Energy & Climate Change Chapter

2021 Comprehensive Plan Update

Lakewood Community & Economic Development Department

Lakewood Planning Commission Review/Recommendations

- February 17, 2021
- March 24, 2021
- April 7, 2021
- April 21, 2021 (Public Hearing)
- May 5, 2021, Recommendation, Resolution No. 2021-02

Lakewood City Council Review/Adoption

- May 24, 2021 Study Session
- June 7, 2021 (Public Hearing)
- June 14, 2021 Study Session
- July 6, 2021 Adoption, Ordinance No. 756

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Contents

Acronyms 3

Energy & Climate Change Chapter – Lakewood Comprehensive Plan 4

Purpose of the Chapter 4

What is Climate Change? 4

Renewable Energy Today 5

Potential Impacts of Climate Change 6

Climate Change in the Pacific Northwest 6

Climate Change Impacts to Washington 6

Climate Change Impacts to Pierce County 7

Climate Change Impacts to Lakewood 9

Climate Change, Environmental Justice, & Equity 9

Recent Washington State Legislation, Engrossed 2nd Substitute 5141 (also known as the HEAL Act) 9

Lakewood City Council Statement on Equity 10

Lakewood Climate Change Advantages and Challenges 11

COVID-19 Impacts 14

Citywide Greenhouse Gas Emissions 14

What GHGs are included? 15

What economic sectors and emission sources are included? 16

Transportation 16

Buildings 17

Solar 19

Google Environmental Insights Explorer GHG Initial Estimates 19

Google Environmental Insights Explorer Rooftop Solar Potential 20

Washington State GHG Emission Reduction Standards 21

Lakewood Energy Generation and Use 22

Carbon Sequestration 24

Key Findings and Recommendations 30

Finding 1: Lakewood can provide leadership and engagement 30

Finding 2: Lakewood can actively regulate land uses to reduce greenhouse gas emissions 30

Finding 3: Lakewood can improve upon its active modes of travel. 31

Finding 4: Restoring and protecting the natural environment will help to mitigate impacts of climate change. 31

ADOPTED

Finding 5: Preparing for potential climate change impacts is as critical as reducing greenhouse gas impacts and planning for long-term sustainability. 31
Energy & Climate Change, Goals, Policies, & Actions 32
Goal EC 1: Provide Leadership in Managing Climate Change. 32
Goal EC 2: Improve Clean and Efficient Transportation Options. 35
Goal EC 3: Increase Sustainable and Energy-Efficient Systems. 39
Goal EC 4: Encourage Sustainable Development. 42
Goal EC 5: Develop a Hazards Management Plan (developing a climate-resilient community). 47

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Acronyms

COVID-19	Coronavirus Disease 2019
CO2	Carbon dioxide
CO2e	Carbon dioxide equivalent
DOH	Department of Health
EPA	Environmental Protection Agency
GHG	Greenhouse gas, limited to CO2, CH4, N2O, and fugitive gases
LKVW	Lakeview Light and Power
MgCO2e	Million metric tons of carbon dioxide equivalent (or its equivalent)
MMTCDE	Million metric tons of carbon dioxide equivalents
MTC02	Metric tons of carbon dioxide (or its equivalent)
MWH	Megawatt-hour (1,000 kilowatt-hours)
NLCD	National Land Cover Database
PSE	Puget Sound Energy
tCO2e	Metric tons of carbon dioxide (or its equivalent) used by Google EIE
TP	Tacoma Power
WDOC	Washington Department of Commerce
WDOT	Washington Department of Transportation
WDOTR	Washington Department of Transportation – Rail Division
VMT	Vehicle Miles Traveled

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Energy & Climate Change Chapter – Lakewood Comprehensive Plan

It is increasingly evident that there are dramatic relationships between greenhouse gas emissions and local transportation and land use patterns. Lakewood has opportunities to build higher density, mixed-use projects around existing public transit infrastructure, schools, parks and neighborhoods. Energy efficiency and sustainability can be further enhanced by incorporating green materials and construction practices into buildings and streetscape improvements. Sustainable development concepts such as natural resource conservation, transit-oriented development, multimodal transportation access and the encouragement of green building are integrated throughout this Comprehensive Plan Chapter.



Figure 1 *(ART DAILY, June 2019)*

The Energy and Climate Change Chapter:

- Describes potential climate change impacts, energy use and greenhouse gas emissions;
- Highlights key findings and recommendations;
- Defines goals for energy and climate change;
- Identifies policies and implementing tasks to address energy and climate change needs; and
- Provides a summary table identifying lead responsibilities for each implementing task.

Purpose of the Chapter

This chapter examines how the city's policies will affect energy consumption and determines what measures can be implemented to reduce greenhouse gas emissions to state required levels. The chapter provides policy direction for conserving energy resources and responding to climate change. Broadly framed goals address energy conservation, renewable energy generation and use, and sustainable and responsible community revitalization. More specifically, policies and implementing tasks are designed to: provide leadership ~~to manage~~ on climate change; promote clean and efficient transportation options; encourage sustainable and efficient energy systems; promote sustainable development; support community revitalization; and build a climate-resilient community.

What is Climate Change?

A balance of naturally occurring gases dispersed in the atmosphere determines the Earth's climate by trapping solar radiation. This phenomenon is known as the "greenhouse effect." Modern human activity, most notably the burning of fossil fuels for transportation and electricity generation, introduces large amounts of carbon dioxide and other gases into the atmosphere. Reductions in the planet's forested regions where greenhouse gases are stored is also a major contributor to the increasing greenhouse effect. Collectively, these gases intensify the natural greenhouse effect, causing global average surface temperature to rise, which in turn affects global climate patterns.

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Renewable Energy Today

Fossil fuels are the primary source of energy in America today. The transportation sector is the single largest consumer of fossil fuels, followed by buildings which use large amounts of energy for lighting, heating and cooling. In addition to growing global, national and local concern over potential impacts of fossil fuel use and their impacts on overall environmental health, there is also widespread uncertainty about the availability and cost of energy.

As the cost of fossil fuel increases, alternatives to private automobiles will become more economically viable. The market for renewable energy is growing each year. Increased greenhouse gas emissions (GHGs), especially CO2 from the use of fossil fuels for energy generation, the dwindling existence of fossil fuel coupled with its high costs, are fueling the renewable energy market. However, the generation of energy from renewable sources requires very large capital investments.

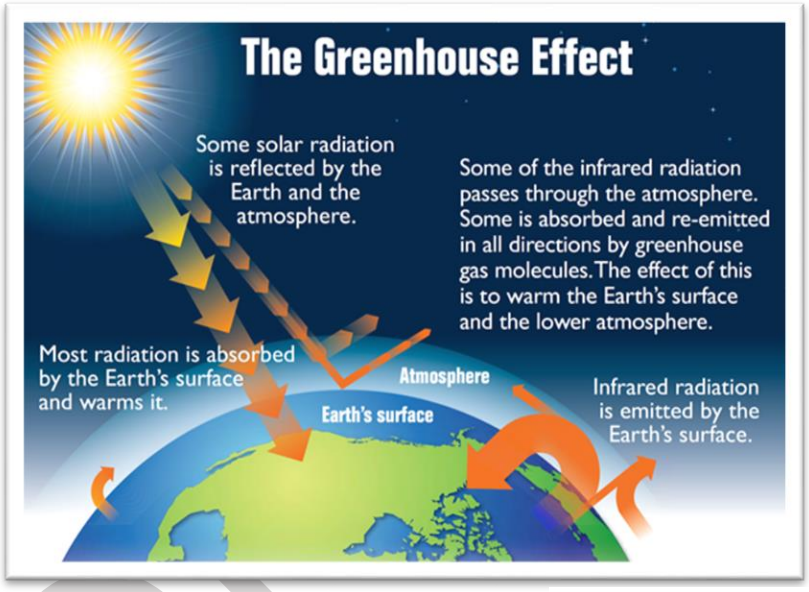


Figure 2 *(EPA 2012)*

For the first time ever, in April 2019, this country's renewable energy outpaced coal by providing 23 percent of US power generation, compared to coal's 20 percent share.[i] In the first half of 2019, wind and solar together accounted for approximately 50 percent of total US renewable electricity generation, displacing hydroelectric power's dominance.

Declining costs and rising capacity factors of renewable energy sources, along with increased competitiveness of battery storage, drove growth in 2019. In the first half of the year, the cost of onshore wind and utility-scale solar declined by 10 percent and 18 percent, respectively, while offshore wind took a 24 percent dip.[ii] The greatest decline was in lithium-ion battery storage, which fell 35 percent during the same period.[iii] This steady decline of prices for battery storage has begun to add value to renewables, making intermittent wind and solar increasingly competitive with traditional, "dispatchable" energy sources.

The renewable energy sector saw significant demand from most market segments as overall consumer sentiment remained positive. Renewable energy consumption by residential and commercial customers increased 6 percent and 5 percent, respectively, while industrial consumption declined slightly, by 3 percent, through June 2019 compared with the previous year.[iv] As in 2018, US corporate renewable

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energy contracts once again hit new levels, as corporations signed power purchase agreements (PPAs) for 5.9 gigawatts (GW) of renewable energy in the first half of 2019.[v]

Potential Impacts of Climate Change

The Intergovernmental Panel on Climate Change findings confirm that human activities are the primary cause of climate change.[vi] Climate impacts can be difficult to observe, in part because changes occur slowly over many years.

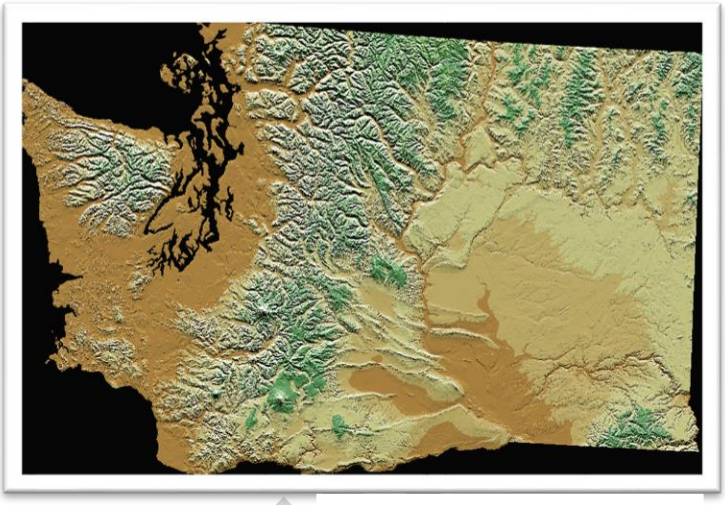


Figure 3 *(Unknown Source)*

Scientists expect changing temperatures to result in: disruption of ecosystems; more frequent and damaging storms accompanied by flooding and landslides; increases in the number and severity of heat waves; extended water shortages as a result of reduced snow pack; increased likelihood of wildfires; and disturbance of wildlife habitats and agricultural activities.

Climate Change in the Pacific Northwest[vii]

By the 2020s, the average temperatures could be higher than most of those experienced during the 20th Century. Seasonally, the Pacific Northwest will experience warming in summer and winter.

Slight changes in summer and winter precipitation are anticipated. Changes in summer precipitation are less certain than changes in winter precipitation. Future years are projected to continue to swing between relatively wet and dry conditions, making it likely that the change due to climate change will be difficult to notice.

There has been an observed increase in the variability of average winter (October-March) season precipitation since 1973 for the Pacific Northwest, but no information on changes at smaller time scales (monthly, daily changes). The cause of this change is unknown. Heavy rainstorms are expected to increase globally; whether they do in the Pacific Northwest will be related to where and how the storm track moves in the future – it could increase, decrease, or stay the same.

Sea levels will increase globally, but there is much uncertainty in the specific amount of increase and how it will vary by location. Coupled with sea level rise, there could also be land subsidence.

Any changes in windstorms are unknown.

Climate Change Impacts to Washington

The United States Environmental Protection Agency (EPA) published a synopsis of the impacts that climate change could have on Washington. Over the past century, most of Washington State has warmed one to two degrees (F). Glaciers are retreating, the snowpack is melting earlier in the year, and the flow of meltwater into streams during summer is declining. In the coming decades, coastal waters

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will become more acidic, streams will be warmer, populations of several fish species will decline, and wildfires may be more common.

Sea level rise will threaten coastal development and ecosystems. Erosion will threaten homes and public property along the shore. Increased flooding could threaten wastewater treatment plants, ferry terminals, highways, and railroads along Puget Sound.

Mudflats, marshes, and other tidal wetlands provide habitat for birds and fish. As water levels rise, wetlands may be submerged or squeezed between the rising sea and structures built to protect coastal development.

Three thousand glaciers cover about 170 square miles of mountains in Washington, but that area is decreasing in response to warmer temperatures.

The flows of water in rivers and streams are increasing during late winter and early spring but decreasing during summer. Warmer winters have reduced average snowpack in Washington by 20 percent since 1950. The snowpack is now melting a few weeks earlier than during the 20th century, and, by 2050, it is likely to melt three to four weeks earlier. Decreasing snowpack means there will be less water flowing through streams during summer. Moreover, rising temperatures increase the rate at which water evaporates (or transpires) into the air from soils and plants. More evaporation means that less water will drain from the ground into rivers and streams.

Declining snow and streamflow would harm some economic sectors and aquatic ecosystems. Less snow means a shorter season for skiing and other winter recreation. Water temperatures will rise, which would hurt Chinook and sockeye salmon in the interior Columbia River Basin. The combination of warmer water and lower flows would threaten salmon, steelhead, and trout. Lower flows would also mean less hydroelectric power.

Climate change is likely to more than double the area in the Northwest burned by forest fires during an average year by the end of the 21st century. Higher temperatures and a lack of water can also make trees more susceptible to pests and disease, and trees damaged or killed burn more readily than living trees. Changing climate is likely to increase the area of pine forests in the Northwest infested with mountain pine beetles over the next few decades. Pine beetles and wildfires are each likely to decrease timber harvests. Increasing wildfires also threaten homes and pollute the air.

The changing climate will affect Washington's agricultural sector, particularly fruits and vegetables, which often require irrigation. Because streams rather than ground water provide most of Washington's irrigation water, the expected decline in streamflow would reduce the water available for irrigation. About two-thirds of the nation's apples come from Washington, and most are grown east of the Cascade Mountains where the dry climate requires irrigation. The Washington Department of Ecology is concerned that yields of apples and cherries may decline in the Yakima River Basin as water becomes less available. Alfalfa, potato, and wheat farmers also require substantial irrigation.

Climate Change Impacts to Pierce County

Pierce County's climate change impacts mirror many of the impacts associated with Washington State.

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Sea levels, depending on future global trends in greenhouse gas emissions and glacial melt rates, are anticipated to rise by up to 6 inches by 2030; up to 15 inches by 2050; and up to 57 inches by 2100.

Ocean acidity is projected to increase 38–109 percent by 2100 relative to 2005 levels. Corrosive conditions are particularly of concern to the shellfish industry in Puget Sound, which depends on good water quality to grow oysters, clams and mussels.

Stream temperatures in the Pacific Northwest are projected to increase by 3°F by 2080. Warmer water temperatures will also result in more lake closures and could be lethal to salmonids and other aquatic species.

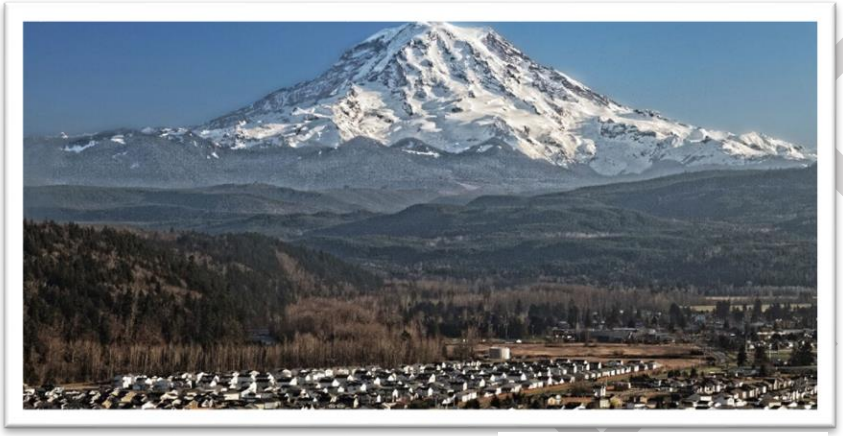


Figure 4 *(Pierce County)*

Current trends indicate that Mount Rainer's glaciers - and other sources contributing to summertime stream flows and sedimentation in Puget Sound watersheds - will continue to melt as temperatures warm. In all years between 2003 and 2009, there has been a net melting of the Emmons and Nisqually Glaciers between 0.5- and 2.0-meters water equivalent.

Extreme heat events will become more frequent while extreme cold events will become less frequent. Wildfires are expected to become more common as temperatures rise and less rain falls during summer months.

Landslides are expected to become more common in winter and spring due to projected increases in extreme precipitation events and increasing winter precipitation, particularly in areas most prone to present-day landslides.

Flood risk is projected to increase during the fall and winter seasons as warmer temperatures cause more precipitation to fall as rain over a larger portion of the basin. Eight of the top ten peak floods have been recorded since 2006. Less snowmelt will cause the lowest flows to become lower in the summer months.

For rivers originating on Mount Rainier, including the Puyallup, White, Nisqually, and Carbon Rivers, sediment loads are expected to increase, further contributing to flood risk, as declining snowpack and glacial recession expose more unconsolidated soils to rain, flood flows, and disturbance events.

Total annual precipitation in the Pacific Northwest is not projected to change substantially, but heavy rainfall may be more frequent and intense, and summer precipitation may decrease. More rain and less snow will fall in the winter.

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Climate Change Impacts to Lakewood

Local impacts are not definitive, but Lakewood could experience:

1. Changes to local weather patterns leading to more frequent peak storm events;
2. Rising Puget Sound water levels which could influence Chambers Creek Dam at high tides and eventually lead to overtopping;
3. Intermittent lakes, such as Carp Lake are likely to become more intermittent, or may disappear;
4. Areas with steep slopes, such as Chambers Creek Canyon, with heavy rainfall events, could lead to increased landslides.
5. Increased flood risk in the Clover Creek watershed; rising flood waters could impact I-5 between Highway 512 and Bridgeport Way;
6. Additional pollutant loading from peak storm events and higher summer temperatures are likely to make existing water quality issues in the city's numerous lakes and streams worse (expect depleted oxygen levels and more algae bloom events); and
7. Potential for fires in Fort Steilacoom Park, the open space areas behind Western State Hospital, JBLM lands adjacent to the city limits, and vacant lands within the I-5 and Highway 512 Corridors. Loss of vegetation and impacts to air quality are at risk.

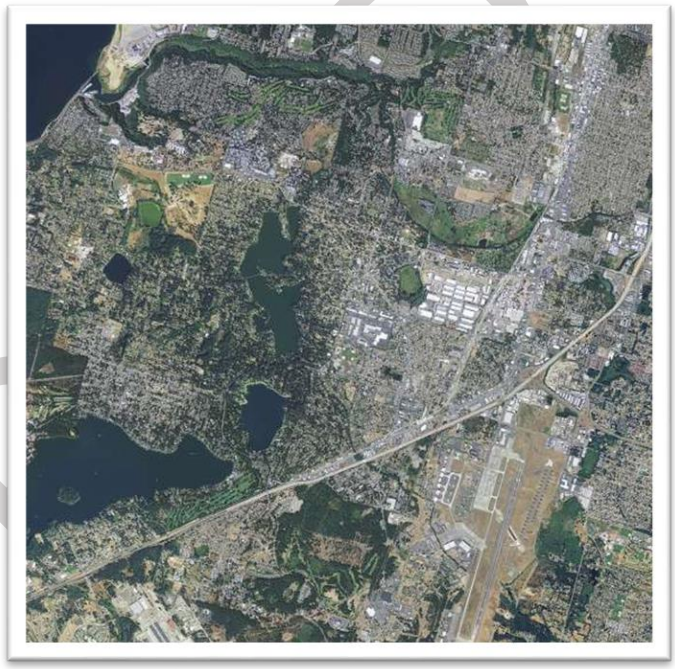


Figure 5 *(LANDSAT)*

Climate Change, Environmental Justice, & Equity

Recent Washington State Legislation, Engrossed 2nd Substitute 5141 (also known as the HEAL Act)

Recently enacted with an effective date of July 25, 2021, the HEAL Act defines environmental justice in state law, creates an Environmental Justice (EJ) Council and an interagency workgroup, and requires the Departments of Health, Ecology, Agriculture, Natural Resources, Commerce, and Transportation, and the Puget Sound Partnership to:

- Incorporate EJ in their strategic plans or other planning documents;
- Plan for meaningful community engagement and public participation;
- Conduct environmental justice assessments;
- Implement equitable budget and funding practices; and
- Report progress, as evaluated by the EJ Council, in implementing the requirements of the HEAL act on public dashboards.

HEAL requires that the Department of Health (DOH), in consultation with the EJ Council, continue to develop and maintain an environmental health disparities map with the most current information

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necessary to identify cumulative environmental health impacts and overburdened communities. State agencies would be directed to consider environmental justice throughout their actions and decision-making processes, ultimately helping the state meet its environment and equity goals more efficiently and effectively. The HEAL Act is meant to improve the enforcement and implementation of statewide programs and policies to work towards ensuring the highest attainable environmental quality and health outcomes for the state and its residents.

The environmental health disparities map is available online. A review of the map shows Lakewood's level of disparities is fairly high for large sections of the city (but not nearly as significant as the city of Tacoma). Neighborhoods with the high levels of disparity and exposure include northeast Lakewood (the Air Corridor zones), central Lakewood, Springbrook, Tillicum, and Woodbrook. Lakewood also has two sites on the Superfund National Priority List, one in Woodbrook and the other in Springbrook near Pacific Highway SW. Nearby, there are six Superfund National Priority sites found on McChord Field. An excerpt of the map has been provided.

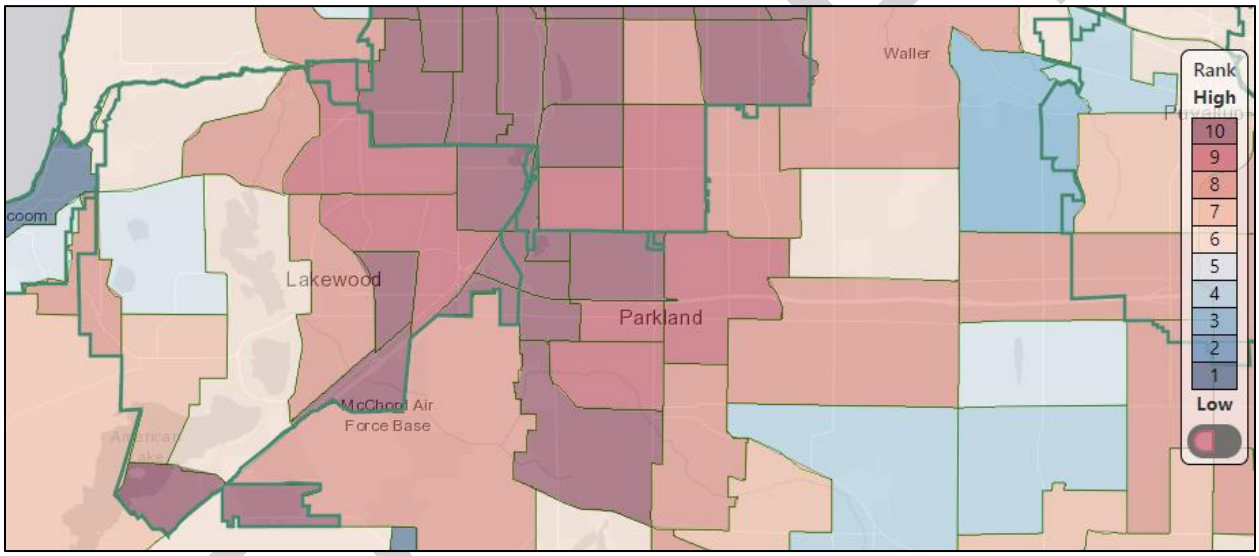


Figure 6 *(State DOH)*

The HEAL Act remains a work-in-progress with many deliverables due in 2023 including possible grants and contracting opportunities that effectuate environmental justice principles, and establish a goal of directing 40 percent of expenditures that create environmental benefits to vulnerable populations and overburdened communities. The HEAL Act budgets and funding processes is an area that community leaders will want to monitor.

Lakewood City Council Statement on Equity

Related to environmental justice principles, the Lakewood City Council adopted Resolution 2021-05 acknowledging that equity is essential to a healthy community. The Council committed to the following practices:

- Instilling equity as a priority of policy and the delivery of services;
- Enacting initiatives that support and celebrate the diversity of the community;
- Ensuring equity in municipal planning;
- Identifying and dismantling preconceived prejudices;
- Increasing sensitivity to social norms and cultural expectations; and

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- Pursuing justice and equity for all residents.

While no mention is made to environmental justice, the city's practices aligns closely with the HEAL Act definition of environmental justice, "…the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. This includes addressing disproportionate environmental and health impacts by prioritizing vulnerable populations and overburdened communities, equitably distributing resources and benefits, and eliminating harm."

This comprehensive plan chapter, along with its implementation program, imbeds environmental justice/equity policies and programs. These are marked by the blue arrow – "➔"

Lakewood Climate Change Advantages and Challenges

Lakewood has advantages and challenges as it prepares for climate change.

Advantages

Climate: Lakewood's moderate climate means lower heating and cooling demands than other areas in the nation and globally.

Access to hydroelectric power: Two of the three power companies that serve Lakewood receive power from hydroelectric plants.

➔ **Rental Housing Safety Program (RHSP):** Requiring minimum building code inspections in the city's large and older rental housing stock potentially reduces energy costs for renters, many of whom fall into low-income categories. According to the U.S. Energy Information Administration, 43 percent of renters report examples of energy insecurity compared to 24 percent of homeowners. Building energy efficiency is widely recognized as one of the best strategies for combating climate change and other energy problems.

Infill Potential: Several underutilized parcels provide opportunities to develop walkable, mixed-use environments to meet resident's needs. However, care must be taken so as to

Challenges

Lakewood is a relatively new city: Upon incorporation in 1996, Lakewood faced many challenges in providing basic municipal services. Climate change policy was not a priority. However, as the city has matured, it is now beginning to examine climate change and its impacts upon the city and region.

Older housing stock: Even though Lakewood incorporated in 1996, as a community, it has been around for over 100 years. Lakewood is primarily a suburb of Tacoma. Much of the housing stock is older and likely needs substantial upgrades to improve energy conservation.

Location: Employment centers are primarily found in Tacoma and the Seattle-Metro area, requiring reliance upon transportation to get to work. Twenty-one percent of resident's commute to Tacoma, and 19 percent to the Seattle-Metro area. About 79 percent use single occupant vehicles, 10 percent use carpool, and five percent use public transit. Average commute distance is 26.4 miles[viii]. Commute trips are significant factors that increase CO2 production.

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ensure that these parcels connect to community attributes and open space, whether public or private.

Transportation: *Some* residents have convenient access to transportation alternatives. Pierce Transit provides several bus routes connecting Lakewood to other parts of Pierce County. Sound Transit provides regular bus transportation to Sea-Tac International Airport, in addition to a commuter rail station. Two transit stations and two park-and-rides are in the city.

Recently revised land use regulations: Lakewood has adopted a Downtown Subarea Plan. A second subarea plan is under preparation for the Lakewood Station District.

Adopted non-motorized transportation plan: The plan provides a comprehensive plan to enhance the Lakewood urban area pedestrian and bicycle systems. This effort was initiated by the city to address long range transportation goals and policies. Originally adopted in 2009, the plan should be updated to better reflect many land policies changes that have occurred in the past 10-years.

In 2013, the city amended the non - motorized plan figures for bike and pedestrian routes. This action was taken as part of the adoption of the Transportation Benefit District. The city did not formally update the non-motorized plan.

Adopted complete streets policy: The city adopted an ordinance in 2016 recognizing transit, bicycling, and walking as fundamental modes of transportation are of equal importance to that of passenger vehicles. This led to the city reconstructing Motor Avenue SW into a complete street.

Lack of a street network: A very limited grid street network is found in the city's older neighborhoods, namely Tillicum, and Lakeview. This creates access issues and requires additional vehicle miles traveled to reach destinations and can discourage walking or biking alternatives.

Lack of street infrastructure: Much of Lakewood lacks curbs gutters, and sidewalks, the basic elements that promote connectivity. While the city has taken steps to improve the situation, current conditions make it difficult to promote walkability when many of the basic services are non-existent.

➔ **Transportation:** Several challenges persist with providing adequate transportation for all Lakewood residents. The community lacks a bus rapid transit system. Sound Transit commuter service is limited. Low-income neighborhoods and areas with high unemployment may not be adequately served by public transit.

Underlying land use patterns: Current land use patterns were established by Pierce County. The county's zoning followed very basic principles. It did not offer much protection from incompatible uses. The county zoning promoted strip commercial development and auto-dependent uses.

Lakewood is not a full-service city: Water is provided by the Lakewood Water District. Sewer is provided by Pierce County Utilities. Waste collection is provided under contract with Waste Management Services. Power is provided by three different power purveyors, Puget Sound Energy, Tacoma Power, and Lakeview Light and Power, a mutual non-profit company. The city does not control these agencies.

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Promoting energy conservation: The city has already installed LED lighting for all streetlights (2,372) and all traffic signals (69).

Open space protections: City has taken action to protect and preserve open spaces both on private and public properties. A review of the National Land Coverage Database, between 2001 and 2016, shows no net loss in open space. City has also been active in expanding parks.

Tree preservation: Since 2001, the city has had in place a tree preservation ordinance. The city is also proactive in regard to removal of trees without permits; over the years, the city has substantially fined property owners. Fines that are collected go into a tree preservation fund which was informally established through the city's master fee schedule. In 2019, with the adoption of Ordinance 726, the city established a city tree fund, Section 18A.70.330. City uses agreed upon restoration payments or settlements in lieu of penalties for removing trees without permits, donations/grants, and other funds allocated by the Council for the following purposes: 1) Acquiring, maintaining, and preserving wooded areas within the City; 2) Planting and maintaining trees within the City; 3) Establishment of a holding public tree nursery; 4) Urban forestry education; Implementation of a tree canopy monitoring program; 5) Scientific research; or 6) Other purposes relating to trees as determined by the City Council.

State Environmental Policy Act (SEPA): As circumstance warrant, the city uses SEPA and LMC Title 14 to mitigate for the loss of trees associated with urban development. In many situations, not all, city requires open space areas to be set aside from development.

City's regulating controls: City has enacted several regulations designed to protect or preserve and enhance the preservation of trees. Examples include the planned

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development district, cottage housing, and the city's tree preservation code, in addition to LMC Title 14.

Floodplain protections: The city updated its floodplain regulations creating an overlay zone and new development standards.

Shoreline Master Program (SMP): SMP regulations restrict development in areas buffering water bodies, streams, or wetlands.

COVID-19 Impacts



Figure 7 *(Unknown source)*

COVID-19 has increased teleworking opportunities for employees which has decreased greenhouse gas emissions from commuting. New estimates based on people's movements suggest that global greenhouse gas emissions fell roughly 10 to 30 percent, on average, during April 2020 as people and businesses reduced activity[ix]. Highway traffic is down 17 percent in Washington State; Pierce Transit has seen a dramatic reduction in ridership, in some cases depending on the day, as much as 70 percent[x]. Employees have adjusted to using virtual platforms for note taking, document sharing and more. Ensuring all employees have the proper resources and training on paperless tools will aid in reaching reduction goals.

The overall impact COVID-19 has on GHG emissions is unknown but will be assessed once the pandemic is over.

Citywide Greenhouse Gas Emissions[1]

Google, through its Environmental Insights Explorer (EIE) program, currently offers a means by which cities can calculate GHG emissions. EIE is a relatively new program which was started in 2018 and offered to a few select cities. Lakewood became aware of the in 2020. It is offered free-of-charge. All that is required is to have a city designated official sign up and Google does all the work. Lakewood became a member of the EIE program in October on last year (2020). Greenhouse emissions data has been analyzed by Google and provided to Lakewood.

[1] There are data elements missing: water, wastewater, and solid waste. Because Lakewood is a contract city it has not been easy to collect data to perform a GHG analysis in these areas. Further, developing a GHG emissions inventory is a new process, so much of the data in these areas has not been collected. That means we relied estimates that may not necessarily be descriptive of Lakewood.

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EIE uses unique Google data sources and modeling capabilities to produce estimates of activity, emissions, and reduction opportunities. The data in EIE is anonymous, highly aggregated and combined with other data sources to create useful environmental insights. The data sources include, for example, aggregated location history data, building outlines and types, and overhead imagery. All of these sources contain useful information for taking action toward a low-carbon future when aggregated to a city scale. Google also uses advanced machine learning techniques to understand how people are moving around the world, and then applies scaling factors, efficiency and emissions factors for specific communities.

Calculating Lakewood's GHG baseline, or inventory, is the first step toward climate action planning. The GHG inventory can help prioritize investments on the most impactful areas, as it highlights the main emission sources or hot spots and can be used as a baseline to measure progress.

The steps Google uses to create an emissions baseline, or inventory, include:

- Defining the city boundaries and the activity sectors that will be included in the assessment.
- Gathering the activity data representing these boundaries and sectors, e.g.: the energy consumed or the volume and type of fuels burned or products consumed.
- Performing a number of data manipulations and estimates, e.g.: accounting for limited coverage or availability of data.
- Applying the right conversion factors to estimate total GHG emissions, e.g.: converting kWh of electricity or gallons of fuel consumed, into GHG emissions. This is done using the so-called emission factors, which represent the average GHG emissions released when burning a type of fuel or when using a type of vehicle or when generating electricity.

What GHGs are included?

EIE accounts for emissions of seven greenhouse gases associated with electricity generation and fuel burning: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6) and nitrogen trifluoride (NF_3). The emissions factors used cover a regional, national or supranational grid, sourced from CURB: Climate Action for Urban Sustainability tool. For each city, Google uses a blended average of the nearest available emission factor data. The unit to measure the total greenhouse gas emissions is metric tons of carbon dioxide equivalent (tCO_2e) or in the imperial system, pounds of carbon dioxide equivalent ($lbCO_2e$).

The EIE tool provides data for the calendar year indicated on each city summary and sector page. For building emissions, a complete calendar year is extrapolated based on the latest Google-sourced data. For transport, all trips taken in the calendar year are included.

Due to the continual improvement in data availability and coverage, and challenges with modelling historic years relative to current data, past years' emissions data is not available, although in Lakewood's case, there is historic data provided for 2018 and 2019.

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What economic sectors and emission sources are included?

There are many activities that may occur within the city boundaries that generate greenhouse gas (GHG) emissions: energy production, transportation, and industrial activities. At this time, EIE does not include waste management, agriculture, forestry, other land uses, or carbon sequestration.

The Environmental Insight Explorer focuses on two sectors that represent the two most important contributors in the total GHG inventory of most cities: road transportation ("transportation") and electricity consumed in residential and commercial buildings ("buildings"). In GPC terms, this corresponds to the following categories:

- Stationary fuel combustion in commercial and residential buildings;
- Grid-supplied electricity consumption in commercial and residential buildings; and
- In-boundary and out-of-boundary road vehicles and boats, including all trips initiated and finished within city boundaries, trips started within city boundaries and finished outside city boundaries, and trips initiated outside city boundaries and finished within city boundaries.

An important note for transportation emissions, EIE accounts for:

- All trips on any road, by using anonymized and aggregated location history data, and modeling the entire population and occupancy factors for each mode of travel; and
- The entire trip, that starts or ends within the city boundary. EIE provide this information since the entire trip is more relevant for reduction planning (such as mode shifts from vehicles to bicycles, for example).

Transportation

Transportation vehicles generate greenhouse gas emissions directly from the combustion of fossil fuels and indirectly by the electricity the electric vehicles (EVs) consume. The quantity of GHGs emitted by the transportation sector in a city depends on factors such as transportation modes, types of fuels used, age and efficiency of the vehicle fleet, total trips and annual miles traveled. It is a complex set of calculations best describe in this chart below.

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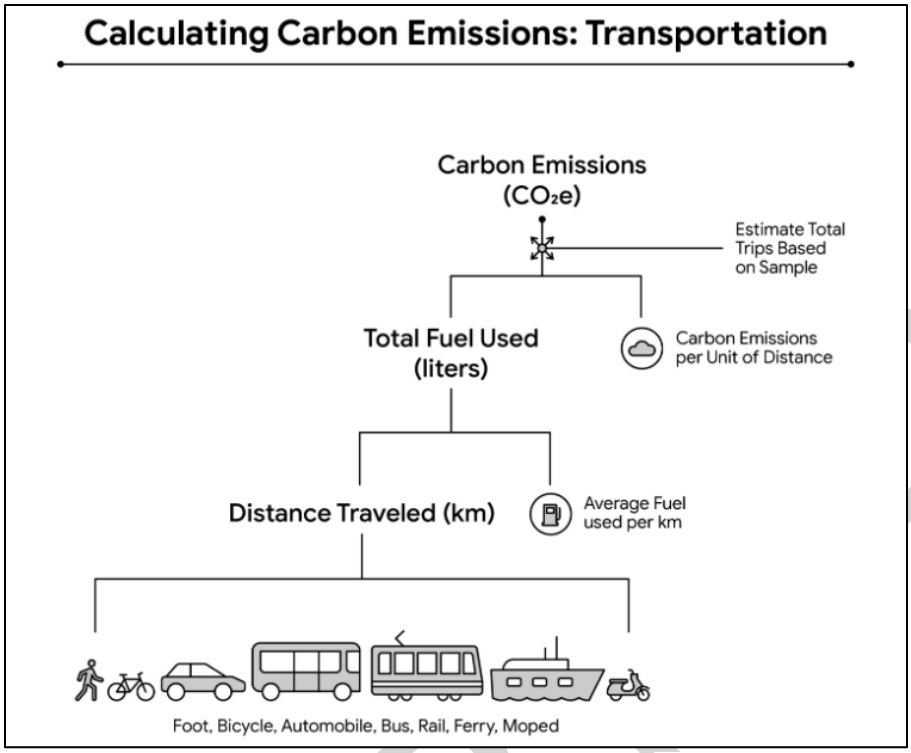


Figure 8 (*Google EIE)*

Google uses proprietary data to characterize the trips taken within the city boundaries and the trips that crossed the city boundaries. This data is derived from location history data, on which they have applied a number of privacy filters, aggregation/anonymization techniques, and inference models.

This data takes into account movement over all major road classifications, from interstates to local roads. Similar to the population (and occupancy factor) scaling techniques used by transportation models based on Household Travel Surveys, EIE estimates annual vehicle trips by mode and vehicle distance traveled (vehicle kilometers traveled: "VKT", vehicle miles traveled: "VMT") for all trips in a city.

These measures are combined with region-specific assumptions from CURB: Climate Action for Urban Sustainability tool, such as the split between gasoline and diesel vehicles (vehicle fleet mix and fuel combinations) and average fuel efficiency. Finally, EIE applies fuel efficiency and emissions factors sourced from CURB to convert the estimated activity data into total emissions of CO2 equivalents (CO2e). The factors also take into account all GHGs produced by burning the fuel, including CO2, methane and others.

Buildings

Buildings generate greenhouse gas emissions from direct combustion of fossil fuels (heating, for example) and indirectly from the electricity the residents and equipment consume. The quantity of GHG emitted directly or indirectly by buildings depends on many factors – for instance, the number of buildings, their type (a hospital consumes more energy than a residential apartment), the heating and cooling technologies deployed and the types of fuels used, the quantity of electricity used by the occupants and the equipment, the source of electricity, and the energy efficiency of the building and

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equipment. Other factors that are much harder to control by cities, such as the climatic zone where the city is located, also have an important impact on the total energy that each building consumes every year.

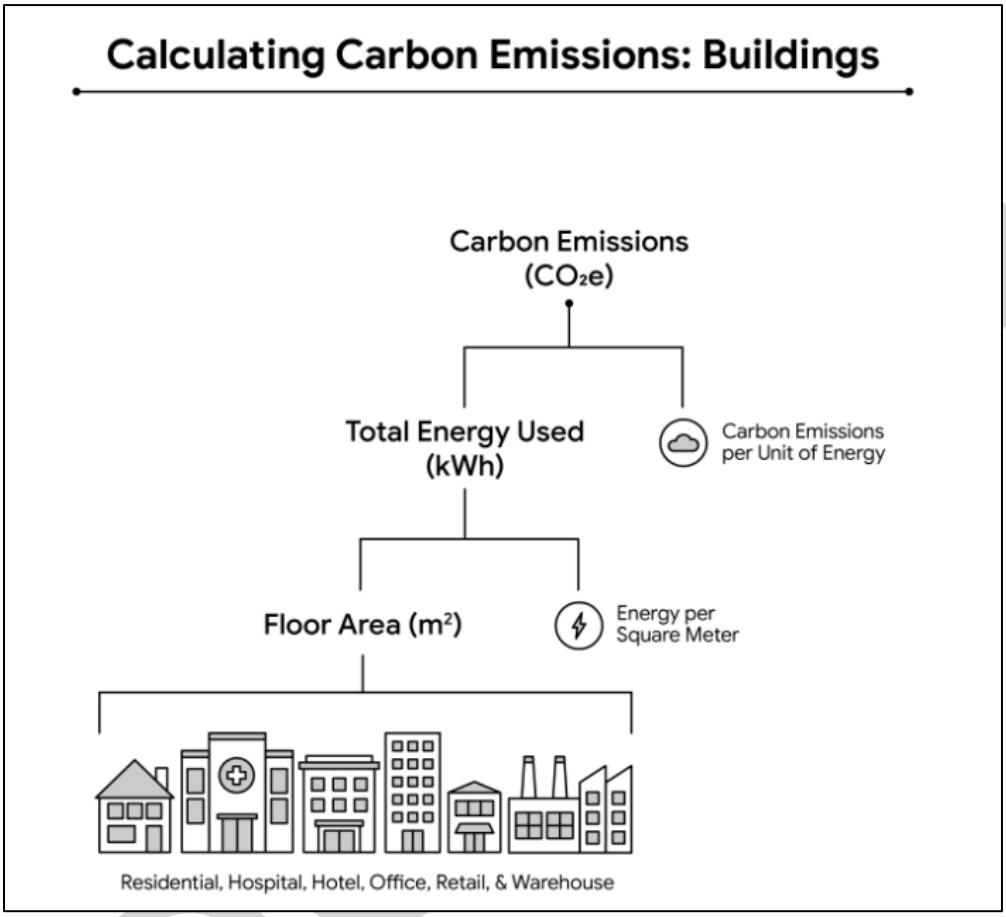


Figure 9 *(Google EIE)*

EIE estimates floor space and assigns a building-type category to most buildings within the city boundaries. Floor space was modeled using data sourced from Google Maps, imagery and 3D modeling. Residential buildings may include houses and apartments, and nonresidential may include offices, retail, warehouses, commercial and mixed-use buildings.

Once the total floor space per type of building is acquired, EIE uses region-specific energy intensity factors (energy per floor space unit) from CURB: Climate Action for Urban Sustainability tool to estimate the total energy consumed to power each type of structure. For each location, EIE uses a blended average of the nearest available emission factor data and assumed a mix of grid-supplied electricity and stationary combustion energy sources based on CURB's energy usage breakdown.

Finally, EIE applies electricity and stationary combustion emission factors sourced from CURB which correspond to the electricity factors published by the International Energy Agency (IEA) in 2012 and the International Panel on Climate Change (IPCC). This process converts the estimated activity data (total electricity consumed) into total GHG emissions. Emission factors are calculated by the IEA using the

electricity generation technologies in the region and national or subnational energy generation emission data.

Because city-specific fuel mix for on-site combustion is not available and is highly variable across cities, EIE assumes a default 50/50 mix of natural gas and diesel oil. The factors also take into account all GHGs produced for electricity generation, including CO2, methane and others.

(IMPORTANT NOTE: Since the utility companies that provide electricity to Lakewood use predominantly renewable energy sources, the level of GHG used in buildings is probably overstated. Also, the assumption of a 50/50 mix of natural gas and diesel (fuel) oil is incorrect. Over 90 percent of buildings use either electricity or natural gas.)

Solar

Renewables and zero-carbon energy sources, including solar, can reduce and offset the emissions from fossil fuel electricity generation. The Environmental Insights Explorer is built upon Google's Project Sunroof tool, which estimates the technical solar potential of all buildings in a region. The current EIE system uses Google Earth imagery to analyze roof shape and local weather patterns to create an aggregated solar potential estimate.

Solar energy production is a viable opportunity to reduce GHG emissions in Lakewood. Solar panels can produce energy wherever there is light, even in the Pacific Northwest. In order to get the most out of a solar panel system, it is important to position the panels correctly, estimate power needs, and understanding the different wiring possibilities.

Solar panels produce maximum power when they are perpendicular to the incoming sunlight. For Lakewood, the position of the solar panel must be at an angle to its latitude, 47 degrees, minus 15 degrees. Therefore, the angle of a solar panel must be at 32 degrees. Since the Pacific Northwest is in the Northern Hemisphere, the sun will be in the southern sky. Panels should face south. Lastly, panels should be relatively clear of trees. If a tree shades a panel, the system will produce less power.

The average home might use anywhere from 5,000 to 8,000 kilowatt hours of power annually, or 14 to 22 kilowatt hours daily. The average power output per square foot of a solar panel system in the Pacific Northwest translates to about 500 to 800 square feet of solar panels. These numbers will vary based on a household's usage habits. While not required, any solar powered system that is generated can be a part of the existing electric grid. A grid-tied system sends the power it generates to a main power grid. The power company credits the producer for any excess solar power the system generates. If solar system is not generating enough power, power is drawn from the grid. (Source data: https://sciencing.com/solar-panels-viable-pacific-northwest-7357.html)

Google Environmental Insights Explorer GHG Initial Estimates

Table 1 provides the approximate metric tons of carbon dioxide equivalent (MGCO2e) by emission type. In 2019, Lakewood's industries, businesses and residents generated about 639,410 MGCO2e.
Other highlights include:

- The transportation greenhouse gas component was the largest source of community emissions (37%), followed by industrial users (23%), and residential users (20%).

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- Greenhouse gas emissions from Lakewood residences account for a substantial percentage of the city's total emissions. In 2019, Lakewood residents produced about 131,192 MgCO2e, primarily from the use of natural gas, and PSE electricity generated from coal-fired plants.

- Combined, commercial/industrial sector GHG emissions are less than that of transportation.
- Transportation is the largest single source of greenhouse gas emissions in Lakewood. Lakewood is a bedroom community for Pierce County, King County, and Thurston County. Prior to COVID-19, around 16,400 persons commuted away from Lakewood during the workday. Commuting patterns show that 79% use single occupant vehicles, 10% carpool, and 5% use public transit.
- Since 1990, on average, Lakewood has increased its GHG emissions by less than one percent per year. However, cumulatively this adds up over time.

Table 1
Lakewood GHG Emissions in 2019

Emission-Type	City of Lakewood 2019 Emissions (MgCO2e)	Percent of Total
Residential		
Residential electricity	72,121	11%
Residential natural gas	59,071	9%
Sub-total	**131,192**	**21%**
Commercial/Industrial		
Non-residential electricity	110,746	17%
Non-residential natural gas	35,629	6%
Sub-total	**146,375**	**23%**
Transportation		
On road vehicles - cross boundary inbound	156,997	25%
On road vehicles - cross boundary outbound	158,353	25%
On road vehicles - in boundary	34,216	5%
Bus VMT - cross boundary inbound	5,274	<1%
Bus VMT - cross boundary outbound	5,955	<1%
Bus VMY – in boundary	1,048	<1%
Sub-total	**361,843**	**57%**
Grand Total	**639,410**	

SPECIAL NOTES:

1. For 2020, transportation emissions are down 27 percent, from 361,843 to 267,000, total tCO2e. The change in numbers is a reflection in the reduction of VMT associated with COVID-19.
2. Transportation emissions are overstated since it includes I-5 and Highway 512 emissions, but it is difficult to determine emissions using the Google EIE model.
2. Residential & non-residential emissions are also overstated since Google uses a 50/50 mix of electricity to carbon fuels. In actuality, the mix is closer to 80/20. If the 80/20 split is used, MgCO2e emissions are calculated at 194,297 for both residential and non-residential.

Source: 2019 Google EIE and ICLEI (Local Governments for Sustainability) Clearpath software.

Google Environmental Insights Explorer Rooftop Solar Potential

The rooftop solar potential for Lakewood is a reduction of 223,000 MgCO2e annually. This number represents a 35 percent reduction in total GHGs. This assumes that solar panels receive at least 75% of

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the maximum annual sun in the city. For Lakewood, the average value of the threshold is 843.20 kWh/kW. The number of existing solar arrays within the city is 57. These existing solar arrays represent less than 1 percent of the total solar potential. Potential emissions reductions equivalent to 47,200 passenger cars taken off the road for one year or 5,730,000 tree seedling grown for 10 years. Estimated solar installation potential is measured at 321,000 MWh AC/year (megawatt alternating current per year). Information about building shapes is calculated using a machine learning algorithm using data from Google Maps and overhead imagery. See Table 2 for specific details on solar production.

Table 2
Total Solar Potential

Carbon Offset Metric Tons	(Property) Count Qualified	KW Median	KW Total	Percent Covered	Percent Qualified
223,313.88	14,589	11.75	331,289.5	97.5266	80.2608

However, there are numerous technical challenges that may affect results by 25% or more. Based on Google's definition of "technical potential," installations must meet the following criteria:

- Sunlight: Every included panel receives at least 75% of the maximum annual sun in the area;
- Installation size: Every included roof has a total potential installation size of at least 2kW;
- Space and obstacles: Only areas of the roof with enough space to install 4 adjacent solar panels are included. Obstacles like chimneys are taken into account.

Washington State GHG Emission Reduction Standards

In 2020, the state amended its Revised Code of Washington (RCW) establishing new standards for GHG reductions. This amendment was in response to a report prepared by the Washington Department of Ecology in 2019 which has set standards for emission reductions. Under RCW 70A.45.020, the revised reduction schedule now has more restrictive standards:

Washington State – current	Reduce GHG emissions to 1990 levels by 2020
	Reduce GHG emissions by 45% below 1990 by 2030
	Reduce GHG emissions by 70% below 1990 by 2040
	Reduce GHG emissions by 95% below 1990 (net zero) by 2050

Utilizing extrapolated data it is estimated that Lakewood's estimated GHG may have been 535,000 MgCO2e although this number has been difficult to quantify. Using RCW 70A.45.020, Lakewood's projected CHG targets would be as follows:

45% below 1990 by 2030:	294,250 MgCO2e
70% below 1990 by 2040:	160,500 MgCO2e
95% below 1990 by 2050:	26,750 MgCO2 e

What does this mean? These target numbers are very aggressive. Lakewood's ability to meet these numbers is unlikely given that the city is not full-service and does not control the decisions and efforts of the service providers. Almost all the utilities that serve Lakewood are provided by outside purveyors

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where the city has limited authority to affect changes in energy and waste management. In Lakewood's situation, the means to reduce GHG emissions is through cooperative agreements with utility providers, tightened sustainability regulations, promoting intermodal and public transportation, community education and outreach, the introduction of electric vehicles and hybrids into the city's fleet system, energy conservation, and efforts to enhance carbon sinking.

Other ways to reduce GHG emissions is through the conversion of PSE electric power to renewable energy resources, a dramatic reduction in vehicle miles driven (VMT), the conversion of internal combustion vehicles to electric vehicles, and converting natural gas users to electricity, – three of these proposals are beyond Lakewood's legislative authority, and the fourth, natural gas conversion, may be regarded as overreach.

Lakewood Energy Generation and Use

As provided in Table 1 above, approximately 44% of the city's 2019 emissions came from Residential, Commercial, and Industrial Built Environment. Changes to fuel sources can have significant impact to the city's GHG emissions.

In the Puget Sound, buildings are most often heated by natural gas and electricity and illuminated by electricity produced by a fuel mix that includes natural gas, nuclear energy, hydroelectric power and renewable energy sources. There are three primary suppliers of energy in Lakewood: Lakeview Light and Power, a member-owned mutual cooperative; Puget Sound Energy, an investor-owned utility; and Tacoma Power, a public utility. Figure 7 shows the boundaries of each of the utility providers within Lakewood.

Table 3 provides information on the utility fuel mix of each of the three utility providers for 2015 and 2019. All three take advantage of hydroelectric power, although PSE less so. Lakeview Light & Power's fuel mix uses nuclear power at a much higher rate than PSE and Tacoma Power.

In 2015, Lakeview Light and Power and Tacoma Power provided around 88 percent of their power from hydroelectric sources. Puget Sound Energy used a different fuel mix including coal, 37 percent; hydroelectric power, 28 percent; natural gas, 30 percent; and wind, 4 percent. In 2019, Lakeview Light and Power and Tacoma Power provided around 82 percent of their power from hydroelectric sources. Puget Sound Energy used a different fuel mix including coal, 32 percent; hydroelectric power, 17 percent; natural gas, 28 percent; and wind, 8 percent. There were slight changes in the utility fuel mix in favor of renewable sources.

In 2019, the Washington Legislature and governor adopted the Washington Clean Energy Transformation Act, requiring the state's electric utilities to fully transition to clean, renewable power by 2045.

Washington's investor-owned utilities, such as Puget Sound Energy, must develop and implement plans to reduce carbon emissions or pay penalties for failing to meet requirements. The Washington State Utilities and Transportation Commission is in the process of developing programs and rules to review companies' plans and ensure compliance with the legislative requirements. To-date, Washington electric companies have surpassed conservation and renewable energy requirements although the impact of COVID-19 may have slowed efforts in 2020 and could further impact efforts in 2021. The city

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of Lakewood GHG emission inventory may not fully identify the impact of utility companies move to renewable sources until 2025 or even 2030.

Table 3
Utility Fuel Mix – 2015[xi] and 2019[xii]

	2015 Lakeview Light & Power	2019 Lakeview Light & Power	% Change	2015 Puget Sound Energy	2019 Puget Sound Energy	% Change	2015 Tacoma Power	2019 Tacoma Power	% Change
Fuel	**Percent**	**Percent**	**Percent**	**Percent**	**Percent**	**Percent**	**Percent**	**Percent**	**Percent**
Biogas	0	0	0	0	0.14	+0.14	0	0	0
Biomass	0.22	0	-0.22	0.32	0.06	-0.26	0.18	0.57	+0.39
Coal	2.35	0	-2.35	36.65	31.98	-4.67	2.71	0	-2.71
Geothermal	0	0	0	0	0.02	+0.02	0	0	0
Hydro	86.30	83.16	-3.14	28.65	17.17	-11.48	88.64	82.33	-6.31
Natural Gas	0.86	0	-0.86	29.66	27.92	-1.74	0.98	0	-0.98
Nuclear	10.18	11.45	+1.27	0.59	0.27	-0.32	6.11	7.10	+0.99
Other biogenic	0.03	0	-0.03	0	0	0	0.02	0	-0.02
Other non-biogenic	0.04	0	-0.04	0.13	0	-0.13	0.04	0	-0.04
Petroleum	0.02	0	-0.02	0.10	0.04	-0.06	0.02	0.03	+0.01
Solar	0	0	0	0	0.87	+0.87	0	0.01	+0.01
Waste	0	0	0	0	0	0	0	0	0
Wind	0	0	0	3.90	8.26	+4.36	1.30	6.62	+5.32
Unspecified	0	5.39	+5.39		13.27	+13.27		3.34	+3.34
Totals	100	100	0	100	100	0	100	100	0

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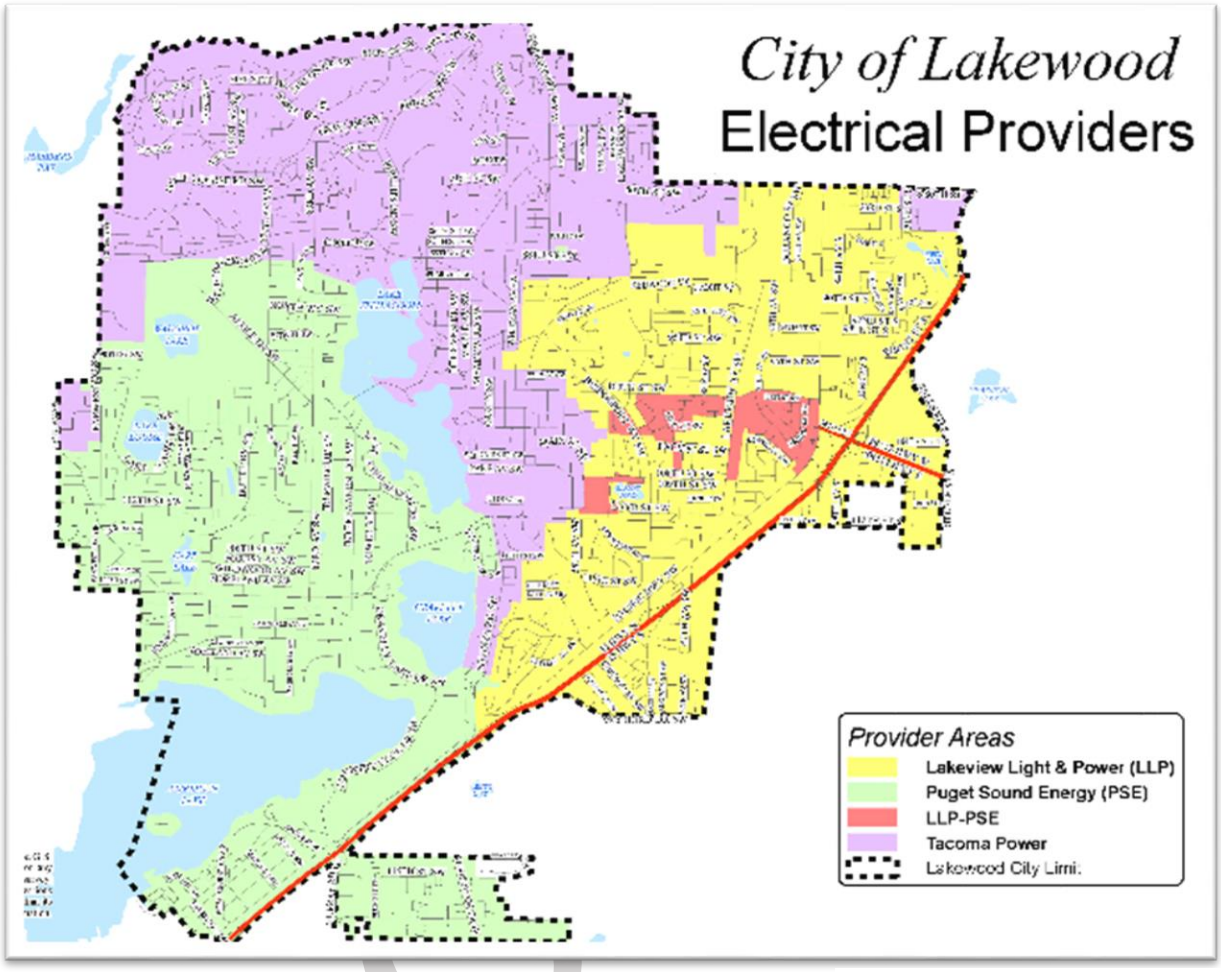


Figure 10 *(City of Lakewood)*

Carbon Sequestration

In addition to reducing GHG emissions, the city of Lakewood has the ability to remove carbon emissions from the atmosphere.

Locally forested areas and tree canopy found in the city's designated open space areas, lawns/fields and wetlands remove carbon emissions from the atmosphere through the process of photosynthesis and store them back into the earth. This process is referred to as carbon sequestration or carbon sinking. The work these natural resources do to support an ecological balance have been largely ignored. Lakewood's inventory estimates of the amount of carbon removed from the atmosphere are unknown as of this writing. Wetlands in particular, specifically the Flett Creek Complex, can store a significant amount of carbon.

Today, all of the city's forested areas and freshwater inland wetlands are currently protected or conserved through the city's open space policies, the shoreline master program, and development regulations, including a tree preservation ordinance. The city has not typically taken in consideration the carbon sequestration benefit of these resources, however, in its decision-making process.

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Lakewood examined the change in land cover over time by comparing the 2001 and 2016 National Land Cover Database (NLCD) land cover types (Figures ~~8~~ 11, ~~9~~ 12, and ~~10~~ 13). The city experienced an increase in urbanization of infill areas. Examples include the development of a vacant lot for Walmart, commercial development along major corridors, the initial stages of industrial development in the Woodbrook Industrial park, new infill short plat subdivisions scattered throughout residentially zoned areas, and new housing development adjacent to the lakes. Of interest, in areas outside Lakewood significant changes took place with the development of the Chambers Creek Golf Course and the expansion of Joint Base Lewis McChord (JBLM).

A significant unknown is the impact of climate change on lakes. Inland waters play a key role in carbon sequestration, with both positive and negative effects. There are three ways carbon is released.

- Lakes release greenhouse gases largely thanks to decomposing algae and other organisms. At the end of their life cycle, the organisms sink to the bottom of the lake. As that organic material decomposes, it naturally increases the amount of carbon in a lake's sediment. Some of that carbon turns into carbon dioxide and methane gas. Those gases are diffused into the atmosphere by bubbling up toward the surface of the lake, and releasing the gas. Half of the carbon that lakes receive is respired and returned to the atmosphere as CO2.

- Increased urban runoff tends to make lakes greener, because it gives algae more nutrients to feed on; that starts the cycle of algae growth to decomposition that leads to gases coming off the surface of the lakes.

- The other factor that affects algae growth in a lake is temperature. Higher temperatures speed up algae reproduction. And the more algae on a lake, the more greenhouse gas emissions come from the lake.

The scientific community lacks adequate data and proper models to evaluate how global warming will affect the ways that freshwater interacts with the land, atmosphere, and oceans. However, one topic is certain, lakes are warming at an alarming rate, outpacing oceans and the atmosphere. And Lakewood's lakes are fairly shallow, exacerbating the situation. Table 3 below lists Lakewood's primary lakes. Average and maximum depths information have been provided.

Table 4
Primary Lakewood Lakes

Name of lake	Surface area (acres)	Average depth (feet)	Maximum depth (feet)	Primary inflow	Primary outflow
Gravelly Lake	160	38	57	Groundwater	Seepage
American Lake	1,091.3	53	90	Groundwater; Murray Creek	Sequalitchew Creek
Lake Steilacoom (reservoir)	306	11	20	Ponce de Leon Creek (springs); Clover Creek	Chambers Creek
Waughop Lake	33	7	Unknown	Groundwater	None
Lake Louise	38	17	35	Groundwater	None
Seeley Lake (wetland)	46	Unknown	Unknown	Groundwater & stormwater	None

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Table 4 Primary Lakewood Lakes					
Name of lake	**Surface area (acres)**	**Average depth (feet)**	**Maximum depth (feet)**	**Primary inflow**	**Primary outflow**
Ward's Lake (Owens Marsh)	11	30	65	Storm water catch basin for southeast Tacoma	Tacoma gravel holding basin (84th Street SW)/ flows into Flett Creek

As lakes begin to warm, dissolved oxygen supply is depleted, and significant changes occur in the lake. Fish species that require cold water and high dissolved oxygen levels are not able to survive. With no dissolved oxygen in the water the chemistry of the bottom sediments is changed, resulting in the release of the plant nutrient phosphorus into the water from the sediments. As a result, the phosphorus concentrations in lakes can reach extremely high levels. During major summer storms or at fall overturn, this phosphorus can be mixed into the surface waters to produce nuisance algae blooms.

Regionally, the loss of land uses like forest, wetland, or fields would increase new emissions while also losing the ability to remove carbon (double impact). This would impact the city's ability to meet state GHG reduction standards. Placing a greater value on ecosystems that provide carbon sequestration introduces a powerful new tool for the Lakewood community to protect its natural resources, lay the groundwork for a future local carbon offset program, and reveals the vital caretaking role that local elected officials can play in increasing natural carbon sequestration and storage.

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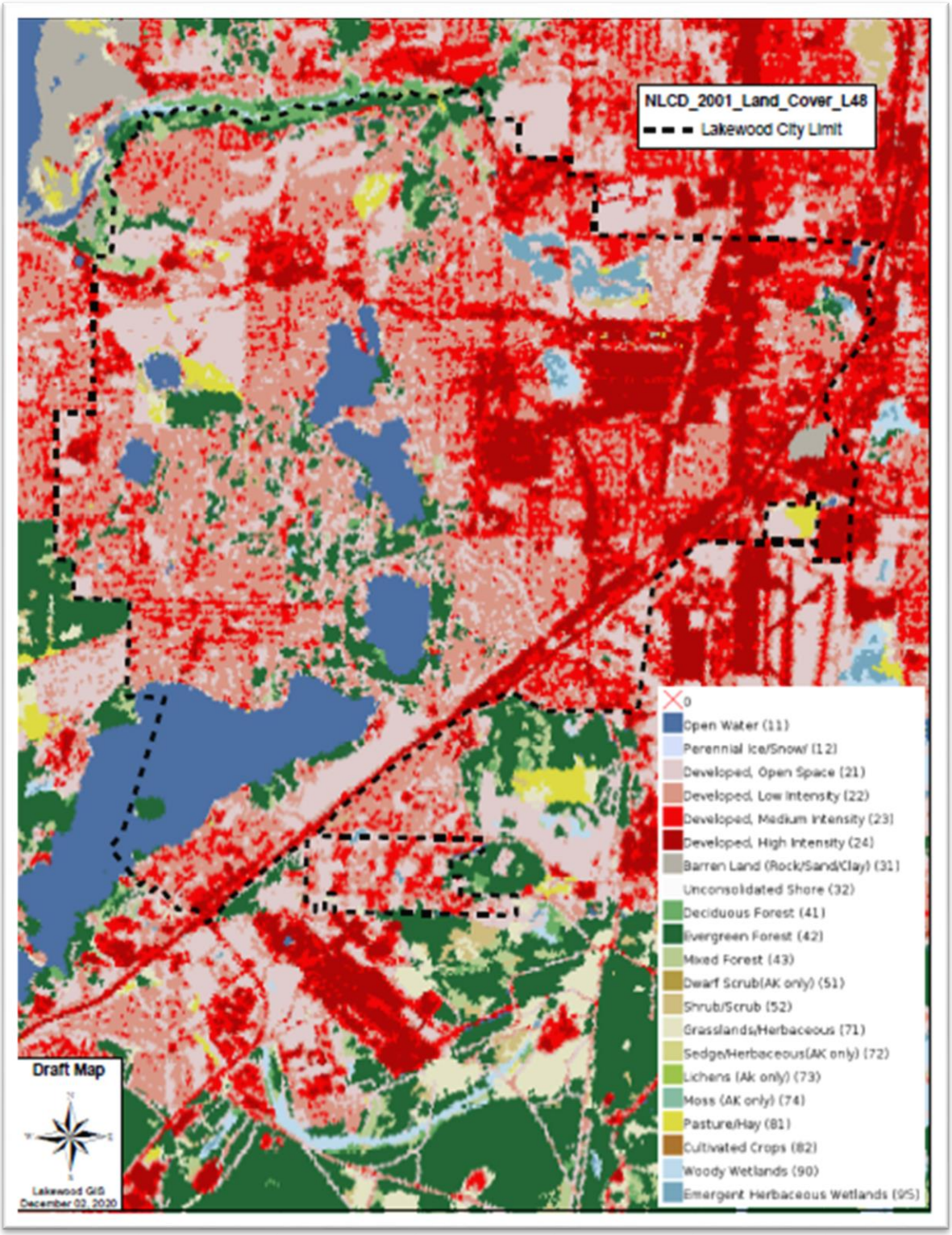


Figure 11
(Lakewood Land Coverage,

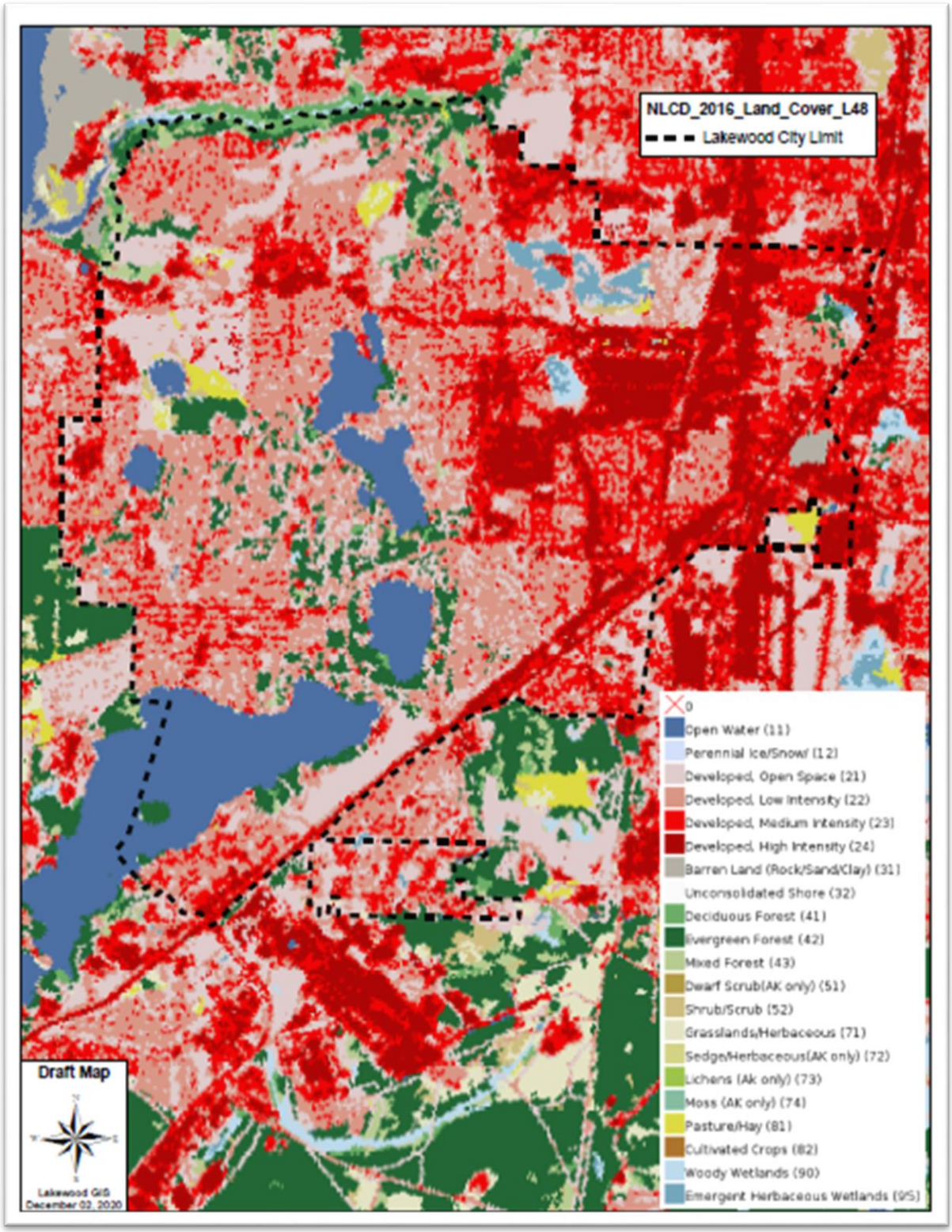


Figure 12
(Lakewood Land Coverage, 2016)

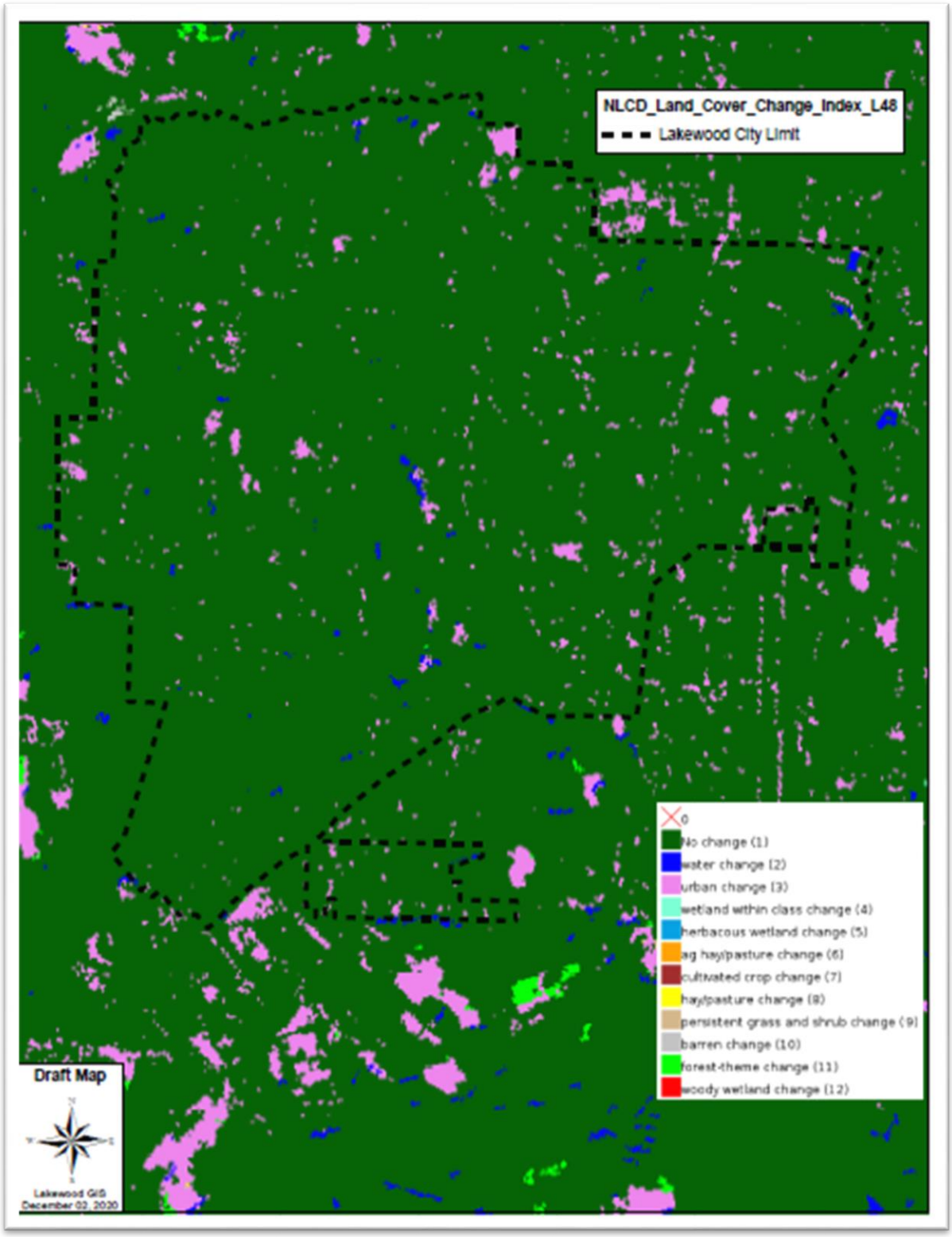


Figure 13
Net Changes in Land Coverage
(Green denotes no change; pink shows urban change)

Key Findings and Recommendations

Reducing greenhouse gas emissions, sustaining healthy ecological systems and adapting to climate disruption are fundamental challenges facing communities around the world. An adequate and timely response to climate change will require collective action and sustained effort from public and private sectors. Local and regional initiatives should be coordinated to protect environmental and human health.

If residents, businesses and city officials are committed to environmental responsibility in planning for Lakewood's future, the city can assume a leadership role in responding and adjusting to the potential impacts of climate change. Greenhouse gas emissions in the city are primarily generated by motor vehicles and largescale commercial and industrial operations. The city is also traversed by Interstate 5 and State Highway 512; both freeways experience substantial congestion during peak commute hours. Therefore, reduction measures must involve residents, local businesses and neighboring jurisdictions.

Lakewood has some favorable characteristics that provide substantial advantages in addressing energy and climate change. These advantages include vacant and underutilized lands, the Downtown and the Lakewood Station District Subarea Plans, and recent revised development codes that help moderate future emissions by facilitating convenient access to employment, transportation modes and essential human services.

Finding 1: Lakewood can provide leadership and engagement

The city will seek opportunities to develop cross jurisdictional solutions based upon state and federal emission reduction targets. Lakewood can play an active role in these efforts by:

- Collaborating and partnering with relevant agencies and organizations to advocate for substantive action on climate change; and
- Raising awareness among Lakewood residents and businesses about key climate change challenges and solutions.
- Leading by example by incorporating new energy efficiency practices and policies.
- Partnering with other local agencies to create a regional approach to addressing climate change.
- ➔ Incorporating environmental justice, and equity policies and programs into climate change decision-making.

Finding 2: Lakewood can actively regulate land uses to reduce greenhouse gas emissions

There is a close link between levels of energy consumption and land development patterns. Land use policies that encourage goods and services to be located within convenient walking distance of residential neighborhoods can decrease reliance on private automobiles. This in turn has the positive benefit of decreased daily energy use. Sustainable development patterns require:

- Promoting mixed-use and infill development in the Downtown and other major activity centers, along key commercial corridors and on vacant and underutilized parcels;
- Promoting walkability in neighborhoods by improving streetscape design and locating housing close to local serving uses and public spaces;
- Prioritizing the use of green and sustainable development standards and practices in planning, design, construction and renovation of buildings and infrastructure;
- Promoting the integration of neighborhood commercial uses in residential areas;

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- Supporting urban agriculture and making locally grown food accessible to all residents; and

Finding 3: Lakewood can improve upon its active modes of travel.

Private automobiles remain the primary mode of travel in the city. Public transit, pedestrian and bicycle facilities can be improved to ensure that transit and active modes of travel become more viable options. Climate-friendly vehicles can also make a significant contribution to emissions reduction. The city can promote climate friendly and efficient transportation options by:

- Coordinating with and supporting Pierce Transit's efforts toward expanding public transit service to improve mobility and reduce reliance on the private automobile;
- Promoting walking and bicycling as a safe and convenient mode of transportation;
- Supporting safe routes to schools and improving bicycle, pedestrian and transit access;
- Advocating for a local long distance passenger rail system to serve the community;
- Reducing reliance on private automobiles as a primary mode of transportation to decrease emissions from vehicle trips; and
- Committing to acquiring fuel efficient vehicles and equipment.

Finding 4: Restoring and protecting the natural environment will help to mitigate impacts of climate change.

Climate change will have impacts on human and environmental health. A healthy natural environment will help enable the community to respond to future climate change-related events. Lakewood can address these challenges by:

- Restoring and expanding ecological systems to support the natural functions of soil, water, tree canopies, creeks, open space and other natural resources; and
- Conserving and protecting wetlands, uplands and natural resources.

Finding 5: Preparing for potential climate change impacts is as critical as reducing greenhouse gas impacts and planning for long-term sustainability.

Communities must reduce greenhouse gas emissions to reduce or even reverse the impacts of climate change. Communities must also prepare for potential impacts to human and environmental health in the short and medium term. Action at the local level to adapt to future impacts will require adequate planning for changing weather patterns.

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Energy & Climate Change, Goals, Policies, & Actions

The following energy and climate change goals, policies, and specific actions build off the findings provided above. The goals and policies are intended to provide guidance to decision makers as they seek to implement the recommend actions. City departments and non-city organizations will play important roles in the implementation of the described actions the approximate timeframes of action implementation and developing priorities.

Implementation of near-term actions will be sought in the next five years. Mid-term actions may be implemented between 5 and 20 years. Long-term actions may be implemented over the next 20 years. Actions that have both near-term and long-term components are best implemented as an ongoing activity over the next 20 years or may have multiple steps that require action at different times.

All of the actions in this document are important, and it is difficult to rank them in priority. The priorities are not intended to provide a "hard" schedule but rather a sense of the relative importance among the strategies listed. It is the expectation that the public review and adoption process will be used to vet and refine these priorities.

Table 5
Acronyms Used in Implementation

CA	City administration (may refer to any city department, as applicable)	LPD	Lakewood Police Department
CC	City Council	O&M	Operations & Maintenance
CM	City Manager	PC	Planning Commission
CED	Community Economic Development	PWE	Public Works & Engineering
CCOMM	City Communications	PARKS	Parks and Recreation
COMM	Community	PRAD	Parks and Recreation Advisory Board
FIRE	West Pierce Fire & Rescue		

Goal EC 1: Provide Leadership in Managing Climate Change

Take steps to address climate change and to manage its effects. This goal entails not only pursuing new programs and strategies but informing residents and businesses about these actions and actively monitoring results to ensure progress in priority areas. Partner with other jurisdictions and organizations to develop effective regional solutions and regulation at regional, state and federal levels. Collaborate with residents, businesses, public agencies and neighboring jurisdictions, in order to meet or exceed state requirements for reductions in greenhouse gas emissions.

Table 6: Goal EC 1 Policies and Tasks
Policy EC 1.1 Provide Leadership and Advocacy: The success of climate change initiatives depends on collaborative approaches. Lakewood will take a leadership role in advocating for local and regional climate change solutions, forge new partnerships, develop innovative solutions, and continue to support and promote regional climate change and sustainability efforts.

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No.	Actions	Who	When	Recommended Priority
A	Develop a five-year ~~action~~ plans for reducing greenhouse gas emissions. The action plan shall include five-main topics: ▪ Incorporation of an environmental justice assessment into the five (5)-year action plan; ▪ A comprehensive greenhouse gas emissions inventory and forecast; ▪ Emissions reduction target(s); ▪ Carbon sequestration targets; & ▪ A program for monitoring and reporting out the implementation tasks found in this document. Since this is a new program for the city, start with easy-to-accomplish tasks, or easy to-solve problems. Also, consider the impact of the end-user, recognizing that that the more stringent the implementation targets, the higher the mitigation costs, although delays, in the long-term, result in net increases in mitigation costs. As the city matures in its efforts to address climate change, move forward with more challenging action items.	CC, CM, PC, CED	Immediate need (2022-2023)	High (unfunded)
B	Inform city residents and businesses, the city council, planning commission, staff, and other stakeholders of the city's emission reduction targets and overall progress. Add targets and progress to the Lakewood dashboard.	CA, CC, CM, CCOMM, PC	Near-term (ongoing)	High
C	Where feasible, enter into formal interlocal cooperation agreements with utility providers to reduce waste, promote water conservation, and improve energy efficiencies.	CC, CM, CA, CED, outside agencies	Near-term (2022-2025)	Medium

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D →	Collaborate with Pierce Transit, Sound Transit, WSDOT Rail Division, Amtrak and major employers in Lakewood to promote greater transit opportunities and use.	CC, outside agencies	Long-term (TBD)	Unknown
E	Amend/revise the current strategic plan that will help guide and focus city resources and program initiatives to (1) reduce greenhouse gas production and the carbon footprint of city government and the Lakewood community, and, (2) reduce and minimize the potential risks of climate change.	CC, CM, CED	Near-term (biannually)	High
F →	Undertake a policy review of the HEAL Act, city comprehensive, strategic, and subarea plans to assure that city policies are appropriately targeted to prepare for and mitigate potential impacts of climate change.	CC, PC, CM, CED	Near-term (biannually)	High
G	Collaborate with neighboring jurisdictions to share best practices and implement regional programs to help residents and businesses meet regional demand reduction targets.	CC, CM, PC, CED, outside agencies	Immediate need (2022-2023)	High (unfunded)
H	Work with energy providers (Puget Sound Energy, Lakeview Light & Power, and city of Tacoma Power) to develop strategies that will reduce energy demand and promote energy conservation.	CC, CM, PWE, CED, outside agencies	Near-term (ongoing)	High (unfunded)
I	Collaborate with local workforce development programs so that city of Lakewood can lead Pierce County in green jobs.	CC, CM, CED	Near-term (biannually)	Medium
J	If warranted, if enabling legislation is in place, and as a means to meet carbon-cutting targets, participate in Washington State's cap-and-trade program. (Program does not go into effect until January 2023, and provided there is a new, approved transportation-spending funding package.)	CC, CM, CED	Near-term (2023-2025)	Low
Policy EC 1.2 Increase Public Awareness and Support: Encourage residents and businesses to reduce their carbon footprint by raising their awareness about the impacts of climate change and by building support for climate change initiatives in Lakewood.				
A	Develop a Request for Proposal whose primary objective is to raise the	CCOMM, CA, CED	Near-term (ongoing)	High (unfunded)

ADOPTED

➔	community's awareness about sources of greenhouse gas emissions and mitigation through climate change action identified in policy documents with the intended result of changing behaviors. Three primary tasks are envisioned: 1) Identifying behavior solutions to reducing GHG emissions; 2) development and implementation of a community education, engagement and activation guide; and 3) development of public facing tools. Project to include an equity screening exercise. Successful engagement with historically under-served groups would be a priority[2].			

Goal EC 2: Improve Clean and Efficient Transportation Options

Expand the city's transportation network by encouraging the use of climate-friendly technology, planning growth around multiple modes of travel and reducing automobile reliance. Promote improved public transit and partner with private developers to undertake citywide improvements that make active modes of travel, such as walking and bicycling, more comfortable and preferable options.

Table 7: Goal EC 2 Policies and Tasks

Policy EC 2.1 Increase Use of Energy Efficient Vehicles and Equipment

Encourage the use of energy efficient vehicles and equipment to reduce energy consumption and carbon emissions and support the use of low-emission or renewable fuel vehicles by residents and businesses, public agencies and city government.

No.	Actions	Who	When	Recommended Priority
A	Develop fleet electrification plan including necessary charging infrastructure and implement electric first policy when purchasing replacement vehicles and other fuel burning equipment. When electric vehicle options are inappropriate, hybrid vehicles should be the second choice.	CA, CM, O&M	Mid-term	High (unfunded)
B	Work with Clover Park School District to promote an anti-idling program for school buses. Encourage the District to educate parents and transportation	PWE, CED, CM, outside agencies	Near-term (ongoing)	High

[2] A good example of a means to climate change behaviors is found on a website called "Climate Change Connection." This was created for the province of Manitoba, Canada through public donations and the Winnipeg Foundation, which is similar to our United Way.

ADOPTED

	providers to avoid idling during pick-up/drop-off times.			

Policy EC 2.2 Expand Affordable Public Transit

Public transit provides an environmentally friendly, cost-effective, and equitable mode of travel for residents and visitors. Lakewood will coordinate with regional transportation agencies and support enhanced and expanded public transit to improve mobility options for residents and visitors. Encouraging transit-supportive development patterns can further maximize the efficiency of these systems and help reduce air pollution and greenhouse gas emissions within Lakewood.

No.	Actions	Who	When	Recommended Priority
A	Continue to collaborate with Pierce Transit, Sound Transit, Washington Department of Transportation (WDOT), and major employers in Lakewood that provide shuttle services, to explore the potential for expanding transit in the evenings for people with special needs. This includes: ▪ Exploring the potential to enhance Lakewood's paratransit service. ▪ Collaborate with regional transportation agencies to maintain and enhance service within the city and region. ▪ Explore strategies to address affordability, access and safety.	CA, CM, COMM, PWE, CED, outside agencies	Mid-term	Medium (unfunded)
B	Coordinate and partner with transit partners to develop an incentives program to expand transit use among residents and employees in Lakewood. This includes exploring the potential for supporting fare-free transit zones in major commercial areas, free or very low-cost bus passes for target groups, pre-tax passes, rebates to employees who give up use of employer parking facilities, and online tools for providing real time information to transit riders. Expand outreach and information programs to promote transit use.	CA, CM, outside agencies	Mid-term	Medium (unfunded)

ADOPTED

C →	Coordinate with both Pierce Transit and Sound Transit to expand service, increase affordability and accessibility for seniors, youth, and low-income households. Ensure that all transit stations and routes to and from these stations are safe.	CA, CM, COMM, PWE, CED, outside agencies	Mid-term	Medium (unfunded)
D →	Coordinate with both Pierce Transit and Sound Transit to ensure public transit service connects major destinations in Lakewood including education institutions, community facilities, employment centers, regional open space areas, and major commercial corridors to serve a greater number of riders and reduce commuter vehicle miles. Encourage development of a bus rapid transit system that connects Downtown Tacoma to Lakewood.	CA, CM, COMM, PWE, CED, outside agencies	Mid-term	Medium (unfunded)
E	Work with both Pierce Transit and Sound Transit to develop a non-motorized connectivity study specific to Lakewood.	CC, CM, PC, PWE, CED, & outside agencies	Near-term (2022-2025)	High (unfunded)
Policy EC 2.3 Develop Safe and Convenient Walking and Bicycling Routes Prioritize and incentivize walking and bicycling as safe and convenient modes of transportation.				
No.	**Actions**	**Who**	**When**	**Recommended Priority**
A	Update the city's non-motorized transportation plan to make Lakewood a more pedestrian and bicycle-friendly city. This includes identifying gaps in the network and explore developing potential pedestrian and bicycle priority areas or districts.	CC, CM, PC, PWE, CED	Near-term (2022-2025)	High (unfunded)
B	Collaborate with Pierce County, University Place, the Town of Steilacoom, Tacoma, and WSDOT to ensure links to a regional commuter trail network.	CC, CM, PC, PWE, CED, outside agencies	Near-term (2022-2025)	Medium (unfunded)
C	As part of the non-motorized transportation plan update, explore bicycle-sharing programs.	CC, CM, PC, PWE, CED	Near-term (2022-2025)	Low (unfunded)
D	Encourage new businesses, schools and residential developments, install and maintain secured bicycle parking facilities.	CED, CA, CM, outside agencies	Near-term (2022-2025)	Medium (unfunded)
E	As part of the non-motorized transportation plan update, review design guidelines and standards for	CC, CM, PC, PWE, CED	Near-term (2022-2025)	High (unfunded)

ADOPTED

	bicycle and pedestrian facilities and amenities that meet local, state and federal standards. Include a uniform citywide signage plan and comply with all Americans with Disabilities Act (ADA) and Washington State accessibility requirements.			
F	As feasible and appropriate, the city shall require new development and redevelopment to provide pedestrian connections and safety improvements to foster use of non-motorized transportation. This includes connections between retail, living, and working places and transit connections and facilities. It includes traffic calming and other safety-related improvements; development of new sidewalks and trails; and new pedestrian and bicycle amenities.	CC, CM, PC, PWE, CED	Near-term (Ongoing)	High
G	Pursue grant funding to plan and construct missing pedestrian and bicycle connections between major destinations, such as, parks, opens spaces, civic facilities, employment centers, retail, and recreation areas.	CC, CM, PC, PWE, CED	Near-term (Ongoing)	High
H	Coordinate and partner with the Clover Park School District and Safe Routes to Schools to expand educational programs and events to encourage and promote walking and biking, including a Bike to School Day, walking school bus, and sidewalk painting for safe routes.	PWE, outside agencies	Near-term (Ongoing)	High
Policy EC 2.4 Expand Regional Passenger Rail Work with Amtrak and Sound Transit to expand commuter rail service and existing parking facilities.				
No.	**Actions**	**Who**	**When**	**Recommended Priority**
A	Coordinate with Washington State Department of Transportation, Sound Transit, and Amtrak about adding an Amtrak Cascades stop within the city.	CC, outside agencies	Mid-term	High (unfunded)
B	Work with Sound Transit to provide for extended hours of operations at the Sound Transit Lakewood Station and to expand the existing parking garage.	CA, CM, COMM, PWE, CED, outside agencies	Mid-term	Medium (unfunded)

ADOPTED

C	Work with Sound Transit to require parking permits and associated fees for commuters who use the Lakewood Station parking garage, but who reside outside the Sound Transit district area boundary.	CC, ST, CM, outside agencies	Mid-term	Medium
Policy EC 2.5 Reduce Private Automobile Use Work toward creation of an urban landscape that will reduce reliance on private automobiles through land use planning and by providing amenities and infrastructure that encourage safe and convenient use of public transit, walking and bicycling.				
No.	**Actions**	**Who**	**When**	**Recommended Priority**
A	Coordinate with Lakewood Chamber of Commerce to inform local employers on the options for and benefits of compressed work weeks, telecommuting, and other schedule adjustments that reduce commute trips.	CC, CM, PC, PWE, CED, CCOMM, outside agencies	Near-term (2022-2025)	Medium (unfunded)
B	Refer to Action Items EC2.1 B AND EC2.3 A – H.	CC, CM, PC, PWE, CED, CCOMM, outside agencies	Near-term (2022-2025)	Medium (unfunded)

Goal EC 3: Increase Sustainable and Energy-Efficient Systems

Reduce the city's consumption of energy by encouraging energy conservation and supporting the consumption of energy produced by climate-friendly technologies. Reduce the city's overall waste stream by reducing the city's consumption of goods and materials.

Table 8: Goal EC 3 Policies and Tasks

Policy EC 3.1 Expand Renewable Energy: Promote the generation, transmission and use of a range of renewable energy sources such as solar, wind power and waste energy to meet current and future demand.				
No.	**Actions**	**Who**	**When**	**Recommended Priority**
A	Encourage and support the generation, transmission and use of locally distributed renewable energy. Advocate at the regional and state level for upgrades to the existing power grid so that it can support renewable energy production and transmission.	CC, CA, CM, CED, COMM	Long-term	High (unfunded)
B	Evaluate incentives that promote the inclusion of solar power with commercial, industrial, and residential development.	CC, CM, PWE, CED, outside agencies	Near-term	High (unfunded)

ADOPTED

C	Establish a Green Energy and Building Fund to provide incentives to increase building electrification conversions and battery storage.	CC, CM, PWE, CED, outside agencies	Medium-term	~~High~~ Medium (unfunded)
D	Reduce the City Hall footprint from three floors to two floors.	CC, CM, CED, CA	Near-term (2021-2025)	High (funded)

Policy EC 3.2 Promote Energy Efficiency and Conservation: Promote efficient use of energy and conservation of available resources in the design, construction, maintenance and operation of public and private facilities, infrastructure and equipment.

No.	Actions	Who	When	Recommended Priority
A →	Work with all utility providers to raise awareness about existing rebate and assistance programs that will increase energy conservation.	CC, CM, CED, outside agencies	Near-term (2021-2025)	High
B →	Work with utilities to explore strategies to reduce GHG emissions in multifamily housing.	CED, outside agencies	Near-term (2021-2025)	High
C →	If necessary, consider financially subsidizing the RHSP to promote energy conservation for rental properties. Alternatively, increase rental housing licensing fees.	CC, CM, CED	Near-term (2021-2025)	High

NOTE: Cumulatively, Items A, B, & C have the potential to lower energy bills for low-income households.

Policy EC 3.3 Promote Solid Waste Reduction and Recycling: Promote waste reduction and recycling to minimize materials that are processed in landfills.

No.	~~What~~ Actions	Who	When	Recommended Priority
A	Support the implementation of the Tacoma-Pierce County Solid Waste Management Plan.	CC, CM, CA, COMM, outside agencies	Near-term (2022-2025)	High (unfunded)
B	Develop a comprehensive recycling and composting program for all city-owned facilities.	CC, CM, COMM	Medium-term	High (unfunded)
C	Work with Pierce County Conservation District to provide residential and business education regarding composting and natural yard care.	CC, CM, COMM	Medium-term	High (unfunded)
D	Continue to support neighborhood events such as garage sales and clean-up/recycling events.	CC, CM, COMM	Medium-term	High (unfunded)
E	Support tool libraries, repair cafes, and other collaborative consumption projects.	CC, CM, COMM	Medium-term	High (unfunded)

ADOPTED

F	Require that all commercial entities participate in recycling and a green waste program, once established.	CC, CM, CED, PWE, COMM	Medium-term	High (unfunded)
Policy EC 3.4 Promote Water Conservation and Reuse: Promote water conservation and recycled water use to reduce energy use associated with wastewater treatment and management.				
No.	**Actions**	**Who**	**When**	**Recommended Priority**
A	Implement water conservation efforts for households, businesses, industries and public infrastructure. Include measures such as the following: ▪ Enforce the Uniform Plumbing Code (IPC), which requires low-flow appliances and fixtures in all new development; ▪ Work with the Lakewood Water District to create an incentives program that encourages retrofitting existing development district-wide with low-flow water fixtures; ▪ Require new development and landscaped public areas to use state-of-the-art irrigation systems that reduce water consumption including graywater systems and rainwater catchment; and ▪ Encourage use of drought-tolerant and native vegetation.	CC, CM, PC, CED, PWE, outside agencies	Near-term (2022-2025)	High
B	Install hydration stations in all municipal facilities to allow refills of reusable water	CC, CM, CED, PARKS, PWE	Medium	Low (unfunded)
C	Require hydration stations all new development that includes private and public parks	CED, PWE	Medium	Low (unfunded)
Policy EC 3.5 Incorporate Sustainable Practices in City Government Operations: Promote climate-friendly standards, practices, technologies and products in all city facilities and operations. Lead by example to reduce greenhouse gas emissions by incorporating best practices and available technologies.				
No.	**Actions**	**Who**	**When**	**Recommended Priority**
A	Refer to Action Items EC 1.1 G and EC 2.1 B.	CC, CA, CM,CED, PWE, CCOMM	Near term (2021-2025)	High (unfunded)

ADOPTED

B	Establish a trip reduction policy that includes a remote work strategy, and appropriate technology.	CA, CM, CED, outside agencies	Near-term (2021)	High
C	Conduct a feasibility study on using treated greywater and rainwater harvesting for non-potable water needs at city facilities	CA, CM, CED, PWE	Long-term	Low (unfunded)
D	Work with energy partnerships to develop and implement an electrification action plan for all city facilities. In new and existing buildings, incorporate strategies to address electricity storage, and focus on highlighting any hurdles or solutions that would be applicable to the broader community	CA, CM, CED, PWE, outside agencies	Long-term	Low (unfunded)
E	Develop a city-wide environmentally preferable purchasing policy (EPP). Consider life-cycle costing as one of the decision-making tools in the process and promote purchasing of local products.	CA, CM, CED, PWE	Long-term	Low (unfunded)
F	Replace all non-energy star office equipment and appliances at their end of their life cycle with energy and water efficiency as a primary consideration for all future purchasing decisions.	CA, CM, CED, PWE	Long-term (on-going)	Low (unfunded)
G	Examine city practices for opportunities to reduce paper consumption in the workplace. Implement a document management information system.	CA, CM, CED, PWE	Near-term (2021-2025)	High (funded)

Goal EC 4: Encourage Sustainable Development

Reduce energy consumption by promoting sustainable land uses and development patterns. Pursue infill development opportunities and encourage the construction of higher-density, mixed-use projects around existing public transit infrastructure, schools, parks, neighborhood-serving retail and other critical services. Incorporate ecologically sustainable practices and materials into new development, building retrofits and streetscape improvements.

Table 9: Goal EC 4 Policies and Tasks

Policy EC 4.1 Promote Mixed-Use and Infill Development
Promote mixed-use, high-density, infill development on vacant and underutilized parcels along commercial corridors, in the Downtown area, and in the Lakewood Station District.

No.	Actions	Who	When	Recommended Priority
A	Regularly update the Downtown Subarea Plan and the Lakewood Station District as	CC, CM, PC, CED	Near-term (2020-2021)	High

ADOPTED

	market conditions and climate conditions change.			
B	Develop plans for key commercial corridors in the city to guide redevelopment of these areas into mixed-use, pedestrian and transit-oriented corridors and nodes. Possible corridors include South Tacoma Way, Steilacoom Boulevard SW, Bridgeport Way, and Union Avenue SW. Include development standards and urban design guidelines.	PC, CED	Medium	High (unfunded)
C	Continue to incentivize mixed-use and infill development (fee waivers, density bonuses, development impact fee, tax benefits, etc.)	CC, CM, PC, CED	Near-term (ongoing)	High (unfounded)
D	Continue to expand and enhance open space lands throughout the city through property acquisition.	CC, CA, PARKS	Near-term (ongoing)	High (depends on grant availability)
E	Conduct a sustainability audit that evaluates existing plans, ordinances, and development standards to identify regulatory barriers to infill development.	PC, PWE, CED, outside agencies	Near-term (2021-2025)	High (unfunded)
F	Conduct a feasibility study to determine how best to allow alternative uses and designs within vacant low-density residential areas. Provide outreach in identified neighborhoods.	PWE, CED	Near-term (2021-2025)	High (unfunded)
G	Consider the use of incentives for new construction projects that exceed energy efficiency standards with a focus on affordable and multifamily housing.	CC, CM, PC, CED	Near-term (2021-2025)	Medium
H	Using the data from the Carbon Sequestration Analysis described in task EC 4.3 C and D, complete an analysis and findings of forested landscapes, ecological function and ecosystem processes, including carbon sequestration, into land use decisions. The city shall keep statistics from each land use decision for a biannual report.	CC, CM, CED, PWE, PARKS	Medium term	Medium
Policy EC 4.2 Develop Compact Walkable Neighborhoods and Livable Streets Promote safe and walkable neighborhoods and inter-connected streets through the design of complete streetscapes, public gathering places and all types of physical development that encourages less vehicle use.				
No.	**Actions**	**Who**	**When**	**Recommended Priority**

ADOPTED

A	Review and if appropriate, update the city's street design standards so that they support public transit, and non-motorized transportation policies. The updated standards should be consistent with and tailored to street or trail function and adjacent land use type. ▪ Update street design standards based on recommendation from the updated non-motorized transportation plan. ▪ Identify on a case-by-case basis priority thoroughfares for developing new green streets in the city to implement a natural systems approach for stormwater management and to expand urban greenery.	CC, CM, PC, PWE, CED	Near-term (2021-2025)	High (some programs are already underway; others have not been started)
B	Evaluate the feasibility of reducing the number or width of travel lanes on future, key mixed-use streets that may have excess capacity and using the capacity and/or regained width for wider sidewalks and bicycle lanes.	CC, CM, PC, PWE, CED	Near-term (2021-2025)	High (some programs are already underway; others have not been started)

Policy EC 4.3 Encourage Green Buildings and Landscaping:
Encourage the use of green and sustainable development standards and practices in planning, design, construction and renovation of facilities; promote the use of green streets that incorporate extensive landscaping, pervious surfaces and native planting; encourage new development and redevelopment projects to be LEED-certified green buildings; and promote ecologically-sensitive approaches to landscaping.

No.	Actions	Who	When	Recommended Priority
A	Ensure that roadway medians include native plants and trees and are wide enough to support their long-term viability with the least demand for irrigation and maintenance.	CC, CM, PC, CED, PWE, O&M	Near-term (2021-2025)	High (unfunded)
B	Continue to prioritize the use of locally propagated native drought-tolerant vegetation and discourage the use of invasive non-native species in home landscaping.	CC, CM, PC, CED, PWE, O&M	Near-term (ongoing)	High

ADOPTED

C	Develop and promote an urban forest management/ master reforestation plan.	CED, PARKS, PC, PRAD, CC, CM	Near-term (2012-2025)	High (unfunded)
D	Evaluate the feasibility of expanding tree planting within the city, including an evaluation of potential carbon sequestration as well as GHG emissions. Specific tasks include: Provide information to the public, including landscape companies, gardeners, and nurseries, on carbon sequestration rates, drought tolerance, and fire resistance of different tree species.	CC, CM, CCOMM, PC, CED, PARKS, PWE,	Near-term (2021-2025)	High (unfunded)
E	Evaluate the benefits and tradeoffs of regulations that require all-electric buildings. Potential tools to require all-electric buildings include city mandates, building code updates, or ordinances. Ideally, these regulations would cover new construction and major renovations.	CC, CM, PC, CED	Near-term (2021-2025)	High (unfounded)
F	Install energy efficient appliances; where appropriate consider the conversion of power to all electricity, and upgrade structures to improve energy conservation.	CC, CM, PC, CED	Near-term (2021-2025)	High
G	Beginning in 2021, adopt and enforce the 2018 Washington State Energy Code.	CC, CM, CED	Near-term (2021-2025)	High
H	Enforce the 2018 International Building Code, Section 429, Electric Vehicle and Charging Infrastructure. This section includes charging infrastructure for accessible parking spaces.	CC, PC, CM, CED, PWE	Near-term (2021-2025)	High
I	Develop a new program to encourage the installation of public electric vehicle charging infrastructure in public spaces.	CC, PC, CM, CED, PWE, outside agencies	Near-term (2021-2025)	Medium
J	Consider local amendments to the building codes to allow for, encourage, or require integration of passive solar design, green roofs, active solar, and other renewable energy sources.	CC, CM, PC, CED	Near-term (2021-2025)	Medium
K	Support the addition of performance-based alternatives to energy codes and appropriate sections of the building code.	CED	Near-term (2021-2025)	High
Policy EC 4.4 Promote Green Infrastructure:				

ADOPTED

Develop green infrastructure standards that relies on natural processes for stormwater drainage, groundwater recharge and flood management. (Green approaches for infrastructure development are environmentally and fiscally efficient and provide long-term benefits to the community by reducing energy consumption and maintenance and capital improvement costs.)				
No.	**Actions**	**Who**	**When**	**Recommended Priority**
A	Refer to Actions Tasks in EC 4.3.	CM, CA, PWE, CED	Medium	Medium (unfunded)
B	Evaluate the feasibility of incorporating Washington State Department of Commerce Incentivizing Low-impact Development report into the development code and as a resource for developers.	CC, CM, PC, CED	Long-term	Medium (unfunded)
C	Evaluate the feasibility of creating a sustainable site planning score to evaluate a development.	CC, CM, PC, CED	Near-term	High (unfunded)
Policy EC 4.5 Encourage Local Food Systems (Urban Agriculture): Collaborate with local urban agriculture advocates to identify sites with urban agriculture potential. Urban agriculture has the potential to supplement the availability of fresh fruit and vegetables in the community, provide economic opportunities to Lakewood residents, lower food costs, reduce overall energy consumption and build social cohesion.				
No.	**~~What~~ Actions**	**Who**	**When**	**Recommended Priority**
A	Assess opportunities for sustainable Urban Agriculture. Work with non-profits and regulatory agencies to explore the potential for creating, expanding and sustaining local urban agriculture, including community gardens, orchards and farmers' markets. The assessment should explore the feasibility of implementing the following strategies: ▪ Developing a site inventory and a management plan to administer the use of potential urban agricultural sites; ▪ Expanding the number and frequency of farmer's markets throughout Lakewood; ▪ Promoting urban agriculture as a desirable civic activity that improves the quality of urban life, food security, neighborhood safety and environmental stewardship;	PARKS, CED, CCOMM	Near-term (2021-2025)	High (partially funded)

ADOPTED

	▪ Establishing a community-based support system for urban growers such as tool banks, shared processing facilities, farmers' markets, community supported agriculture ventures, funding streams and technical service providers; ▪ Offering locally grown food to local schools, hospitals, nursing homes, food banks, daycare centers, correction facilities and businesses such as restaurants, while creating economic opportunities for urban growers and related industries; ▪ Creating training programs for unemployed people to work in urban food-related businesses as a source of jobs; ▪ Working with representatives of community gardening and urban farming organizations to meet needs unique to urban farm enterprises; ▪ Ensuring long-term land commitment for community gardens, entrepreneurial farms and other urban agriculture ventures; ▪ Updating building codes to encourage rooftop gardening.			
B	Coordinate with Clover Park School District in developing school-based programs that integrate nutrition and gardening in order to raise awareness about the connection between healthy food choices and locally grown fresh produce and the environmental benefits of urban agriculture.	PARKS, CED	Near-term (2021-2025)	High (partially funded)

ADOPTED

Goal EC 5: Develop a Hazards Management Plan (developing a climate-resilient community)

While the impacts of climate change on local communities are uncertain, it is important to prepare to respond to major storm events and protect residents and businesses from increased risks of natural disasters.

Resilience involves three abilities which are related to hazards management: 1) the ability to absorb strain and preserve functioning despite the presence of adversity; 2) an ability to recover or bounce back from untoward events – as the community becomes better able to absorb a surprise and stretch rather than collapse; and 3) an ability to learn and grow from previous episodes of resilient action.

Table 10: Goal EC 5 Policies and Tasks

Policy EC 5.1 Avoid and Minimize Impacts: When considering climate change impacts, first seek to avoid impacts altogether, then minimize them, and finally, adapt to the unavoidable impacts as much as possible.				
No.	**Actions**	**Who**	**When**	**Recommended Priority**
A	Refer to Action Items listed in EC 2.1, 2.3, 3.3 - 3.5, and 4.1 - 4.3.	CC, CM, CA, PARKS, CCOMM, CED, LPD, FIRE, PWE, outside agencies	Near-term (2021-2025)	High (unfunded)
Policy EC 5.2 Identify Risks: Improve the ability to identify areas prone to greater risk from climate change hazards and restrict development and redevelopment in those areas. Increase support for mapping and data collection of high-risk areas.				
No.	**~~What~~ Actions**	**Who**	**When**	**Recommended Priority**
A	Perform a climate change assessment report for the community's lakes.	CC, CM, PWE	Medium	High (unfunded)
B	Develop a community wildfire protection plan using community assistance grants.	CC, CM, PC, CED, FIRE	Long-term	Medium (unfunded)
C	Review, and as appropriate, update Lakewood Municipal Code based on Community Wildfire Protection Plan recommendations and best management practices.	CC, CM, PC, CED, FIRE	Long-term	Medium (unfunded)
D	Review, and as appropriate, update Lakewood Municipal Code (LMC) Title 14, Environmental Protections. Title 14 provides regulations for geologic hazard areas, flood hazard areas, and critical lands and natural resources. Climate change impacts may require that new regulations be inserted into this chapter.	CC, CM, PC, CED	Near-term (2021-2025)	High (unfunded)
D	Refer to Action Items EC 1.1 A and F			
Policy EC 5.3 Align Plans and Strategies: Align land use, hazard mitigation, transportation, capital improvement, economic development, and other relevant plans. All of the community's plans, land use, hazard mitigation, transportation, capital improvement, economic development, and other relevant plans, should be working toward the same goals, and their performance measures, indicators, and policy recommendations aligned.				

ADOPTED

No.	~~What~~ Actions	Who	When	Recommended Priority
A	Refer to Action Items EC 1(C) and EC 1(D).			

Policy EC 5.4 Prepare a Hazard Management Plan: Develop a comprehensive approach to hazards management planning to include possible climate change scenarios and includes both pre-incident and post-incident responses.

- Develop post-disaster redevelopment plans.
- Expand federal and state support for climate-related hazards management.
- Continue to coordinate and cooperate with the hazards-management community.

No.	~~What~~ Actions	Who	When	Recommended Priority
A	Review, and as appropriate update the city's hazard mitigation plan to address climate change.	LPD, FIRE	Near-term (2021-2025)	High

Policy EC 5.5 Adopt and Enforce Building and Energy Codes: As required by Washington State, update building and life safety codes to better address the variety of hazards that are likely to result from climate change.

No.	~~What~~ Actions	Who	When	Recommended Priority
A	Every two years, or as otherwise dictated by Washington State, update LMC Title 15, Buildings and Construction Codes to address hazards resulting from climate change.	CC, CM, CED, FIRE	Near-term (2021-2025)	High

Policy EC 5.6 Maintaining Services: Develop a resilience strategy for the purposes of maintaining strong city finances and livable places, thereby allowing the city to more easily adapt to emergent climate-related disasters.

No.	Actions	Who	When	Recommended Priority
A	Analyze climate risks and benefits of resilience measures to property value and city revenue streams.	CC, CM, PC, CED	Long-term	Medium (unfunded)
B ➔	Map vulnerable community assets and disadvantaged neighborhoods.	CC, CM, PC, CED, PWE	Long-term	Medium (unfunded)
C	Include resilience requirements in local building and zoning codes.	CC, CM, PC, CED	Long-term	Medium (unfunded)
D	Communicate climate risks and resilience activities to the public.	CC, CM, CCOMM	Long-term	Medium (unfunded)
E	Engage economic development organizations in city resilience planning efforts.	CC, CM, CED	Long-term	Medium (unfunded)

ADOPTED

F →	Update city budget process to ensure equitable resource allocation.	CC, CM, CA	Long-term	Medium (unfunded)
G →	Address household financial and climate vulnerability in a holistic manner by coordinating complementary programs.	CC, CM, CED	Long-term	Medium (unfunded)

[i] Oliver Milman, "US generates more electricity from renewables than coal for first time ever," Guardian, October 2018, https://www.theguardian.com/environment/2019/jun/26/energy-renewable-electricity-coal-power, accessed October 2018.

[ii] David Weston, "Offshore wind and batteries LCOE falling sharply," March 2019, https://www.windpowermonthly.com/article/1580195/offshore-wind-batteries-lcoe-falling-sharply, accessed October 2018.

[iii] Ibid.

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