2012 GREENHOUSE GAS EMISSIONS INVENTORY

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SUMMARY

As part of Chula Vista's climate action program and its commitment to reduce greenhouse gas (GHG) or "carbon" emissions, the Department of Public Works' Conservation Section performs emission inventories to identify GHG sources and to help guide policy decisions. The 2012 GHG Emissions Inventory is the City's latest evaluation of its progress in reaching its emissions reduction goal and builds upon past inventory efforts. The inventory's municipal operations component utilizes the ICLEI Local Government Operations Protocol, while its community component uses ICLEI's new U.S. Community Protocol, which is the first national standard for community-wide GHG inventories. As such, community GHG emissions were recalculated for 1990 (where feasible) and 2005 based on the new protocol in order to provide a more accurate comparison to recent 2012 emission levels.

The 2012 inventory indicates that Chula Vista's annual citywide GHG levels are 1,011,481 metric tons of carbon dioxide equivalent (MT CO_2e). Compared to 2005, Chula Vista's citywide GHG emissions have increased by 8%. However, 2012 per capita emissions are approximately 5% below 2005 levels and 33% below 1990 levels. GHG emissions from municipal sources (i.e. operations, facilities, and vehicle fleet) in 2012 were lower than 1990 and 2005 levels, approximately 41% and 8% respectively. Unlike the last two inventories (2009 & 2010 data not shown), there was a slight increase in citywide energy consumption over the last couple years due most likely to local economic recovery. As with past inventories, community transportation activity has continued increasing with 2012 vehicle miles traveled (VMT) about 29% higher than in 2005. In order to reach the current community emissions reduction goal of 20% below 1990 emission levels, the City will have to reduce its GHG emissions by more than 359,332 MT CO_2e (35%); however, statewide initiatives are expected to help achieve some of these reductions by 2020.

METHODOLOGY

Chula Vista has been a regional and national leader in climate action policies and programs designed to reduce greenhouse gas (GHG) 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 has reported 2008, 2009, and 2010 municipal emissions to The Climate Registry, which is North America's premier voluntary greenhouse gas reporting system designed to archive participants' early actions to reduce GHG emissions. Through this past involvement, the City has committed itself to reducing its greenhouse gas emissions.

PARAMETER	ANALYSIS	DATA PROVIDER	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). Because the most recent 3rd party verified emission factor is from 2009, calculations were made to estimate the impacts of the increased power from renewable sources - CA average electricity emission coefficients (CH_4 & N_2O) - Default natural gas emission coefficients
	Municipal		- Metered electricity & natural gas use - Fuel shipment invoices - Energy consumption was categorized by buildings, outdoor lighting, and wastewater	
Transportation	Community	SANDAG	- Annual VMT data was derived from average weekday VMT values for Chula Vista. Trips that either started or ended in Chula Vista but ended or started in another jurisdiction were discounted by 50% while through trips were not included	- Default fuel (CO_2/CH4/N2O / gallon) emission coefficients - CalTrans EmFac emission coefficients (CO_2e / mile) (*community analysis only*)
	Municipal	Public Works Dept.	- Fuel consumption totals include transit and equipment use	
Solid Waste	Community	CalRecycle	- Solid waste disposal data for Chula Vista residents and businesses at all California landfills - Waste charecterization, per year, provided by Cal Recycle.	- Default fugitive methane (CH_4) emission estimates (based on EPA WARM Model)
	Municipal	Republic Services	- Solid waste disposal data includes trash hauled by Republic Services and by City staff	
Wastewater	Community	City of San Diego	- Amount of wastewater sent to City of San Diego Waste Water Treatment Plants (WWTP)	- City of San Diego WWTP data
	Municipal	SDG&E	- Energy used to pump wastewater to WWTPs	- Modified SDG&E emission factor (same as used in energy sector)
Water (embeded energy)	Community	Otay & Sweetwater Authority water districts	- Amount of water used by all community (2005 data comes from Growth Management Oversight Commission reports)	- California Energy Commission report detailing embedded kWh per gallon of water - Modified SDG&E emission factor (same as used in energy sector)
	Municipal		- Amount of water used by government operations	
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.

The City's 2012 GHG Emissions Inventory was compiled and calculated using the Local Government Operations Protocol (LGOP, Version 1.1) and the U.S. Community Protocol (Version 1.0), which were created by ICLEI and supported by California regulatory agencies to provide methodologies for local governments to better estimate their annual greenhouse gas emissions from municipal-operated and community sources, respectively. In both protocols, the emissions from five main parameters – building energy consumption, transportation, water (embedded energy), wastewater, and solid waste – are evaluated. These parameters are based solely on "end use activities" and their emissions are expressed as CO_2 equivalent (or CO_2e), which allows greenhouse gases of different strengths to be added together. To perform emission calculations, the City utilized the Climate and Energy Management Suite tool (Version 2.0) provided by the Statewide Energy Efficiency Collaborative. Finally, emissions for 2005 and 1990 were recalculated, where feasible, using the new U.S. Community Protocol in order to provide a more accurate comparison to recent 2012 emission levels.

With technical assistance from the Energy Policy Initiatives Center (EPIC) at the University of San Diego, City staff collected "activity data" from a number of municipal and external data providers including CalTrans, SANDAG, SDG&E, CalRecycle, the Otay and Sweetwater Authority Water Districts, the City of San Diego, the Chula Vista Recreation Department, and the Public Works Department (Table 1). In most cases, the data providers were able to offer aggregated empirical data for calendar year 2012. Default emissions coefficients and related assumptions were generally used for transportation and waste analyses. However, staff included Utility-specific electricity coefficients for CO_2 emissions for energy analyses. SDG&E's CO_2 emission factor has not been third-party verified and updated since 2009, yet the utility has more than doubled its percentage of renewable electricity (from 9% to 20%) over the past few years. To help account for this increased renewable energy use, EPIC created a modified CO_2 emission factor, which the City incorporated into its 2012 community and municipal inventories. Additionally, the 2005 SDG&E emission factor, as reported in the LGOP, used statewide defaults, which contributed to an artificially low emission factor. For this reason, the 2006 SDG&E emission factor was used as a proxy emission factor for 2005. For CH_4 and N_2O emissions, all inventories used the California Grid Average electricity coefficients for the particular year (or most recently available year).

RESULTS

Community Inventory

In 2012, community GHG emissions from Chula Vista totaled 1,011,481 MT CO_2e (Table 2, Figure 1). The sector with the greatest amount of emissions (39% of total) was transportation or mobile sources. The residential energy use sector was the second highest source producing a quarter (26%) of total community emissions, followed by the commercial energy use (20%) and solid waste (6%) sectors. Compared to 1990 and 2005, total citywide emissions in 2012 were 24% and 8% higher, respectively (Table 2). However, 2012 per capita emissions are approximately 5% below 2005 levels and 33% below 1990 levels. Emissions from all energy sectors have increased by 5% or 25,102 MT CO_2e in total since 2005, while transportation-based emissions are estimated to have increased 26% or 80,322 MT CO_2e. Solid waste and water (embedded energy) had emissions decrease since 2005 (26% and 13%, respectively), while emissions from wastewater treatment has increased in parallel with population growth (15%).

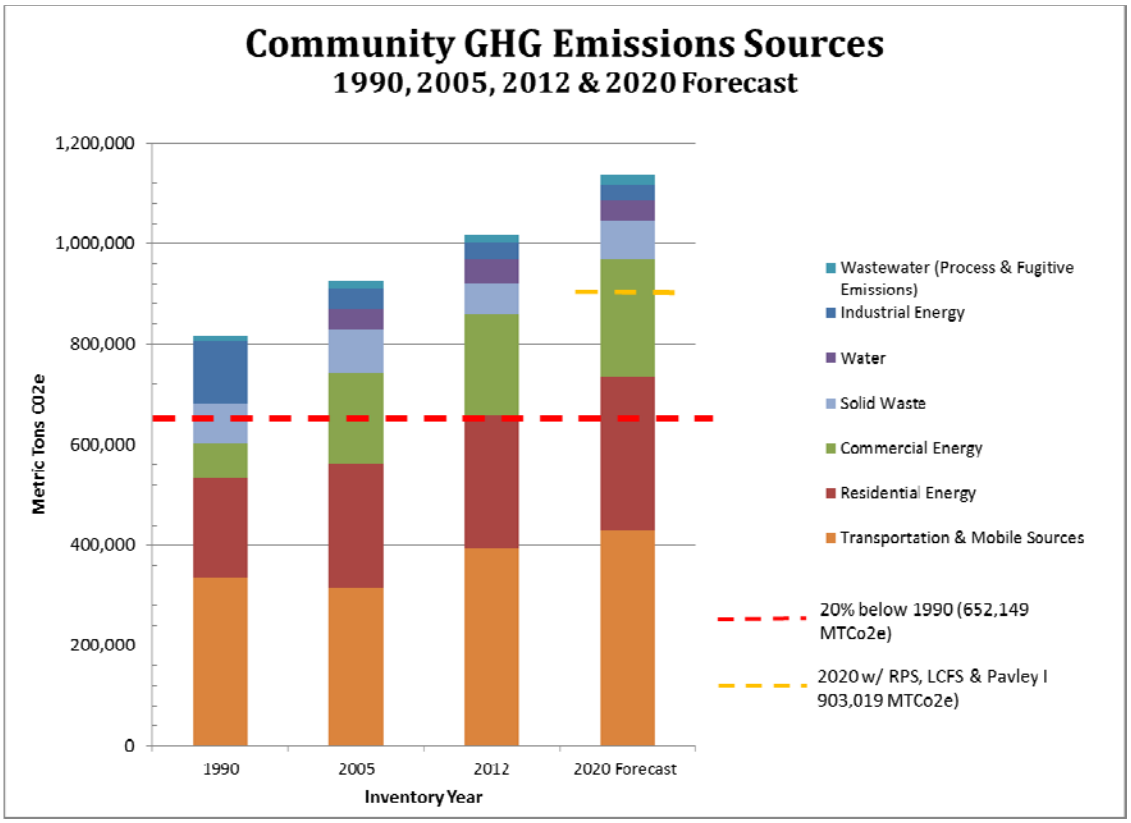

Figure 1: Total GHG emissions from community sources (by sector) in 1990, 2005, 2012, and 2020 (forecasted). The darker dashed line represents the City's carbon reduction goal, while the lighter dashed line signifies reduction impacts from state and federal action. Due to changes in inventory methodology, 1990 emissions are not directly comparable with 2005 or 2012 levels.

Municipal Inventory

Chula Vista's 2012 municipal GHG emissions were 18,931 MT CO_2e (Table 3, Figure 2). The majority of emissions came from the City's vehicle fleet, which accounted for 36% of total emissions. The next highest emission sectors were building energy use (23%) and solid waste-associated emissions (16%). External lighting energy use (traffic control signals & street lights) and water (embedded energy) accounted for 12% and 13% respectively of total emissions. Emissions from wastewater pumping were insignificant at less than 1%. Compared to 1990 and 2005, total municipal operation emission levels in 2012 were 41% and 8% lower, respectively (Table 3). The largest decrease in 2012 emissions from previous years was within the external lighting energy use sector, which decreased by 18,042 MT CO_2e (89%) since 1990. Furthermore, all sectors had unchanged or lower emissions in 2012 compared to 2005, except for the solid waste wastewater sector which increased by 20% (524 MT CO_2e) and 16% (3 MT CO_2e) respectively during the time period. At this point, the City has surpassed its original GHG emission reduction goal for municipal operations by over 30%.

Table 2: COMMUNITY ANALYSIS - 1990, 2005, and 2012

Annual Consumption (Metric Units)

		1990	2005	2012	% Change (2012 vs. 1990)	% Change (2012 vs. 2005)
Population		135,136	217,543	249,382	85%	15%
Housing Units		49,849	73,115	79,255	59%	8%
Land Area (Acres)		18,558	33,024	33,042	78%	0%
Annual Vehicle Miles Traveled (VMT)		465,300,000	623,802,614	806,789,254	73%	29%
Energy Use (MMBtu)	Residential	2,438,280	3,416,724	3,642,556	49%	7%
	Commercial	767,716	2,305,220	2,586,867	237%	12%
	Industrial	1,342,551	485,504	327,471	-76%	-33%
	Total	4,548,547	6,207,448	6,556,894	44%	6%
Solid Waste (Tons)		179,986	217,881	159,833	-11%	-27%
Potable Water (million gallons)		NA	12,666	10,403	NA	-18%

Annual Greenhouse Gas (GHG) Emissions (Metric Tons CO2e)

		1990	2005	2012	% Change (2012 vs. 1990)	% Change (2012 vs. 2005)
Per Capita		6.0	4.3	4.1	-33%	-5%
Per Housing Unit		16.4	12.8	12.8	-22%	0%
Per Acre		43.9	28.2	30.6	-30%	8%
Transportation ($MTCO_2e$)[1]		335,435	313,011	393,333	17%	26%
Energy Use ($MTCO_2e$)	Residential	197,115	247,559	264,170	34%	7%
	Commercial	71,363	182,951	202,721	184%	11%
	Industrial	123,128	41,670	30,391	-75%	-27%
	Total	391,606	472,180	497,282	27%	5%
Solid Waste ($MTCO_2e$)		78,539	85,039	62,504	-20%	-26%
Potable Water (embeded energy)		NA	46,951	40,643	NA	-13%
Waste Water		9,607	15,457	17,719	84%	15%
Total GHG Emissions ($MTCO_2e$)		815,186	932,638	1,011,481	24%	8%
20% GHG Reduction Goal				652,149		
Reductions Needed To Reach Goal				359,332		

* All GHG emissions are reported in CO_2 Equivalent (CO_2e) 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: MUNICIPAL ANALYSIS - 1990, 2005, and 2012

Annual Consumption (Metric Units)

		1990	2005	2012	% Change (2012 vs. 1990)	% Change (2012 vs. 2005)
Employees		866	1,198	863	0%	-28%
Vehicle Fleet Fuel Use (Gallons or Equivalent)		478,344	1,102,823	897,603	88%	-19%
Energy Use (MMBtu)	Buildings	35,527	70,790	54,765	54%	-23%
	External Lights	147,100	27,780	21,764	-85%	-22%
	Sewage	7,122	257	215	-97%	-16%
	Total	189,749	98,827	76,744	-60%	-22%
Solid Waste (Tons)		5,400	6,603	7,942	47%	20%
Potable Water (million gallons)		NA	NA	602	NA	NA

Annual Greenhouse Gas (GHG) Emissions (Metric Tons CO_2e)

		1990	2005	2012	% Change (2012 vs. 1990)	% Change (2012 vs. 2005)
Per Employee		36.9	17.2	21.9	-41%	27%
Vehicle Fleet		4,655	9,282	6,800	46%	-27%
Energy Use	Buildings	3,728	5,856	4,414	18%	-25%
	External Lights	20,260	2,895	2,218	-89%	-23%
	Sewage	981	19	22	-98%	16%
	Total	24,969	8,770	6,654	-73%	-24%
Solid Waste		2,356	2,582	3,106	32%	20%
Potable Water (embeded energy)		NA	NA	2,371	NA	
Total GHG Emissions		31,980	20,634	18,931	-41%	-8%
20% GHG Reduction Goal				25,584		
Reductions Needed To Reach Goal				0	*Goal Obtained	

* All GHG emissions are reported in CO_2 Equivalent (CO_2e) 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.

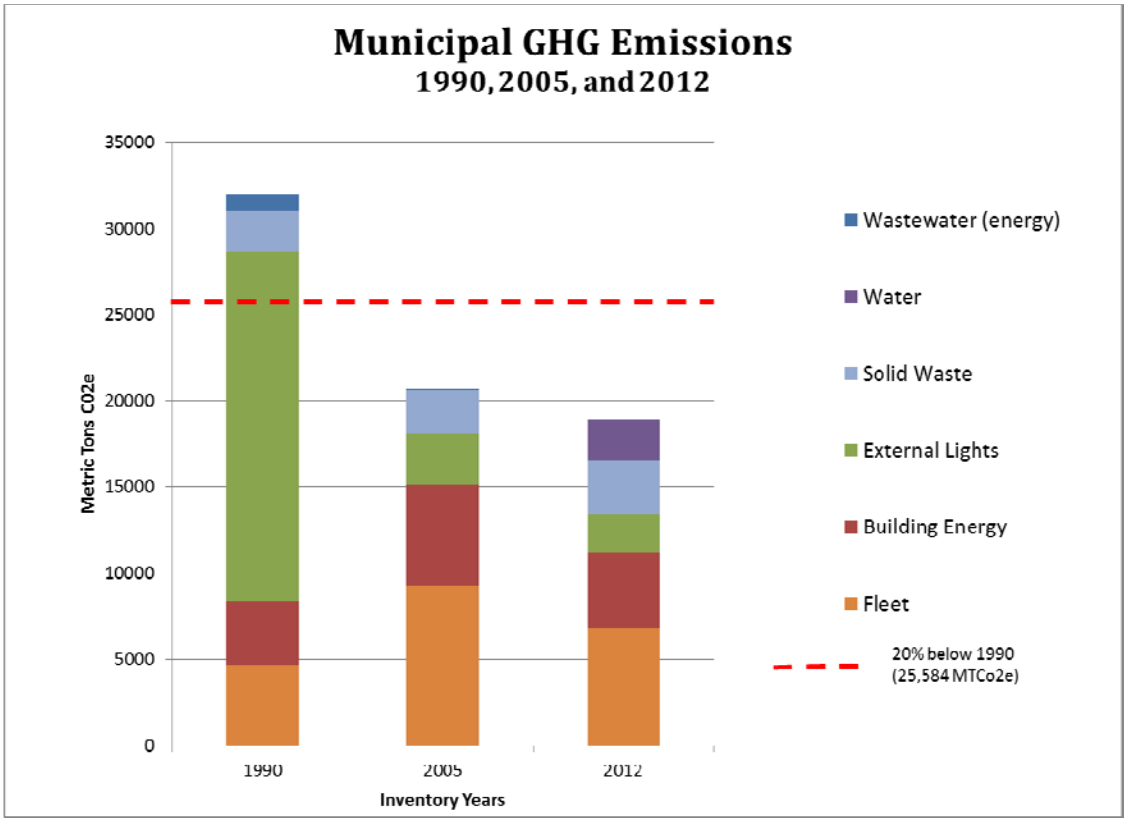

Figure 2: Total GHG emissions from municipal sources (by sector) in 1990, 2005, and 2012. The dashed line represents the City's carbon reduction goal. Due to a lack of available data, emissions from the water sector are not included in the 1990 and 2005 inventories.

DISCUSSION

Municipal Emissions

As evident by the 2012 inventory results, the City of Chula Vista has successfully lowered the GHG emissions associated with its municipal operations since the 1990s. This dramatic reduction is largely driven by decreases in emissions from the external lighting energy use sector, which is 89% lower in 2012 than in 1990. Although emissions from building energy use have increased by 18% since 1990, this sector's emissions have actually decreased over the past 5 years and are currently 25% below 2005 levels. These trends are mainly due to the City's ongoing energy management and upgrade efforts. For the external lighting sector, traffic signals and street lights were retrofitted to energy-saving LED technologies in the mid-1990s and in the last couple years, respectively. For the building sector, recent energy upgrade projects include the installation of solar photovoltaic systems at 11 facilities, more efficient HVAC systems at Normal Park Senior Center and the Public Works Corp Yard, and lighting improvements at 52 municipal facilities. It should also be noted that 1990 and 2005 inventories do not include emissions from the water sector due to a lack of available data, but this sector most likely represents only 10% of total municipal emissions.

As far as the municipal fleet, fuel usage has decreased by 19% since 2005. However, emissions from fleet use have decreased by approximately 27% during the same time period. This disparity is due to the successful implementation of the City's Clean Fleet Policy in 2008, which prioritizes alternative fuels and hybrid technologies whenever a fleet vehicle is replaced. Over the last few years, over 30% of the municipal fleet has transitioned to operate on electricity, propane, compressed natural gas, or biodiesel. While not fully captured in the municipal inventory, the City has also leveraged its "buying power" to promote cleaner fuel sources through its contracted fleets. Over the last few years, the City's trash hauler and transit company have completed 100% shifts to alternative fuel sources.

Community Emissions

Comparing 2012 community-wide emissions to 1990 levels is problematic due to the new US Community Protocol and related calculating tools, which includes revised methodologies for calculating emissions especially from the transportation, water, and solid waste sectors. For example, Vehicle Miles Traveled (VMT) from freeway use in Chula Vista is excluded from the 1990 inventory, but is included in the 2005 and 2012 inventories. These latter year inventories also discount vehicle trips that either start or end outside of the City by 50% and exclude pass through trips that do not stop in Chula Vista. Although understanding recent emissions relative to 1990 levels can provide some insight into long-term trends, it is more valid to compare GHG emission levels in 2005 and 2012, because these inventory years were able to be calculated in completely similar ways.

Although the City has had significant success in lowering GHG emissions from municipal operations, reducing community-wide GHG emissions has been a challenge. GHG emissions from community sources are 8% higher since 2005, which was driven by a 26% and 5% increase in the transportation and energy sectors, respectively. While it is difficult to reduce transportation-related emissions due to long-standing land use form and commuting patterns, there are local, state, and federal programs that are beginning to actively target this sector by reducing the carbon-intensity of vehicle fuels, improving fuel efficiency, and promoting alternative transportation options. The City itself continues to integrate "smart growth" design principles into its development review and approval process and to facilitate the installation of alternative fuel infrastructure throughout the community that may further help address these emissions.

As far as emissions from energy use in the community, Chula Vista has numerous programs and policies to expand energy efficiency and renewable energy opportunities. Most notably, the City's Green Building Standard has required over 2,000 new and renovated buildings to exceed state energy codes by at least 15%. Likewise, the Chula Vista Free Resource & Energy Business Evaluation (FREBE) program has successfully helped over 3,000 local businesses identify energy-saving improvements at their facilities resulting in over 60% of participants implementing an energy-reducing behavior or retrofit. Finally, the City is in the final phase of launching a local Property Assessed Clean Energy (or PACE) program, which will provide financing to residents and businesses for energy and water conservation upgrades.

As part of the 2012 inventory, City staff also calculated a "Business As Usual" (BAU) emissions forecast for 2020, which is the target year for California's Assembly Bill 32 law (Table 4). The

forecast looks at current GHG emission levels and projects future emissions using population growth rates and other factors calculated by EPIC, while assuming that no new actions will be taken to reduce emissions. The forecast predicts that total Chula Vista community emissions will increase by 13% from current levels by 2020. When the impact from the Low-Carbon Fuel Standard (LCFS), vehicle fuel efficiency standards (Pavley I), and the 33% Renewable Portfolio Standard (RPS) are considered, these statewide GHG reduction measures are expected to reduce annual emissions in Chula Vista by 236,279 $MTCO_2e$ by 2020 (lighter dashed line in Figure 1). Therefore, Chula Vista would still need to implement additional local measures to lower GHG emissions annually by approximately 250,000 $MTCO_2e$ in order to meet the City Council-approved reduction goal.

Table 4: 2020 GHG Emission Forecast

Annual GHG Emissions (Metric Tons CO2e)			
	2012	Growth Forecast[1]	2020 Forecast
Transportation & Mobile Sources	393,333	9%	429,255
Residential Energy	264,170	15%	304,714
Commercial Energy	202,721	15%	233,834
Solid Waste	62,504	25%	77,856
Water	40,643	-12%	35,645
Industrial Energy	30,391	15%	35,055
Wastewater	17,719	25%	22,071
Total	**1,011,481**	**13%**	**1,138,431**

1 - Provided by University of San Diego Energy Policy Initiatives Center (EPIC)

NEXT STEPS

Chula Vista's climate action program is guided by its Climate Action Plan (CAP), which includes 18 strategies to lower greenhouse gas emissions and the community's vulnerability to future climate change impacts. These strategies are also designed to maximize co-benefits to the community such as utility savings, better air quality, reduced traffic congestion, local economic development, and improved quality of life. Due to a changing California regulatory framework as part of AB32 implementation, the City will be pursuing a formal update process for its current CAP over the next year. The main reasons for updating the CAP include aligning it with new climate action planning and tracking tools and selecting new climate mitigation strategies to help achieve the City's greenhouse gas emissions reduction target. The CAP update process is a major near-term priority within the *City of Chula Vista Strategic Plan's* "Healthy Community" goal.