



2009 GREENHOUSE GAS EMISSIONS INVENTORY

Brendan Reed
Cory Downs

SUMMARY

As part of Chula Vista's climate protection program and its commitment to reduce greenhouse gas (GHG) or "carbon" emissions 20% below 1990 levels, the Department of Conservation & Environmental Services performs emissions inventories to identify GHG sources and to help guide policy decisions. The *2009 GHG Emissions Inventory* is the City's latest evaluation of its progress in reaching its emissions goals and builds upon past inventory efforts for 1990, 2005, and 2008. The 2009 inventory utilizes the Local Government Operations Protocol which is sponsored by ICLEI, the California Climate Action Registry, The Climate Registry, and the California Air Resource Board. The 2009 inventory indicates that Chula Vista's annual citywide GHG levels are 928,169 metric tons of Carbon Dioxide Equivalent (MT CO₂e). Compared to 1990, Chula Vista's citywide GHG emissions have increased by 28%, but have decreased by 2% since the 2008 inventory. In addition, per capita emissions are approximately 27% below 1990 levels. GHG emissions from municipal sources (i.e. operations, facilities, and vehicle fleet) in 2009 are approximately 47% below 1990 levels.

Unlike previous inventories, there was actually a reduction in citywide energy consumption due most likely to the global economic downturn. In addition, SDG&E's percentage of grid-supplied renewable energy continues to increase further contributing to lower energy-related emissions compared to 2008. Transportation levels and their associated GHG emissions, however, increased since last year. To reach the community emissions reduction commitment outlined in the original CO₂ Reduction Plan, the City must decrease annual emissions by at least 346,536 metric tons of carbon equivalent.

INTRODUCTION

Chula Vista has historically been a regional and national leader in climate protection policies and programs designed to reduce greenhouse gas or "carbon" emissions. The City has participated in the United Nations Framework Convention on Climate Change, ICLEI Cities for Climate Protection Campaign, and the Conference of Mayor's Climate Protection Agreement. In addition, Chula Vista recently joined The Climate Registry which is North America's premier voluntary greenhouse gas (GHG) reporting system designed to archive participants' early actions to reduce GHG emissions and prepare them for future carbon trading opportunities. Through this past involvement, the City has committed itself to reducing its greenhouse gas emissions 20% below 1990 levels by 2010 based on a widely-adopted international target. It should be noted that the international community has since revised the reduction target date to 2012.

The City of Chula Vista's Greenhouse Gas Emissions Inventory for calendar year 2009 was compiled and calculated using the Local Government Operations Protocol (LGOP) and ICLEI's Clean Air & Climate Protection 2009 software (Version 2.1). The LGOP is sponsored

by ICLEI, the California Climate Action Registry, The Climate Registry, and the California Air Resources Board and allows local governments to better estimate their annual greenhouse gas emissions from municipal-operated sources. The software also calculates the emissions from major community sources in order to help further shape local climate change policy and goals. The most recent emission coefficients specific to California and/or the San Diego region were used in all quantifications. As such, past years' emission levels were recalculated if new emission coefficient data was available in order to provide a more accurate comparison between inventory years.

As stated above, the *2009 GHG Emissions Inventory* separates emissions into two major analyses, community and municipal. The community analysis represents the quantity of GHG emissions produced throughout the entire City from both public and private sectors. The municipal analysis only represents emissions from City facilities and operations. In both analyses, the protocol evaluates emissions from three main parameters - energy consumption, transportation, and waste. It is important to clarify that these data parameters are based solely on end use or net results. For example, the City's emissions from electricity are calculated based on the total kilowatts used, not the kilowatts saved in City-sponsored efficiency programs or the emissions output of the South Bay Power Plant. Although there are six GHGs outlined in the Kyoto Protocol – carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆) – the inventory calculates emissions based on CO₂ Equivalent or CO₂e which allows emissions of different strengths to be added together. For example, one metric ton of methane emissions is equivalent to 21 metric tons (MT) of carbon dioxide (or CO₂e) in global warming potential.

In addition to outlining its 2009 inventory results in this report, the City has formally submitted its municipal inventory to The Climate Registry (TCR) for public review and vetting. The Climate Registry, which was based on the California Climate Action Registry, but expanded to include participants from across North America, is a more robust greenhouse gas accounting procedure requiring third-party verification. Participation in TCR complements the City's other climate protection efforts by documenting GHG emissions as it relates to Assembly Bill 32's (California Global Warming Solutions Act of 2006) statewide reduction targets and prepares the City for potential carbon trading opportunities in the future. The City of Chula Vista is the first local government in San Diego County to successfully report its GHG emissions through The Climate Registry. The City of Chula Vista is also the first local government in San Diego County to participate in San Diego Gas & Electric's Cool Planet Program which reimburses the City's costs for preparing and verifying its GHG emissions inventory. The City is eligible to participate in the Cool Planet Program because of its aggressive energy efficiency retrofit efforts on its municipal facilities. It should be noted that the total municipal emissions reported in this inventory report differ from the total emissions submitted to TCR due to its slightly different carbon accounting methodology.

RESULTS

With technical assistance from ICLEI, City staff collected "activity data" from a number of municipal and external sources, including CalTrans, SDG&E, California Integrated Waste Management Board (CIWMB), the Chula Vista Recreation Department, and the Public Works Department (Table 1). In most cases, these data sources were able to provide aggregated

empirical data for calendar year 2009. However, for community transportation levels it was necessary to forecast 2009 data from 2008 CalTrans' Highway Performance Monitoring Systems due to the fact that 2009 data has not been published yet. This will be updated in future inventory reports as more accurate data becomes available.

Default emission coefficients and related assumptions were generally used for transportation and waste analyses. For energy analyses, staff included Utility-specific electricity coefficients for CO₂ emissions. If these coefficients were not available for a particular inventory year (or prior year), the California Grid Average electricity emission coefficients were used. All inventories used the California Grid Average electricity coefficients for CH₄ and N₂O emissions for the particular year (or most recently available year). This approach is consistent with the Local Government Operations Protocol and preferred by the California Air Resources Board, The Climate Registry, and ICLEI for GHG reporting.

PARAMETER	ANALYSIS	SOURCE	ACTIVITY DATA	EMISSION FACTOR
Energy	Community	SDG&E	- Metered electricity & natural gas use - Local power generation plants excluded from Industrial Sector's natural gas totals in order to avoid double counting emissions	- SDG&E-specific electricity emission coefficients (CO ₂) - CA average electricity emission coefficients (CH ₄ & N ₂ O)
	Municipal	SDG&E	- Metered electricity & natural gas use - Fuel shipment invoices - Energy consumption was categorized by buildings, outdoor lighting, and wastewater	- Default natural gas emission coefficients
Transportation	Community	CalTrans	- Annual VMT data (excluding freeways) was derived from average daily VMT values for Chula Vista	- Default fuel emission coefficients - Default occupancy & vehicle classes (community analysis only)
	Municipal	Public Works Dept.	- Fuel consumption totals include transit and equipment use	
Waste	Community	CIWMB	- Solid waste disposal data for Chula Vista residents and businesses at all California landfills	- Default fugitive methane (CH ₄) emission estimates (based on EPA WARM Model) - Methane capture rates at Otay Landfill
	Municipal	Allied Waste Services	- Solid waste disposal data includes trash hauled by Allied Waste Services and by City staff	
Other	Municipal	Recreation Dept.	- pH canisters' shipment invoices	- Default fugitive carbon dioxide (CO ₂) emissions coefficients

Table 1: Data sources and emission factors used for community and municipal emissions analyses.

Community Inventory

In 2009, community GHG emissions from Chula Vista totaled 928,169 MT CO₂e (Table 2, Figure 1). The sector with the greatest amount of emissions (approximately 48%) was transportation or mobile sources. The residential sector was the second highest source producing about 27% of total community emissions from energy use, followed by the

commercial (21%) and industrial (4%) sectors. Because of the high methane recovery rates at County landfills, the community did not have significant emissions from solid waste disposal.

Compared to 2008 emission levels, 2009 total emissions from citywide sources decreased 2%. The decrease between the two inventory years was attributable to reductions in overall energy use, with emissions from residential, commercial, and industrial energy use decreasing 39,269 MT CO₂e or 8% cumulatively. Transportation-based emissions increased 4% or 15,571 MT CO₂e since calendar year 2008.

Chula Vista’s 2009 citywide GHG emissions were 28% higher than 1990 levels and there were emission increases in nearly all sectors since 1990 (Figure 1). The City’s residential and commercial sectors’ energy emissions increased by approximately 28% and 175%, respectively, compared to the baseline year. Emissions from transportation activity were 32% greater in 2009 compared to 1990, while the industrial sector emissions had a 71% reduction between the 2009 and 1990 inventory years from 123,128 to 35,444 annual metric tons most likely due to more accurate energy tracking in recent years (see page 9). Similar to past inventories, emissions from Chula Vista solid waste disposal at County landfills continued to be not significant in 2009.

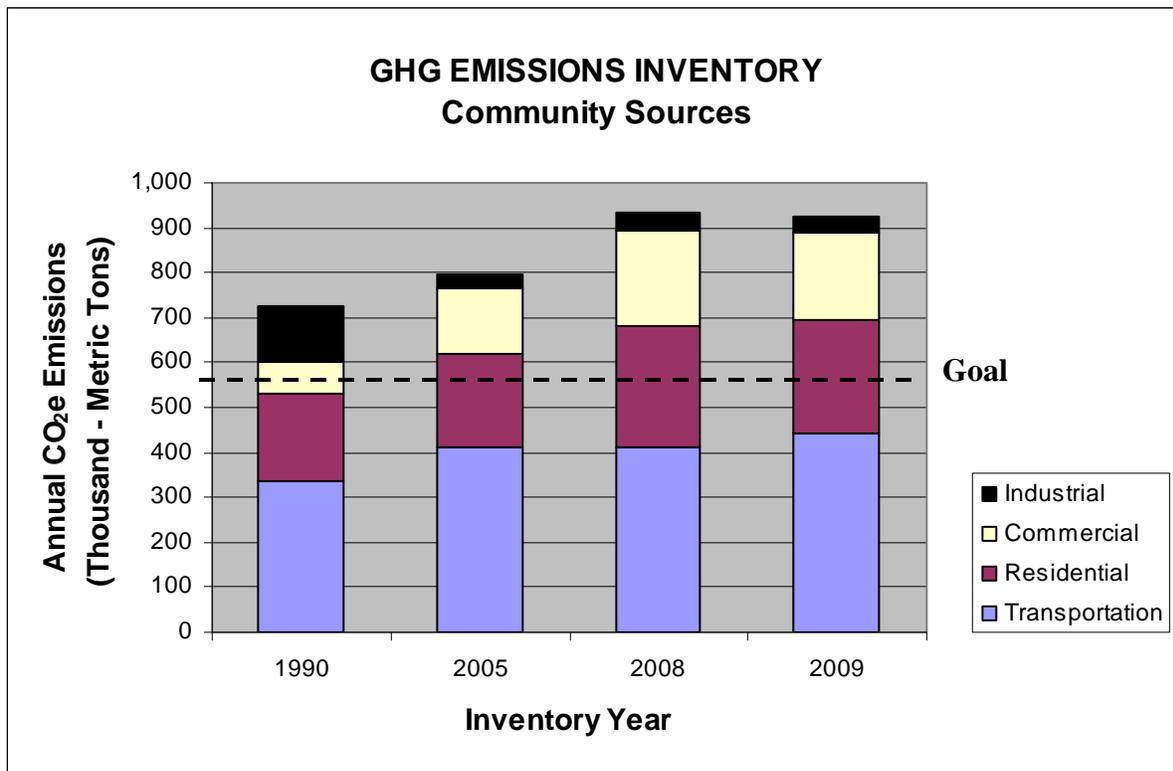


Figure 1: Total GHG emissions from community sources (by sector) in 1990, 2005, 2008, and 2009. Emissions from the solid waste sector were non-significant (<1 MT CO₂e) and are not graphed. Dashed line represents carbon reduction commitment.

COMMUNITY ANALYSIS

Metrics								Annual Greenhouse Gas (GHG) Emissions (Metric Tons CO ₂ e)							
		1990	2005	2008	2009	% Change (2009 vs. 1990)	% Change (2009 vs. 2008)			1990	2005	2008	2009	% Change (2009 vs. 1990)	% Change (2009 vs. 2008)
Population		135,136	217,543	231,305	235,006	74%	2%	Per Capita		5.4	3.7	4.1	3.9	-27%	-4%
Housing Units		49,849	73,115	77,452	78,173	57%	1%	Per Housing Unit		14.6	10.9	12.3	11.9	-19%	-3%
Land Area (Acres)		18,558	33,024	33,024	33,024	78%	0%	Per Acre		39.2	24.2	28.8	28.1	-28%	-2%
Annual Vehicle Miles Traveled (VMT) (Thousands)		465,300	684,600	727,100	757,500	63%	4%	Transportation		335,435	412,306	428,683	444,254	32%	4%
Energy Use (MMBtu)	Residential	2,438,280	3,416,724	3,641,904	3,531,753	45%	-3%	Energy Use	Residential	197,115	207,533	271,971	252,309	28%	-7%
	Commercial	767,716	2,305,220	2,557,321	2,514,921	228%	-2%		Commercial	71,363	146,245	212,432	196,162	175%	-8%
	Industrial	1,342,551	485,504	388,748	390,358	-71%	0%		Industrial	123,128	32,013	38,781	35,444	-71%	-9%
	Total	4,548,547	6,207,448	6,587,973	6,437,032	42%	-2%		Total	391,606	385,791	523,184	483,915	24%	-8%
Solid Waste (Tons)		179,986	217,881	174,583	188,733	5%	8%	Solid Waste		0	0	0	0	0%	0%
Total GHG Emissions		727,041	798,097	951,867	928,169	28%	-2%	20% GHG Reduction Goal						581,633	
Reductions Needed To Reach Goal														346,536	

* All GHG emissions are reported in CO₂ Equivalent (CO₂e) which allows emissions of different strengths to be added together. For example, one metric ton of methane emissions is equivalent to 21 metric tons of carbon dioxide (or CO₂e) in global warming potential.

Table 2: Summary of community GHG inventory metrics and emission levels for 1990, 2005, 2008, and 2009.

Although there was an increase in total community emissions from 1990 to 2009, the amount of GHG emissions per person, per household, and per acre decreased (Figure 2). The per capita emissions rate was lowered 27% from 5.4 to 3.9 metric tons CO₂e annually. Per household emissions were reduced from 14.6 to 11.9 metric tons (19%), while emissions per acre decreased 28% from 39.2 to 28.1 metric tons. Nonetheless, in order to achieve the City’s 2010 GHG reduction target, annual community emissions would be required to be reduced by at least an additional 346,536 metric tons CO₂e.

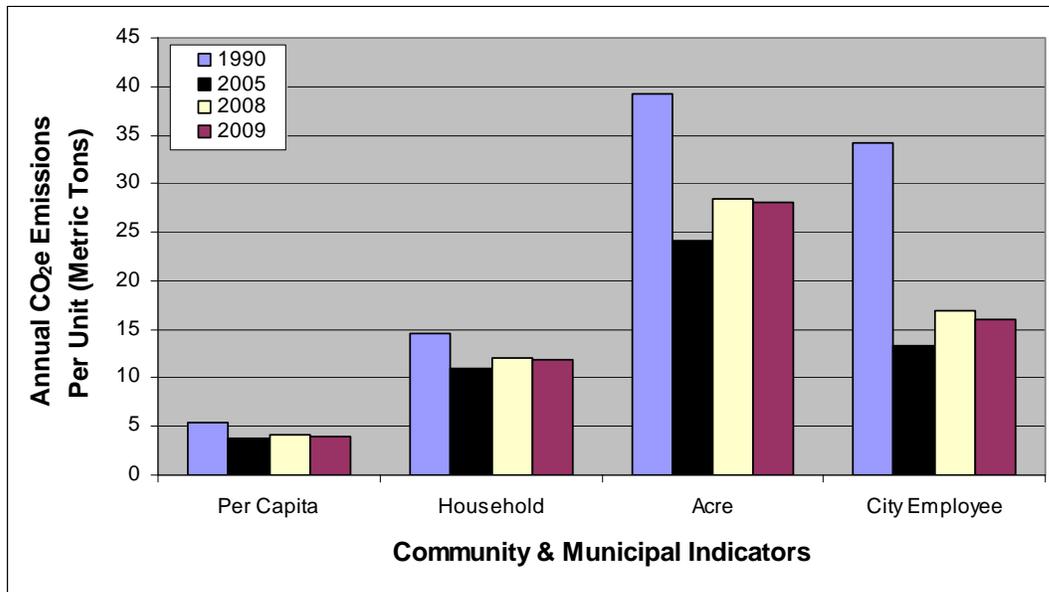


Figure 2: Per capita, household, acre, and City employee contributions to GHG emissions in 1990, 2005, 2008, and 2009.

Municipal Inventory

Chula Vista’s 2009 municipal GHG emissions were 15,704 metric tons CO₂e (Table 3, Figure 3). Similar to the community analysis, the majority of municipal emissions were from transportation sources representing 50% of total emissions. Energy use for building and outdoor lighting generated 32% and 18% of total emissions, respectively. Emissions from sewage and solid waste operations were not significant in the 2009 municipal analysis.

Compared to 2008 emission levels, municipal emissions in 2009 decreased by 7% or 1,220 MT CO₂e. The largest decrease in 2009 was from the building and external lighting sectors which decreased by 751 and 483 MT CO₂e, respectively. Sewage-related GHG emissions decreased slightly by 30 MT CO₂e, while the vehicle fleet sector increased emissions by 44 metric tons (<1%) between 2008 and 2009.

When compared to 1990 levels, GHG emissions from municipal operations decreased by 13,920 metric tons CO₂e or 47% and emission levels per City employee (full-time equivalent) decreased 53% (Figure 2, Table 3). These reductions were mainly caused by lower energy consumption and corresponding emissions (20,260 to 2,793 metric tons) in the external lighting sector (includes street lights and traffic signals) due to energy-efficiency retrofit efforts over the past 20 years (Figure 3). Sewage sector emissions also decreased by 98% resulting in only 21 MT CO₂e being produced in 2009. However, this reduction is most likely due to differences in how pump station energy meters were segregated out of the dataset between the two inventory years. The municipal building sector increased its emissions 35% or 1,317 metric tons since 1990 as new buildings and facilities have been constructed and expanded. Likewise, the municipal fleet sector, which includes Chula Vista Transit, increased its emissions by 3,190 MT or 69% higher than 1990. Similar to past inventories, emissions from municipal solid waste disposal at County landfills continued to be not significant in 2009.

MUNICIPAL ANALYSIS

Metrics							Annual Greenhouse Gas (GHG) Emissions (Metric Tons CO ₂ e)*								
	1990	2005	2008	2009	% Change (2009 vs. 1990)	% Change (2009 vs. 2008)		1990	2005	2008	2009	% Change (2009 vs. 1990)	% Change (2009 vs. 2008)		
Employees	866	1,198	989	979	13%	-1%	Per Employee	34.2	13.3	17.1	16.0	-53%	-6%		
Vehicle Fleet Fuel Use (Gallons or Equivalent)	478,344	1,102,823	923,364	947,109	98%	3%	Vehicle Fleet	4,655	9,281	7,801	7,845	69%	1%		
Energy Use (MMBtu)	Buildings	35,527	70,790	65,439	63,709	79%	-3%	Energy Use	Buildings	3,728	4,576	5,796	5,045	35%	-13%
	External Lights	147,100	27,780	30,422	28,297	-81%	-7%		External Lights	20,260	2,032	3,276	2,793	-86%	-15%
	Sewage	7,122	257	480	216	-97%	-55%		Sewage	981	19	51	21	-98%	-59%
	Total	189,749	98,827	96,341	92,222	-51%	-4%		Total	24,969	6,627	9,123	7,859	-69%	-14%
Solid Waste (Tons)	5,400	6,603	7,331	8,269	53%	13%	Solid Waste	0	0	0	0	0%	0%		
							Total GHG Emissions	29,624	15,908	16,924	15,704	-47%	-7%		
							20% GHG Reduction Goal					23,699			
							Reductions Needed To Reach Goal					0			

* All GHG emissions are reported in CO₂ Equivalent (CO₂e) which allows emissions of different strengths to be added together. For example, one metric ton of methane emissions is equivalent to 21 metric tons of carbon dioxide (or CO₂e) in global warming potential.

Table 3: Summary of municipal GHG inventory metrics and emission levels for 1990, 2005, 2008, and 2009.

DISCUSSION

As demonstrated in this report, Chula Vista has experienced great success in reducing annual GHG emissions associated with its municipal operations. The City's investment in more energy efficient traffic signals in the mid-1990s continues to produce dramatic reductions in overall municipal energy consumption and related emissions. While building energy use increased between 1990 and 2009, it has shown moderate reductions since 2005 although there were multiple buildings constructed or expanded during this time period including 2 Civic Center buildings, 3 recreation centers, 3 fire stations, and numerous park sites. There have also been recent reductions in emissions from sewage-related energy use as pump stations have been replaced with passive gravity-flow systems. Finally, municipal fuel use has decreased since the 2005 inventory, but remains higher than 1990 levels.

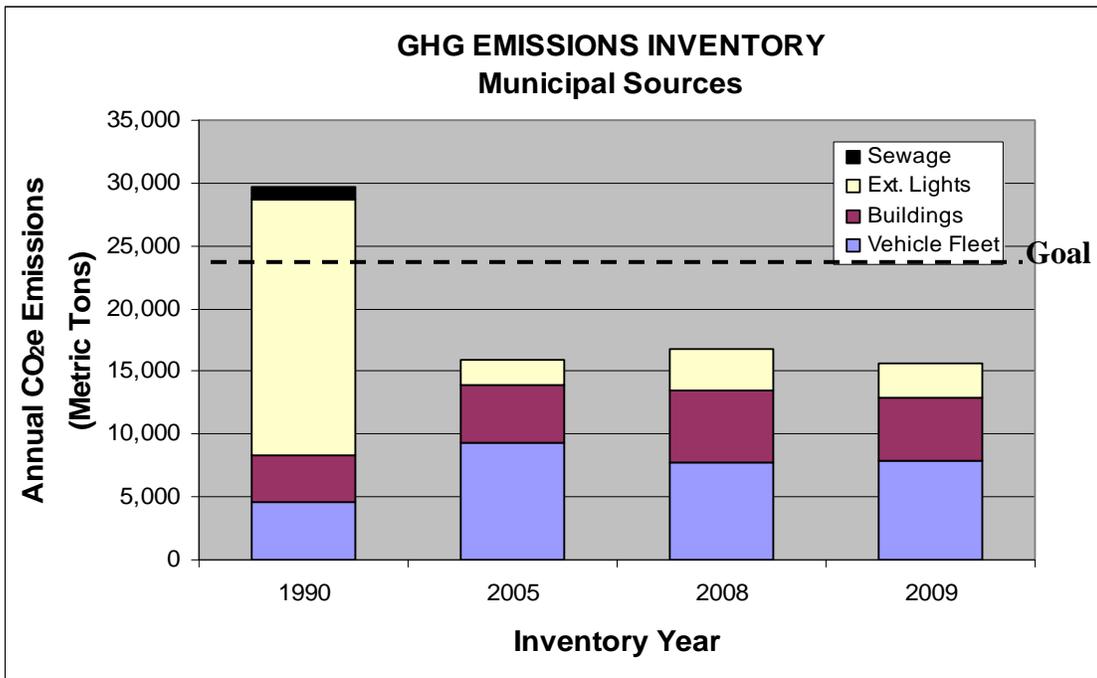


Figure 3: Total GHG emissions from municipal sources (by sector) in 1990, 2005, 2008, and 2009. Emissions from the solid waste sector were non-significant (<1 MT CO₂e) and are not graphed. Dashed line represents carbon reduction commitment.

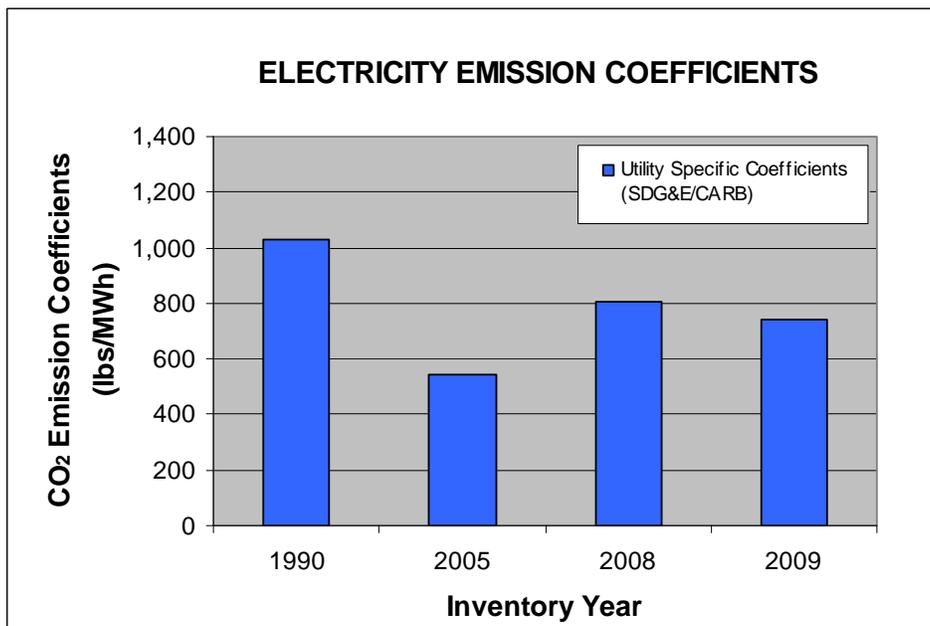


Figure 4: Carbon Dioxide (CO₂) emission coefficients from delivered grid electricity in 1990, 2005, 2008 and 2009.

Chula Vista's overall community GHG emission levels are still considerably higher than 1990 levels. The only community sector to reduce emissions between 1990 and 2009 was the industrial energy use sector. Because commercial and industrial energy use could not be segregated in the 1990 inventory, these reductions in industrial sector emissions are most likely due to more accurate energy consumption tracking in recent years. If commercial and industrial emission levels are combined in each inventory year, there was an overall 19% increase in emissions from the combined sectors between 1990 and 2009. Annual community GHG emissions have, however, decreased slightly since the last inventory report. This can be attributed to lower energy use in the residential, commercial, and industrial sectors. In addition, the carbon "intensity" of SDG&E delivered electricity has been recently reduced by 8% which has also contributed to recent emission reductions (Figure 4). It should be noted that a portion of these recent energy use reductions may have been caused by the local economic downturn (through more vacant building space) and may be reversed as the economy rebounds over the next few years.

Since 1990, the City of Chula Vista's efforts to reduce GHG emissions (climate "mitigation") have helped to avoid approximately 340,000 metric tons of CO₂e annually. While state and federal climate actions such as increasing grid-delivered renewable energy, improving minimum vehicle fuel efficiency, and lowering fuel carbon content will continue to benefit the City's climate protection efforts, they will not automatically enable Chula Vista to accomplish its carbon reduction commitment. The City specifically plays a unique and vital role in ensuring that future growth (an additional 27,000 homes and 85,000 residents by 2030) is accomplished through sustainable community design. These new structures will need to be designed to maximize their energy/water efficiency, walkability, and access to public transit and alternative fuel infrastructure to minimize additional sources of GHG emissions. The City will also serve a main role in improving the efficiency of its existing building stock. Through City-sponsored evaluations, incentives, and financing programs, the energy and water efficiency of existing residential and commercial buildings throughout Chula Vista can be improved which helps to drastically lower GHG emissions and to reduce community members' utility expenses.

To address these factors, Chula Vista implemented seven new climate mitigation measures in 2008 which build off of the City's original Carbon Dioxide Reduction Plan (1996) and together constitute Chula Vista's comprehensive *Climate Action Plan*. The seven measures were initially developed and recommended by the City's Climate Change Working Group (CCWG) - comprised of residents, businesses, and community-group representatives - and were subsequently adopted by City Council. Specifically, the new measures focus on lowering energy and water consumption, installing renewable energy systems, promoting alternative fuel vehicle use and designing pedestrian and transit-friendly communities. In concert with future state and federal climate actions, these measures will help the City achieve its carbon reduction commitment.

Over the last 2 years, there has been significant progress in implementing the new measures which will help reduce and/or avoid GHG emissions at a municipal operations and community level. In regards to municipal operations, a new phase of facility retrofit projects are being initiated which will install more efficient lighting and heating/cooling technologies and generate over 1.6 million kWh in annual energy savings (equivalent to approximately \$250,000

in cost savings). These efficiency improvements are being complemented by the installation of approximately 500 kW of solar photovoltaic (PV) systems beginning in October. When the systems are completed at the 11 sites, it will generate approximately 675,000 kWh of “carbon-free” electricity and represent a 7-fold increase in the City’s onsite renewable energy generation capacity. The City has also begun construction of a 12,000-gallon biodiesel tank at the Public Works Corp Yard which will allow the municipal fleet’s approximately 125 heavy duty vehicles to transition to an alternative fuel source. Two major contracted fleets, operated by Allied Waste and Chula Vista Transit, have already completed a 100% transition to alternative fuel sources. These efforts will help Chula Vista maintain its current 47% GHG emissions reduction (compared to 1990) from municipal operations and assist with further lowering citywide emission levels to meet the 20% commitment.

At the community level, the City has implemented a variety of new programs to reduce GHG emissions. Conservation & Environmental Services Department staff, in partnership with SDG&E, has integrated onsite efficiency evaluations into the City’s business licensing process as part of the Free Resource & Energy Business Evaluation (FREBE) program. Over 900 businesses have participated in the program since January and approximately 95% of surveyed participants have implemented at least one of the City’s recommendations for lowering energy use and monthly utility costs. The City also launched the first phase of its *Home Upgrade, Carbon Downgrade* program which features point-of-sale rebates for community members who purchase energy efficient appliances at local retailers. The City-sponsored rebates (totaling \$30,000) have been coupled with over \$100,000 of California and utility-sponsored rebates further helping residents and businesses afford the new energy-saving equipment. The Development Services Department has begun to fully implement the City’s new Increased Energy Efficiency Ordinance and Chula Vista Green Building Standards. The new standards have resulted in over 200 new residential and commercial units exceeding California energy efficiency requirements by 15-20% and/or indoor water efficiency requirements by 20%. In addition, over 6,000 new residential units and 1.3 million square feet of new commercial space that have met the City’s new energy-saving Air Quality Improvement Guidelines have been submitted for advanced planning review. Finally, over 17 development projects (completed or in process) have been required to meet the City’s new Landscape Water Conservation Ordinance leading to lower outdoor water use. These development-related efforts have been aided by extensive staff training and public outreach campaigns.

NEXT STEPS

Long-term and full implementation of the new climate protection measures will greatly contribute to meeting the City’s carbon reduction goals. For municipal operations, staff is working with financial advisors to further investigate the issuance of Clean Renewable Energy Bonds (CREBs) and Qualified Energy Conservation Bonds (QECBs) to finance the installation of an additional 1.1 MW of solar photovoltaic systems and the retrofitting of an additional 4,400 streetlights with more efficient technologies, respectively. Both tax credit bonds are structured to allow the funded projects’ energy cost savings to fully repay the bond debt. Staff anticipates presenting the proposed bond packages to City Council within the next few months for formal review and consideration.

On a community level, the *Home Upgrade, Carbon Downgrade* program will be expanding in October to include low interest financing for property-owners interested in energy efficiency and renewable energy improvements. The revolving loan fund is structured so that participants' loan terms will be based on the monthly cost savings generated by their energy-saving improvements. Contractors hired by participating property-owners to perform the improvements will also have to meet high consumer protection, training, and workmanship standards. Although the initial federal funding for the program is limited, staff believes that it can serve as the basis for a broader community retrofit effort in the future which would be required to substantially lower GHG emissions associated with the City's existing building stock. As such, staff plans to return to City Council in early 2011 for consideration of a municipal bond package to support an expanded community energy retrofit loan program.

Finally, the Climate Change Working Group – comprised of residents, businesses, and community representatives – has developed a set of recommendations to help the City reduce its risk from climate change-related impacts (known as climate “adaptation”). Their recommended *Climate Adaptation Strategies* specifically address vulnerabilities related to energy and water supplies, public health, wildfires, biodiversity, coastal resources, and the local economy. The recommended strategies complement the City's existing climate mitigation measures without duplicating or contradicting them. A few recommendations which pertain to energy and water supply would also generate GHG emission reductions by mitigating the Urban Heat Island Effect and promoting local water supplies (instead of imported water). If supported by City Council, staff would develop more detailed implementation plans for the 11 recommendations for future public review and consideration.