Multnomah County 2017

Carbon Emissions and Trends

September 18, 2019

Bureau of Planning and Sustainability
Innovation. Collaboration. Practical Solutions.
City of Portland, Oregon

Multnomah County 2017 Carbon Emissions and Trends

We are in a climate crisis. July 2019 was the hottest month in recorded history with scorching heat in Europe and massive wildfires in Siberia and Alaska. According to the World Meteorological Organization, "July 2019 has rewritten climate history, with dozens of new temperature records at the local, national and global level[1]."

In the Pacific Northwest, the region has warmed substantially, nearly 2°F since 1900[2]. This temperature rise is leading to warmer winters, decreasing snowpacks, hotter summers, and heavier storms. Scientific models predict increasing the risk of both flooding and drought, water scarcity, large wildfires, warmer stream temperatures, harmful algae blooms, life-cycle impacts for salmon, damage to recreational tourism economies, and negative human health impacts from poor air quality and heat.

Despite 26 years of climate planning and mitigation in Portland, local carbon emission reductions have started to plateau around 15% below 1990 levels, see Figure 1. This is both a success story, and a warning. The reductions to date are impressive given we've welcomed 38% more people and 34% more jobs during the same time. Collectively we have reduced per person emissions in Multnomah County by 38% since 1990, although these reductions have slowed. Despite our successes, our emission reduction efforts clearly need to rapidly accelerate.

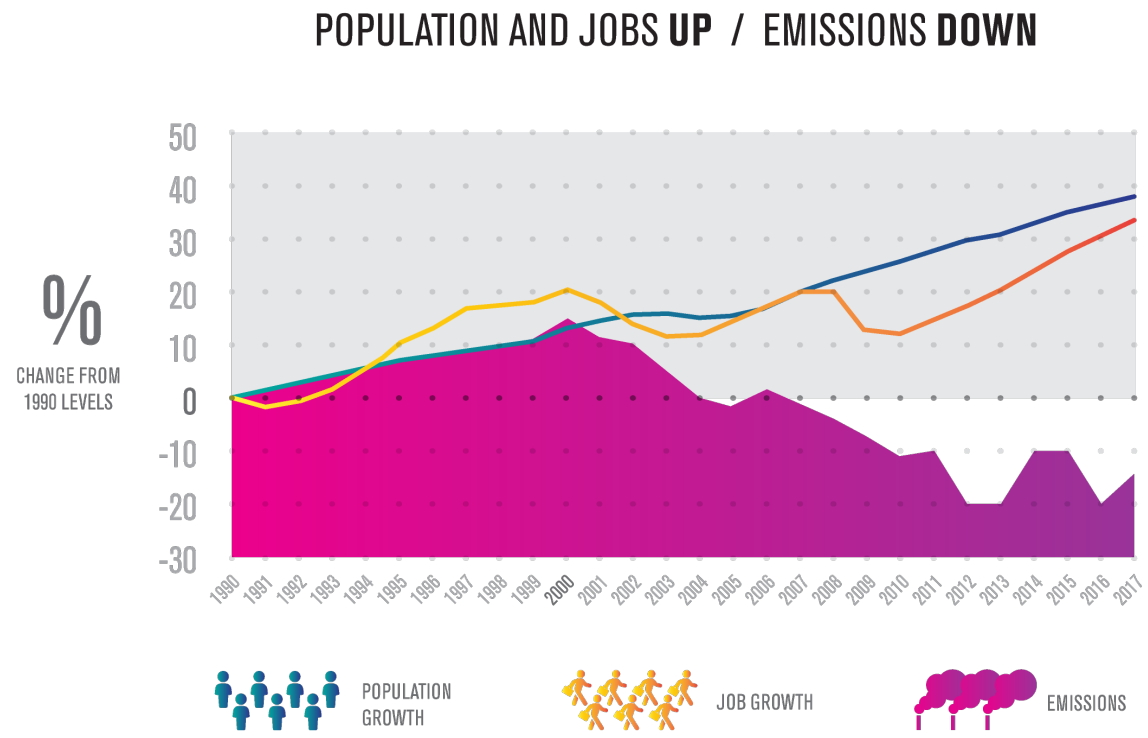

Figure 1: Emissions continue to decline from their peak in 2000, despite significant population growth and increase in jobs. Portland has maintined the decoupling of emissions from growth. However, reductions have reached a plateau in recent years.

Transportation sector emissions are increasing dramatically, currently 8% over 1990 levels, and 14% over their lowest levels in 2012. Portland has experienced year over year increases in transportation related emissions for the past five years, with transportation emissions growing faster than population growth over the same period.

The United Nations International Panel on Climate Change (IPCC) released a special report in October 2018[3] that reiterated the need to limit global warming to 1.5°C to avoid the worst impacts of climate change, including the risk of severe weather events, reduced heat-related mortality, reduced water scarcity, prevent sea level rise that could render delta and low-coastal regions uninhabitable, where two-thirds of the world's population live. IPCC projects that limiting warming to the 1.5°C will require an unprecedented transformation of every sector of the global economy to achieve a 50% reduction in carbon emissions by 2030 and net-zero carbon emissions by 2050. To achieve this Portland must reduce our local emissions by an additional 35% in the next 11 years, a daunting task.

This white paper presents Portland's carbon emission inventory, including sources and trends for the years 1990 to 2017 for Multnomah County. The intent of this paper is to provide information about the pressing challenge to uphold Portland's share of the Paris Climate Agreement. Portland conducts annual emissions inventories to inform policy and planning to reduce emissions. The inventory shows where to focus mitigation efforts and whether we are on track with emission reduction goals. Households and businesses can also assess their own carbon emissions by using free online tools, like the Cool Climate Network's calculators:

- Households - https://coolclimate.berkeley.edu/calculator
- Businesses - https://coolclimate.berkeley.edu/business-calculator

Emissions overview from 2017

Portland and Multnomah County have been tracking local carbon emissions for nearly 30 years using an annual sector-based emissions inventory. This sector-based carbon emissions inventory is widely used by local, state and national governments and meets the Global Protocol for Community-scale GHG Emission Inventories (GPC).

A conventional sector-based carbon emissions inventory shows emissions resulting from four primary categories: fuel use in transportation (e.g. gasoline, diesel, and propane) and energy use in homes, commercial buildings, and industrial facilities (e.g. natural gas for heating, electricity, industrial process fuels), see Figure 2. The City maintains an annual inventory of countywide emissions from these sources, together with landfilled solid waste, wastewater treatment, and other fugitive emissions.

***Fugitive emissions** are emissions of gases or vapors from pressurized equipment that escape due to leaks and other unintended releases of gases. These leaks occur during gas extraction from the ground, gas distribution to end users, or gas that escapes from equipment like air conditioning or refrigeration units. Fugitive emissions contribute to air pollution and climate change.*

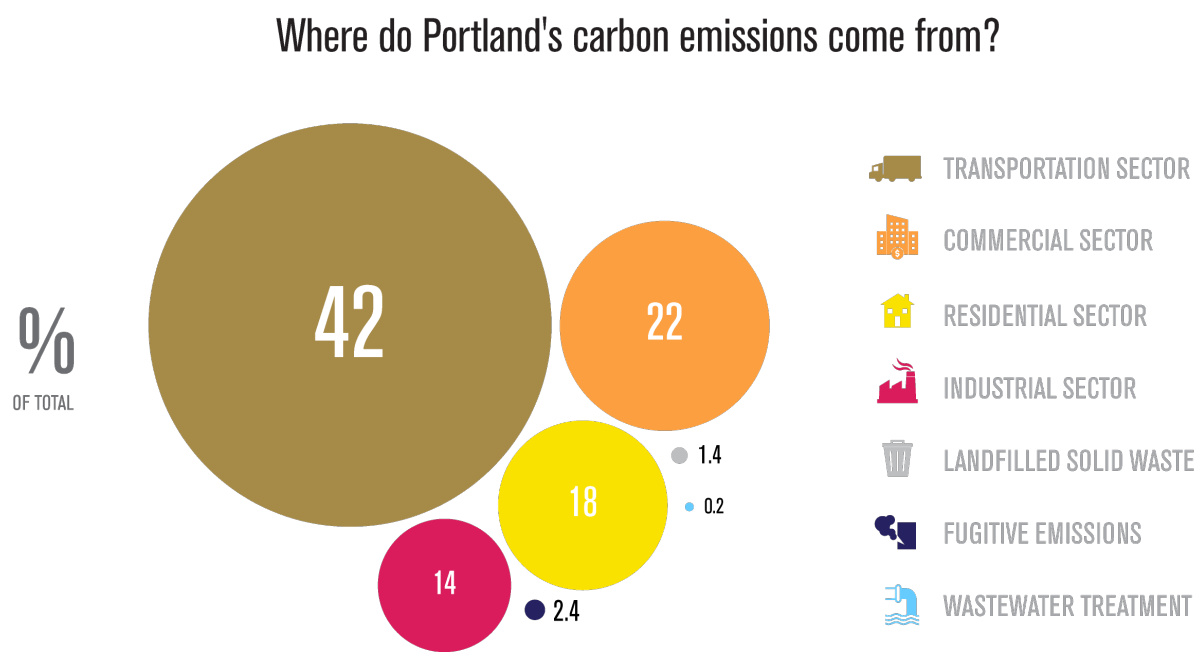

Figure 2: 40 percent of local emissions come from the energy used to run, heat and cool our homes and businesses, and over 40 percent come from transporting people and goods. These proportions have changed as the transportation sector share of local emissions has increased significantly since 2013, when they only accounted for 38 percent of emissions.

This inventory method allocates carbon emissions across the residential, commercial, industrial and transportation sectors based on fuel and energy use in those sectors. It also assigns emissions to solid waste disposal based on the tonnage and type of materials hauled to regional landfills, local wastewater treatment practices, and estimates of fugitive emissions generated in Multnomah County based on population.

Two primary factors influence the emissions trends over time:

1. The amount of energy used in the different sectors (e.g. residential, commercial, industrial, transportation).
2. The carbon-intensity (carbon emissions per unit of energy) of the different energy sources (e.g., electricity, natural gas, gasoline, diesel).

The carbon intensity of energy used in Multnomah County has declined substantially, carbon emissions per unit of energy were 21% lower in 2017 than in 1990. This results in overall reduction in carbon emissions even as the total amount of energy use has increased 8% since 1990.

Today, carbon emissions from Multnomah County total 7,702,000 Metric tons of carbon dioxide equivalents (MT CO2e), which is a 15% reduction from 1990 levels, see figure 5. This decline reflects the continued growth of renewable energy resources like wind and solar in the Pacific Northwest, investments in transit and bike infrastructure, dense and walkable neighborhoods, renewable transportation fuels, as well as the transition from fuel oil to natural gas for heating. These efforts combined have reduced per-person emissions in Multnomah County to 38% below 1990 levels, see Figure 3. This means that a person living in Portland today produces 38% fewer carbon emissions than they would have in 1990.

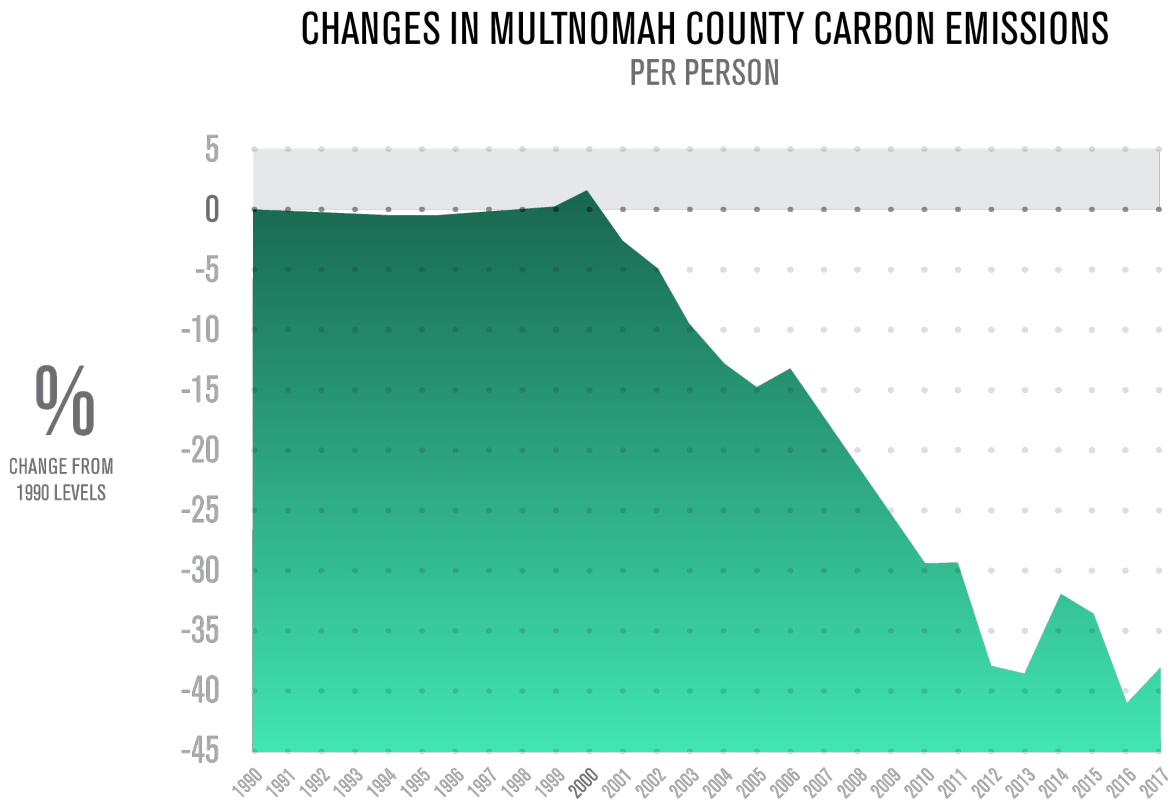

Figure 3: Multnomah County per person carbon emissions have fallen significantly, currently 38% below 1990 levels.

Electricity generation is the single largest source of local carbon emissions, 28%, see Figure 4. These emissions are the result of the carbon intensity of coal and natural gas burned to produce the electricity that powers Multnomah County households and businesses.

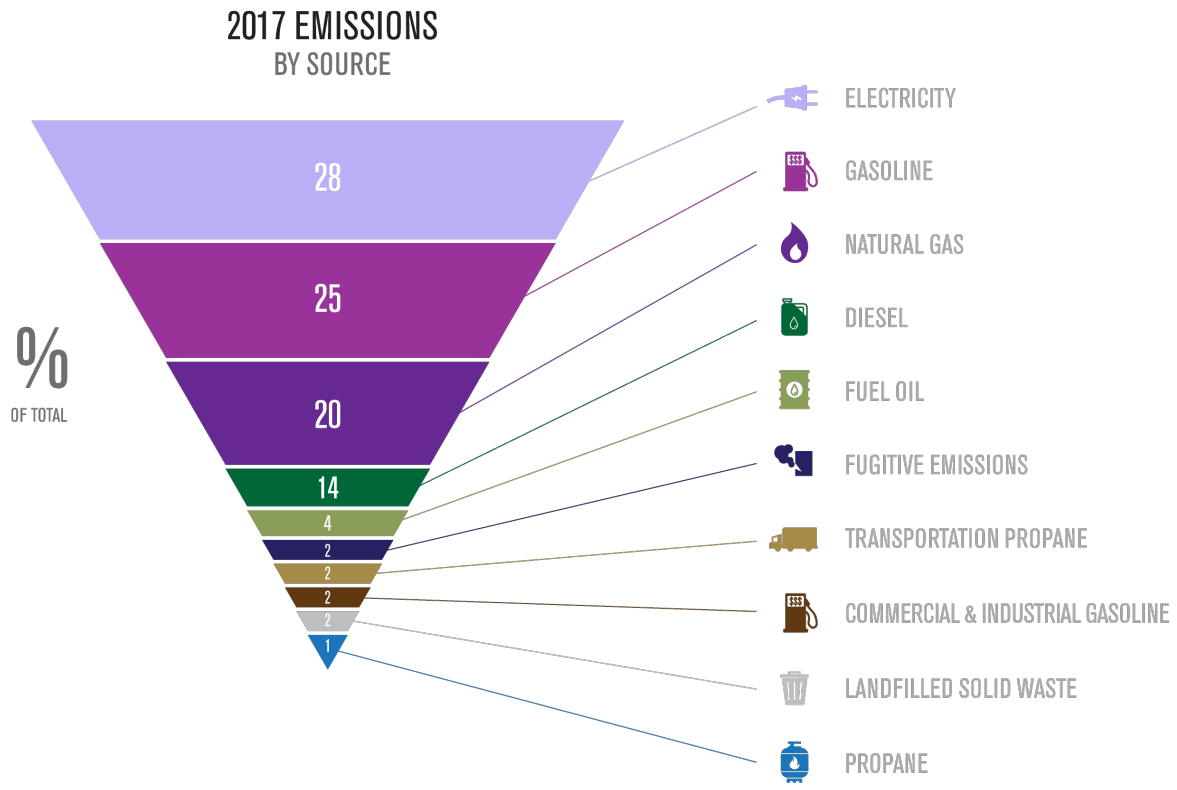

Figure 4: Nearly all of Multnomah County's carbon emissions come from four sources - electricity, gasoline, natural gas, and diesel fuel. Emissions from electricity are the single largest source of local carbon emissions. Additional emissions not shown on chart include wastewater treatment, kerosene, and residual fuel oil -- less than 1% of total emissions.

All transportation fuels (gasoline, diesel, propane, ethanol, biodiesel) combined account for 42% of carbon emissions. These emissions are the result of driving vehicles powered by gasoline, diesel and propane, the transportation of goods, off road vehicles and equipment used for construction, and a transit system dominated by diesel buses.

Direct use of natural gas, primarily used to heat buildings, water, and in industrial processes, is the third major source, at 20%.

Emissions trends

Over time, emissions fluctuate depending on numerous complex factors like the economy, weather, population growth, and local individual behavior. For instance, from 2016 to 2017 emissions increased 6%, due primarily to a very cold winter and increased use of transportation fuels. Due to the complex interaction of numerous factors, this year-to-year change is less significant than the overall trend. Tracking emissions with the same methodology since 1990 allows us to focus on the main sources of carbon emissions and track our overall trajectory towards long-range goals.

The emissions trend, in Figure 5, shows that since 2010 emissions have varied substantially from year to year, due to the carbon intensity of the electric grid and variations in weather. This inventory uses eGRID emission factors for the Northwest Power Pool, which includes Washington, Oregon and most of Montana, Idaho, Wyoming, Nevada, and Utah, and cannot be disaggregated by State. These factors are based on data collected every other year and are heavily affected by weather patterns, as the Northwest Power Pool is dominated by hydroelectric power from Pacific Northwest dams. When there are high rainfall years, hydroelectric dams generate more power, reducing the carbon emissions that result from electricity generation. In dryer years, emissions increase, causing up to 10% variation in emissions. However, if we look through the annual variations from 2010-2017, at the larger trend, we see that emission reductions have reached a plateau.

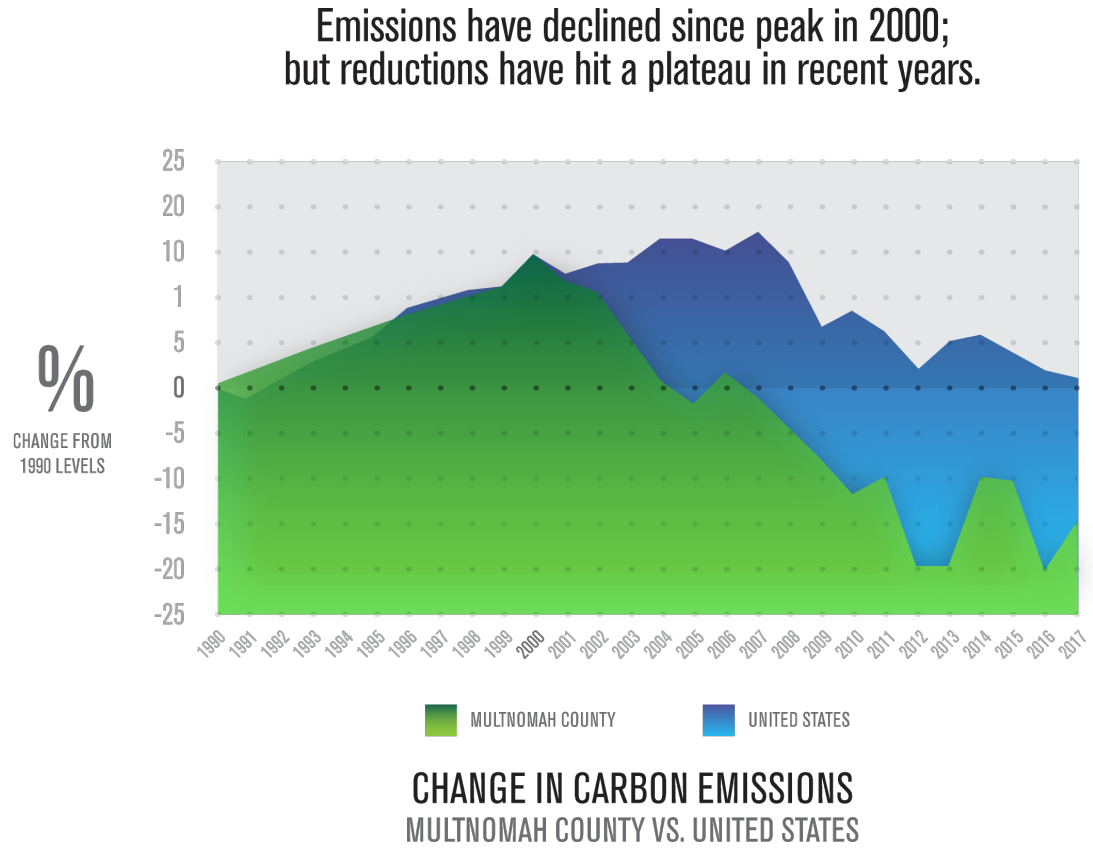

Figure 5: Total carbon emissions in 2017 were 15 percent below 1990 levels. There was a 6 % increase in emissions from 2016 to 2017, mostly the result of winter heating and increased transportation fuel use.

Emissions resulting from residential and multifamily energy use have declined 19% below 1990 levels, a per-person decrease of 41%. This is primarily a result of the improved efficiency of appliances and lighting, weatherization retrofits of homes, the transition from oil to natural gas as a home heating fuel, and the increased use of renewable energy by utilities.

Emissions from energy use in the commercial sector have declined by 10% since 1990. Over the same period, emissions from the industrial sector have declined by 42%, while the total number of jobs has increased by 34%. This is the result of improved efficiency and shifts toward lower-carbon fuels, both in direct consumer use and by electric utilities. For the industrial sector, there remains strong demand for industrial jobs and industrial land, indicating that the reductions are the result in a decrease in the carbon-intensity of industrial jobs, as opposed to a loss of industrial sector jobs[4]. There has also been a shift from energy intensive manufacturing, like aluminum smelting to less energy intensive manufacturing activities.

While emissions are down in other sectors, the reverse is true for transportation, see Figure 6. Over the last six years, transportation sector emissions have climbed above 1990 levels, a 14% increase from their lowest level in 2012. Transportation sector emissions are not as high as they would have been without a 2% decrease in the carbon intensity of transportation fuels. This was largely achieved by the increased use of biofuels in Oregon, including a statewide Renewable Fuel Standard that requires diesel to be blended with a minimum of 5% biodiesel and gasoline to be blended with a minimum of 10% ethanol for fuels sold in Oregon.

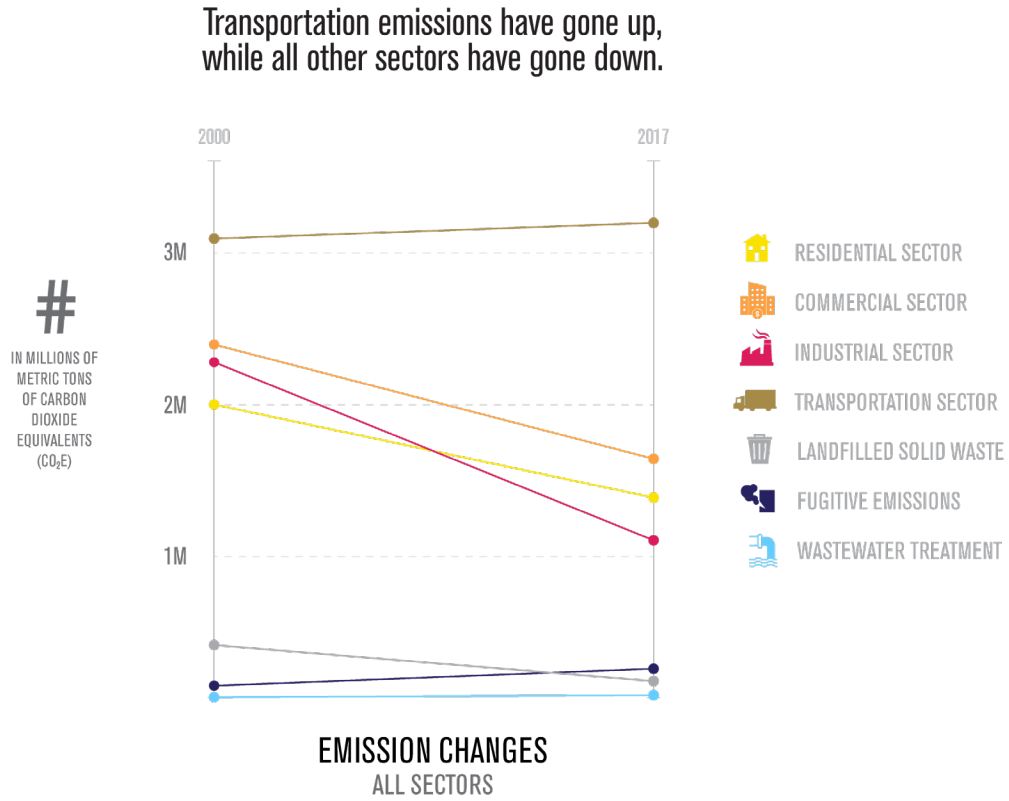

Figure 6: Since peak emissions in 2000, emissions have declined across all sectors, except for transportation which is currently 3% over 2000 levels. Due to the limited availability of data, fugitive emissions are estimated based on population and will therefore increase annually with population growth.

The following sections explore our primary emissions sources in more detail – transportation fuels, natural gas, and electricity.

Deep dive on transportation sector data

As discussed above, transportation sector emissions have increased in recent years. The increase in transportation emissions has tracked closely with recovery from the 2009 recession and are currently 8% above 1990 levels.

Transportation sector emissions come from use of transportation fuels (gasoline, diesel, propane, ethanol, biodiesel) and estimated vehicle miles travelled. These emissions are the result of driving vehicles powered by gasoline, diesel and propane, the transportation of goods, off road vehicles and equipment used for construction, and a transit system dominated by diesel buses. In recent years there have been more electric vehicles on the road, but because these vehicles are fueled with electricity – charged in people's homes and businesses without metering - the emissions are allocated to the buildings sector.

According to Metro, per person daily vehicle miles travelled (VMT) have remained relatively flat across the region since 2010, despite significant population growth. More Portlanders are on the road driving, but they aren't driving longer distances.

This section focuses on gasoline sales, see Figure 7 below, because gasoline data is the most accurate transportation fuel source at the local level. Total gasoline sales in Multnomah County in 2017 were 2% below 1990 levels, notable given the 38% increase in population over the same period.

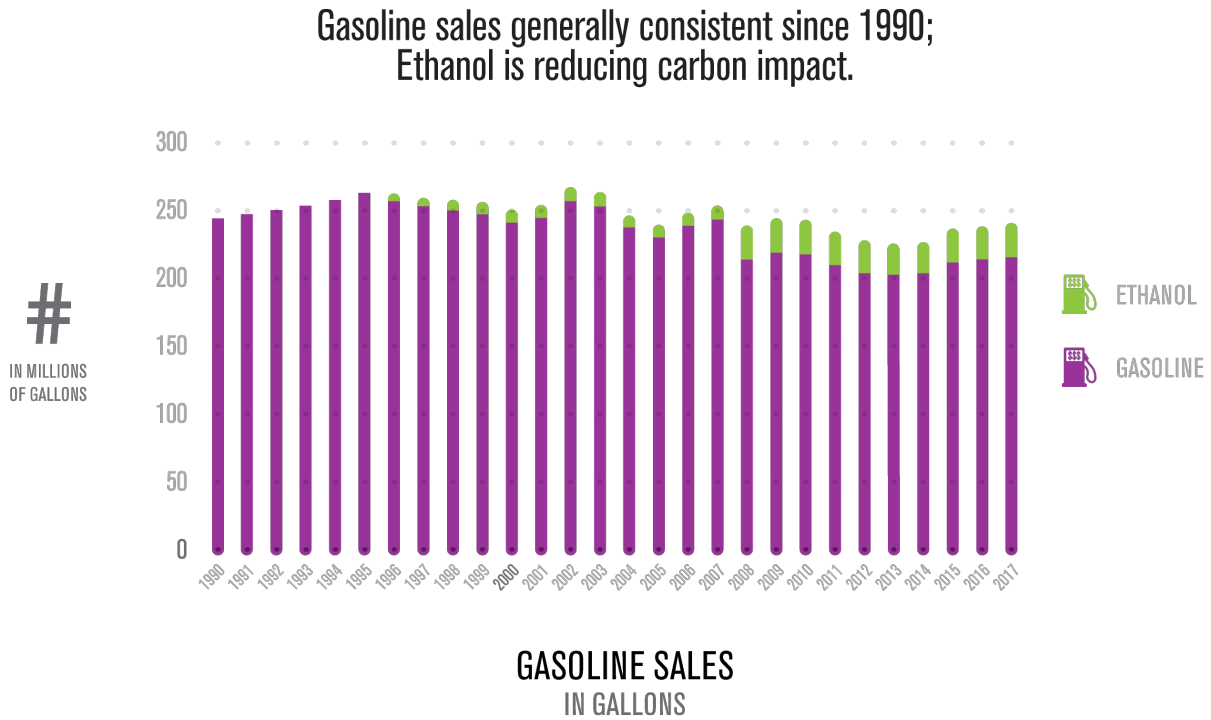

Figure 7: Gasoline sales have remained generally consistent since 1990. We've reduced the carbon emissions per unit of gasoline sold through Portland and Oregon's Renewable Fuel Standards, which require 10% ethanol in every gallon of gasoline. Gasoline sales data is available at the County level, reported by the Oregon Department of Transportation as fuel tax revenue is distributed by County.

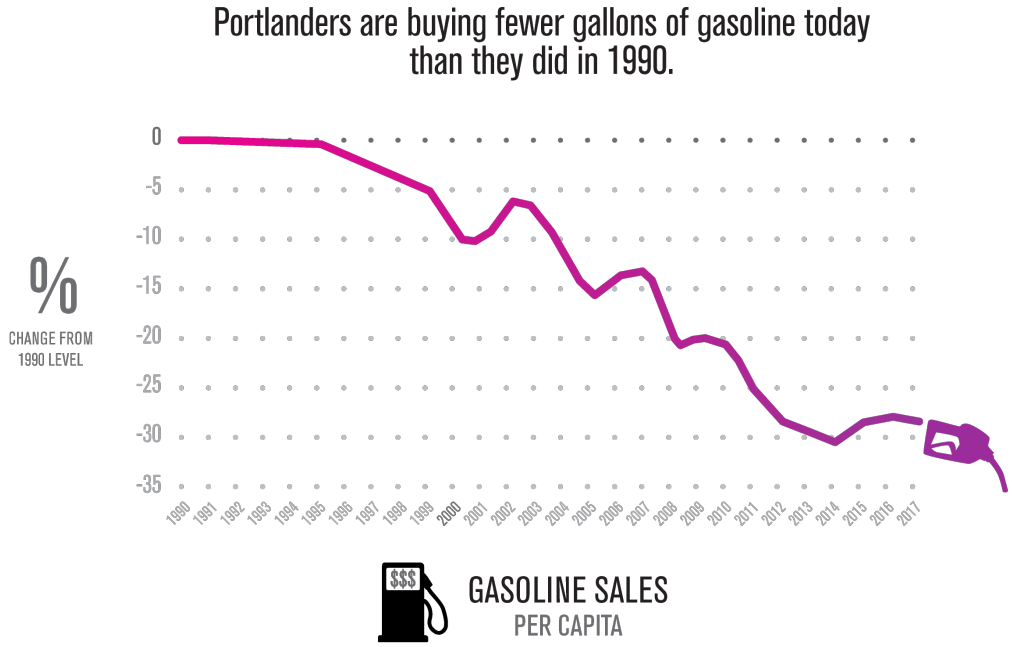

Figure 8: Since 1990 sales of gasoline per person have declined rapidly, the result of more efficient vehicles and more complete and connected neighborhoods that enable better walking, biking, and access to public transit.

Per-person gasoline sales are down 28% below 1990 levels, see Figure 8. This is the result of increasingly complete and connected neighborhoods, regional transit system investments, shifts from driving to walking and bicycling, improved vehicle fuel efficiency and use of lower-carbon fuels such as biodiesel, ethanol and electricity.

Deep dive on natural gas

Natural gas is one of the primary sources for carbon emissions in Multnomah County. Natural gas is used for heating buildings, heating water, and used in industrial processes. Natural gas accounts for 20% of total Multnomah County carbon emissions. Both the City of Portland and Multnomah County have adopted resolutions establishing a goal of 100 percent renewable energy to replace natural gas communitywide by 2050.

Since 1990, natural gas has largely replaced fuel oil for home heating and associated carbon emissions have declined as a result. Historically, natural gas has been used as a transition fuel, as it is cleaner burning fuel than fuel oil. Fuel oil sales in Portland have declined 80% since 1990. Today in Portland, only 4% of housing units are heated with fuel oil and 51% are heated with natural gas. Natural gas is the primary heating source for Portland's single-family, owner-occupied housing, see Table 1. The challenge of decarbonizing home heating will require extensive private investment and public policies to switch to lower carbon energy sources.

Table 1: Portland's owner-occupied housing stock is primarily heated by natural gas. The renter occupied housing stock is primarily heated with electricity, making these units easier to decarbonize as the electricity grid becomes more renewable. According to the US Census, 1% of Portland housing units, or nearly 2,000 units, do not have heat.

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates

House Heating Fuel	Number of Occupied Units	Percent Total Occupied Units	Percent of Owner-Occupied units	Percent of Renter-Occupied Units
Natural Gas	134,280	51%	71%	29%
Propane Gas	3,001	1%	1%	1%
Electricity	107,116	41%	20%	65%
Fuel Oil	10,462	4%	6%	2%
All other	4,277	2%	2%	1%
No fuel	1,813	1%	0%	1%
	260,949			

In addition, national studies have demonstrated that lifecycle emissions from natural gas extraction and distribution systems are greater than previously understood. Fortunately, NW Natural's Portland-area distribution system for natural gas is one of the best in the nation, with 100% of its cast iron and bare steel pipes having been replaced. There are still opportunities for property owners to upgrade natural gas pipes on their properties to further reduce these fugitive emissions from escaping the natural gas distribution system. Portland's emissions inventory includes federally reported fugitive emissions from the natural gas distribution system.

In 2017 NW Natural logged their highest-ever sales of natural gas in Multnomah County, 6% over the previous peak in 2000, see Figure 9 below. In 2017, compared to 2016, there was a 27% increase in residential usage and a 22% increase in commercial usage.

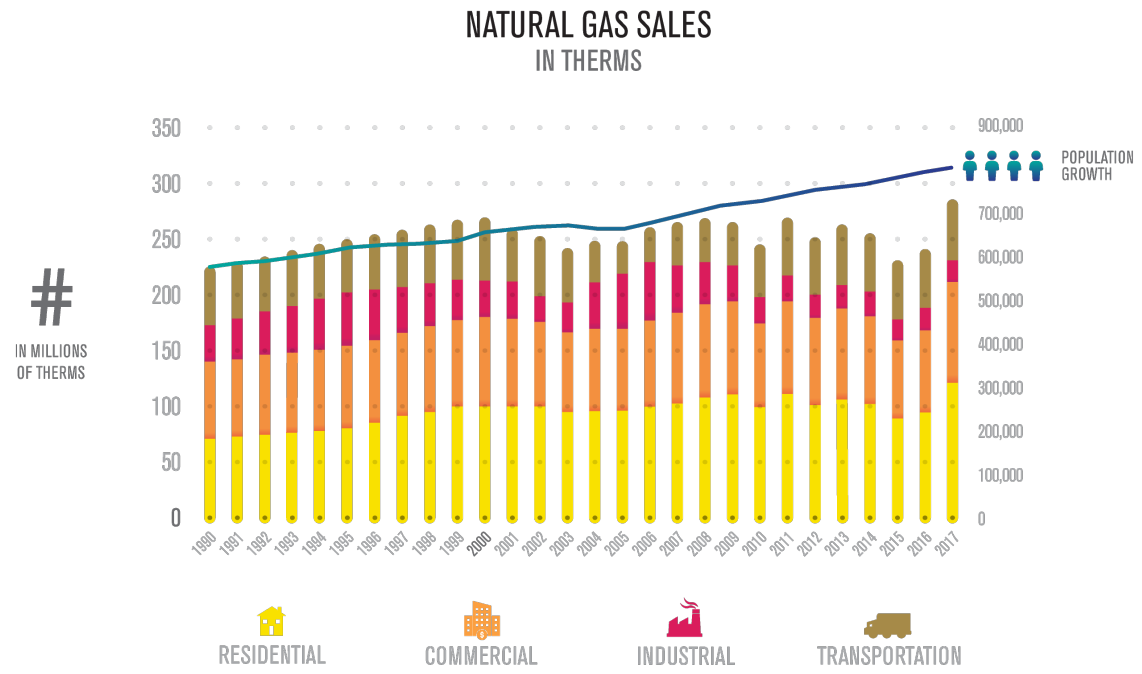

Figure 9: Natural gas sales, primarily used for heating, track with weather patterns. 2017 was an unusually cold winter, resulting in higher than average natural gas use in the residential and commercial sectors. 2017 had the highest ever natural gas sales for NW Natural in Portland, 6 percent over the previous peak in 2000. As Portland is growing we have become more efficient in the use of natural gas, reducing per person natural gas usage, primarily because buildings owners have upgraded gas furnaces and water heaters to more efficient models. Data reported by NW Natural.

This increase was not the result of new construction of gas heated units or new people moving to Portland, but the result of an unusually cold winter. Winter heating days in 2017 were higher than normal levels. 2017 was the coldest winter heating season since 2008 and 1985 before that. To provide context, natural gas usage in 2008 was 153 therms per person. In 2017 natural gas usage per person was lower, down to 150 therms per person. Therefore, even with colder temperatures, our use of natural gas today is more efficient than a decade ago. Given this, we expect natural gas emissions to decline for 2018 with a return to more normal winter heating.

Deep Dive on Electricity

Electricity is our single largest local source of carbon emissions. Electricity is used for power in all sectors. Electricity grid mix must become more renewable over time. This is even more important as electrification of our transportation system, homes, and businesses play a key role in decarbonizing the local economy. Unfortunately, the grid is not as green as we think, see figure 10. For our local utilities, Portland General Electric (PGE) and Pacific Power (PAC), 63% of electricity is still sourced from fossil fuels.

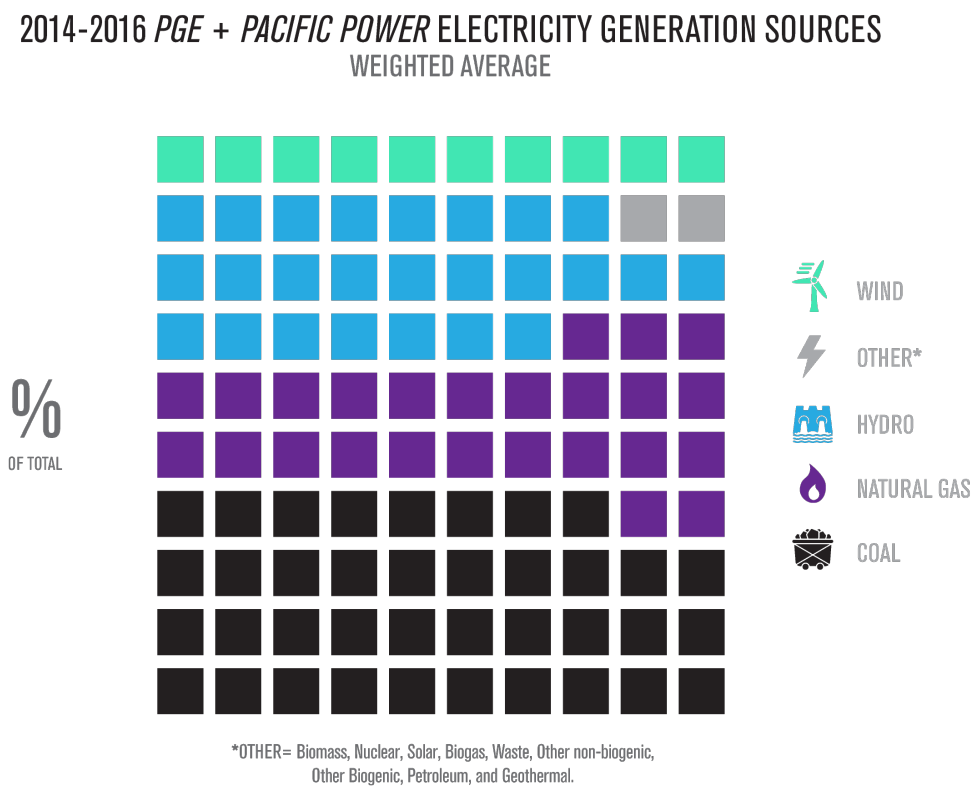

Figure 10: Weighted three-year average of electric generation sources for Portland's two electric utilities, based on data from the Oregon Department of Energy, including direct generation and grid power purchases. The data shows that 63% of Portland's electrical grid mix is sourced from fossil fuels that contribute to climate change.

PGE provides 75% of electricity purchases in Multnomah County. According to the Oregon Department of Energy[5] three-year weighted average. PGE generates or purchases electricity sourced from 28% natural gas and 29% coal. PGE generates 80% of their power and purchases 20% from the Northwest Power Pool, an organization of major utility providers in the Northern US and lower Canada.

PAC provides 25% of electricity purchases in Multnomah County. 63% of their electricity is directly generated from coal and 17% is from natural gas. PAC purchases 10% of their power from the Northwest Power Pool.

Emissions included in this paper are based on the Northwest Power Pool, with emission factors published by eGRID, for compliance with international reporting and protocols. The City of Portland also reviews emissions using utility specific emission factors on an annual basis. Using emission factors for PGE and PAC, the trends track very closely to the Northwest Power Pool emission factors, except that

PGE and PAC emissions are higher due to the lack of hydroelectric generation, as compared to the Pacific Northwest grid as a whole.

As we seek to move more sources to electricity, we must also work to reduce the carbon intensity of the grid. Currently a 50% reduction is required by the Oregon Renewable Portfolio Standard by 2040, but only 15 to 20% is renewable today. Both the City of Portland and Multnomah County have adopted resolutions establishing a goal of 100 percent renewable electricity communitywide by 2035.

As shown in Figure 11, electricity purchases peaked in 2000 and have generally declined since. Currently grid power purchases (excluding voluntary green power) are down 5% below 1990 levels, even with a 38% increase in population over the same period. Figure 11 shows grid electricity purchases by sector. The slow reduction in energy use speaks to the need to accelerate energy efficiency investments to reduce per person electricity use. The figure also shows the share of electricity purchases for voluntary green power, which have helped to reduce overall emissions from electricity.

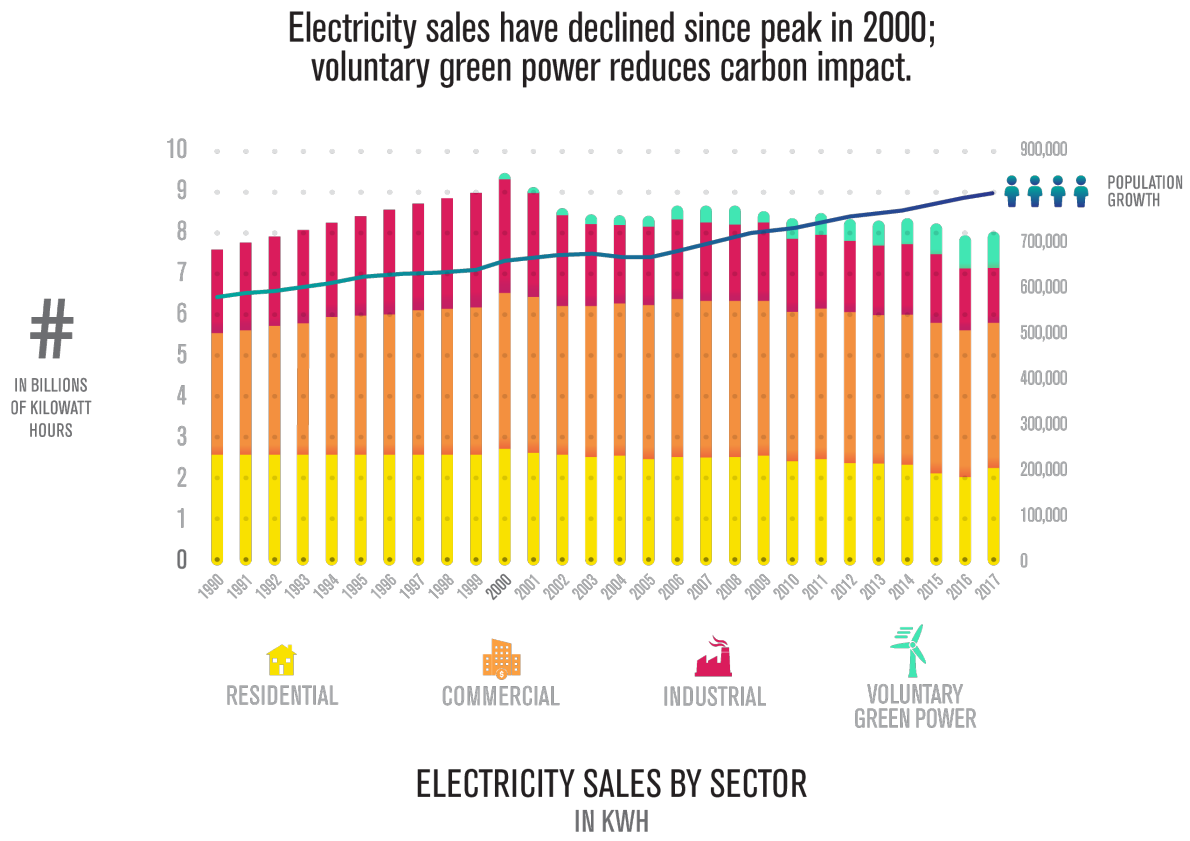

Figure 11: Electricity sales for Portland General Electric and Pacific Power have declined from their peak in 2000, even with significantly more people in Multnomah County. Electricity is primarily used to power lighting and electronics. Although 41% of Portland's housing units are heated with electricity, mostly in multifamily buildings. Half of all electricity use is from the commercial sector, primarily used to power lighting, water heating, refrigeration, air conditioning and ventilation. Voluntary green power purchases by utility customers have helped to reduce carbon emissions that result from electricity generation. Data reported by Portland General Electric and Pacific Power.

Voluntary green power purchases are electricity purchases where the customer has selected to pay a higher rate for green power. These voluntary green power purchases require utilities to procure more renewable energy and do not count towards State Renewable Portfolio Standard targets. Voluntary

green power purchases have increased year over year since 2000, see Figure 12. These purchases help reduce overall emissions from electricity generation. Portland has one of the highest participation rates in voluntary green power programs in the country, with participants accounting for more than ten percent of all electricity purchases.

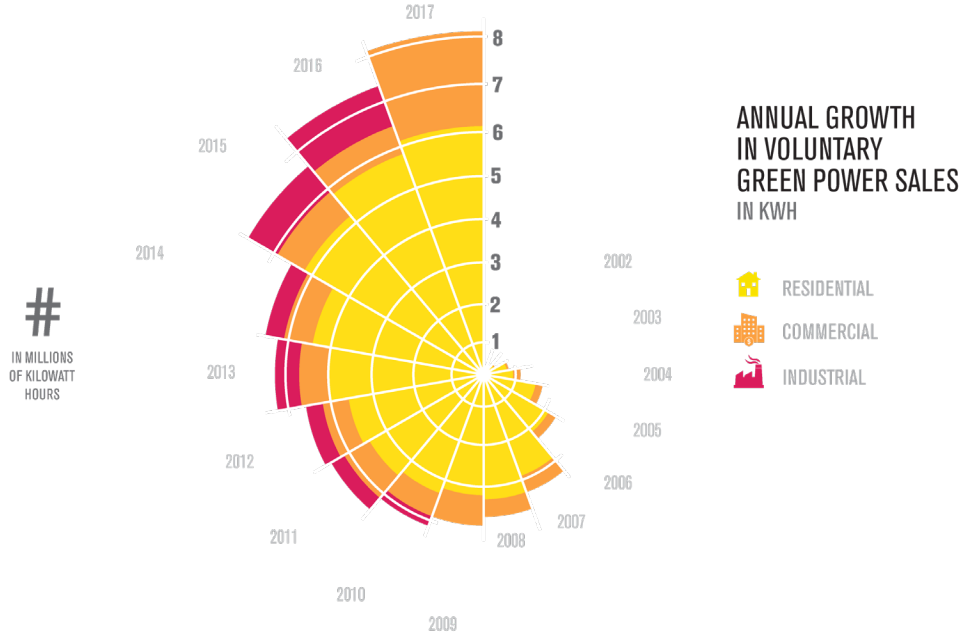

Figure 12: Both of Portland's electric utilities have been nationally recognized for their successful voluntary green power programs. These programs have seen year-over-year growth and currently account for 10% of all electricity sales. Data reported by Portland General Electric and Pacific Power.

Over the same period, Portlanders have invested in solar photovoltaic panels, or solar panels. Solar panel installs have continued to grow, even with reduced State and Federal incentives, see figure 13. Collectively, Portlanders have installed more than 4,600 solar systems, generating 34 MW of power annually. In terms of carbon emissions, that's the equivalent of driving 62 million miles per year.

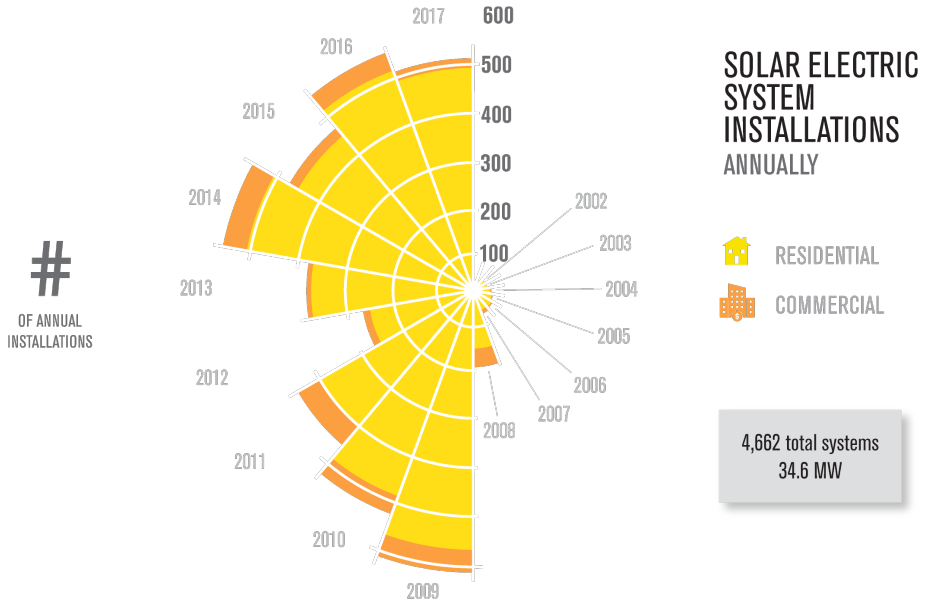

Figure 13: Solar installs in Portland remain strong, even with declining state and federal incentives. There is much more opportunity for cost effective large-scale solar systems on commercial and industrial facilities. The State's new community solar program should enable more Portlanders to benefit from renewable solar energy. Data reported by Energy Trust of Oregon.

Solar electric systems are an important part of our overall grid mix and a pathway to decarbonize our energy supply by 2050. Solar electric systems are challenging at a small scale, however, and not every home can accommodate solar panels. Opportunities exist to focus investment on larger utility scale solar facilities, these could include commercial and industrial solar installs, or community solar.

> ***"Community solar"*** *means solar photovoltaic energy systems that provide owners and subscribers the opportunity to share the costs and benefits associated with the generation of electricity. Subscribers receive credits on their utility bill for a share of the solar electricity generated by a community solar project.*

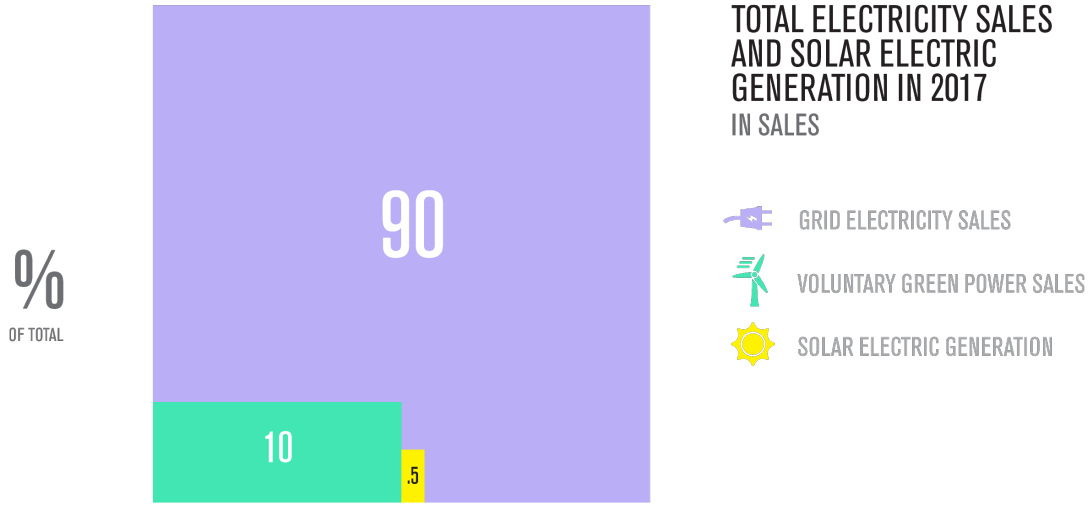

Figure 14: Portland's total electricity use is offset partially by voluntary green power purchases (10% of electricity used) and solar electric systems (.5% of electricity used) installed on Portland's homes and businesses. Data reported by Portland General Electric, Pacific Power, and Energy Trust of Oregon.

Investments in voluntary green power purchases remain an important way to reduce carbon emissions from electricity purchases, see figure 14. In addition, PGE is now offering a green tariff – Green Future Impact program - that provides customers with bundled renewable energy certificates. To strengthen its renewable energy commitment, the City of Portland infrastructure bureaus enrolled in PGE's Green Future Impact program. Starting in 2021, the City will receive 46,600 annual megawatt-hours – approximately 40 percent of its annual PGE electricity load- from a new solar facility in Central Oregon.

Renewable energy certificates (RECs) *are tradeable, market-based instruments that represent the legal property rights to the environmental attributes of one megawatt-hour (MWh) of renewable electricity generation. A REC is issued for every MWh of electricity generated and delivered to the electric grid from a renewable energy resource. Electricity cannot be considered renewable without a REC.*

Unbundled Renewable Energy Certificates (RECs) refer to RECs that are sold, delivered, or purchased separately from electricity. RECs provide no physical delivery of electricity to customers and as such the customer is purchasing power from a separate entity than the one selling them the REC. A bundled REC is when the customer is purchasing the electricity and the REC together from the same utility.

Inventory methodology changes

Portland tracks carbon emissions annually. Since the 2017 Progress report, staff have worked to update emissions inventories in accordance with the new Global Protocol for Community-scale GHG Emission Inventories to stay in alignment with Paris Agreement (limiting global warming to 1.5 degrees Celsius).

Protocols

By updating protocols, Portland stays in alignment with other cities around the world, enabling better tracking against long range goals with greater confidence. Updating protocols is a challenge for cities and can create discrepancies with previously reported emissions. For example, to move to the global reporting protocol, Portland had to update accounting methods for emissions from landfilled waste, wastewater treatment, and fugitive emissions. This required finding new data sources all the way back to the 1990 baseline to consistently compare data year over year.

The City of Portland utilizes multiple emission protocols to compare results and better refine estimates of emissions produced locally. By reviewing data using different protocols, Portland can make up for gaps in individual methodologies. For example, Portland reports electricity sector emissions by greenhouse gas, a level of detail only available for the Northwest Power Pool, although as discussed above, those emissions are lower than the emissions from Portland's two electric utilities. Therefore, the use of multiple protocols allows Portland to better understand what's happening locally.

The time required to find and evaluate new data sets for a protocol change delays the frequency of emissions inventory reporting. Changes to protocols that affect data collection and carbon accounting limit comparability with previously reported data using older methodologies. With a baseline year of 1990, protocol changes create substantial new work as more than 20 years of inventories need to be consistently updated.

Changes in data sources

This 2017 inventory includes a variety of new data sources and emission factors that have been applied back to the 1990 baseline. New data sources increase annual emissions as they are added to the inventory. These changes help improve the accuracy of the emissions inventory but can negate comparability with previously published emissions.

New data sources include:

- New eGRID electricity emission factors for 2014 and 2016, (US EPA)
- Waste incineration, (Oregon DEQ)
- Improved estimates of propane use, (US EIA)
- Better accounting of emissions from wastewater treatment and septic tanks, (Oregon DEQ)
- Better accounting of fugitive emissions (NW Natural, US EPA, Oregon DEQ)

Reporting carbon emission data

Portland reports emissions annually through the Carbon Disclosure Project for compliance with international agreements, like the Covenant of Mayors and C40's Deadline 2020. Portland will continue to monitor and report on annual carbon emissions, noting when changes are made to methodologies that limit comparability with previously reported data. When data is fully updated, the emission data are released publicly through Climate Action Plans, Progress Reports, or periodic publications like this one.

[1] Source: World Meteorological Organization, 2019, https://public.wmo.int/en/media/news/july-matched-and-maybe-broke-record-hottest-month-analysis-began

[2] Source: Oregon Fourth Climate Assessment, 2019, http://www.occri.net/media/1095/ocar4full.pdf
[3] Source: Intergovernmental Panel on Climate Change, 2018, https://report.ipcc.ch/sr15/pdf/sr15_spm_final.pdf

[4] Source: Regional Industrial Site Readiness Full Report, Mackenzie, 2017, https://portlandalliance.com/assets/pdfs/RPT-Regional%20Industrial%20Site%20Readiness-2017%20Inventory%20Update-171020.pdf
[5] Source: Oregon Department of Energy, 2019, https://www.oregon.gov/energy/energy-oregon/Pages/Electricity-Mix-in-Oregon.aspx

Carbon dioxide emissions in Multnomah County, 1990 - 2017

This report has been generated for Portland, Oregon using ClearPath software suite from ICLEI-USA

Note: Figures have been revised from previous years to incorporate revised data from U.S. E.I.A., updated electricity emission coefficients provided by eGRID and changes to estimated propane use.

Total emissions (metric tons CO2-equivalent)

Year	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	Change since previous year	Change since1990
Residential	1,725,000	1,756,000	2,007,000	1,639,000	1,553,000	1,635,000	1,342,000	1,367,000	1,594,000	1,438,000	1,190,000	1,397,000	17.4%	-19%
Commercial	1,877,000	2,042,000	2,393,000	2,006,000	1,892,000	1,923,000	1,575,000	1,585,000	2,010,000	2,004,000	1,579,000	1,680,000	6.4%	-10%
Industrial	1,891,000	2,104,000	2,299,000	1,470,000	1,335,000	1,432,000	1,237,000	1,193,000	1,397,000	1,391,000	1,173,000	1,099,000	-6.3%	-42%
Transportation	2,979,000	3,155,000	3,120,000	3,145,000	2,940,000	2,874,000	2,815,000	2,823,000	2,846,000	2,949,000	3,008,000	3,216,000	6.9%	8%
Solid Waste	510,000	490,000	423,000	474,000	98,000	98,000	93,000	107,000	102,000	117,000	117,000	110,000	-6.0%	-78%
Wastewater Treatment	19,000	23,000	16,000	13,000	15,000	15,000	17,000	17,000	18,000	18,000	17,000	17,000	0.0%	-11%
Fugitive Emissions	36,000	76,000	133,000	153,000	184,000	184,000	191,000	168,000	173,000	184,000	183,000	183,000	0.0%	408%
Total	**9,037,000**	**9,646,000**	**10,391,000**	**8,900,000**	**8,017,000**	**8,161,000**	**7,270,000**	**7,260,000**	**8,140,000**	**8,101,000**	**7,267,000**	**7,702,000**	**6.0%**	**-15%**
% change from 1990	0%	7%	15%	-2%	-11%	-10%	-20%	-20%	-10%	-10%	-20%	-15%		
% change from 2000			0%	-14%	-23%	-21%	-30%	-30%	-22%	-22%	-30%	-26%		

Year	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	Change since previous year	Change since1990
Multnomah Co. population	583,887	626,500	660,486	675,175	735,334	747,977	758,817	766,082	776,712	790,294	799,766	807,555	0.97%	38%
Multnomah Co. Jobs	375,768	415,113	453,254	428,305	421,452	430,662	441,648	451,880	465,483	480,109	492,062	502,929	2.21%	34%

Per capita emissions (metric tons CO2-equivalent)

Year	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	Change since previous year	Change since1990
Residential	3.0	2.8	3.0	2.4	2.1	2.2	1.8	1.8	2.1	1.8	1.5	1.7	16%	-41%
Commercial	3.2	3.3	3.6	3.0	2.6	2.6	2.1	2.1	2.6	2.5	2.0	2.1	5%	-35%
Industrial	3.2	3.4	3.5	2.2	1.8	1.9	1.6	1.6	1.8	1.8	1.5	1.4	-7%	-58%
Transportation	5.1	5.0	4.7	4.7	4.0	3.8	3.7	3.7	3.7	3.7	3.8	4.0	6%	-22%
Solid Waste	0.9	0.8	0.6	0.7	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-7%	-84%
Wastewater Treatment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1%	-35%
Fugitive Emissions	0.1	0.1	0.2	0.2	0.3	0.2	0.3	0.2	0.2	0.2	0.2	0.2	-1%	268%
Total	**15.5**	**15.4**	**15.7**	**13.2**	**10.9**	**10.9**	**9.6**	**9.5**	**10.5**	**10.3**	**9.1**	**9.5**	**5%**	**-38%**
% change from 1990	0%	-1%	2%	-15%	-30%	-30%	-38%	-39%	-32%	-34%	-41%	-38%		
% change from 2000			0%	-16%	-31%	-31%	-39%	-40%	-33%	-35%	-42%	-39%		

Energy use in Multnomah County, 1990 - 2017

This report has been generated for Portland, Oregon using ClearPath software suite from ICLEI-USA

Note: Figures have been revised from previous years to incorporate revised data from U.S. E.I.A., updated electricity emission coefficients provided by eGRID and changes to estimated propane use.

Total energy use (million BTUs)

Year	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	Change since previous year	Change since1990
Residential	18,214,000	18,900,000	21,253,000	20,012,000	20,554,000	21,965,000	20,586,000	21,269,000	20,759,000	18,910,000	19,493,000	23,024,000	18.1%	26%
Commercial	19,415,000	20,606,000	22,593,000	21,236,000	21,465,000	22,062,000	21,217,000	21,440,000	21,579,000	21,442,000	21,620,000	23,520,000	8.8%	21%
Industrial	22,064,000	24,657,000	24,670,000	18,127,000	17,124,000	18,559,000	17,890,000	17,448,000	17,610,000	17,569,000	17,441,000	16,269,000	-6.7%	-26%
Transportation	40,496,000	42,822,000	42,889,000	43,683,000	43,257,000	42,260,000	41,394,000	41,463,000	41,801,000	43,524,000	44,242,000	44,803,000	1.3%	11%
Wastewater Treatment	363,000	373,000	354,000	593,000	677,000	597,000	599,000	717,000	746,000	749,000	698,000	705,000	1.0%	94%
Total	**100,552,000**	**107,358,000**	**111,759,000**	**103,651,000**	**103,077,000**	**105,443,000**	**101,686,000**	**102,337,000**	**102,495,000**	**102,194,000**	**103,494,000**	**108,321,000**	**4.7%**	**8%**
% change from 1990	0%	7%	11%	3%	3%	5%	1%	2%	2%	2%	3%	8%		
% change from 2000			0%	-7%	-8%	-6%	-9%	-8%	-8%	-9%	-7%	-3%		

Year	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	Change since1990
Multnomah Co. population	583,887	626,500	660,486	675,175	735,334	747,977	758,817	766,082	776,712	790,294	799,766	807,555	38%

Per capita energy use (million BTUs)

Year	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	Change since previous year	Change since1990
Residential	31.2	30.2	32.2	29.6	28.0	29.4	27.1	27.8	26.7	23.9	24.4	28.5	17%	-9%
Commercial	33.3	32.9	34.2	31.5	29.2	29.5	28.0	28.0	27.8	27.1	27.0	29.1	8%	-12%
Industrial	37.8	39.4	37.4	26.8	23.3	24.8	23.6	22.8	22.7	22.2	21.8	20.1	-8%	-47%
Transportation	69.4	68.4	64.9	64.7	58.8	56.5	54.6	54.1	53.8	55.1	55.3	55.5	0%	-20%
Wastewater Treatment	0.6	0.6	0.5	0.9	0.9	0.8	0.8	0.9	1.0	0.9	0.9	0.9	0%	40%
Total	**172.2**	**171.4**	**169.2**	**153.5**	**140.2**	**141.0**	**134.0**	**133.6**	**132.0**	**129.3**	**129.4**	**134.1**	**4%**	**-22%**
% change from 1990	0%	0%	-2%	-11%	-19%	-18%	-22%	-22%	-23%	-25%	-25%	-22%		
% change from 2000			0%	-9%	-17%	-17%	-21%	-21%	-22%	-24%	-24%	-21%		