

COUNTY OF MARIN

INTERIM COMMUNITY GREENHOUSE GAS
EMISSIONS ASSESSMENT

April 2017

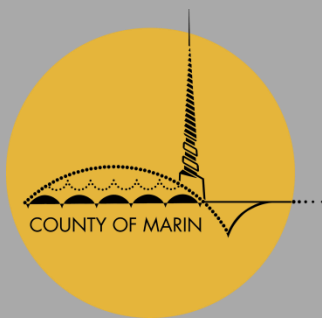


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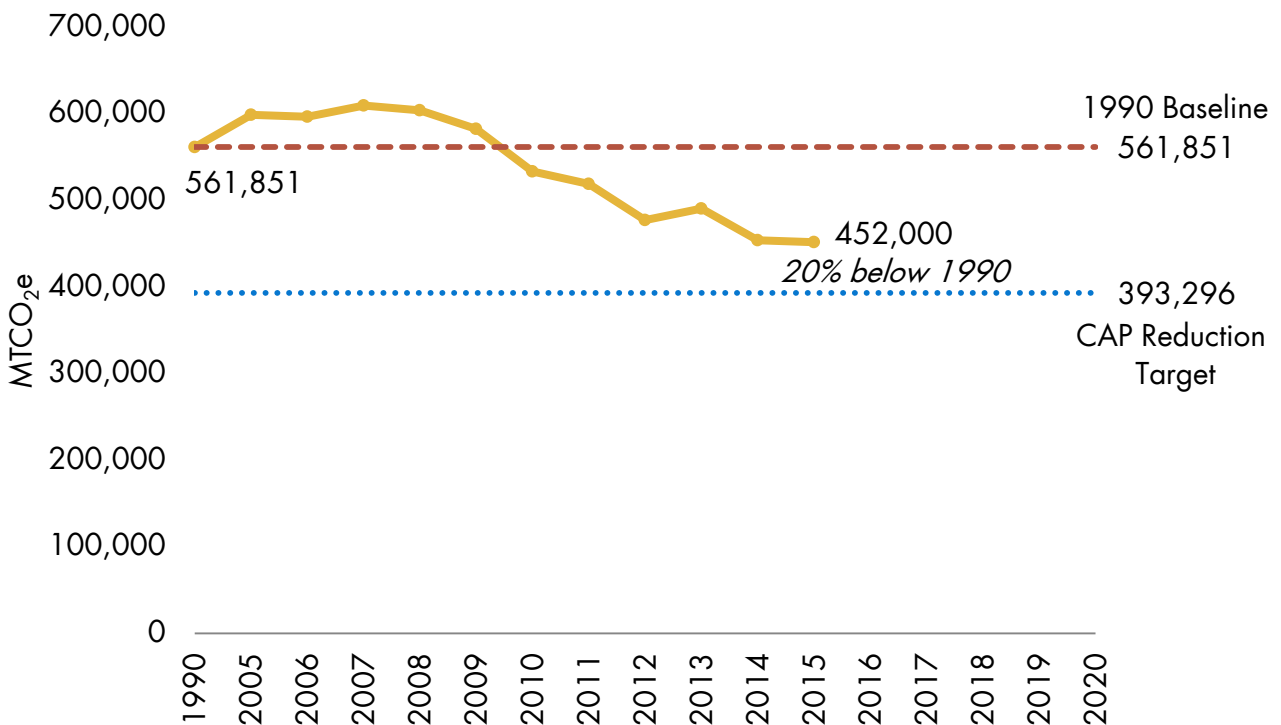
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EXECUTIVE SUMMARY

The County of Marin's Climate Action Plan Update, adopted in November 2015, establishes a target of reducing community greenhouse gas (GHG) emissions in the unincorporated portions of the County 30% below 1990 levels by 2020. This report provides an overview of progress towards those goals.

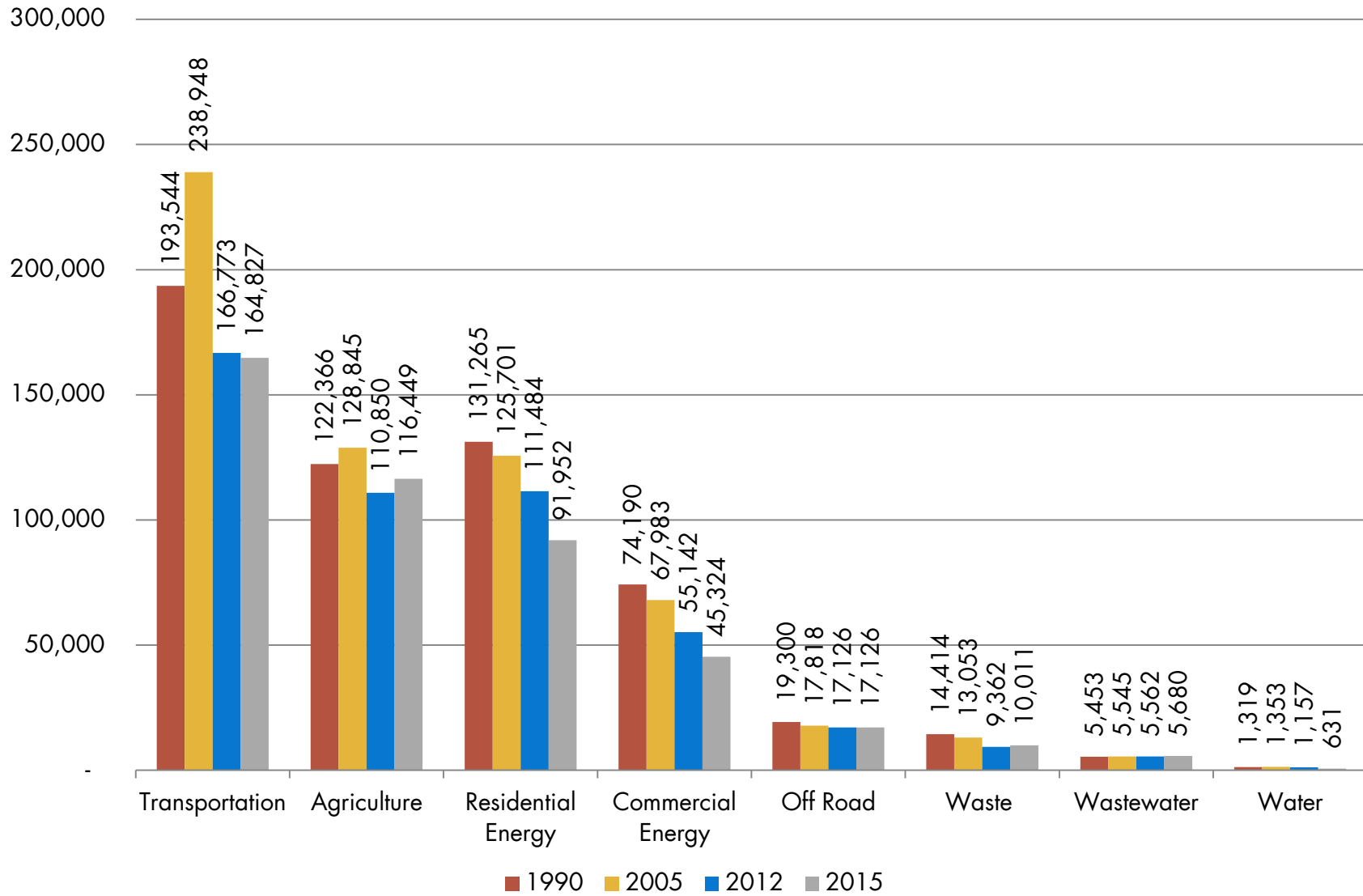
This GHG assessment uses data and estimates to provide a checkup on the County's reductions between inventory years. It shows that through 2015, community emissions in unincorporated Marin County were 20% below 1990 levels, from 561,851 metric tons of carbon dioxide equivalent (MTCO_{2e}) to 452,000 MTCO_{2e} (Figure 1). This leaves an additional 10% (58,705 MTCO_{2e}) to reduce before the end of the 2020 target year.

Figure 1: Progress Towards Community Emission Reduction Targets (MTCO_{2e})



In addition to demonstrating overall progress towards goals, this assessment helps the County understand how emissions have changed over time in different sectors. Sectors, the groups into which a GHG inventory is broken, include residential and commercial energy, transportation, agriculture, water and wastewater, off-road equipment, and waste disposal. Measuring the reduction or growth trends in each sector clarifies the County's understanding of past conditions and focuses implementation efforts going forward. Figure 2 shows the change of each of the CAP's seven sectors from 1990 (the CAP's baseline year) to 2015, specifically how emissions have increased or decreased in the intervening 25 years. 2005, the baseline year for other jurisdictions in the County is included for reference, as is 2012, the most recent complete inventory year.

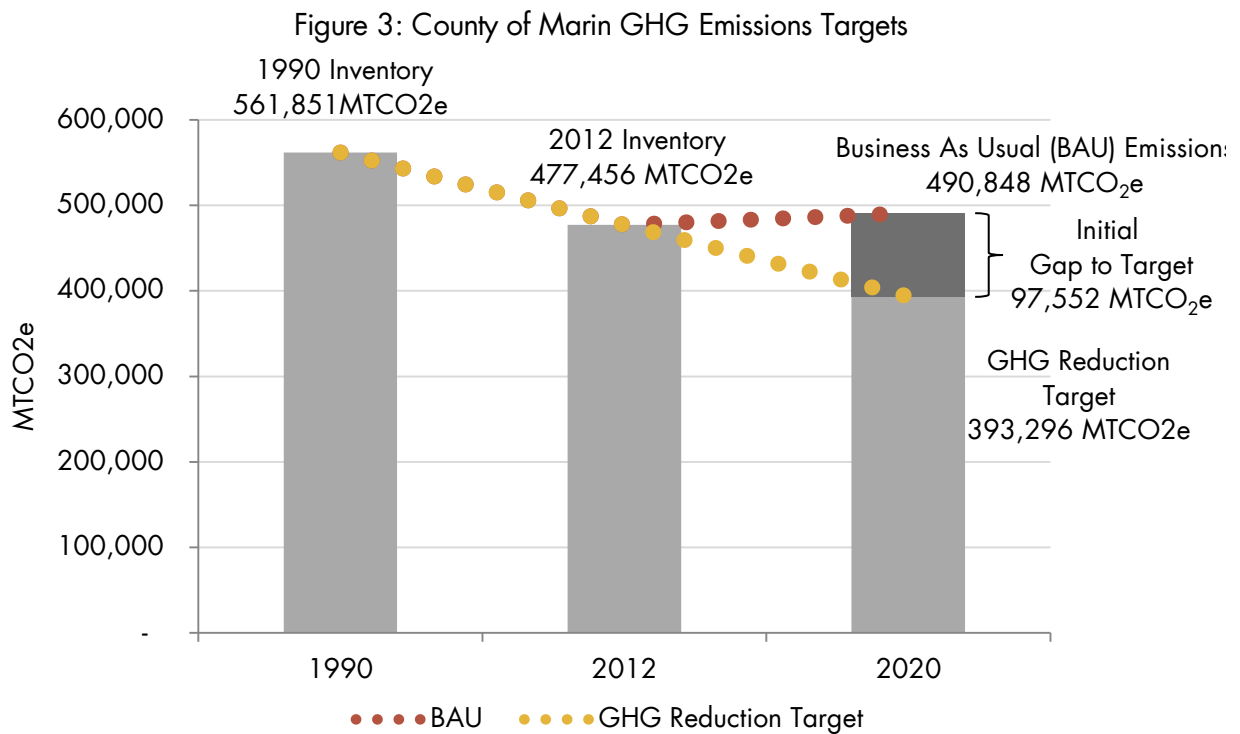
Figure 2: Change in Community Emissions by Sector, Baseline to 2015



INTRODUCTION

CLIMATE ACTION PLAN

In November 2015, the Board of Supervisors adopted the County of Marin Climate Action Plan Update (the CAP). The CAP sets targets for the unincorporated County to reduce greenhouse gas (GHG) emissions from both community and municipal activities. The CAP includes an inventory of community and municipal GHG emissions generated in 2012, and establishes a 2020 target for the County to reduce metric tons of carbon dioxide equivalent (MTCO₂e) in the community to 30% below 1990 levels, double the state's reduction target. If no action is taken to reduce emissions, in a scenario called "Business as Usual" or BAU, the CAP forecasts that community emissions in 2020 will be nearly 100,000 MTCO₂e above the adopted target (Figure 3).



This report provides an interim update to the CAP's 2012 community GHG inventory, providing a snapshot of the County of Marin's progress towards reduction targets. This assessment uses the best available data through 2015, but is not equivalent to the complete emission inventory completed for the CAP. This report uses projections and estimations for calculating portions of off-road emissions, vehicle miles traveled, and agricultural populations and emission factors. A complete inventory update for both the community and municipal inventories will occur in late 2017 or early 2018, depending on data availability. Completing a full inventory requires time-intensive and detailed data collection, but will provide a critical assessment of progress before the 2020 target year. The information in this report illustrates emission trends to help the County shape implementation efforts to respond to current conditions and meet GHG reduction targets.

INTERIM GHG ASSESSMENT

The CAP analyzes emissions from seven sectors:

- Building Energy: emissions from electricity generation and natural gas use by residential, commercial, and industrial buildings.
- On-Road Transportation: fuel consumption emissions from passenger and commercial vehicles operating within the unincorporated areas.
- Off-Road Vehicles and Equipment: fuel consumption emissions from use of off-road equipment, such as cranes, bulldozers, and lawnmowers.
- Solid Waste Generation: methane emissions from waste disposed by unincorporated communities.
- Water Conveyance: emissions from electricity and natural gas consumption associated with water conveyance, including groundwater pumping, local water distribution, and surface water diversion.
- Wastewater Treatment: process emissions from wastewater treatment.
- Agriculture: nitrogen oxide emissions from fertilizer application and methane emissions from manure management and enteric fermentation from livestock in the unincorporated areas.

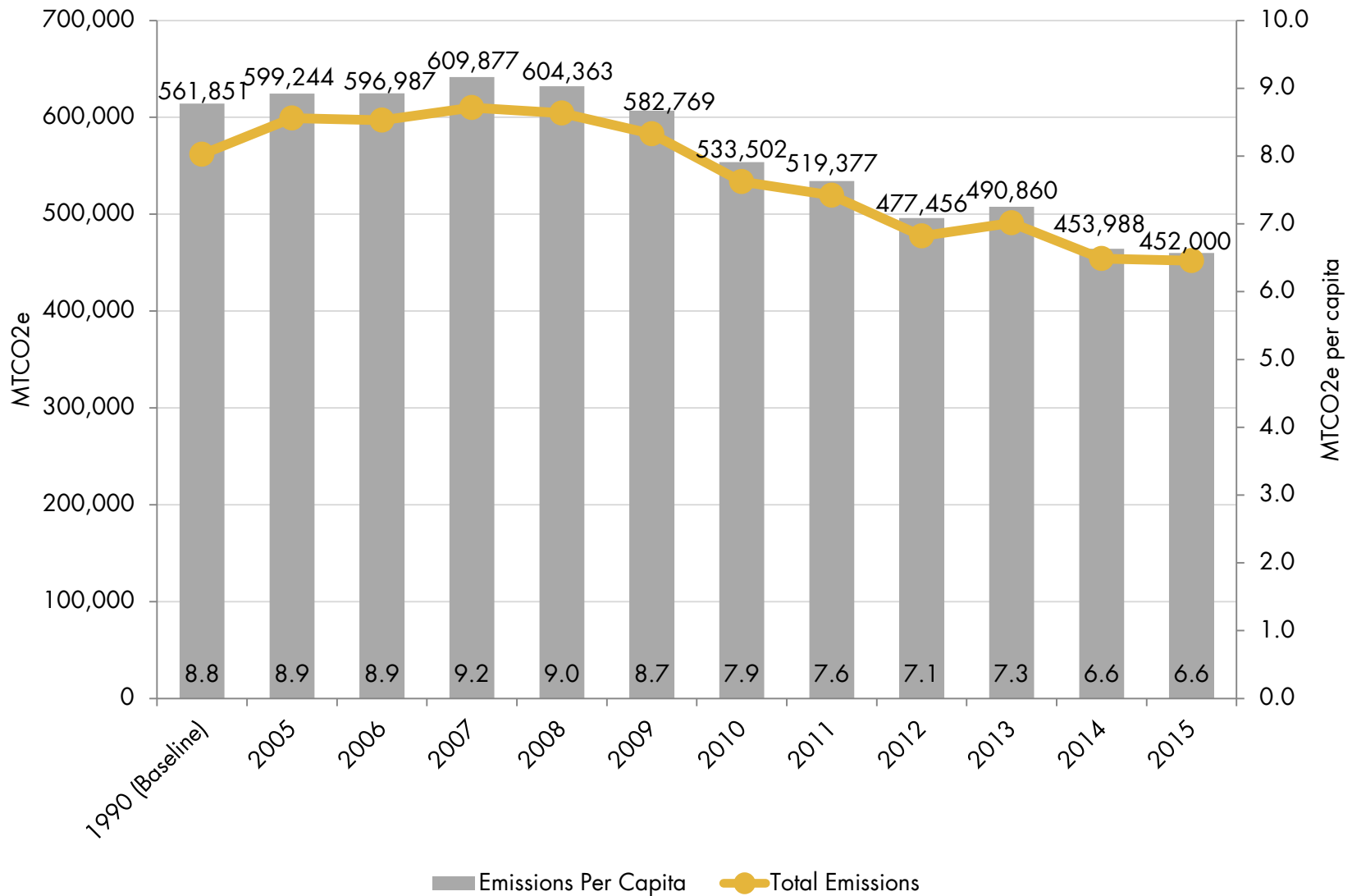
The interim assessment presented in this report, while not as comprehensive as a complete inventory, can provide an idea of how the share of emissions in each sector has changed over time. [Table 1](#) shows how emissions in these sectors have changed since the CAP's baseline year (1990). Total community emissions in the unincorporated areas of the County decreased 20% between 1990 and 2015. [Figure 4](#) shows the progress of emissions reductions since 1990 in total MTCO₂e and in MTCO₂e per capita.

Water consumption and building energy use have had the largest reductions in emissions since 1990, with a 52% decrease in water use emissions, 39% decrease in nonresidential energy emissions, and a 30% decrease in residential energy emissions. Each of these sectors have benefitted from the increased proportion of renewable electricity supply through both MCE and PG&E. Increased capacity to divert waste to be recycled or composted in the County also allowed for a 31% decrease in waste emissions since 1990.

Table 1: County Of Marin GHG Emissions By Sector, Baseline to 2015 (MTCO₂e)

Year	Residential Energy	Commercial Energy	Transportation	Waste	Water	Wastewater	Off Road	Agriculture	Total Emissions	Total Change from 1990
1990 (Baseline)	131,265	74,190	193,544	14,414	1,319	5,453	19,300	122,366	561,851	0%
2005	125,701	67,983	238,948	13,053	1,353	5,545	17,818	128,845	599,244	7%
2006	123,667	62,225	233,640	13,302	1,279	5,520	17,719	139,634	596,987	6%
2007	137,605	73,969	228,451	12,432	1,766	5,492	17,620	132,541	609,877	9%
2008	137,263	78,345	223,376	11,429	1,807	5,524	17,521	129,096	604,363	8%
2009	132,775	73,267	222,987	9,748	1,494	5,548	17,422	119,528	582,769	4%
2010	119,054	57,028	199,885	9,725	1,060	5,566	17,324	123,860	533,502	-5%
2011	119,092	51,771	197,134	9,451	941	5,616	17,225	118,147	519,377	-8%
2012	111,484	55,142	166,773	9,362	1,157	5,562	17,126	110,850	477,456	-15%
2013	111,006	51,569	165,579	9,827	1,035	5,586	17,126	129,132	490,860	-13%
2014	91,081	46,732	164,393	9,428	844	5,651	17,126	118,733	453,988	-19%
2015	91,952	45,324	164,827	10,011	631	5,680	17,126	116,449	452,000	-20%
Sector Change from 1990	-30%	-39%	-15%	-31%	-52%	4%	-11%	-5%	-20%	

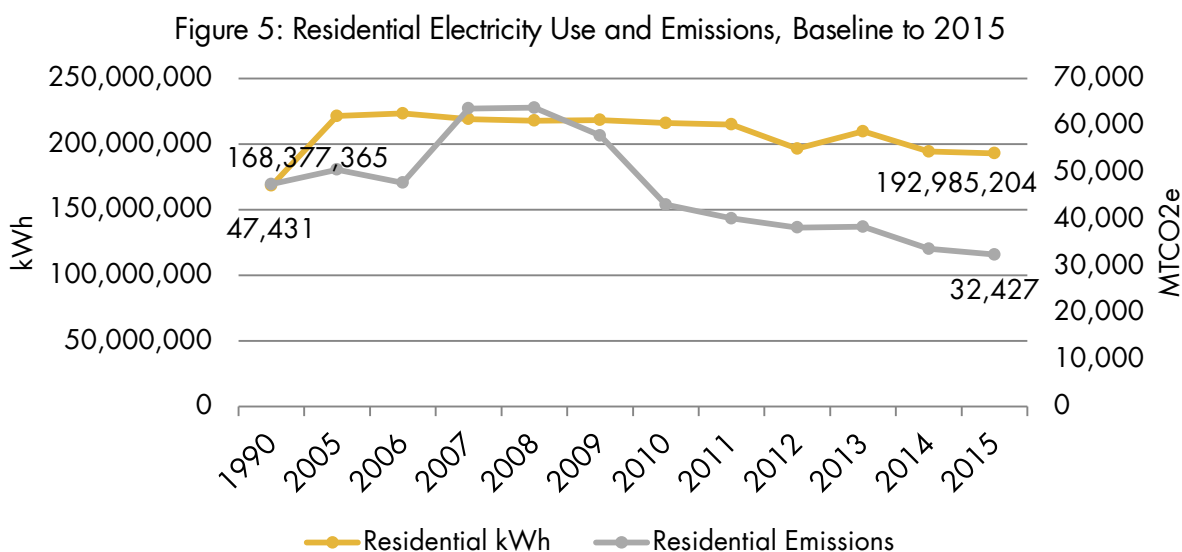
Figure 4: County of Marin GHG Emissions and Emissions per capita, Baseline to 2015



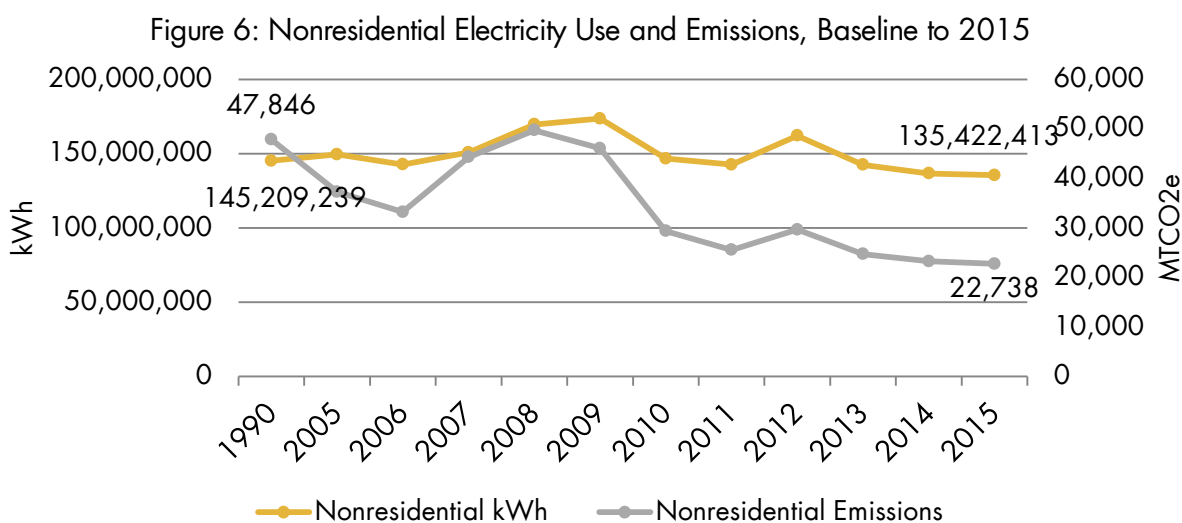
SECTOR SPOTLIGHT: BUILDING ENERGY USE

ELECTRICITY USE AND GHG EMISSIONS

Residential electricity use in unincorporated Marin County has increased 15% since 1990, 24,607,839 kilowatt hours (kWh). In the ten years from 2005 to 2015, however, electricity use fell 13% from 221,367,672 kWh to 192,985,204 kWh, assumed to be a result of conservation efforts, solar installations, and efficiency upgrades over the course of the decade. Despite an increase in kWh consumption in homes since the baseline year, emissions from residential electricity use decreased 32% in the same period, from 47,431 MTCO_{2e} to 32,427 MTCO_{2e} (Figure 5). This is possible due to the increased portion of renewables in Marin’s electricity supply.



Electricity use in the nonresidential sector decreased 7% since 1990, from 145,209,239 kWh to 135,422,413 kWh in 2015 (Figure 6). In the same period, nonresidential electricity emissions decreased by over half (52%), from 47,846 MTCO_{2e} to 22,738 MTCO_{2e}.



The growing availability of low and zero carbon electricity has driven associated emission reductions in the unincorporated County. To comply with statewide renewable portfolio targets, a growing share of PG&E’s electricity is sourced from renewable energy. MCE, which began serving customers in mid-2010, provides electricity that is less carbon intensive than PG&E’s electric portfolio. In addition, MCE’s Deep Green program offers customers the opportunity to purchase 100% renewable electricity (compared to 50% renewable in their standard option). PG&E has launched a Community Solar Choice program, which allows its customers similar flexibility to elect 100% renewable energy. As more data becomes available on program adoption, the County will be able to report on the impact PG&E’s program has on electricity emissions.

In 2015, PG&E provided 29.4% of residential electricity and 23.8% of nonresidential electricity in the unincorporated County (Table 2). MCE Light Green provides 69% of residential electricity, growing from 14.3% in 2010. Nonresidential electricity provided by Light Green has grown from 8.4% in 2010 to 72.8% in 2015. Residential Deep Green adoption has grown from 0.3% of residential electricity in 2010 to 1.6% in 2015. Nonresidential enrollment in Deep Green increased from 0.3% of nonresidential electricity in 2010 to 3.4% in 2015. The continued adoption of low and zero carbon electricity options is necessary to meet CAP goals.

Table 2: Electricity Supply by Provider (% of Total kWh)

	Residential Electricity			Nonresidential Electricity		
	PG&E	MCE Light Green	MCE Deep Green	PG&E	MCE Light Green	MCE Deep Green
1990	100%	0%	0%	100%	0%	0%
2005	100%	0%	0%	100%	0%	0%
2006	100%	0%	0%	100%	0%	0%
2007	100%	0%	0%	100%	0%	0%
2008	100%	0%	0%	100%	0%	0%
2009	100%	0%	0%	100%	0%	0%
2010	85.4%	14.3%	0.3%	91.3%	8.4%	0.3%
2011	71.2%	28.7%	0.1%	83.5%	15.3%	1.2%
2012	53.4%	45.4%	1.2%	56.1%	42.3%	1.6%
2013	29.5%	69.1%	1.4%	24.4%	73.7%	1.9%
2014	30.3%	68.1%	1.6%	25.3%	72.5%	2.2%
2015	29.4%	68.8%	1.8%	23.8%	72.6%	3.6%

NATURAL GAS USE AND GHG EMISSIONS

In addition to electricity use, emissions from natural gas use (measured in therms) are included in assessment of residential and nonresidential building energy sectors. In many homes and businesses, natural gas is used to provide space heating and power equipment (such as stoves and water heaters). Unlike electricity, natural gas does not have variable emission factors, so fluctuating therm usage and associated GHGs follow the same pattern, as shown in [Figure 7](#) and [Figure 8](#). From 1990 to 2015, residential therm usage and emissions decreased 29%. Nonresidential therm usage and emissions decreased 14% from 1990 to 2015.

Figure 7: Residential Natural Gas Use and Emissions, Baseline to 2015

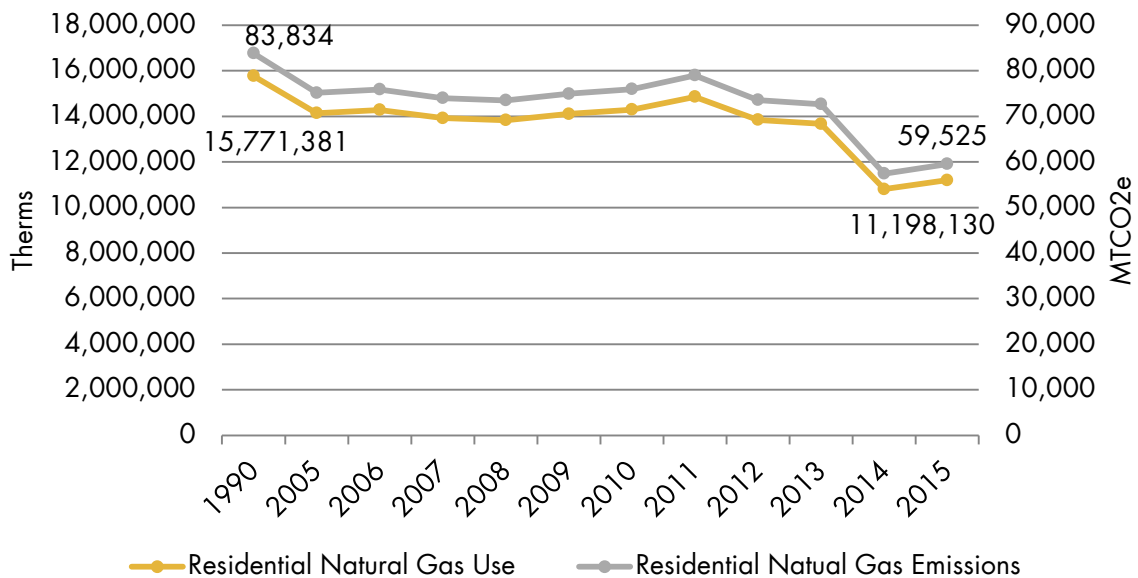
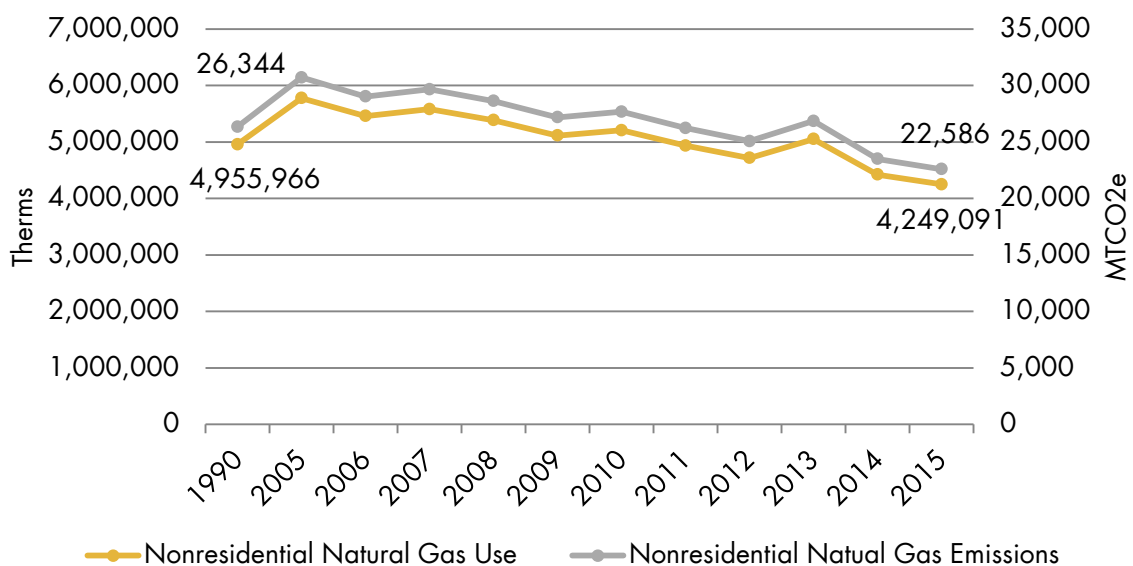


Figure 8: Nonresidential Natural Gas Use and Emissions, Baseline to 2015

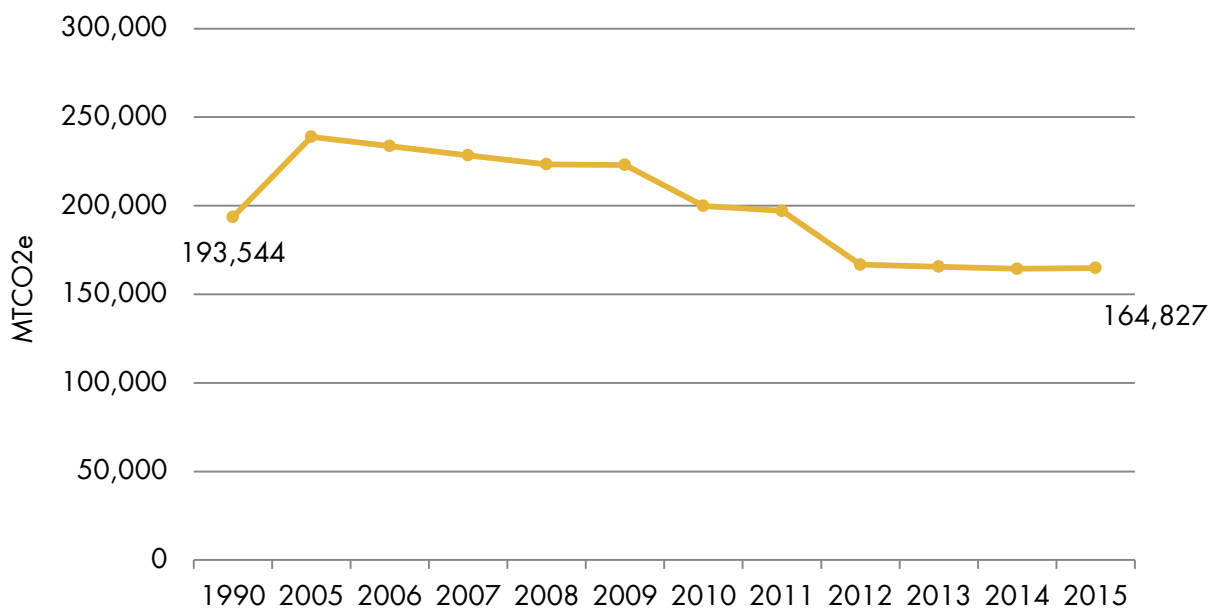


SECTOR SPOTLIGHT: TRANSPORTATION

Emissions from on-road transportation are estimated to have decreased 15% from 1990 to 2015 (Figure 9). This is a combination of a decrease in vehicle miles traveled (VMT) and, improved mileage standards, and cleaner fuels. The State of California's Low Carbon Fuel Standard (LCFS), as well as increased adoption of fuel efficient and zero emission vehicles, helps reduce emissions associated with vehicle travel. Since 2010, 2,795 EV rebates have been issued in the County, one of the highest per capita adoption rates in the Bay Area.

This interim GHG assessment uses estimation methods consistent with the 2012 GHG inventory to allow for comparison to the baseline year. Still, there remains a need for better data on vehicle miles traveled in the unincorporated County. The CAP's 1990 baseline year uses CalTrans data, which is the only data available from the time, yet still increases the risk of inaccuracy due to the gap of nearly 30 years between the baseline year and the present. The County will continue to explore the most appropriate approach to baseline calculation in future inventories. The County is also working with the Transportation Agency of Marin (TAM) to learn about best available methods to measure annual VMT data for increased accuracy. In the meantime, continuing to implement CAP measures targeted at reducing emissions from on-road transportation can ensure that the County moves forward towards CAP targets.

Figure 9: On-Road Emissions, Baseline to 2015

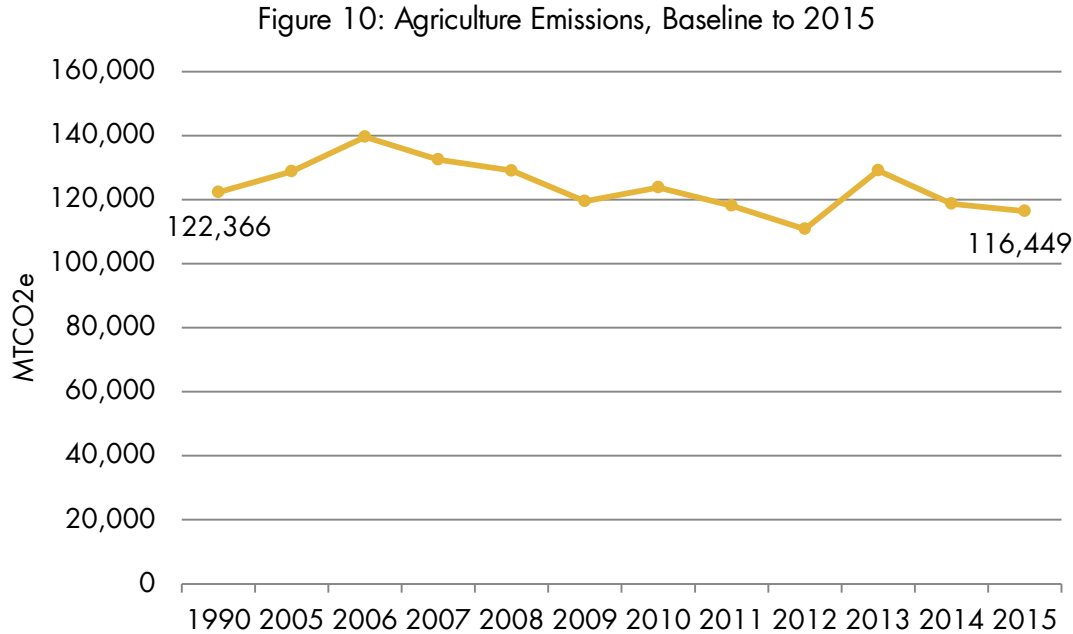


SECTOR SPOTLIGHT: AGRICULTURE

Of all the local CAPs in Marin, the unincorporated County's is the only one to include emissions from agriculture. Chapter 6 of the CAP focuses on the role of agricultural activities in Marin County on countywide emissions. This sector includes GHG emissions from manure management (fugitive emissions of methane and nitrous oxide), enteric fermentation (fugitive emissions of methane and nitrous oxide), and fertilizer use (fugitive emissions of nitrous oxide). Agricultural emissions have decreased 5% since the baseline year, from 122,366 MTCO₂e in 1990 to 116,449 MTCO₂e in 2015 (Figure 10).

Certain agricultural variables, such as composition of feed for cattle or chickens, can significantly alter livestock emissions factors. Detailed data on how feed proportions have changed since 2012 was not collected for the interim GHG assessment. As a proxy, emissions factors used in the 2012 inventory are assumed to remain the same through 2015. Emissions reductions from carbon sequestration, which were quantified in the CAP as an informational item, are not included here.

Additionally, the County of Marin's Department of Agriculture, Weights and Measures, which tracks livestock and crop populations in the County, has recently changed some of the data it collects, in order to protect farmer privacy. This most specifically impacts counts of poultry, hogs, and goats, which are based on voluntary data or has been removed from crop reports to increase anonymity. In instances where no data was available, an average of the prior 5 years of data was used.



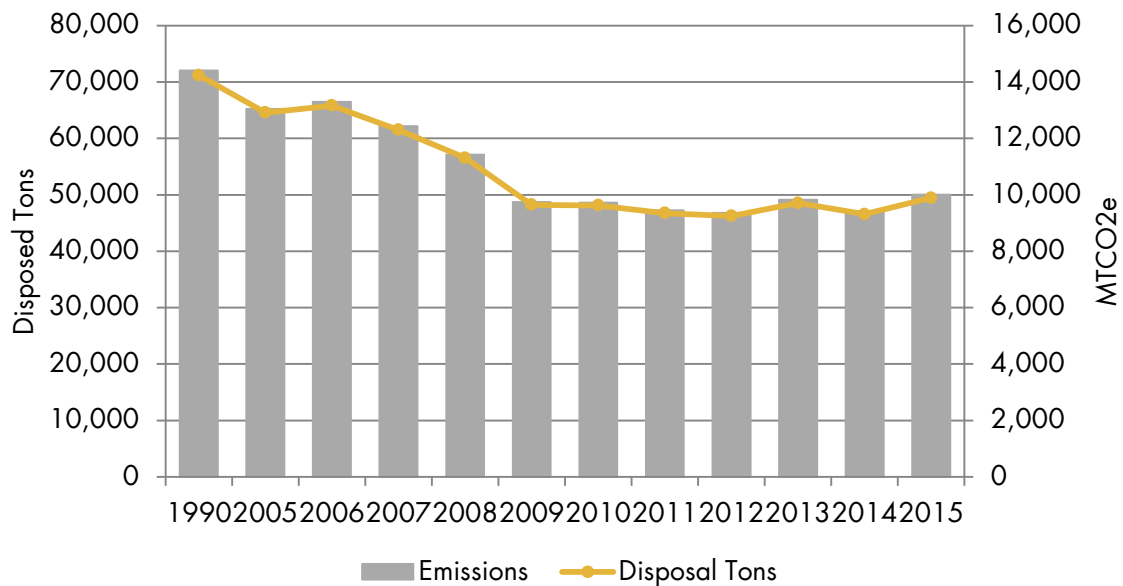
SECTOR SPOTLIGHT: WASTE

Communitywide waste disposal decreased 31% between 1990 and 2015 (Table 3 and Figure 11). This reduction occurred in the same period that population increased 7% in unincorporated Marin, indicating an overall per person reduction in waste disposal. This is likely attributable to an increased availability of recycling and composting services, reducing the amount of waste that ends up in the landfill each year. Emissions from waste disposal decreased 31% from 1990 in 2015, corresponding with disposal reduction.

Table 3: Waste Disposal Tons, Baseline to 2015

	Disposal Tons	Change, Baseline to 2015
1990	71,179	0%
2005	64,573	-9%
2006	65,809	-8%
2007	61,505	-14%
2008	56,542	-21%
2009	48,224	-32%
2010	48,112	-32%
2011	46,754	-34%
2012	46,231	-35%
2013	48,529	-32%
2014	46,557	-35%
2015	49,438	-31%

Figure 11: Waste Disposal (Tons) and Associated Emissions, Baseline to 2015.

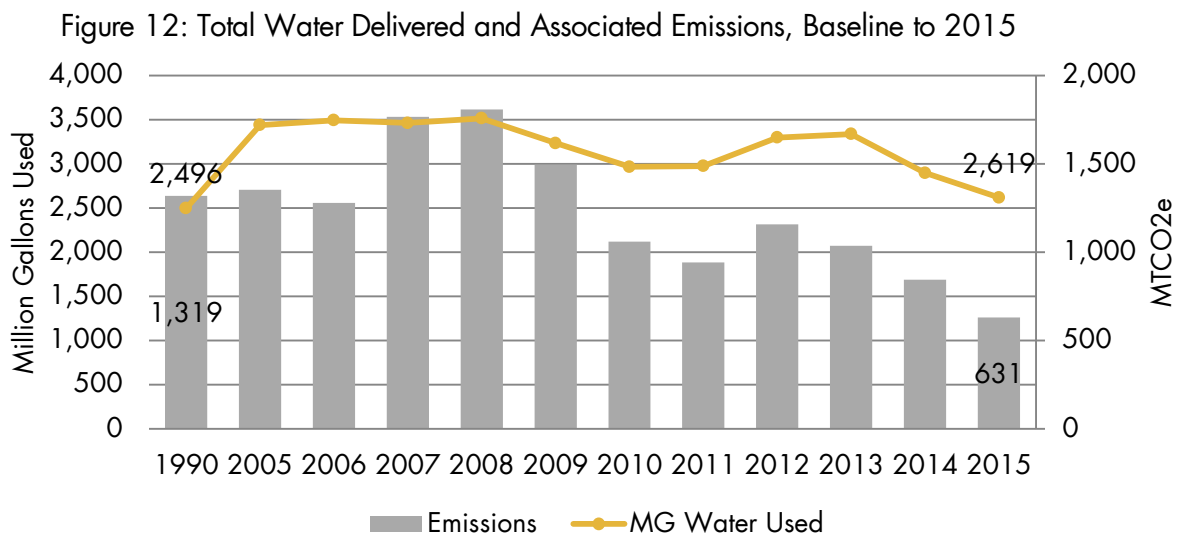


SECTOR SPOTLIGHT: WATER USE

The total water delivered in unincorporated Marin County increased 5% from 1990 to 2015 (Table 4). To account for population growth since the baseline year, Table 4 also shows per capita water use (in million gallons). By this measure, County residents use 2% less water per person than in 1990. Total water use has decreased 23% in the ten years between 2005 and 2015, demonstrating more significant decreases in recent history. Despite the slight increase in water use from the CAP's baseline year, emissions associated with water consumption have fallen by nearly half since 1990 (Figure 12). The decrease in emissions, despite an increase in usage, is the result of a cleaner electricity supply from both PG&E and MCE.

Table 4: Water Use (Million Gallons), Baseline to 2015

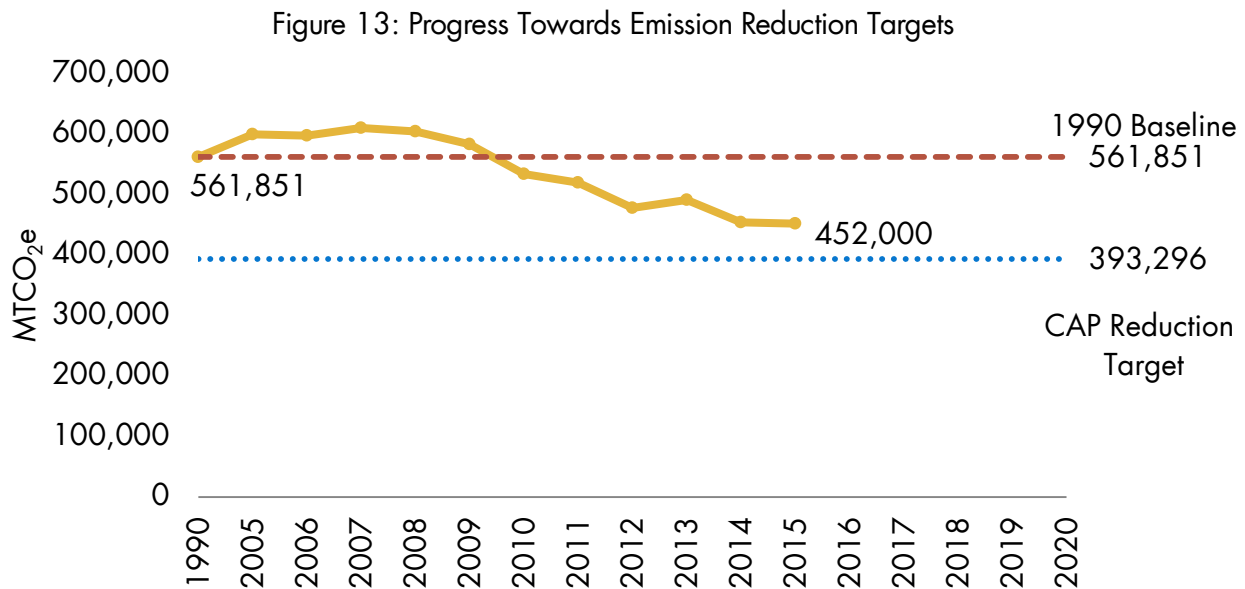
	Per Capita Water Use	Change in Per Capita Water Use, Baseline to 2015	Total Water Delivered	Change in Total Water Delivered, Baseline to 2015	Change in Total Water Delivered, 2005 to 2015
1990	0.039	0%	2,496	0%	
2005	0.051	31%	3,438	38%	0%
2006	0.052	34%	3,493	40%	2%
2007	0.052	34%	3,463	39%	1%
2008	0.053	35%	3,514	41%	2%
2009	0.048	23%	3,234	30%	-6%
2010	0.044	13%	2,965	19%	-14%
2011	0.044	12%	2,976	19%	-13%
2012	0.049	26%	3,298	32%	-4%
2013	0.049	27%	3,337	34%	-3%
2014	0.042	9%	2,896	16%	-16%
2015	0.038	-2%	2,619	5%	-24%



SUMMARY AND NEXT STEPS

OVERVIEW OF ASSESSED PROGRESS

The observed reduction of 20% from 1990 to 2015 (Figure 13) reflects the impacts of community action, state, regional, and local policy choices, and an increase in availability of clean, low emission energy. The County has a 58,705 MTCO₂e (10%) gap remaining to meet the 2020 target.



NEXT STEPS

The County is coordinating efforts to ensure CAP targets are achieved by 2020. County staff is developing an effective framework to achieve reduction goals and preparing the County to address climate change beyond 2020. Specific actions to be taken in the coming months include:

- In late 2017 or early 2018 (pending data availability), develop a complete community and municipal inventory to provide a more detailed overview of emission reduction progress.
- Finalize the establishment of a cross-departmental CAP Subcommittee to streamline collaborative Climate Action Plan implementation efforts and coordinate community engagement efforts. This internal working group is set to launch in early spring, 2017.
- Coordinate with Marin Climate and Energy Partnership to increase engagement of County residents, within and outside of the County's sphere of influence, to support sustainability and emission reduction efforts.
- Pursue grant opportunities to implement specific CAP measures as well as development of a post-2020 forecast and policy document.
- Conduct two community workshops per year to provide updates on CAP implementation progress to the public.

COMMUNITY RESOURCES

While County officials and staff coordinate efforts at the government level, there is a wealth of resources available to Marin's community members to start taking action on climate today. Additional information can be found at www.marinclimate.org/what-you-can-do and www.marinsustainability.org.

BUILDING ENERGY

OPT FOR 100% RENEWABLE ELECTRICITY

Residents and businesses in Marin have the opportunity to purchase 100% renewable electricity, reducing emissions associated with fossil-fuel generated energy. These options are available through MCE's Deep Green program or PG&E's Solar Choice program.

GO SOLAR

The Marin Solar Program (www.marinsolar.org) can help you begin the process of evaluating whether the installation of a solar system is suitable for your home or business. Staff can answer questions you may have before contacting a contractor, including about available incentives, financing opportunities, and local regulations.

INCREASE BUILDING EFFICIENCY

Installing insulation, sealing duct leaks, and upgrading to energy-efficient windows and appliances can reduce costs and energy use in homes and businesses. Homeowners in Marin County can take advantage of Energy Upgrade California® Home Upgrade's technical resources as well as financial incentives. Visit www.marincounty.org/energyupgrade to learn more.

Businesses in Marin County can leverage free technical assistance services offered by SmartLights, which will also help identify available rebates for upgrades. Both PG&E and MCE offer on-bill financing programs that eliminate the up-front costs of energy efficiency upgrades to businesses. Visit www.marinenergywatch.org to learn more.

TRANSPORTATION

GREEN YOUR COMMUTE

Finding alternatives to driving alone on your way to work or school can minimize emissions from cars, reduce congestion, and improve public health. 511.org, a program of the Metropolitan Transportation Commission (www.511.org) has interactive online tools to help find a carpool or transit route between common destinations, such as home and work. Safe Routes to Schools (www.saferoutestoschools.org) organizes walking and bicycling groups to give students a safe, car-free way to get to school on time.

DRIVE ELECTRIC

As electric car ranges extend, more charging infrastructure becomes available, and costs decrease, residents may explore buying or leasing an electric car, which, when paired with 100% renewable energy, provides a GHG-free method of vehicle travel.

SOLID WASTE

REDUCE WASTE

Zero Waste Marin (www.zerowastemarin.org) offers a range of resources and programs to help residents and business reduce the amount of waste they send to the landfill each year, and educate community members about proper waste disposal.

WATER & WASTEWATER

SAVE WATER

The delivery, treatment, and removal of water and wastewater require a significant amount of energy. Reducing water use not only supports conservation and reduces drought impacts, but also reduces associated energy use. Look for the WaterSense label when purchasing appliances, and reach out to your water provider to find out about available rebates for water efficiency upgrades.

AGRICULTURE

SHOP LOCAL

Purchasing locally-grown produce and food from farmer's markets minimizes emissions from transportation of food and supports the local economy. A number of organizations in Marin County, such as the Marin Carbon Project and the Marin Agricultural Land Trust, work to preserve and enhance working agricultural lands. Their research continues to seek new ways to modify existing farms to sequester more carbon and provide a model for carbon-friendly agriculture.