve the CAP targets, new approaches to retrofit at a larger scale will be required.

## Building Retrofits Actions

| ACTION | DESCRIPTION | CATF TARGET OUTCOME | TIMING | GHG IMPACT | CO-BENEFITS | COST | METRICS |
|---|---|---|---|---|---|---|---|
| **IMPROVE THE ENERGY PERFORMANCE OF EXISTING RESIDENTIAL BUILDINGS** | Achieve 50% thermal savings and 10% plug load[5] savings in 100% of all existing buildings. | B3: Heating and cooling buildings require less energy. | Start: Immediately<br><br>Completion: 2040 | Medium | Equity: High<br>Employment: Medium<br>Cost Effectiveness: Low | $$$$$ | Number of homes retrofitted |

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[5] Plug load: The energy consumed by electronic devices and appliances that are plugged into electrical outlets. These devices include computers, televisions, lamps, chargers, kitchen appliances, and other electronic equipment.

| ACTION | DESCRIPTION | CATF TARGET OUTCOME | TIMING | GHG IMPACT | CO-BENEFITS | COST | METRICS |
|---|---|---|---|---|---|---|---|
| **IMPROVE THE ENERGY PERFORMANCE OF EXISTING COUNTY BUILDINGS** | Achieve 50% thermal savings and 10% plug load savings in 100% of all existing buildings. | B3: Heating and cooling buildings requires less energy. | Start: Immediately<br><br>Completion: 2040 | Low | Equity: Enabler<br>Employment: Medium<br>Cost Effectiveness: Low | $$ | Number of buildings retrofitted |

## Building Retrofits Implementation Mechanisms

| Implementation Mechanisms | |
|---|---|
| **ADVOCACY** | Advocate for the state to make home energy scores mandatory upon sale of a home. |
| **ADVOCACY** | Advocate for the state and/or utilities to provide energy use scores on monthly utility bills along with information on audits and incentives. |
| **EDUCATION** | Educate residents on energy retrofits that can be completed in their homes, the benefits of energy retrofits, qualified energy auditors and local contractors that can conduct energy retrofits, and myth-busting on technologies such as heat pumps. |
| **EDUCATION** | Promote participation in the Energy Trust of Oregon Industrial Equipment and Agriculture Technical Assistance and Incentive programs. |
| **EDUCATION** | Communicate and promote existing programs and incentive stacking opportunities that residents can take advantage of through state, utility, county, and other local government programs. |
| **EDUCATION** | Report on county energy retrofits, host public workshops and share information about results and payback. |
| **EDUCATION** | Promote Oregon's Rural & Agricultural Energy Audit Program to rural small businesses to increase the uptake of energy audits and baselining. |
| **INITIATIVE** | Partner with low-income housing agencies and seek funding to conduct a bulk energy retrofit pilot to retrofit several housing units at one time with minimal disruption to residents. |
| **INITIATIVE** | Apply for Rural Energy for America Program Energy Audit & Renewable Energy Development Assistance Grants to subsidize energy audits and renewable energy site assessments for small rural businesses and agricultural producers. |
| **INITIATIVE** | Pilot sub-metering in county buildings to track energy usage by end use. |
| **INITIATIVE** | Undertake a building retrofit and recommissioning study to identify measures for reducing energy use and develop an overall schedule for retrofits to occur in county facilities. |

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| Implementation Mechanisms | |
|---|---|
| **INITIATIVE** | Integrate the building retrofit and recommissioning study results into the county's asset management plan so replacements and cost estimates reflect energy reduction needs. |
| **INITIATIVE** | Provide training to building permit staff so they can be ambassadors of energy efficiency incentive programs to residents applying for building permits. |
| **POLICY** | Develop a revolving energy fund policy that ensures utility, operations and maintenance savings achieved from county building retrofits is reinvested into future county retrofit projects. |
| **POLICY** | Amend the county's asset management policy (and budgeting and procurement policies, if necessary) to ensure building upgrades will include energy upgrades. |
| **PROGRAM** | Develop new and modify existing incentive programs to provide larger incentives for lower-income housing dwellers and individuals earning less than 80% of the average household income. |
| **PROGRAM** | Expand the county's weatherization and energy audit programs to provide residents with at least partial support if they make less than 80% of the median household income. |
| **PROGRAM** | Develop and implement a commercial Property Assessed Clean Energy (PACE) program that allows commercial building owners to access a long-term low-interest loan from the county to complete energy upgrades, and pay it back over a period of up to 20 years through increased property taxes. Develop the program so the loan stays with the building rather than the owner (so the current owner receiving the benefits of the upgrades is bearing the costs), drawing from examples in Deschutes County and Multnomah County. |
| **PROGRAM** | Participate in energy benchmarking initiatives, and annually update energy-use and emissions for each county facility. |
| **PROGRAM** | Develop and implement a residential Property Assessed Clean Energy (PACE) program that allows homeowners to access a long-term low-interest loan from the county to complete energy upgrades, and pay it back over a period of up to 20 years through increased property taxes. Develop the program so the loan stays with the home rather than the homeowner (so the current homeowner receiving the benefits of the upgrades is bearing the costs), drawing from examples in Deschutes County and Multnomah County. |
| **PROGRAM** | Develop a split-incentive that benefits both tenants and building owners to encourage more energy retrofits in tenant-occupied housing. |

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# D. New Building Performance

Low-carbon new building performance refers to a new building designed and constructed to consume low levels of energy and generate low levels of greenhouse gas emissions throughout its lifecycle. This can be achieved through various techniques such as:

- Designing the building to maximize natural light and ventilation
- Using energy-efficient materials and equipment
- Incorporating renewable energy systems such as solar panels or wind turbines
- Choosing a location that is close to public transportation and other amenities
- Incorporating green roofs, rainwater harvesting and greywater recycling systems
- Applying, where appropriate: Passive house standards, LEED[6], BREEAM[7], WELL[8] building standards

A new low-carbon building is expected to have low energy consumption, low emissions, and high indoor air quality and thermal comfort, with a positive impact on the people that use it and on the environment. Since buildings and building systems are long-lasting assets, choices made today will impact emissions in the county for decades to come and will either increase or decrease the burden on future generations. Increasing the proportion of low-carbon and net-zero builds over time can also prepare the workforce now for changes that will impact the whole industry by 2030. Other benefits include improved air quality and lower utility bills.

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[6] LEED (Leadership in Energy and Environmental Design) is a green building certification system that evaluates a building's overall sustainability, energy efficiency, and environmental impact such as water conservation, indoor air quality, and material use. LEED awards buildings a rating based on performance in these areas.

[7] BREEAM (Building Research Establishment Environmental Assessment Method) is similar to LEED, but originating in the UK. It assesses a building's environmental, social, and economic performance across several categories, such as energy use, water efficiency, and waste management. Based on the building's performance in these categories, it is awarded a rating from Pass to Outstanding.

[8] WELL Building Standard is a certification system focused on human health and well-being within the built environment. It assesses a building's design, operations, and policies based on various aspects, such as air quality, water quality, and lighting, to ensure the occupants' health, comfort, and overall well-being are considered and optimized.

# New Building Performance Actions

| ACTION | DESCRIPTION | CATF TARGET OUTCOME | TIMING | GHG IMPACT | CO-BENEFITS | COST | METRICS |
|---|---|---|---|---|---|---|---|
| **IMPROVE THE ENERGY PERFORMANCE OF NEW RESIDENTIAL BUILDINGS** | All new buildings are net-zero energy ready by 2030 - meet thermal net-zero energy standards (4.75 MBTU/ft2) by 2030, adoption increases linearly[9] to 2030. | B1: New buildings are built to a net zero emissions standard. | Start: Immediately<br><br>Completion: 2030 | Medium | Equity: Low<br>Employment: Medium<br>Cost Effectiveness: High | $$$$ | Energy intensity[10] of new buildings (MBTU/ft2) |
| **IMPROVE THE ENERGY PERFORMANCE OF NEW INSTITUTIONAL, COMMERCIAL AND INDUSTRIAL BUILDINGS** | All new buildings are net-zero energy ready by 2030 - meet thermal net-zero energy standards (7.92 MBTU/ft2) by 2030, adoption increases linearly to 2030. | B1: New buildings are built to a net zero emissions standard. | Start: Immediately<br><br>Completion: 2030 | Medium | Equity: Low<br>Employment: Medium<br>Cost Effectiveness: High | $$$ | Energy intensity of new buildings (MBTU/ft2) |
| **IMPROVE THE ENERGY PERFORMANCE OF NEW COUNTY BUILDINGS** | New county facilities are built with a carbon neutral strategy by 2023. All new buildings are net-zero energy ready by 2030 (meet thermal net-zero energy standards (7.92 MBTU/ft2) by 2030) | B1: New buildings are built to a net zero emissions standard. | Start: Immediately<br><br>Completion: 2030 | Low | Equity: Low<br>Employment: Medium<br>Cost Effectiveness: High | $$ | Energy intensity of new buildings (MBTU/ft2) |

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[9] Adoption increases linearly: the rate of adoption or acceptance of a new concept, technology, or practice grows at a consistent, steady pace over time. In a linear growth pattern, the increase in adoption happens at a constant rate, forming a straight line when plotted on a graph. This contrasts with exponential growth, where the rate of adoption accelerates over time, forming a curve on the graph.

[10] Energy intensity of new buildings: the amount of energy consumed per unit area (usually per square meter or square foot) in a newly constructed building, used to evaluate the energy performance of a building and compare it to other buildings or established benchmarks. Buildings with lower energy intensity are considered more energy-efficient, as they consume less energy for their size. Energy intensity can be influenced by factors such as building design, construction materials, insulation, heating and cooling systems, and the use of energy-efficient appliances and lighting. Reducing energy intensity in new buildings is a crucial aspect of sustainable development and climate change mitigation strategies.

# New Building Performance Implementation Mechanisms

| Implementation Mechanisms | |
|---|---|
| **ADVOCACY** | Advocate for training and micro-credential programs for skilled tradespeople to increase their knowledge and skills around energy-efficient building practices. |
| **ADVOCACY** | Advocate for building code advancement at the state level and support the ability to require extending the Oregon Reach Code to county governments. |
| **EDUCATION** | Report on county high-efficiency builds, host public workshops, and share information about results and payback. |
| **EDUCATION** | Promote the use of Energy Efficient mortgages offered through Energy Star and the federal government, which allow borrowers to purchase or refinance a home that is already energy efficient (such as an ENERGY STAR certified home) or finance energy efficient improvements to an existing home. |
| **POLICY** | Develop a tiered green building standard and require developers to submit site plans that meet a threshold energy score, and provide financial and non-financial incentives to support them to build to those standards; in particular, for Multi-Unit Residential Buildings (MURBs), provide a density bonus and expedited permits; for commercial buildings, provided expedited permits. |
| **POLICY** | Adopt a policy that commits the county to completing a carbon neutral strategy for each new county facility. |
| **POLICY** | Adopt a policy that commits the county to constructing all new county facilities to meet thermal net-zero energy standards of 25 kWh/m2 by 2030. |
| **POLICY** | Develop a Sustainable Procurement Policy that supports the county's new build commitments. |

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# E. Low Emission Vehicles (LEVs)

LEVs produce lower levels of emissions, and are considered a sustainable and environmentally friendly alternative to traditional gasoline and diesel vehicles which can produce significant amounts of air pollution and greenhouse gas emissions. LEVs include:

- Electric vehicles (EVs) powered by electricity that produce zero emissions at the tailpipe, powered by batteries recharged through the electric grid or by fuel cells that convert hydrogen into electricity.
- Hybrid electric vehicles (HEVs) with both a gasoline engine and an electric motor that can run on either power source or a combination of both, and typically produce lower emissions than traditional gasoline-powered vehicles.
- Plug-in hybrid electric vehicles (PHEVs), similar to HEVs, but with a larger battery that can be recharged through the electric grid. They can run on electricity for shorter distances, and typically produce lower emissions than traditional gasoline-powered vehicles.
- Fuel cell vehicles (FCVs) run on hydrogen fuel cells that convert hydrogen into electricity to power the vehicle and produce only water vapor as emissions.

## Low Emission Vehicles Actions

| ACTION | DESCRIPTION | CATF TARGET OUTCOME | TIMING | GHG IMPACT | CO-BENEFITS | COST | METRICS |
|---|---|---|---|---|---|---|---|
| **ELECTRIFY COUNTY FLEET** | 100% of new light and medium duty vehicles and equipment purchased for county operations will be zero emissions by 2030, and 100% of light duty vehicles in service will be zero emissions by 2035.<br><br>100% of new heavy duty vehicles and equipment purchased for county operations will be zero emissions by 2035, and 100% of heavy duty vehicles in service will be zero emissions by 2040. | T4: The county's transportation activities produce net-zero emissions. | Start: Immediately<br><br>Completion: 2040 | Low | Equity: Low<br>Employment: Low<br>Cost Effectiveness: High | $$ | Number of electric vehicles in county fleet |

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| ACTION | DESCRIPTION | CATF TARGET OUTCOME | TIMING | GHG IMPACT | CO-BENEFITS | COST | METRICS |
|---|---|---|---|---|---|---|---|
| **SUPPORT LOW EMISSION PERSONAL VEHICLES** | 50% of new personal vehicles sold in Clackamas County are zero emission vehicles by 2030, 90% by 2035, and 100% by 2040.<br><br>100% of registered vehicles are zero emission by 2050. | T2: Emissions from transporting people are eliminated. | Start: Immediately<br><br>Completion: 2050 | High | Equity: Low<br>Employment: Low<br>Cost Effectiveness: High | $ | Electric vehicle sales<br>Number of EV charging stations |
| **SUPPORT LOW EMISSION COMMERCIAL USE VEHICLES** | 50% of heavy-duty vehicles sold in Clackamas County are zero emission vehicles by 2035, and 90% by 2040.<br><br>100% of registered vehicles are zero emission by 2050. | T4: The county's transportation activities produce net-zero emissions. | Start: Immediately<br><br>Completion: 2050 | High | Equity: Low<br>Employment: Low<br>Cost Effectiveness: High | $$$$ | Electric vehicle sales<br>Number of EV charging stations |
| **ELECTRIFY LAST MILE DELIVERED** | Transfer 10% of heavy/medium duty vehicle miles traveled to light duty/electric micro-mobility in urban areas by 2035 | T7: Reduce all emissions and eliminate tailpipe emissions from freight. | Start: Immediately<br><br>Completion: 2035 | Low | Equity: Low<br>Employment: Medium<br>Cost Effectiveness: High | $ | VMTs delivered by light duty vehicles |
| **ENCOURAGE WORK FROM HOME** | 12% of potential commutes are replaced with telework by 2025. | T2: Emissions from transporting people are eliminated. | Start: Immediately<br><br>Completion: 2025 | Low | Equity: High<br>Employment: N/A<br>Cost Effectiveness: High | $ | Number of jobs able to work from home |

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# Low Emission Vehicles Implementation Mechanisms

| Implementation Mechanisms | |
|---|---|
| **ADVOCACY** | Advocate for the implementation of recommendations made by the multi-state Zero Emission Vehicle (ZEV) Deployment Support Task Force to increase the supply of ZEVs and charging infrastructure. |
| **ADVOCACY** | Advocate for a rule similar to the Clean Truck Rule 2021 that applies to agricultural, forestry, and off-road vehicles, and accompanying incentives. |
| **ADVOCACY** | Advocate for the enforcement of the Clean Truck Rule 2021, the enhancement of the Advanced Clean Truck rule as technology evolves and the market expands, and the further development of the multi-state Medium- and Heavy-Duty Zero Emission Vehicle (ZEV) Deployment Support Task Force. |
| **ADVOCACY** | Advocate for implementation of the emissions reduction target set out by the Air Transport Association:<br>• 5% decrease in emissions from Sustainable Aviation Fuel;<br>• 13% reduction from new technologies, electric, and hydrogen;<br>• 3% from operational efficiency; and<br>• 19% from offsets. |
| **EDUCATION** | Offer an education program for dealerships that sell EVs that allows them to educate potential clients on the benefits of EVs and the availability of incentives. Promote dealerships that have participated. |
| **EDUCATION** | Develop an education and promotion campaign on the benefits of working from home and hybrid working, while also promoting the ways people can still support local businesses and the local economy. |
| **EDUCATION** | Promote and share information about electric vehicle incentives from the Federal Tax Credit, Oregon Clean Vehicle Rebate, Oregon Charge Ahead Rebate, and multi-unit residential and commercial electric vehicle infrastructure rebates and residential rebates from Portland General Electric. |
| **EDUCATION** | Educate commercial fleet owners on and promote their participation in PGE's Fleet Partner Program to receive advice and guidance on fleet decarbonization and potential incentives for EV chargers. |
| **INFRASTRUCTURE** | Purchase zero emissions equipment and machinery for county operations as they become available, as a pilot/demonstration, and share feedback with the public. |
| **INFRASTRUCTURE** | Install rapid charging stations in commercial and business districts with frequent high deliveries. |
| **INITIATIVE** | Complete a county fleet optimization study to:<br>• ensure that future vehicle purchases are right-sized for the tasks they are required for<br>• investigate the efficiency of vehicle sharing and sign-out programs for county staff<br>• investigate the efficiency of staging county fleet vehicles at different locations for access by staff<br>• investigate the potential energy-use and emissions reductions associated with installing technology to monitor driver behavior and reduce idling |

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| Implementation Mechanisms | |
|---|---|
| **INITIATIVE** | Develop and implement a Green Fleet and/or Alternative Fuel Fleet Strategy/Roadmap that aligns with the Green Fleet and/or Alternative Fuel Fleet Policy and the modeled timeline for the county acquiring zero emissions vehicles. |
| **POLICY** | Develop, adopt, and implement a policy that requires all new county operations facilities to include electrical conduit to support EV charging. |
| **POLICY** | Through the site permitting process, require multi-unit residential buildings and commercial buildings/parking lots to be wired for electric vehicle charging. |
| **POLICY** | Develop and adopt an anti-idling policy that includes fines for idling in commercial and business districts. |
| **POLICY** | Develop, adopt, and implement a policy that requires all new publicly accessible county facilities and parking lots to include electrical conduit to support EV charging. |
| **POLICY** | Develop, adopt, and implement a Green Fleet and/or Alternative Fuel Fleet Policy. |
| **POLICY** | Review county's policies on remote work to:<br>• Allow for off-site work when in-person work is not an operational requirement<br>• Allow for a consolidated work week (e.g. 4 10-hour days) where operationally appropriate<br>• Allow for off-site work when there are inclement and extreme weather days<br>Make this policy public. |
| **POLICY** | Support the development of refueling stations for zero emissions medium and heavy-duty vehicles through zoning ordinances. |
| **POLICY** | Develop policy that makes rules surrounding micro mobility usage clear, and publicize the policy and the county's openness to micro mobility delivery solutions. |
| **POLICY** | Develop and adopt zoning ordinances that limit and prohibit the development of new gas stations that sell gasoline and non-renewable diesel, and support the development of alternative fueling stations. |
| **PROGRAM** | Participate in PGE's Fleet Partner Program to receive advice and guidance on fleet decarbonization and potential incentives for EV chargers. (Note: this may partially or completely fulfill the action noted above.) |
| **PROGRAM** | Register the county for the Oregon Clean Fuels Program and Advanced Crediting Program so the county can sell credit through the Oregon Fuels Reporting System and reinvest funds into fleet greening and EV infrastructure expansion. |

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# F. Transit

Transit refers to the transportation of people and goods using public or mass transportation systems such as buses, trains, subways, trams and ferries. Public transit is typically operated by government agencies or private companies under contract to the government. The goal of transit is to provide efficient, affordable, and accessible transportation services to the public. It can help to reduce traffic congestion, air pollution, and dependence on fossil fuels, while promoting economic development and improving access to jobs, education, and other opportunities. The various types of transit available include:

- Bus Rapid Transit (BRT)
- Light Rail Transit (LRT)
- Heavy Rail Transit (HRT)
- Commuter Rail
- Cable Cars
- Gondola
- and more

Transit systems vary widely in terms of their size, scope, and level of service, depending on the population density and transportation needs of the area they serve.

## Transit Actions

| ACTION | DESCRIPTION | CATF TARGET OUTCOME | TIMING | GHG IMPACT | CO-BENEFITS | COST | METRICS |
|---|---|---|---|---|---|---|---|
| **SUPPORT LOW EMISSION TRANSIT** | Beginning in 2025 all electric transit uses renewable electricity.<br><br>Only zero emissions buses will be procured beginning in 2025.<br><br>All transit vehicles will be zero emissions by 2040. | T5: Reduce emissions of transit operations | Start: 2025<br><br>Completion: 2040 | Low | Equity: High<br>Employment: Medium<br>Cost Effectiveness: High | $$$$ | Number of electric transit vehicles in fleet |

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# Transit Implementation Mechanisms

| Implementation Mechanisms | |
|---|---|
| **ADVOCACY** | Advocate for all transit operators within Clackamas County to meet the modeled action target for transit electrification (in line with TriMet's decarbonization plan). Increase renewable energy use in transit operations. |
| **INITIATIVE** | Convene/facilitate parties in discussions on transit emissions reductions. |
| **INFRASTRUCTURE** | Expand high capacity transit to Oregon City, Boring/Sandy, east/west along the OR212/Sunnyside area. |
| **INFRASTRUCTURE** | Connect end of MAX Orange line to Green MAX lines with high capacity transit. |

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# G. Energy Generation

Low-carbon energy generation refers to the production of electricity or heat using energy sources that produce low levels of greenhouse gas emissions and mitigate climate change. Increasing the use of low-carbon energy sources can help improve air quality and reduce dependence on fossil fuels, which can also have a positive impact on public health.

Renewable energy sources are considered the most sustainable and environmentally friendly option, as they produce little to no emissions and do not rely on finite fossil fuel resources. Renewable energy generation makes a significant contribution to GHG reduction. It can take many forms, but all shifts to renewable energy require drastic changes that are challenging to scale to meet current energy demand. These sources include renewable energy sources such as solar, wind, hydro, tidal, geothermal and renewable natural gas (RNG).

- Renewable natural gas (RNG): a type of natural gas produced through anaerobic digestion from renewable resources, such as organic waste from landfills, sewage treatment plants, and agricultural operations. It is considered a low-carbon energy source because it is produced from organic matter that would otherwise decompose and release methane, a potent greenhouse gas, into the atmosphere. It also can displace fossil fuel-based natural gas and reduce the overall greenhouse gas emissions.
- Solar energy: produced by capturing sunlight and converting it into electricity, primarily by using solar panels, which contain photovoltaic (PV) cells. When sunlight hits the PV cells, it excites the electrons inside, creating an electric current.
- Wind energy: produced by harnessing the natural movement of air to generate electricity. Wind turbines -- tall structures with rotating blades -- capture the wind's kinetic energy. Wind pushes the turbine blades, causing them to spin, and the spinning motion is connected to a generator that converts the mechanical energy into electricity.
- Hydro energy, also known as hydropower: produced by harnessing the power of flowing water typically by building a dam or a barrier across a river to create a reservoir of water behind it. When the water is released through the dam, it flows over turbines, causing them to spin, and the spinning motion is converted into electricity by a generator.
- Tidal energy: generated by capturing the power of ocean tides. Rising and falling tides create a flow of water that can be harnessed to produce electricity using devices such as underwater turbines, which spin as water flows through them, or by building tidal barrages that create a difference in water levels and generate electricity when water is released through turbines.
- Geothermal energy: produced by harnessing the natural heat from the Earth's core, which is generated by the radioactive decay of elements within the Earth and gets stored in underground reservoirs of hot water and steam. Geothermal power plants drill deep wells into the ground to access these reservoirs and bring the hot water or steam to the surface, where it is used to drive turbines and generate electricity.

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# Energy Generation Actions

| ACTION | DESCRIPTION | CATF TARGET OUTCOME | TIMING | GHG IMPACT | CO-BENEFITS | COST | METRICS |
|---|---|---|---|---|---|---|---|
| **ADOPT RNG** | All natural gas is carbon neutral (via RNG or offsets) by 2035 and fossil-free (no fossil fuel natural gas) after 2050. | E4: Switch to non-emitting energy sources. All energy is produced by net zero emissions means. | Start: Immediately<br><br>Completion: 2050 | High | Equity: Low<br>Employment: N/A<br>Cost Effectiveness: Low | N/A | Amount of natural gas converted to RNG |
| **ADOPT NEW RESIDENTIAL ROOFTOP SOLAR** | Achieve 50% thermal savings and 10% plug load savings in 100% of all existing buildings by 2040. | E4: Switch to non-emitting energy sources. All energy is produced by net zero emissions means. | Start: Immediately<br><br>Completion: 2035 | Low | Equity: Low<br>Employment: Low<br>Cost Effectiveness: Low | $$$$ | Amount of solar installed |
| **ADOPT NEW COUNTY ROOFTOP SOLAR** | 100% of new county facilities include solar photovoltaic (PV) by 2035. 50% of existing county facilities include solar PV by 2050 and battery storage. | E4: Switch to non-emitting energy sources. All energy is produced by net zero emissions means. | Start: Immediately<br><br>Completion: 2050 | Low | Equity: Low<br>Employment: Low<br>Cost Effectiveness: Low | $$$ | Amount of solar installed |
| **PROCURE GREEN ELECTRICITY** | 30% of residential and business customers purchase carbon-free electricity by 2025. | E2: Energy required for county operations produces net zero emissions.<br>E5: Renewable energy is produced and used locally to the highest degree possible.<br>E6: Energy provided is in dynamic response to demand. | Start: Immediately<br><br>Completion: 2025 | Low | Equity: Low<br>Employment: N/A<br>Cost Effectiveness: Low | N/A | Amount of green electricity purchased |

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# Energy Generation Actions Implementation Mechanisms

| Implementation Mechanisms | |
|---|---|
| **ADVOCACY** | Advocate for the implementation of HB 2021. |
| **ADVOCACY** | Advocate for the state to intervene to make it attractive for RNG companies to use locally-sourced RNG in Oregon. |
| **EDUCATION** | Promote the Solar Within Reach program to low and middle income earning homeowners to receive rebates for residential solar PV. |
| **EDUCATION** | Promote Oregon's Solar + Storage Rebate Program to residents, contractors and low-income service providers. |
| **EDUCATION** | Educate the community on the benefits of community energy and Renewable Energy Credit purchase programs available through PGE. |
| **EDUCATION** | Develop community education materials on the benefits of solar PV and storage, and address myths about the technologies. |
| **INFRASTRUCTURE** | Upgrade infrastructure to implement the RNG policy. |
| **INITIATIVE** | Work with PGE to involve individuals earning low incomes in future program design. |
| **INITIATIVE** | Convene PGE and local businesses to explore a program for businesses to sponsor green energy use in low income communities. |
| **INITIATIVE** | Undertake a study to explore local generation and distributed energy resources (micro-grid, district energy) opportunities, especially those that are supported through grant programs, can provide access to non-emitting energy for low income residents, and have a minimal impact on the environment, indigenous territories, and human health. |
| **INITIATIVE** | Develop and implement a county solar strategy/roadmap that aligns with the county solar policy and the modeled timeline for the county adding solar to new and existing facilities. |
| **INITIATIVE** | Engage the community on ground mount and community scale solar, explore future opportunities to create a Rural Renewable Energy Development (RRED) zone, add ground mount solar outside the urban growth boundary, and explore opportunities for the county or landowners to utilize the Rural Renewable Energy Development Zones tax exemption. |
| **INITIATIVE** | Study the county's ability to further incentivize solar and battery storage for new buildings, and ensure low-income service providers are part of the engagement process. |
| **POLICY** | Develop and adopt a county solar policy to add solar to all new county-owned buildings. |
| **POLICY** | Explore the development and adoption of a clean energy tariff ordinance that makes renewable energy opt out rather than opt in for residents and commercial energy customers. |
| **POLICY** | Create a policy to make use of all renewable natural gas sources controlled by the county (e.g. bio-methane from wastewater treatment). |

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# H. Waste and Wastewater

Waste and wastewater refer to the materials and liquids generated by human activities such as household, industrial, and commercial operations.

- Waste: Solid materials that are discarded as unwanted, such as garbage, paper, plastics, metal, and glass. The management of waste includes collection, transportation, treatment, and disposal through methods such as recycling, composting, incineration and landfilling. The goal of waste management is to reduce the amount of waste sent to landfills, minimize the environmental impact of waste disposal, and recover valuable resources from the waste stream. More broadly, the goal of sustainable materials management and consumption shifts is to reduce the amount of carbon emissions tied to the production, use and waste of products.
- Wastewater: The liquid by-products of human activities, such as sewage and industrial effluent, which is typically collected and transported through a network of pipes to a treatment facility. Wastewater treatment methods include physical, chemical, and biological processes. The goal of wastewater treatment is to remove pollutants and pathogens, so that the water can be safely returned to the environment or reused.

Proper management of waste and wastewater is essential for protecting public health and the environment; preventing the pollution of air, water, and soil; conserving resources, and recovering valuable materials.  It can also reduce greenhouse gas emissions by focusing on three key areas: waste reduction, recycling, and proper disposal.

1. Waste reduction: Minimizing the amount of waste generated can lower the overall demand for new products and materials, which in turn reduces the energy and emissions associated with manufacturing and transportation.
2. Recycling: Recycling materials like paper, plastic, glass, and metals helps to decrease the need for extracting and processing raw materials. This conserves energy and reduces the associated emissions from resource extraction, transportation, and manufacturing processes.
3. Proper disposal: Organic waste, such as food scraps and yard trimmings, can release methane, a potent greenhouse gas, when they decompose in landfills. Composting these materials  reduces methane emissions and creates valuable soil amendments that help store carbon in the soil. Additionally, capturing and using landfill gas (a mix of methane and carbon dioxide) as a source of energy can also help reduce greenhouse gas emissions.

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# Waste and Wastewater Actions

| ACTION | DESCRIPTION | CATF TARGET OUTCOME | TIMING | GHG IMPACT | CO-BENEFITS | COST | METRICS |
|---|---|---|---|---|---|---|---|
| **DIVERT ORGANIC WASTE** | Reduce organic waste sent to landfills by 50%. | FA3: Recycling and waste prevention -- reduce/ eliminate consumption emissions upstream from landfills | Start: Immediately<br><br>Completion: 2030 | Low | Equity: High<br>Employment: Medium<br>Cost Effectiveness: N/A | To be costed when feasibility study conducted | Amount of waste diverted from landfill |
| **RECOVER WASTEWATER METHANE** | Maximize RNG generation and onsite use at all Waste Water Treatment Plan (WWTP) facilities in Clackamas County where applicable.<br><br>Produce renewable natural gas (and other fuels) locally from wastewater treatment. | FA1: Reduce wastewater emissions system-wide. | Start: Immediately<br><br>Completion: 2030 | Medium | Equity: N/A<br>Employment: N/A<br>Cost Effectiveness: Low | $$$$$ | Amount of renewable natural gas generated from WWTP |

# Waste and Wastewater Implementation Mechanisms

| Implementation Mechanisms | |
|---|---|
| **ADVOCACY** | Advocate for the continued development of extended producer responsibility programs across the state for materials with significant carbon impacts, and for education materials to be developed by the producer responsibility organizations (PROs)[11]. |
| **ADVOCACY** | Advocate for the implementation of SB 582, the development of producer responsibility organizations packaging by 2024 and implementation of packaging-oriented extended producer responsibility programs by 2025. |
| **ADVOCACY** | Advocate for the implementation of recommendations made by the Oregon Truth-in-Labeling Task Force, including mandated customer-facing recyclability labels. |
| **EDUCATION** | Educate residents on food waste reduction. |

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[11] Producer responsibility organizations (PROs) support manufacturers, importers, and retailers in meeting their extended producer responsibility (EPR) obligations. EPR is a policy approach that makes producers responsible for the post-consumer management of their products, including waste management, recycling, and disposal.

| Implementation Mechanisms | |
|---|---|
| **INFRASTRUCTURE** | Maximize biomethane[12] production. |
| **INITIATIVE** | Investigate the potential for heat capture from wastewater to utilize as on-site energy. |
| **PROGRAM** | Adopt residential and multifamily food scraps collection programs for inclusion of food waste in yard debris. |

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[12] Renewable natural gas (RNG) and biomethane are often used interchangeably to describe the same product. Both refer to a sustainable and environmentally-friendly form of natural gas produced from organic waste material, such as agricultural waste, landfill waste, and wastewater treatment plant waste. To convert biomethane into RNG, it undergoes a purification process to remove impurities and other gases such as carbon dioxide, hydrogen sulfide, and moisture. The purified biomethane, now called RNG, has similar properties to fossil-based natural gas and can be used interchangeably in the same applications, including heating, electricity generation, and transportation fuel. The main advantage of RNG is that it's derived from renewable sources and helps reduce greenhouse gas emissions, making it a more sustainable energy option.

# I. Natural Sequestration

Natural sequestration refers to the process by which carbon dioxide ($CO_2$) and other greenhouse gasses are naturally absorbed and stored in various carbon sinks such as oceans, soils, forests, and wetlands. These carbon sinks act as a "buffer" against the increasing levels of $CO_2$ in the atmosphere, helping to mitigate the effects of climate change.

- Forests act as carbon sinks by absorbing $CO_2$ through photosynthesis, a process in which plants convert $CO_2$ and water into oxygen and sugar. The carbon is stored in the trees, and other vegetation in the form of biomass.
- Wetlands and coastal ecosystems, such as seagrass beds, mangroves, and salt marshes, act as carbon sinks by absorbing and storing large amounts of carbon in soil and sediment.
- Oceans play a large role as a carbon sink by absorbing about 25% of the $CO_2$ emitted by human activities.

Natural sequestration can also be enhanced through conservation and restoration efforts, such as reforestation, afforestation [13], agroforestry, and sustainable land management practices. It can also be enhanced through ocean fertilization, which increases the growth of phytoplankton and other microorganisms that absorb $CO_2$.

Natural sequestration is considered a complementary approach to reducing greenhouse gas emissions and mitigating climate change, rather than a substitute for it, as the $CO_2$ emissions are still being produced and the storage capacity of natural sinks[14] is limited.

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[13] Afforestation and reforestation are both processes related to the establishment of trees in an area, but they differ in terms of the previous state of the land. Afforestation refers to the establishment of a forest or the planting of trees in an area where there were no trees before. This can be done on land that has never been forested or on land that was deforested long ago and has since been used for other purposes, such as agriculture or urban development. Reforestation, on the other hand, involves planting trees in an area that was recently deforested or had a significant reduction in forest cover. This can occur naturally through the regeneration of native tree species or through human intervention, such as planting trees to replace those that were cut down or lost due to natural disasters, logging, or other human activities.

[14] Natural sinks refer to natural systems' ability to absorb carbon from the atmosphere. For example: trees.

# Natural Sequestration Actions

| ACTION | DESCRIPTION | CATF TARGET OUTCOME | TIMING | GHG IMPACT | CO-BENEFITS | COST | METRICS |
|---|---|---|---|---|---|---|---|
| **CONSERVE LANDS WITH HIGH GHG BENEFITS** | Enroll 8,000 acres of lands with high GHG sequestration benefits into the Conservation Reserve Program (CRP) and the Agricultural Conservation Easement Program (ACEP) to reduce GHG emissions through riparian buffers, tree planting, and the conservation of wetlands and organic soils. | No Target Outcome identified. | Start: Immediately<br><br>Completion: 2050 | TBD | Equity: TBI<br>Employment: TBI<br>Cost Effectiveness: TBI | Out of scope for this project. | Number of acres sequestered in the CRP and ACEP. Amount of GHG emissions reduced. |
| **PLANT TREES IN COMMUNITY AREAS** | Plant a new tree for every resident of Clackamas (418,000) in Clackamas County between 2022 and 2050 and manage using regenerative agriculture methods. | FA4: Reduce countywide emissions due to Ag/Forest activities. | Start: Immediately<br><br>Completion: 2050 | Low | Equity: TBI<br>Employment: TBI<br>Cost Effectiveness: TBI | Out of scope for this project. | Number of trees planted. |
| **INCREASE SOIL SEQUESTRATION** | Increase sequestration in soils by promoting no-till farming, responsible fertilizer use, etc. | FA5: Increase countywide carbon storage & sequestration | Start: Immediately<br><br>Completion: 2050 | TBD | Equity: TBI<br>Employment: TBI<br>Cost Effectiveness: TBI | Out of scope for this project. | TBD.[15] |

# Natural Sequestration Implementation Mechanisms

| Implementation Mechanisms | |
|---|---|
| **ADVOCACY** | Advocate for the state to implement its new goals for carbon sequestration with programs that support local government action. |
| **ADVOCACY** | Advocate for state funding for wetland expansion. |
| **ADVOCACY** | Advocate for the approval of the $5 million funding request from the Oregon Agricultural Heritage Program to the state government to be used as a match for federal dollars to implement agricultural easements with willing landowners. |

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[15] This action is difficult to measure, but important. A metric will be developed, going forward, that is appropriate for this action.

| Implementation Mechanisms | |
|---|---|
| **EDUCATION** | Encourage conservation easements to protect forests and high-value natural heritage lands. |
| **EDUCATION** | Educate residents and landowners on preserving current trees including minimizing forest fire risk. |
| **EDUCATION** | Publicly share information on how to install and maintain green infrastructure. |
| **EDUCATION** | Be a hub for information and promote agricultural practices that increase sequestration in soils. |
| **EDUCATION** | Promote the Conservation Reserve Program and the Agricultural Conservation Easement Program to landowners and other conservation easements. |
| **INITIATIVE** | Develop an urban forest management strategy with recommendations on the following:<br>• Meeting the canopy cover target and number of trees planted, focusing on both individual plantings (street trees) and opportunities to create new rural and urban forests<br>• Identifying trees resilient to expected changes in climate, and building resilience through diversified plantings throughout the county<br>• Maintaining a county-wide tree inventory, and monitoring and tracking tree conditions<br>• Introducing improved soil standards for new county plantings<br>• Monitoring for and managing climate-related risks to trees such as diseases, pests, and heat stress, and identifying the introduced species that can be planted to maintain canopy targets, as well as ways to manage habitat loss for birds and animals reliant on current tree species in the county<br>• Identifying roles for the county, local organizations, and resident scientists, including considering a collaborative tree monitoring program throughout the community |
| **INITIATIVE** | Host community tree planting events and utilize the events to disseminate information about green infrastructure. |
| **INITIATIVE** | Develop a strategy for the county to conserve forests and high natural heritage value lands. |
| **INITIATIVE** | Plant trees alongside trails, sidewalks, and outdoor sports fields/facilities to provide cooling benefits. |
| **INITIATIVE** | Increase planting around creeks to maintain creek temperatures. |
| **INITIATIVE** | Assess the health of wetlands within the county and develop restoration plans. |
| **INITIATIVE** | Assess current canopy cover in the county, as a whole and separately in more and less developed areas, and with an equity lens (e.g. are there vulnerable communities with less canopy cover that could lead to increased heat risk?). |
| **INITIATIVE** | Assess the need/ability for the county to purchase additional lands for tree planting. |
| **INITIATIVE** | Add conserved land data/mapping to the county's website/open data and actively reach out to partners and stakeholders to share information. |
| **POLICY** | Strengthen policy-based protection of natural heritage systems, woodlands, and floodplain areas from development, and utilize zoning ordinances to create and maintain connected natural heritage systems. |
| **POLICY** | Develop policies to maintain existing tree canopy coverage. |
| **POLICY** | Develop policies to require enhanced wetland, marsh and riparian buffer areas. |
| **POLICY** | Set a county-wide canopy cover target of at least 40% and an overall natural cover target that includes wetlands and tall grass of 60%. |
| **POLICY** | Update standards for green space access and tree planting to address climate change in new developments and determine the funding structure (i.e., co-pay by the county and developers). |

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| Implementation Mechanisms | |
|---|---|
| **POLICY** | Update standards for tree planting on new private developments to incorporate climate-based targets. |
| **PROGRAM** | Increase tree management to help young trees thrive in a changing climate. For example, increase watering, add watering bags/gators to street trees and educate property owners on proper care; assist the migration of native trees to areas where they are more likely to survive. |
| **PROGRAM** | Develop educational materials and a support program to encourage tree buffers for soil protection on agricultural lands. |

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