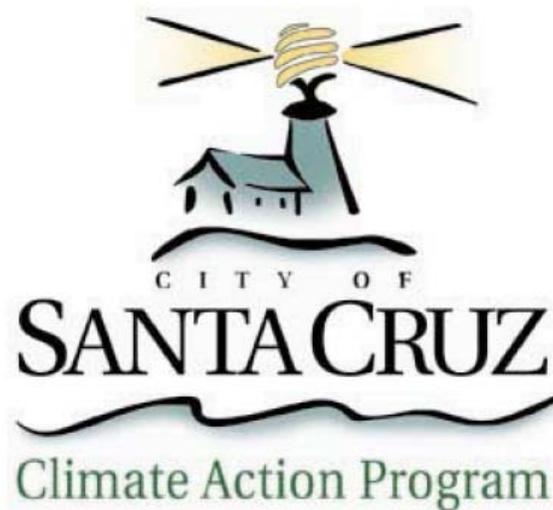


City of Santa Cruz

Inventory of Municipal and Community Greenhouse Gas Emissions

Summary of Findings



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Climate Action Program

1. Background & Methodology

The first step in establishing a Climate Action Plan is to quantify the current greenhouse gas emissions from the municipality and from the various community sources (transportation, residential homes, business and industry). This information will help identify key emissions sectors, help focus reduction strategies and set initial levels from which to track program success. The City of Santa Cruz uses resources from several key organizations in order to assist in the complicated science of accurately quantifying greenhouse gas emissions.

ICLEI – Local Governments for Sustainability

ICLEI – Local Governments for Sustainability is an international organization that assists local governments in reaching their goals of sustainability and climate change mitigation. The Climate Action Program staff works closely with ICLEI as one of the 400 members representing the United States in the Cities for Climate Protection campaign, an internationally recognized program that provides the tools and framework needed to help communities track and reduce their GHG emissions.

Such resources include useful excel databases that help organize energy use data or calculate emissions savings available from hundreds of different projects, upgrades and programs (icleiusa.org). The framework behind the Cities for Climate Protection consists of five milestones:

1. Conduct a baseline emissions inventory and forecast
2. Adopt an emissions reduction target for the forecast year
3. Develop a Local Climate Action Plan
4. Implement the policies and measures in the Local Climate Action Plan
5. Monitor and verify results

The Climate Action Program staff has already completed a baseline inventory from activities in 1996. Although the international standard for a baseline inventory is 1990, the City of Santa Cruz did not have enough historical data to complete one. Therefore the City has set reduction goals of 30% below 1996 levels by 2020, and 80% below by 2050.

Local Government Operations Protocol

The Local Government Operations Protocol was produced through the partnerships of many organizations including ICLEI USA, the California Air Resources Board, the California Climate Action Registry as well as many other local municipalities and serves as a guideline in proper data collection and analysis. The LGOP contains methodologies on how to calculate all scopes of greenhouse gas emissions of the six main GHGs: carbon dioxide, sulfur hexafluoride, nitrous oxide, methane, hydrofluorocarbons and perfluorocarbons. (tinyurl.com/lgoprotocol) All of the emissions reported in this Climate Action Plan are produced using the LGOP, otherwise the attached appendices (XX-XX) outline how the calculations, not covered by the LGOP, were performed.

Emissions Sectors

Throughout this document municipal, community and city will be referred to when discussing both emissions and actions. Municipal will mean all municipal operations that allow for the day-to-day operation of city services. Community or community wide refers to all activity within city limits. This includes all municipal, residential, commercial, waste, industrial and transportation emissions. Community-wide may also be interchanged with city-wide. The transportation sector encompasses all vehicle traffic (except miles traveled on the UCSC campus) within the City limits on both local roads and highways.

Data Sources

Municipal emission data sources come from within the city's various departments. Energy use, fuel use and various other metrics are tracked on special computer programs or from hardcopy sources. All waste data used is also provided internally by the Dimeo Lane staff. Residential, commercial and industrial emissions from electricity and natural gas come from energy use data provided by PG&E. As there is no solid protocol on how to calculate transportation emissions, the Climate Action staff had to develop a model based on data provided by many sources including the California Department of Transportation, the Monterey Bay Unified Air Pollution Control District and the California Air Resources Board.

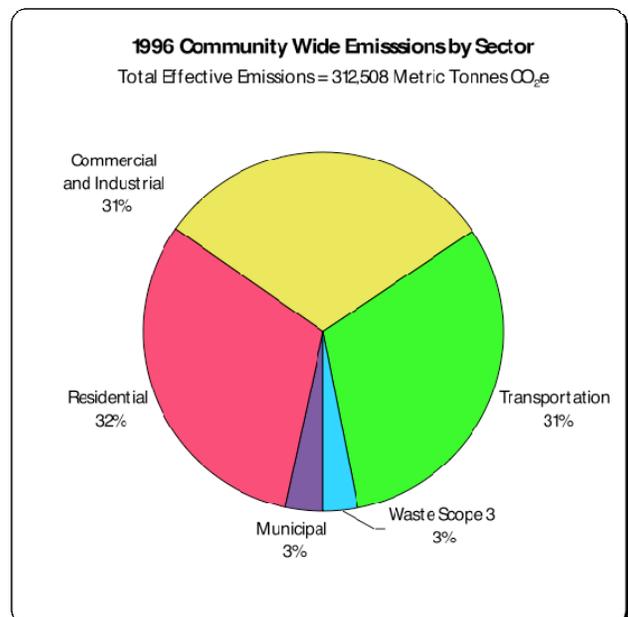
Carbon Dioxide Equivalent

All emissions will be reported in terms of CO₂e since carbon dioxide is not the only greenhouse gas emitted through the consumption of fossil fuels and the anaerobic digestion of waste. For example when electricity is generated CO₂ (carbon dioxide), CH₄ (methane), NO_x (nitrous oxides) and other greenhouse gases are emitted all with their own unique heat trapping ability called Global Warming Potential (GWP). Carbon dioxide has a GWP of exactly 1 (since it is the baseline unit to which all other greenhouse gases are compared). Methane's GWP is 21 since it traps 21 times more heat than CO₂; therefore, every Tonne of methane emitted is equivalent to 21 Tonnes of CO₂. The same can be said for nitrous oxides which have a GWP of roughly 310. If one tonne of methane and one tonne of nitrous oxides are emitted this is the same as saying 331 Tonnes CO₂e are emitted ($[1 \text{ Tonne CH}_4 \times 21] + [1 \text{ Tonne NO}_x \times 310] = 331 \text{ Tonnes CO}_2\text{e}$).

2. Community Greenhouse Gas Emissions Baseline

The baseline emissions inventory for community emissions, from which all reduction goals will be based, is 312,508 Tonnes CO₂e

The pie graph to the right includes all emissions, which can be reduced, from all activities within Santa Cruz city limits and is organized into sectors and is reported in Metric Tonnes of Carbon Dioxide Equivalent (CO₂e). Industrial/Commercial activities, transportation and residential home emissions each account



for roughly 31% of total emissions. Industrial, Commercial and Residential emissions include emissions from the generation of electricity used and the onsite combustion of natural gas for space and water heating. The transportation sector includes all personal vehicle use within City limits on both local roads and state highways. Municipal operations (this accounts for **all** public services including street lighting, city vehicle use, heating and lighting of public facilities, water treatment and delivery and the treatment of most of the county's wastewater) yet it only account for 3% of the total community emissions.

The only sector of emissions that was inventoried but not reported here is Scope 1 Waste. These are the greenhouse gases that escape the landfill facility every year though the anaerobic digestion of organic waste in place and are not reported here as there are not ways for the City to reduce these in any way. The landfill is already covered with a landfill gas capture system that is able to capture 75% of the gases that are processed and there is no further room for more capture capabilities. Waste Scope 3 is an estimation of the emissions that will occur at the Dimeo Lane Landfill once the waste put in place, in the given year, digests into methane (a potent greenhouse gas that is 21 times more effective at trapping heat than CO₂).

Community Sector	1996	2020 Emissions Objective
Municipal	10,211	7,148
Residential	98,705	69,094
Commercial/Industrial	167,689 (95,769)*	67,039
Transportation	97,942	68,559
Waste (Scope 3)	9,881	6,916
Total	384,427 (312,508)**	218,755
* This value is the 2000 commercial/industrial emissions inventory ** 1996 Total Emissions include Commercial/Industrial emissions from 2000 as to not count the loss of key industries (from 1996 to 2000) as an emissions benefit. All reductions and goals in Commercial/Industrial sector are based on 2000 for the same reason, therefore the baseline from which all goals		

As stated above, the community of Santa Cruz's baseline emissions inventory is 312,508 Tonnes (effective, from which all emissions reductions will be based; however the community actual emitted 384,427 Tonnes (actual). These separate inventories, effective and actual, exist so that we do not support the loss of key industries (Wrigley's & Salz Tannery) between 1996 and 2000 (and the associated large drop in emissions) as a sustainable way to cut emissions. For statistical purposes we have included the actual and effective emissions in the table below.

The table above organizes the baseline emissions and 2020 goals for all sectors of the Santa Cruz community. As noted in the table, both 1996 actual and effective emissions for the commercial/industrial sector are included for informational purposes. However all 2020 objectives are based off of the values in parenthesis.

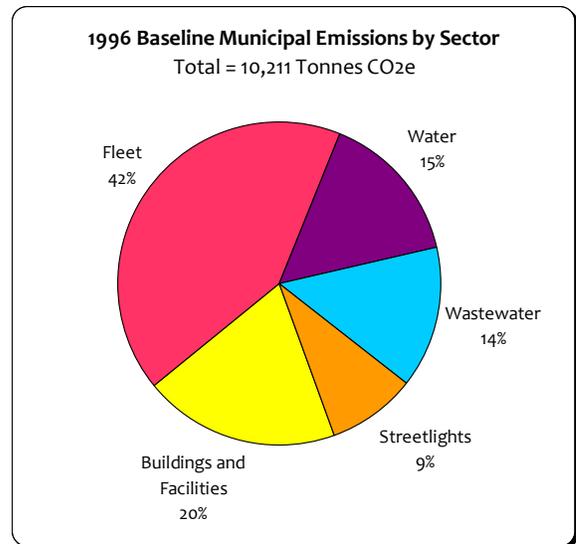
Santa Cruz must reduce yearly emissions to 218,755 Tonnes CO_{2e} by 2020 in order to the 30% reduction goals set by the City.

Sub-sectors of Municipal Emissions

A close inspection of municipal emissions by sector is necessary as State regulations will soon go into effect that will require strict reporting of municipal emissions. The municipality will report its emissions in terms of sectors just as the community was reported in several different emissions sectors.

In 1996, the municipality emitted 10,211 Tonnes of CO₂e.

Baseline Emissions by Department (Tonnes CO ₂ e)		
	1996	2020 Goals
Buildings and Facilities	2,017	1,412
Fleet	4,266	2,987
Water	1,569	1,098
Wastewater	1,438	1,007
Streetlights	921	645
Total Energy Emissions	10,211	7,148



3. Tracking Community Greenhouse Gas Emissions

Climate Action staff has not only inventoried emissions from 1996 but also calendar years 2000, 2005 and most recently 2008. These three other inventories have been performed in order to track emissions over long periods of time and hopefully show a decrease. Below is a table that best summarizes the emissions from all community sectors for all years mentioned. The table also includes how much each sector has changed from 1996 when compared to 2008 emissions.

Community Wide GHG Emissions (Tonnes CO₂e)

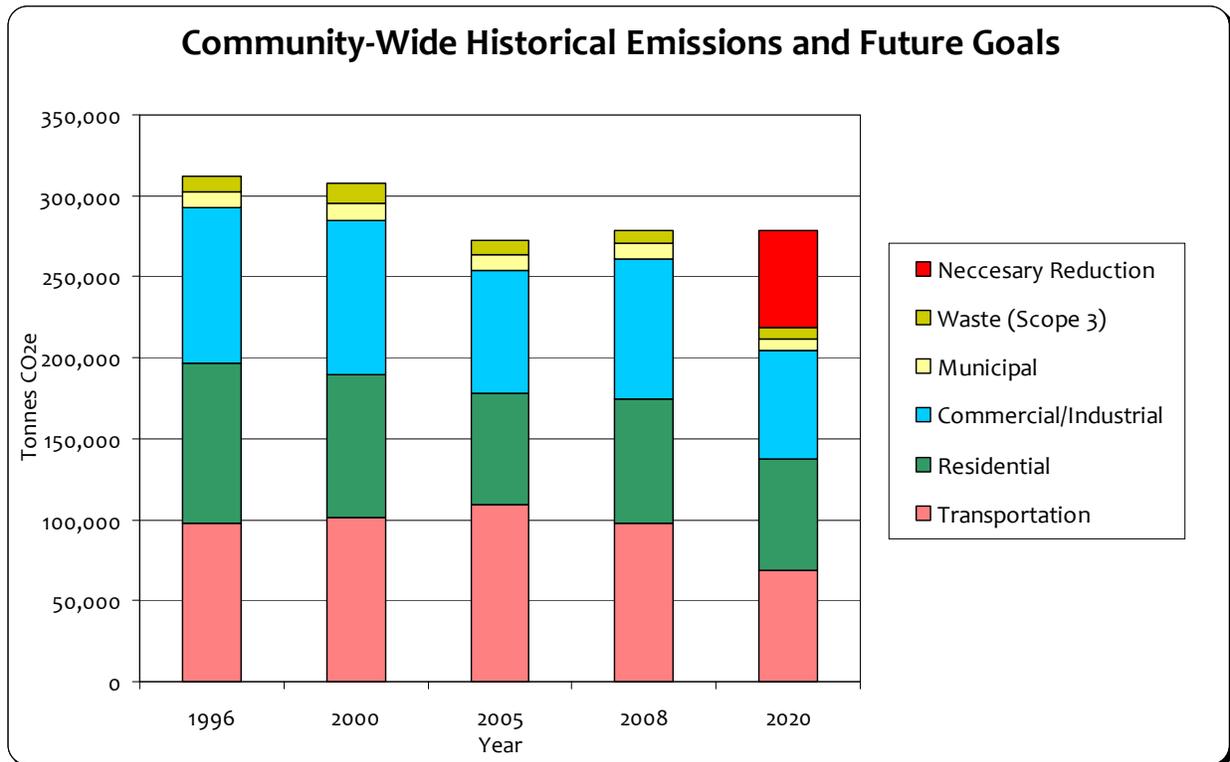
Community Sector	1996	2000	2005	2008	% change from 1996	2020 Emissions Objective
Municipal	10,211	10,231	10,239	10,228	0%	7,148
Residential	98,705	87,605	68,368	76,802	-22%	69,094
Commercial/Industrial	167,689	95,769	75,461	85,957	-10%	67,039
Transportation	97,942	101,769	109,655	97,759	0%	68,559
Waste (Scope 3)	9,881	12,353	8,584	7,914	-20%	6,916
Total	384,427	(312,508)*	307,727	278,661	-11%	218,755

* 1996 Total Emissions include Commercial/Industrial emissions from 2000 as to not count the loss of key industries (from 1996 to 2000) as an emissions benefit. All reductions and goals in Commercial/ Industrial sector are based on 2000 for the same reason, therefore the baseline from which all goals and reductions will be based is 312,508 Tonnes

Since 1996 only two sectors (municipal and transportation) have failed to make any significant reductions or increases in their emissions. However the other sectors have made significant re-

ductions in their emission that should be applauded. Residents reduced home energy enough to see a 10% reduction in emissions. Local businesses and industries have reduced emission by 22% since 1996 most likely as a result of participation in the Monterey Bay Area Green Business Program which has a section focuses entirely on reducing energy use and increasing the use of energy efficient appliances and materials. The 20% reduction in Waste Scope 3 emissions correlates to a reduction in waste put into the landfill this year and the efforts should be credited to all sectors of the community.

The graph below tracks community emissions by sector in all years inventoried. Notice that that large drop in commercial/industrial emissions from 1996 to 2000 is not included so that the values reflect those used in calculating goals and reductions. The large drop in transportation emis-



sions from 2005 to 2008 is noticeable here and is most likely due to recent economic conditions and residents drive less in order to save money. The bright red section of this graph represents the reductions that must be made for the community to reach the 20 by 30 (20% below 1996 levels by 2030) goals. The sole purpose of this Climate Action Plan (which is currently under development) is to provide a roadmap on how to fill this red block through various programs, incentives, partnerships and innovations all geared towards reducing greenhouse gas emissions.