

# SONOMA COUNTY GREEN HOUSE GAS INVENTORY

2018 Update



UPDATED SEPTEMBER 25, 2020

### **Credits and Acknowledgements:**

Prepared by the Regional Climate Protection Authority (RCPA).

The RCPA thanks its member and partner agencies for providing the data and information needed to develop this 2018 GHG Inventory Update.

### **Acronyms and Abbreviations:**

BayREN	Bay Area Regional Energy Network
CA2020	Climate Action 2020 and Beyond
CARB	California Air Resources Board
CH <sub>4</sub>	methane
CO <sub>2</sub>	carbon dioxide
CO <sub>2</sub> e	carbon dioxide equivalent
EV	electric vehicle
GDP	gross domestic product
GHG	greenhouse gas
GRP	Global Reporting Protocol
ICLEI	International Council for Local Environmental Initiatives
IPCC	Intergovernmental Panel on Climate Change
LGO	Local Government Operations Protocol
MMTCO <sub>2</sub> e	million metric tons of carbon dioxide equivalent
MTCO <sub>2</sub> e	metric tons of carbon dioxide equivalent
N <sub>2</sub> O	nitrous oxide
PG&E	Pacific Gas & Electric Company
RCPA	Regional Climate Protection Authority
SCP	Sonoma Clean Power
SCTA	Sonoma County Transportation Authority
VMT	vehicle miles traveled
WRI	World Resources Institute

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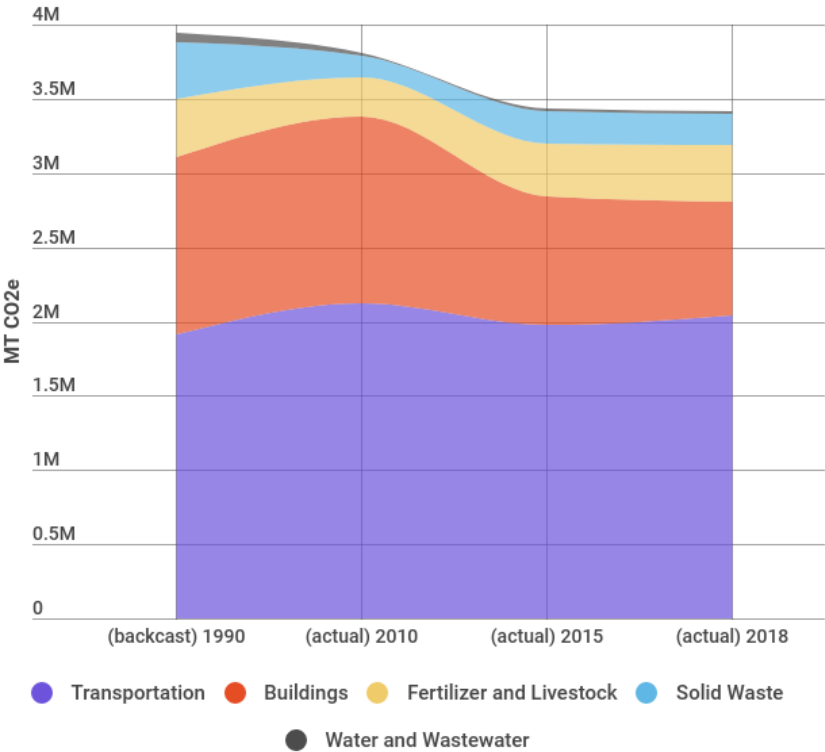


# EXECUTIVE SUMMARY

Sonoma County is committed to measuring, tracking, and reporting our greenhouse gas (GHG) emissions to communicate progress and focus our actions. While our ambitious GHG reduction goals take into account the critical role both regional and state entities play, our GHG inventory reflects the sectors and emissions sources that can be reduced through the actions of local governments and regional entities. The Sonoma County Regional Climate Protection Authority (RCPA) established a baseline communitywide GHG inventory for calendar year 2010 and a backcast inventory for 1990 as part of the Climate Action 2020 and Beyond (CA2020) development process. The RCPA completed this 2018 inventory update to help track progress towards achieving the short and long-term emissions reduction goals established in CA2020. The results of this inventory update will also be used to inform the development of RCPA’s 2030 Climate Emergency Mobilization Strategy.

Sonoma County emissions in 2018 were 3.41 million metric tons CO<sub>2</sub>e (MT CO<sub>2</sub>e), slightly below 2015 emissions of 3.44 MT CO<sub>2</sub>e (figure 1). Relative to 1990 emissions, 2018 emissions decreased by 13%. Since the 2015 inventory update, countywide population grew less than 1% and gross domestic product (GDP) increased 10%.<sup>1</sup> The 2018 update shows that Sonoma County has made progress toward the countywide reduction goal of 25% below 1990 levels by 2020 but needs to reduce emissions by another 0.5 million MT CO<sub>2</sub>e to meet the 2020 target. To meet the 2030 target of 40% below 1990 emissions (2.37 million MT CO<sub>2</sub>e), Sonoma County must reduce emissions at a faster rate than it achieved between 1990 and 2018.

Figure 1 **Sonoma County Emissions Trends 1990 – 2018**



<sup>1</sup> [U.S Census Bureau American Community Survey](#) and the [Bureau of Economic Analysis U.S. Department of Commerce](#)

As outlined in CA2020, Sonoma County's regional approach to reducing GHG emissions recognizes the shared nature of the challenge as well the fact that Sonoma County communities each have a different capacity to achieve emission reductions. Additionally, statewide policies and programs to reduce GHG emissions related to building energy and transportation play a critical role and represent 50% of the local GHG reductions needed to reach our 2020 target.

This 2018 inventory report is an important milestone in our work to reduce countywide emissions. Midway through 2020, it is time to develop a new strategy to accelerate and focus our efforts to meet our existing 2030 goal set in CA 2020, and to reduce emissions even further in line with the scientific imperative to avoid the catastrophic impacts of unchecked climate change. In response to this challenge, RCPA is working with its members, partners, and the community to develop a 2030 Climate Emergency Mobilization Strategy.

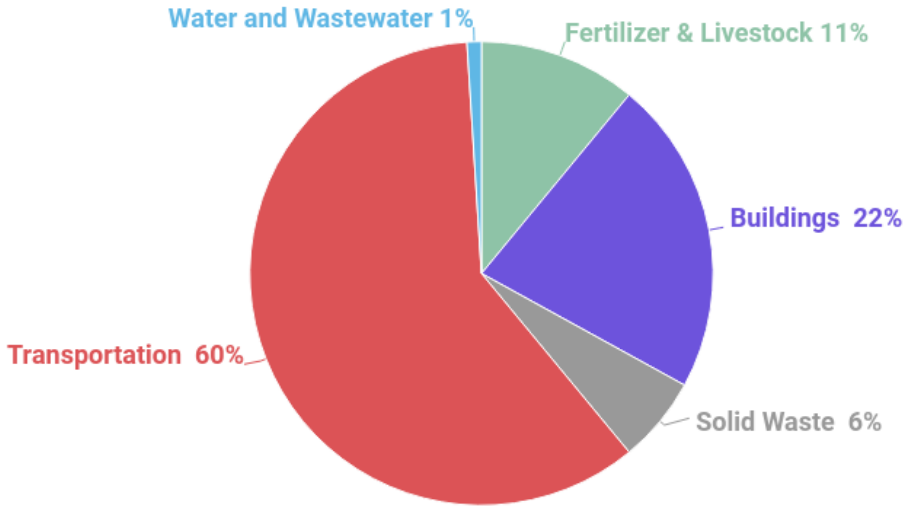
## KEY FINDINGS

**Emissions from energy used in buildings decreased 12% between 2015 and 2018**, or a total of 37% between 1990 and 2018 which exceeds the short-term CA2020 goal of 27% by 2020. This reduction is largely attributed to Sonoma Clean Power, which was created in 2014 to provide cleaner electricity to Sonoma County households and businesses. As our electricity supply has grown cleaner, emissions from natural gas have become a greater percentage of total emissions. The next phase of our decarbonization plan will need to focus on phasing out natural gas for space heating, water heating, and cooking to continue reducing emissions in the building energy sector.

**Transportation continues to be the largest source of emissions for the county.** Approximately 60% of total countywide emissions were from transportation in 2018 (figure 2). Between 2015 and 2018, vehicle miles traveled by residents and employees within the county increased by almost 10% or approximately 1 million miles per day. Emissions during this same time period increased by 3%. Emissions have risen at a lower rate than vehicles miles traveled due to improvements in fuel efficiency and a shift from fossil fuel vehicles to hybrid and electric vehicles.

**Emissions from waste sent to landfills decreased 7% between 2015 and 2018.** The total tons of waste disposed increased significantly in 2018 due to the large volume of debris from the 2017 wildfires. However, while there were GHG impacts from the combustion of homes and other structures in the 2017 fires, the resulting debris was largely ash. By the time the ash was delivered to the landfill there were minimal gases left to escape and thus GHG emissions from this debris were negligible.

Figure 2 2018 Greenhouse Gas Emissions by Sector



### NEXT STEPS

In September 2019, the RCPA Board adopted a Climate Emergency Resolution outlining the agency’s commitment to leading countywide efforts to mitigate and adapt to climate change in the decade ahead. The resolution directed the RCPA to develop a 2030 Climate Emergency Mobilization Strategy. The strategy will define a ten-year emergency policy package of measures that will have the greatest impact on local emissions. These measures will focus on actions that need to be taken countywide to address the scale of the climate crisis. The RCPA is now working with our members, partners, and community members to develop this strategy and will assist with policy development and implementation for those areas that provide the greatest impact to reducing emissions.

In addition to the 2030 Climate Emergency Mobilization Strategy, RCPA will continue to work with the Sonoma County Transportation Authority (SCTA) to implement the Shift Sonoma County Plan released in 2018<sup>2</sup>. This plan defines and evaluates strategies to shift transportation away from single occupant vehicles towards cleaner, healthier and more efficient modes of transportation. The RCPA also leads Sonoma County’s participation in multiple energy and water savings programs through [BayREN](#), a collaboration of the nine Bay Area counties to deliver targeted, integrated, regional-scale climate solutions focused on energy, water and resiliency. The RCPA is leading the development and implementation of Water Upgrades \$ave, a new BayREN program that will provide utility on-bill financing for the implementation of water and energy saving improvements in single family and multifamily residences.

<sup>2</sup> [Shift Sonoma County Low Carbon Transportation Plan](#)

# SONOMA COUNTY EMISSIONS

The communitywide greenhouse gas (GHG) emissions inventories for Sonoma County capture the primary sources of emissions that can be reduced through the actions of local governments and regional entities: energy use in our homes, businesses, vehicles, off-road equipment; emissions from treating and delivering water; emissions from materials that are thrown away; and fertilizer and livestock operations. This approach is known as an “activity-based” inventory. It involves measuring or modeling the primary emissions-generating activities in Sonoma County and translating them into GHG emissions based on standardized or locally specific emissions factors.<sup>3</sup> To provide the community with more insight on the impacts of our consumption patterns on emissions, this report also includes a snapshot of Sonoma County’s consumption-based emissions.

Local emissions-generating activities addressed in this report are summarized in the Appendix. The analysis of emissions includes carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O). Of these gases, CO<sub>2</sub> emissions contribute the most to global warming, both internationally and locally.<sup>4</sup> All three gases are expressed as metric tons of carbon dioxide equivalent (MTCO<sub>2</sub>e), based on the global warming potential of these gases relative to CO<sub>2</sub>.

## SOURCE SPECIFIC FINDINGS

This section provides an overview of 2018 GHG emissions from five primary countywide sources: building energy, transportation, solid waste, water and wastewater, and livestock and fertilizer management.

Table 1 **GHG Emissions by Sector**

Sector	Total GHG Emissions (MT CO <sub>2</sub> e)				% Change
	1990	2010	2015	2018	1990-2018
Transportation	1,910,000	2,126,452	1,975,453	2,041,927	7%
Buildings	1,197,000	1,253,662	865,558	759,970	-37%
Fertilizer and Livestock	393,000	267,573	358,331	390,316	-1%
Solid Waste	386,000	138,691	218,855	204,283	-47%
Water and Wastewater	58,000	19,177	17,722	16,794	-71%
<b>Sonoma County Total</b>	<b>3,944,000</b>	<b>3,805,556</b>	<b>3,435,918</b>	<b>3,413,292</b>	<b>-13%</b>

## BUILDING ENERGY

Countywide emissions from energy used in residential and non-residential buildings decreased about 12% from 2015 to 2018. The total decrease from 1990 to 2018 of about 37% exceeds the sector-specific emissions reduction target set in CA2020.

This large reduction in emissions from building energy use results mostly from the 2014 inception of Sonoma Clean Power (SCP) – a community choice energy provider which offers Sonoma County communities the choice of purchasing lower-carbon and zero-carbon electricity delivered through PG&E power lines. In 2018, Sonoma Clean Power provided approximately 81% of the total electricity used by Sonoma County residents, an increase from 73% of the total in 2015 (figure 3). Electricity is

<sup>3</sup> [U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions](#)

<sup>4</sup> [U.S. EPA Greenhouse Gas Emissions](#)



also generated by PG&E (9% of total) and Healdsburg Electric (3% of total). Healdsburg Electric is an independent utility operated by the City of Healdsburg. For the remaining 7% of electricity categorized as Direct Access, PG&E provides the transmission and distribution services but not electricity generation. Due to data privacy requirements, PG&E is not able to share the names of utilities in the Direct Access category.

Figure 3 **Sonoma County Electricity Providers**

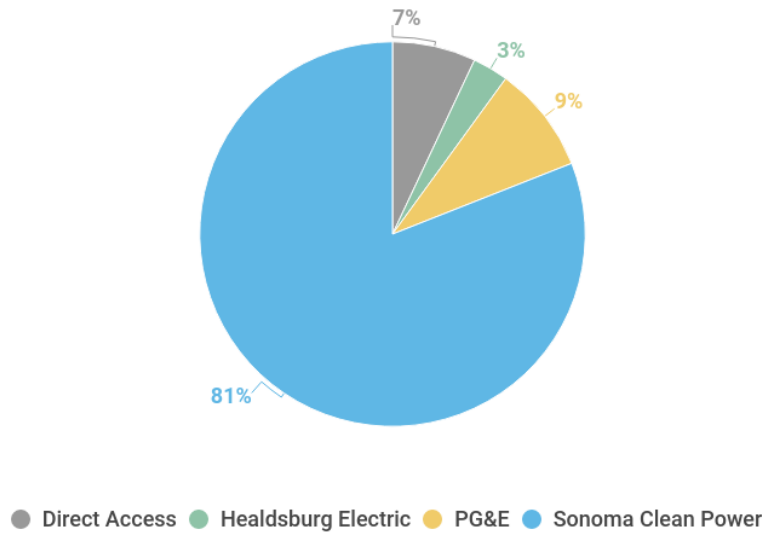
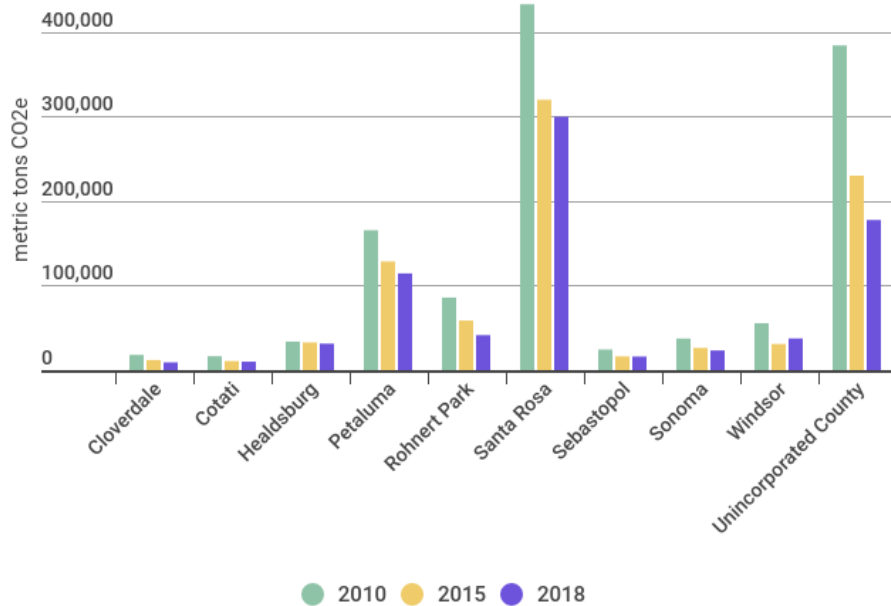


Figure 4 **Building Energy Emissions by Jurisdiction**

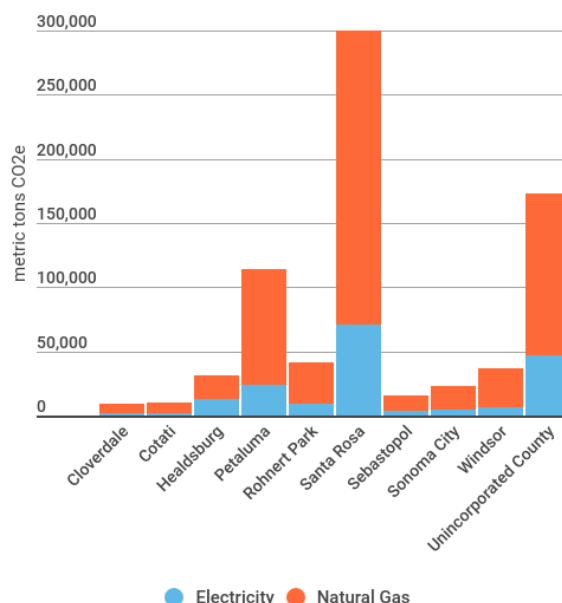


Looking ahead to the CA2020 goal for 2030 to reduce overall emissions 40% below 1990 levels, Sonoma County will need to make additional reductions in the building energy sector to achieve this goal.

One opportunity to further reduce emissions in this sector is to increase the percentage of Evergreen customers using 100% renewable electricity purchased from Sonoma Clean Power. Currently, 99% of the Sonoma Clean Power electricity purchased is CleanStart.

Another critical step is to transition from natural gas appliances for space heating, water heating, and cooking to all electric appliances. Figure 5 shows that our natural gas emissions have become the predominant source of emissions in the building energy sector as our emissions from electricity have declined due to cleaner sources. In addition to the direct emissions produced from burning natural gas for heating and cooking, there are other climate and health impacts. The pipelines that deliver natural gas to our homes leak methane, a greenhouse gas that is 84 times more potent than CO<sub>2</sub><sup>5</sup>, and cooking with natural gas can cause unhealthy levels of indoor air pollution.<sup>6</sup>

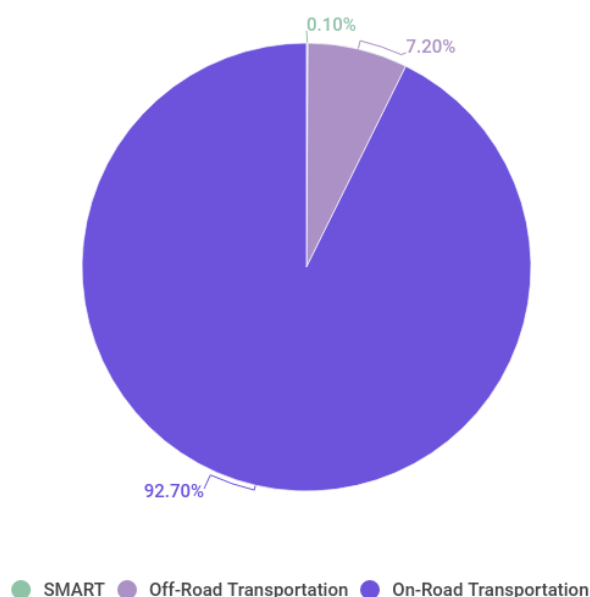
Figure 5 2018 Building Energy Emissions (MT CO<sub>2</sub>e) by Source



## TRANSPORTATION

The transportation sector accounts for approximately 2 million MT CO<sub>2</sub>e, or 60% of 2018 emissions, and is the largest source of emissions for the County. This sector includes emissions from on-road driving, off-road driving and equipment, and Sonoma-Marín Area Rail Transit (SMART). Countywide emissions from the transportation sector increased 3% from 2015 to 2018. The majority of emissions in this sector are from on-road driving (figure 6).

Figure 6 Transportation Emissions by Source



SMART emissions were not included in the 2015 inventory because service did not begin until August 2017. For 2018, Sonoma County's share of SMART's total estimated emissions was 1,994 MT CO<sub>2</sub>e or 0.1% of total countywide transportation emissions.

Sonoma County residents drove approximately one million more miles a day in 2018 than in 2015. Figure 7 shows how this countywide increase in

<sup>5</sup> [Methane: The other important greenhouse gas](#)

<sup>6</sup> [Gas Stoves: Health and Air Quality Impacts and Solutions](#)

vehicle miles traveled (VMT) resulted in a per capita increase in each community.

Figure 8 shows the total countywide emissions for on-road and off-road transportation combined for each jurisdiction. Emissions increased from 2015 to 2018 for all jurisdictions except Healdsburg and Santa Rosa. The increases ranged from less than 1% for Sebastopol and Sonoma to 11% for the unincorporated County.

For on-road transportation, emissions are determined by multiplying an estimate of vehicle miles traveled (VMT) by an emissions factor. The emissions factor is obtained from a California Air Resources Board (CARB) emissions model which uses Sonoma County vehicle registration data from the Department of Motor Vehicles to estimate the number of vehicles by type and fuel. Using this data, the emission factor from the CARB model reflects improvements in fuel efficiency and the shift from fossil fuel to hybrid and electric vehicles. The Appendix contains more information on the data sources used to calculate emissions in the transportation sector.

Figure 7 **Per Capita Daily Vehicles Miles Traveled by Jurisdiction**

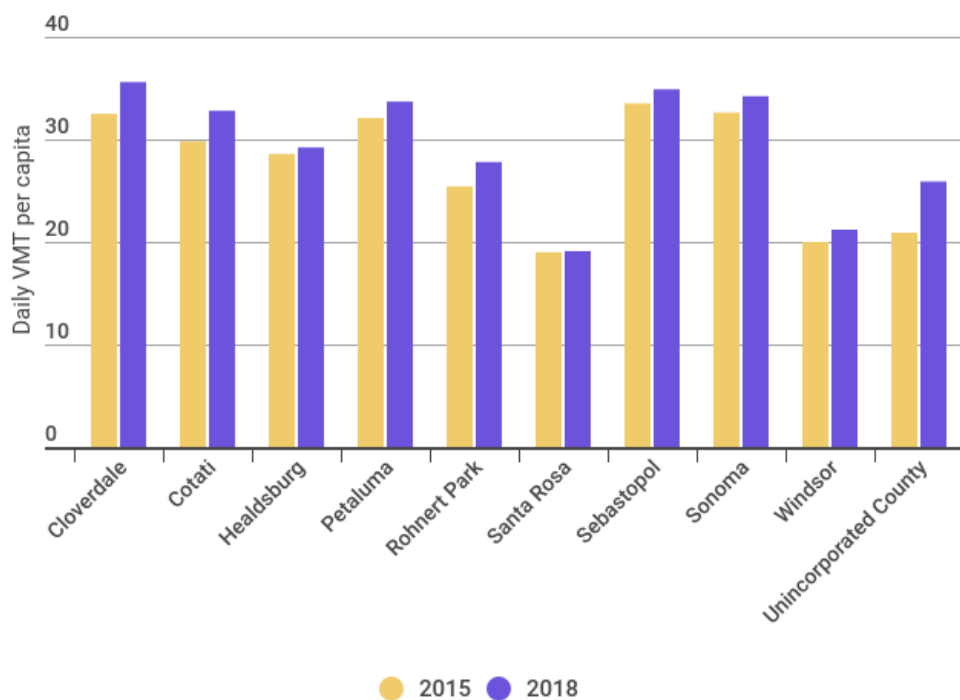
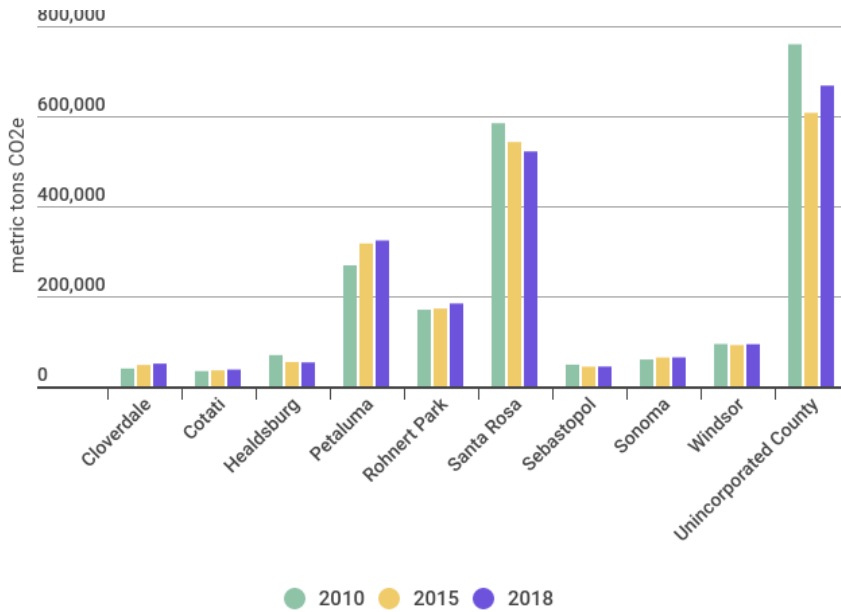


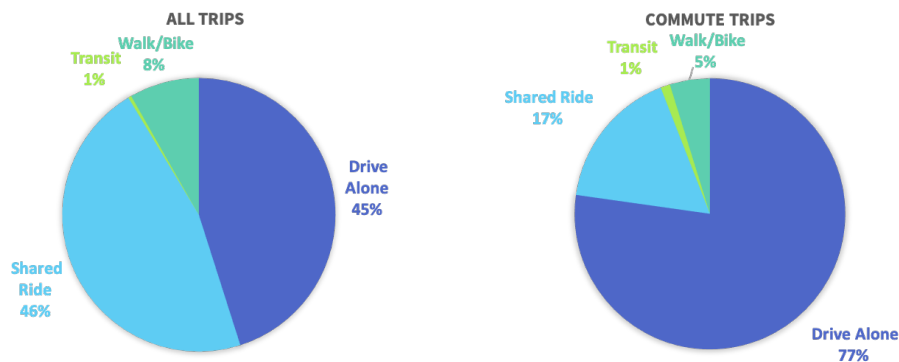
Figure 8 **Transportation Emissions (MTCO<sub>2</sub>e) per Jurisdiction**



The Shift Sonoma County Low Carbon Transportation Plan outlines two key strategies to reduce transportation emissions – fuel shift and mode shift. The fuel shift strategy sets a goal of reducing petroleum use in transportation by 50% by 2030. This goal will be achieved through overall fleet fuel efficiency gains and the replacement of internal combustion engine vehicles with electric vehicles (EVs). The Shift Plan sets a target of 100,000 EVs in Sonoma County by 2030.

The Shift Plan includes goals to transition to low carbon forms of transportation, such as biking, walking, transit and carpools. These 2040 goals are to reduce per capita vehicle miles traveled (VMT) by 10%, shift 4% of single occupant vehicle trips to biking or walking, increase transit ridership by 4 times, and to reduce average household travel costs below 2010 levels. Currently, 45% of all trips and 77% of commute trips are single occupant vehicle trips (figure 9).<sup>7</sup>

Figure 9 **Travel Modes in Sonoma County**



<sup>7</sup> Sonoma County Travel Model

Sonoma County saw more electric vehicles sold in 2018 than any previous year, bringing the total registered EVs to 4,192 battery electric vehicles and 4,088 plug-in hybrid electric vehicles (figure 10). Vehicle electrification is a major component of meeting our greenhouse gas reduction goals for Sonoma County. EV sales will need to continue to accelerate if Sonoma County is to reach its goal of a 50% reduction in transportation emissions by 2030 (figure 11).

Figure 10 **Total registered EVs in Sonoma County**

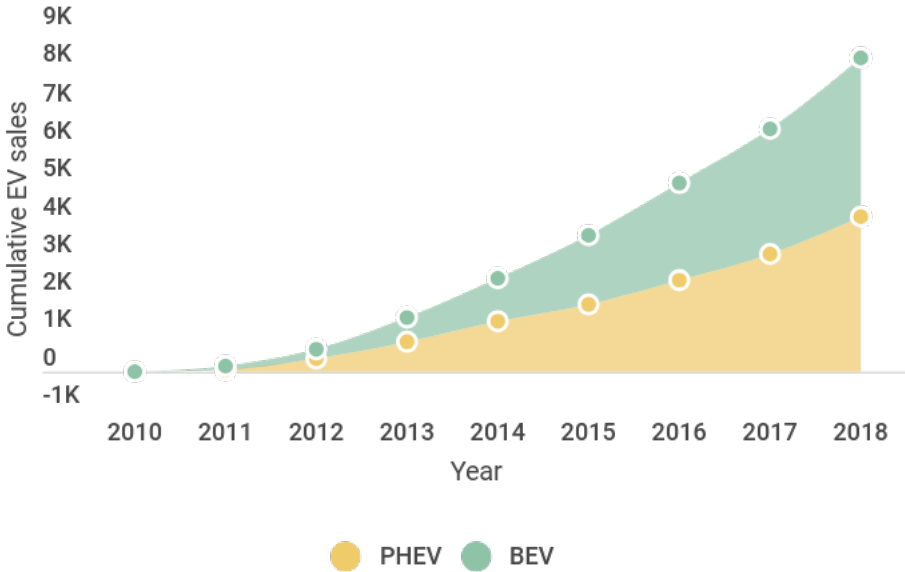
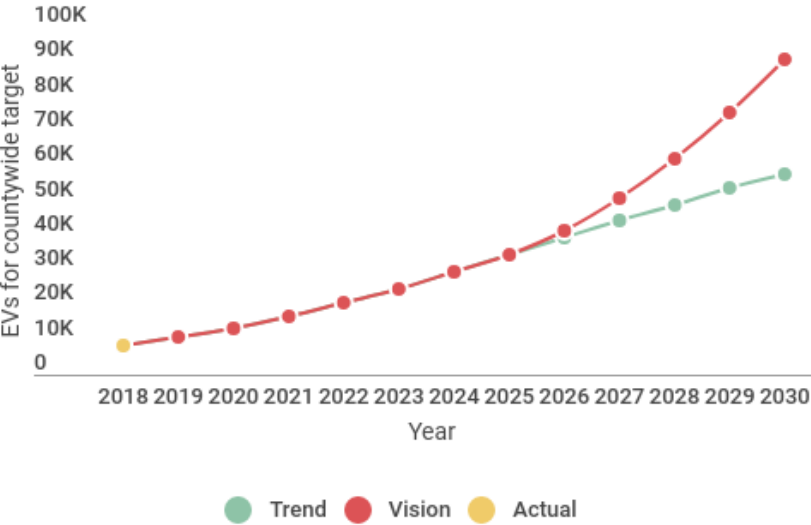


Figure 11 **Path to Achieve Shift Plan EV Target**



**SOLID WASTE**

In 2018, approximately 1,245,720 tons of solid waste generated in Sonoma County were landfilled, a significant increase from the 388,000 tons landfilled in 2015. Only 30% or about 360,200 tons of the 2018 waste was municipal solid waste; the remaining 70% was debris from the 2017 wildfires. While there were GHG impacts from the combustion of homes and other structures in the 2017 fires, the resulting debris was largely ash. By the time the ash was delivered to the landfill there were minimal gases left to escape and thus GHG emissions from this debris were negligible<sup>8</sup>. The 2018 estimated emissions from solid waste were about 204,000 MT CO<sub>2</sub>e (about 6% of total 2018 emissions and a 7% decrease from 2015). A breakdown of solid waste by jurisdiction was not available at the time this report was published but will be provided in an updated version of the report in the future.

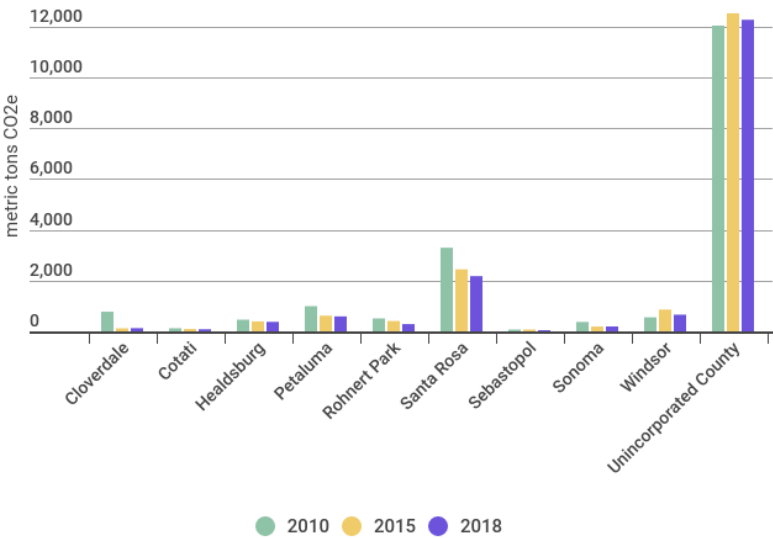
Zero Waste Sonoma, formerly known as the Sonoma County Waste Management Agency, is leading efforts to achieve zero waste by 2030, which means diverting as much material as possible from landfills and into more beneficial use. Zero Waste Sonoma uses the Waste Reduction Model (WARM)<sup>9</sup> to track and report GHG emissions reductions, energy savings, and economic impacts from waste management practices such as source reduction, recycling, and diversion. For 2018, Zero Waste Sonoma reported a reduction in GHG emissions due to recycling and composting of 303,465.17 MT CO<sub>2</sub>e. Without these practices, it is estimated that Sonoma County’s waste emissions would have been over 500,000 MT CO<sub>2</sub>e for 2018.

**WATER AND WASTEWATER**

Countywide emissions from Water and Wastewater decreased by approximately 5% from about 17,700 MT CO<sub>2</sub>e in 2015 to 16,800 MT CO<sub>2</sub>e in 2018 (figure 12). Emissions result from wastewater treatment and water conveyance. The majority of emissions in this sector result from wastewater treatment. Wastewater treatment includes a variety of different processes, which release methane and nitrous oxide.

Sonoma Water manages most of the water conveyance within the county. Since 2015, Sonoma Water has contracts to procure 100% of its electricity needs through renewable and carbon free resources, thus achieving a carbon neutral electricity supply to power Sonoma Water’s water conveyance and wastewater processing systems.<sup>10</sup>

Figure 12 **Water and Wastewater Emissions (MTCO<sub>2</sub>e) per Jurisdiction**



<sup>8</sup> [Zero Waste Sonoma](#)

<sup>9</sup> [EPA Waste Reduction Model \(WARM\)](#)

<sup>10</sup> [Sonoma Water](#)

### LIVESTOCK AND FERTILIZER

Livestock and fertilizer emissions are the third largest source of emissions in Sonoma County. The primary emissions are generated by enteric (digestive) fermentation and manure management (figure 13). Emissions from this sector increased due to livestock population growth between 2015 and 2018 (figure 14). Emissions from this sector are included in the countywide inventory, but not allocated to any specific jurisdiction.

Figure 13 Livestock and Fertilizer Emissions by Source

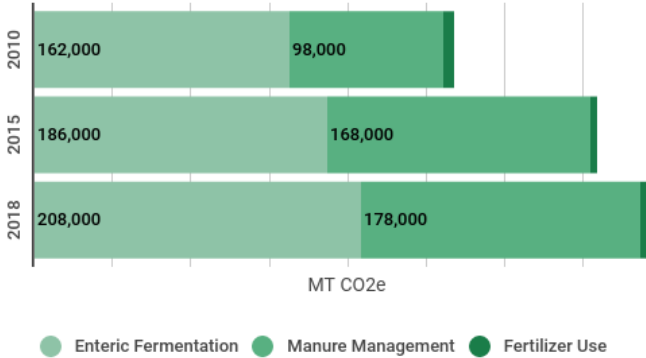
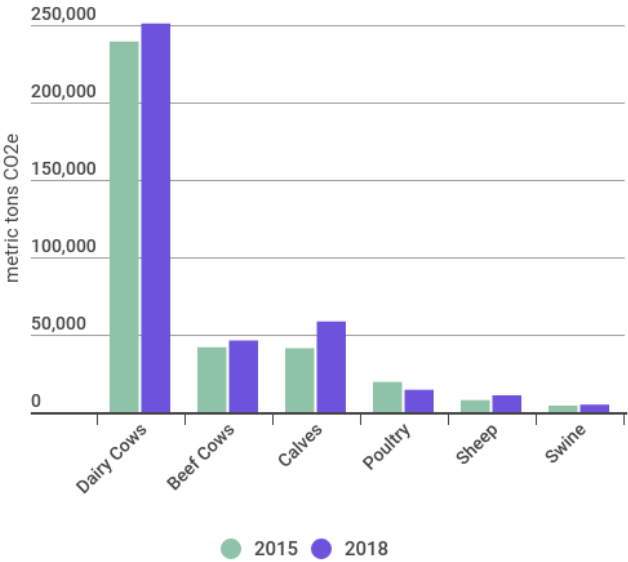


Figure 14 Livestock Emissions (MTCO<sub>2</sub>e) by Livestock Type



### CONSUMPTION BASED INVENTORY

Consistent with RCPA’s 2010 and 2015 GHG inventories, this GHG inventory does not include all human activities in Sonoma County that drive an increase or decrease in atmospheric GHG emissions. Rather than trying to account for every source of emissions, this approach focuses on monitoring progress on the largest emissions sources that can most directly be influenced by local government actions. The consumption-based emissions categories that were excluded from this inventory update include the consumption of goods and services imported into Sonoma County and air travel.

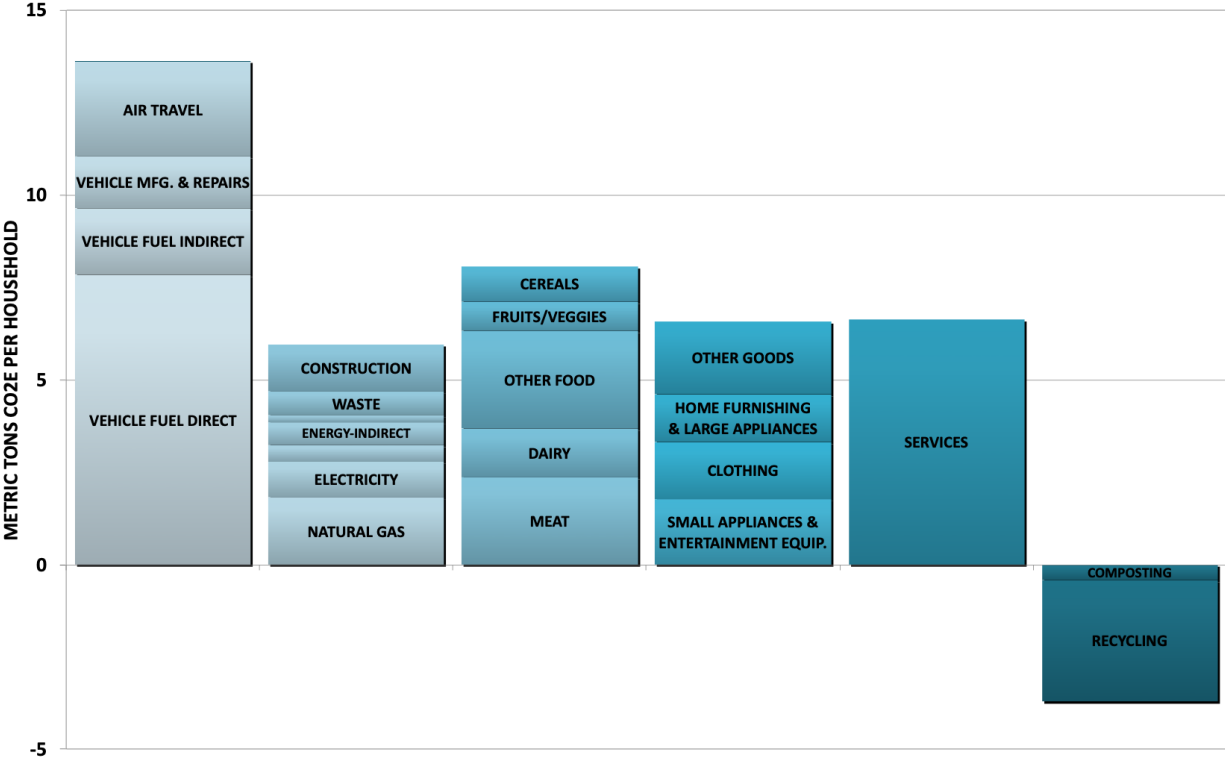
Because the community has expressed interest in understanding the estimated magnitude of our emissions in these consumption-based categories relative to our 2018 inventory, we are including

data from a 2015 study released by the Cool Climate Network<sup>11</sup>, a University-Government-Business-NGO Partnership at the University of California, Berkeley.

Based on this study, Sonoma County’s total consumption-based emissions in 2015 were 7.2 million MT CO<sub>2</sub>e, significantly higher than the approximately 3.4 million MT CO<sub>2</sub>e activity-based emissions reported in this inventory update. The 2015 average Sonoma County household carbon footprint of 40.4 MT CO<sub>2</sub>e per year is shown in Figure 15. In addition to the consumption-based inventory for Sonoma County, the Cool Climate Network offers tools that individuals and businesses can use to calculate their own carbon footprints and identify actions to take to reduce their emissions.

There is some duplication in reporting between the RCPA and consumption-based inventories. For example, the emissions from fossil fuel used to power our on-road transportation and building sectors are included in both inventories. The consumption-based inventory complements the RCPA inventory and can help our community identify additional actions that we can all take to reduce emissions from our consumption of goods and services.

Figure 15 **2015 Average Sonoma County Household Carbon Footprint**<sup>12</sup>



<sup>11</sup> [Cool Climate Network](#)

<sup>12</sup> Assumes 2.6 persons per household



# MEMBER JURISDICTION EMISSIONS

Sonoma County continues to work towards the cleaner, more sustainable future envisioned in [Climate Action 2020 and Beyond](#) (CA2020). In the last year, the RCPA and a majority of Sonoma County jurisdictions adopted Climate Emergency Resolutions that recognize the urgency of taking action now to address the climate crisis. Jurisdictions continue to work on existing climate action plans, updating long-term policy goals, and pursuing the implementation of GHG reduction measures outlined in CA2020. Each jurisdiction’s focus on climate action and commitment to these goals and measures outlined in CA2020 demonstrates the collective recognition of the need to address climate change at the local and regional level.

Table 2 summarizes the 1990 backcast and 2010 through 2018 GHG inventories by jurisdiction. The Appendix contains additional tables that report emissions by sector for each jurisdiction. Jurisdiction level solid waste data was not available at the time this report was prepared and has instead been reported as a total for each year. This report will be updated with the solid waste emissions data by jurisdiction when it is available.

Table 2 **GHG Emissions by Jurisdiction**

	Total GHG Emissions (MT CO <sub>2</sub> e)				% Change
	Backcast	Inventory			
	1990	2010	2015	2018	1990-2018
<b>Emissions by Jurisdiction<sup>13</sup></b>					
Cloverdale	50,780	58,196	59,277	59,573	17%
Cotati	45,840	50,247	46,092	47,169	3%
Healdsburg	83,240	103,413	86,828	84,646	2%
Petaluma	375,060	435,244	446,532	439,212	17%
Rohnert Park	250,490	256,240	231,659	225,545	-10%
Santa Rosa	1,020,740	1,020,406	864,760	823,642	-19%
Sebastopol	65,220	72,489	59,887	59,929	-8%
Sonoma	86,780	97,188	90,291	87,594	1%
Windsor	115,850	150,030	122,700	131,283	13%
Unincorporated County	1,073,590	1,155,839	850,706	858,105	-20%
<i>Emissions not assigned to individual communities</i>					
Fertilizer and Livestock	392,800	267,573	358,331	390,316	-1%
SMART	-	-	-	1,994	NA
Solid Waste	383,600	138,691	218,855	204,283	-47%
<b>Sonoma County Total</b>	<b>3,943,990</b>	<b>3,805,556</b>	<b>3,435,918</b>	<b>3,413,292</b>	<b>-13%</b>

<sup>13</sup> Jurisdiction totals will be updated with solid waste emissions for each year when 2018 data is available

## CONCLUSION

The results of the 2018 inventory update show that Sonoma County is making progress towards meeting the greenhouse gas reduction goals established in CA2020. However, more ambitious targets and actions are needed if we are to avoid reaching a tipping point beyond which the effects of climate change become increasingly uncontrollable. Since the last inventory update, California's Governor Jerry Brown issued an executive order establishing a 2045 statewide target to achieve carbon neutrality, and Senate Bill 100 was passed which sets a 100% clean electricity goal for the State by 2045.

In September 2019, the RCPA Board adopted a Climate Emergency Resolution<sup>14</sup> outlining the agency's commitment to leading countywide efforts to mitigate and adapt to climate change in the decade ahead. The resolution directed the RCPA to develop a 2030 Climate Emergency Mobilization Strategy. The strategy will define a ten-year emergency policy package of measures that will have the greatest impact on local emissions. These measures will focus on actions that need to be taken countywide to address the scale of the climate crisis. The RCPA will work with our members, partners, and community members to develop this strategy and will assist with policy development and implementation for those areas that provide the greatest impact to reducing emissions.

In addition to the 2030 Climate Emergency Mobilization Strategy, RCPA will continue to work with the Sonoma County Transportation Authority (SCTA) to implement the Shift Sonoma County Plan released in 2018. This plan defines and evaluates strategies to shift transportation away from single occupant vehicles toward cleaner, healthier and more efficient modes of transportation. The RCPA also leads Sonoma County's participation in multiple energy and water savings programs through [BayREN](#), a collaboration of the nine Bay Area counties to deliver targeted, integrated, regional-scale climate solutions focused on energy, water and resiliency. The RCPA is leading the development and implementation of Water Upgrades \$ave, a new BayREN program that will provide utility on-bill financing for the implementation of water and energy saving improvements in single family and multifamily residences.

RCPA will continue to provide periodic GHG inventory updates to track Sonoma County's progress towards its reduction goals. The next inventory update for the year 2020 will be published in 2022. To help measure progress between major inventory updates, RCPA plans to develop additional indicator metrics that will be reported on a more frequent basis to assess progress toward meeting our climate goals.

In its 2019 Climate Emergency Resolution, RCPA's Board resolved that "an urgent global climate mobilization effort to reverse global warming is needed to achieve zero net emissions as quickly as possible and that full community participation, inclusion, and support is integral to our efforts to safely draw down carbon from the atmosphere and accelerate adaptation and resilience strategies in preparation for intensifying climate impacts." RCPA is committed to working with its member and partner agencies to use the results from the 2018 GHG Inventory Update to inform this mobilization effort and achieve reductions at the speed and scale needed to respond to the climate crisis.

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<sup>14</sup> [RCPA Climate Emergency Resolution No. 2019-002](#)

# APPENDIX

## MEMBER JURISDICTION EMISSIONS BY SECTOR

Emissions for the solid waste sector will be added when the 2018 solid waste data by jurisdiction is available.

### CLOVERDALE

	Total GHG Emissions (MT CO <sub>2</sub> e)				% change 1990-2018
	Backcast 1990	Inventory			
Sector	1990	2010	2015	2018	1990-2018
Buildings	12,600	18,000	11,948	9,168	-29%
Transportation	37,110	39,423	47,207	50,277	35%
Water and Wastewater	740	773	121	128	-83%
<b>Total</b>	<b>50,450</b>	<b>58,196</b>	<b>59,277</b>	<b>59,573</b>	<b>17%</b>

### COTATI

	Total GHG Emissions (MT CO <sub>2</sub> e)				% change 1990-2018
	Backcast 1990	Inventory			
Sector	1990	2010	2015	2018	1990-2018
Buildings	14,650	16,422	10,680	9,967	-32%
Transportation	30,550	33,701	35,314	37,122	22%
Water and Wastewater	640	123	98	80	-87%
<b>Total</b>	<b>45,840</b>	<b>50,247</b>	<b>46,092</b>	<b>47,169</b>	<b>3%</b>

### HEALDSBURG

	Total GHG Emissions (MT CO <sub>2</sub> e)				% change 1990-2018
	Backcast 1990	Inventory			
Sector	1990	2010	2015	2018	1990-2018
Buildings	21,310	33,708	32,544	31,311	47%
Transportation	61,750	69,245	53,893	52,960	-14%
Water and Wastewater	180	460	392	375	108%
<b>Total</b>	<b>83,240</b>	<b>103,413</b>	<b>86,828</b>	<b>84,646</b>	<b>2%</b>

### PETALUMA

	Total GHG Emissions (MT CO <sub>2</sub> e)				% change 1990-2018
	Backcast 1990	Inventory			
Sector	1990	2010	2015	2018	1990-2018
Buildings	134,720	165,349	128,530	114,401	-15%
Transportation	234,510	268,902	317,384	324,220	38%
Water and Wastewater	5,830	994	618	590	-90%
<b>Total</b>	<b>375,060</b>	<b>435,244</b>	<b>446,532</b>	<b>439,212</b>	<b>17%</b>

## ROHNERT PARK

	Total GHG Emissions (MT CO <sub>2</sub> e)				% change 1990-2018
	Backcast	Inventory			
Sector	1990	2010	2015	2018	
Buildings	84,930	85,796	58,625	41,359	-51%
Transportation	162,120	169,935	172,626	183,898	13%
Water and Wastewater	3,440	509	409	288	-92%
<b>Total</b>	<b>250,490</b>	<b>256,240</b>	<b>231,659</b>	<b>225,545</b>	<b>-10%</b>

## SANTA ROSA

	Total GHG Emissions (MT CO <sub>2</sub> e)				% change 1990-2018
	Backcast <sup>15</sup>	Inventory			
Sector	1990	2010	2015	2018	
Buildings	NA	165,349	128,530	114,401	NA
Transportation	NA	268,902	317,384	324,220	NA
Water and Wastewater	NA	994	618	590	NA
<b>Total</b>	<b>1,020,740</b>	<b>1,020,406</b>	<b>864,760</b>	<b>823,642</b>	<b>-19%</b>

## SEBASTOPOL

	Total GHG Emissions (MT CO <sub>2</sub> e)				% change 1990-2018
	Backcast	Inventory			
Sector	1990	2010	2015	2018	
Buildings	21,840	24,371	16,224	16,071	-26%
Transportation	43,000	48,041	43,585	43,806	2%
Water and Wastewater	380	76	78	52	-86%
<b>Total</b>	<b>65,220</b>	<b>72,489</b>	<b>59,887</b>	<b>59,929</b>	<b>-8%</b>

## SONOMA

	Total GHG Emissions (MT CO <sub>2</sub> e)				% change 1990-2018
	Backcast	Inventory			
Sector	1990	2010	2015	2018	
Buildings	31,750	37,331	26,278	23,280	-27%
Transportation	51,970	59,486	63,823	64,121	23%
Water and Wastewater	3,060	371	190	193	-94%
<b>Total</b>	<b>86,780</b>	<b>97,188</b>	<b>90,291</b>	<b>87,594</b>	<b>1%</b>

<sup>15</sup> CA 2020 did not develop a 1990 backcast by sector for Santa Rosa

## WINDSOR

	Total GHG Emissions (MT CO <sub>2</sub> e)				% change 1990-2018
	Backcast 1990	Inventory 2010 2015 2018			
<b>Sector</b>	<b>1990</b>	<b>2010</b>	<b>2015</b>	<b>2018</b>	<b>1990-2018</b>
Buildings	34,600	55,549	30,907	37,442	8%
Transportation	79,110	93,928	91,360	93,454	18%
Water and Wastewater	2,140	553	433	386	-82%
<b>Total</b>	<b>115,850</b>	<b>150,030</b>	<b>122,700</b>	<b>131,283</b>	<b>13%</b>

## UNINCORPORATED COUNTY

	Total GHG Emissions (MT CO <sub>2</sub> e)				% change 1990-2018
	Backcast 1990	Inventory 2010 2015 2018			
<b>Sector</b>	<b>1990</b>	<b>2010</b>	<b>2015</b>	<b>2018</b>	<b>1990-2018</b>
Buildings	502,330	384,293	230,096	177,401	-65%
Transportation	546,210	759,518	607,667	668,177	22%
Water and Wastewater	25,050	12,028	12,943	12,527	-50%
<b>Total</b>	<b>1,073,590</b>	<b>1,155,839</b>	<b>850,706</b>	<b>858,105</b>	<b>-20%</b>

## METHODOLOGY AND DATA SOURCES

This 2018 greenhouse gas (GHG) inventory update follows the [US Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions](#), which provides detailed methodologies tailored for local government jurisdictions and agencies working to track emissions in the United States. The U.S. Community Protocol was created by the International Council for Local Environmental Initiatives (ICLEI), an organization of local, regional, and national governments that have committed to reducing greenhouse gas emissions. This protocol is specifically geared towards completing a GHG emissions inventory at the community scale in the United States and includes emissions from businesses, residents and transportation. There are over 600 local governments in the U.S. who are ICLEI members utilizing the U.S. Community Protocol to inventory greenhouse gases.<sup>16</sup>

This is an activity-based inventory that captures the primary sources of emissions within a jurisdictional boundary that can be reduced through the actions of local governments and regional entities. In contrast, a consumption-based inventory also accounts for emissions that occur outside a jurisdictional boundary as a result of activities taking place within that jurisdictional boundary. In partnership with the World Resources Institute (WRI) and C40 Cities Climate Leadership Group (C40), ICLEI has also developed the Global Reporting Protocol (GRP), which is the global counterpart to the US Community Protocol and utilizes a consumption-based approach. Cities who have signed onto voluntary global networks and initiatives focused on reporting and tracking greenhouse gas reductions and comparing across countries, such as the Global Covenant of Mayors, are encouraged to use the GRP.<sup>17</sup>

In total, ICLEI has developed four protocols for different emissions areas and needs – In addition to the U.S. Community Protocol and the GRP, the Local Government Operations Protocol (LGO Protocol) provides details guidance on accounting for emissions from municipal buildings, facilities and

<sup>17</sup> [ICLEI Global Reporting Protocol](#)

vehicles and the Recycling and Composting Emissions Protocol provides guidance on accounting for the benefits of recycling and composting community-generated waste.<sup>18</sup>

Consistent with RCPA's 2010 and 2015 GHG inventories, this GHG inventory does not include all human activities in Sonoma County that drive an increase or decrease in atmospheric GHG emissions. Rather than trying to account for every source of emissions, this approach focuses on monitoring progress on the largest emissions sources that can most directly be influenced by local government actions. The emissions categories that were excluded from this inventory update include:

- Carbon sinks through biological carbon sequestration
- Consumption of goods and services imported into Sonoma County
- Industrial and commercial stationary sources
- Air travel

These categories are explored in sections 2.4.1 through 2.4.4 in Climate Action 2020.

This 2018 inventory update uses a variety of activity data sources from local jurisdictions as well as state and federal sources (table 3). The inventory uses the 100-year global warming potential (GWP) values from the IPCC Fifth Assessment Report<sup>19</sup>, consistent with current international and national GHG inventory practices.

In preparation for the 2018 inventory update, RCPA reviewed prior inventories and researched new methodologies to incorporate into the 2018 inventory. Where necessary to correct errors or incorporate new methodologies, RCPA recalculated emission estimates for all inventory years to maintain a consistent time-series. This practice is consistent with IPCC and California Air Resources Board (CARB) inventory guidelines.

As a result of RCPA's review, changes in estimates were made to the following sectors:

- Transportation: Updated emission factors using latest EMFAC model, EMFAC2017. Prior inventories used an earlier version of EMFAC, EMFAC2011. Changes were also made to the off-road inventory to incorporate updated emission factors from new or revised off-road models.
- Building Energy: Included emissions from the Direct Access<sup>20</sup> category for all inventory years. Adjusted jurisdiction totals to remove double counting of emissions from the Water sector.
- Fertilizer and Livestock: Updated fertilizer input estimate for wine grapes.

Methodologies for calculating GHG inventories are continually evolving and changing. The RCPA will continue to monitor and incorporate local government best practices for inventorying emissions to meet our ambitious GHG reduction goals.

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<sup>18</sup> [ICLEI Greenhouse Gas Protocols](#)

<sup>19</sup> [IPCC Fifth Assessment Report](#)

<sup>20</sup> The Direct Access category represents the kWh of electricity for which PG&E provides transmission and distribution services but not electricity generation. Due to data privacy requirements, PG&E is not able to share the names of utilities in this category, but the emissions are included in the inventory.

Table 3 **Activity Data by GHG Sector**

<b>Sector</b>	<b>Primary Emissions Source</b>	<b>Key Activity Data</b>	<b>Data Sources</b>
<b>Building Energy</b>	Production of electricity (emissions generated at power plants) Combustion of natural gas	Total electricity use (megawatt hours) Total natural gas use (therms)	Electricity providers: PG&E, Healdsburg Electric, Sonoma Clean Power Natural gas provider: PG&E
<b>On-Road Transportation</b>	Combustion of gasoline and diesel fuel in vehicles	Vehicle miles traveled Fuel type and fuel economy of countywide vehicle fleet Travel patterns	Sonoma County Transportation Authority California Air Resources Board (CARB) EMFAC2017 Model
<b>Off-Road Transportation and Equipment</b>	Combustion of fossil fuels in equipment (e.g., cranes, bulldozers, lawn mowers) Combustion of fossil fuels in off-road vehicles (e.g., tractors, boats, ATVs)	Fuel consumption in off-road vehicles and equipment Socioeconomic data	CARB OFFROAD2007, OFFROAD2017, RV2018, PC2014 models
<b>Solid Waste</b>	Methane emissions from decomposition of material sent to landfills	Tons of residential and commercial waste sent to landfills Profile of waste material in each jurisdiction (e.g., 19% office paper, 36% food waste)	Zero Waste Sonoma CalRecycle
<b>Wastewater Treatment</b>	Emissions of methane and nitrous oxide that occur during wastewater treatment	Population served by each wastewater treatment plant (WWTP) Method of wastewater treatment at each WWTP Amount of digester gas produced at each WWTP	Sonoma Water Sanitation districts and jurisdictions that operate a WWTP
<b>Water Conveyance</b>	Production of electricity associated with the pumping and movement of water from source to user	Water consumption Water supply sources (e.g. groundwater, recycled water)	Urban Water Management Plans and water consumption data for each jurisdiction Sonoma Water
<b>Livestock and Fertilizer</b>	Emissions of nitrous oxide from the application of fertilizer Emissions of methane and nitrous oxide from livestock and manure management	Acres and types of crops grown in the county Livestock populations	Sonoma County 2018 Annual Crop Report U.S. Dept. of Ag National Agricultural Statistics Service