

CLIMATE PROTECTION

Standing Together for the Future

GREENHOUSE GAS EMISSION INVENTORIES
FOR EIGHT CITIES IN SONOMA COUNTY, CALIFORNIA

—SEPTEMBER 2003—



“ *As local elected officials, WE ACCEPT THE CHALLENGE presented by global climate change. People gave us their vote and entrusted us to act on behalf of the future as well as the present. We want to inspire people in this community and worldwide. We promise to help create innovative solutions to improve our quality of life, save money, and protect the climate. Please join us in this vital pursuit.* ”

Presented as part of a project administered by the Sonoma County Waste Management Agency

ACKNOWLEDGMENTS

- County and City elected officials for their leadership and bold vision
- The Sonoma County Waste Management Agency Board for project oversight, Ken Wells, Director, and Charlotte Fisher, Administrative Analyst
- City staff—listed on the back inside cover—for guidance and responses to our considerable requests
- ICLEI’s Cities for Climate Protection for technical support, leadership, and the original vision
- Climate Protection Campaign Advisors: Jane Bender, Ernie Carpenter, Michael Friedenber, Mike Sandler, and Alan Strachan

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- North Bay Corporation
- Pacific Gas and Electric Company ~ many thanks also to PG&E for supplying city utility records
- Sonoma County Waste Management Agency

We are also grateful for two anonymous donors who enabled us to expand the project beyond its original scope.

Fifteen supplemental reports provide expanded information about the inventory results and implications.

- Analyses for each of the five major sectors in the inventory: electricity and natural gas, water and wastewater, fleets, employee commutes, and solid waste
- Separate GHG emissions inventories for each of the eight cities: Cloverdale, Cotati, Healdsburg, Petaluma, Rohnert Park, Sebastopol, Sonoma, and Windsor
- A description of some bold ideas and opportunities for climate protection
- A description of lessons learned regarding our project approach

This report and the supplements except for city-specific reports are available at www.skymetrics.us

For more information, please contact:

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GUIDE TO ALPHABET SOUP

CO2carbon dioxide
eCO2equivalent pounds or tons of CO2
FAQ	.....frequently asked questions
FY	.....fiscal year (July 1 to June 30)
GHG	.....greenhouse gas
ICLEI	.....International Council for Local Environmental Initiatives
KWH	.....kilowatt hours
SCWA	.....Sonoma County Water Agency
SCWMA	.....Sonoma County Waste Management Agency
SSU	.....Sonoma State University

Standing Together for the Future

GREENHOUSE GAS EMISSION INVENTORIES
FOR EIGHT CITIES IN SONOMA COUNTY, CALIFORNIA

—SEPTEMBER 2003—

SUMMARY OF KEY POINTS OF THIS REPORT

- Eight Sonoma cities collaborated to inventory the greenhouse gas emissions associated with their municipal operations—buildings, traffic signals and streetlights, water and wastewater, fleets, employee commutes, and solid waste. Last year, the County of Sonoma and City of Santa Rosa completed similar inventories for their operations. Sonoma municipalities did this as part of Cities for Climate Protection®, an international campaign of local governments to save money, reduce emissions, and protect the climate.
- Sonoma County set a national precedent in 2002 when 100 percent of our cities and the County pledged to measure and reduce their greenhouse gas emissions.
- Sonoma County sets another national precedent in 2003—100 percent of its municipalities have inventoried the emissions associated with their operations.
- Total greenhouse gas emissions from July 2000 to June 2001 for the eight cities' operations are about 12,000 tons. By way of reference, emissions for the County of Sonoma were 37,000 tons, and for Santa Rosa 40,000 tons for the same time period.
- Cities' next steps: Set emission reduction targets, develop a plan for achieving them, and implement emission reduction actions
- Community's next step: Expand climate protection County-wide to include all sectors—business, residents, and government
- Many opportunities exist for municipalities to both decrease significant amounts of greenhouse gas emissions and save significant amounts of money, producing far-reaching positive impacts.
- Energy is like spirit. It is the invisible, essential life force that affects every part of our lives. Energy is the nexus between the economy, environment, and security. If we get energy right, many significant benefits will follow—for ourselves and the future.

Unique features of this Inventory Project

- Widespread, strong commitment among local elected leaders to protect the climate
- Financial support given by the County to the cities for their inventories
- Close and effective collaboration among the project's many and varied participants
- Extensive analyses for electricity, natural gas, water, and wastewater
- Web tools created to enhance this project including interns' online weekly project reports and web-based employee commute survey

HOW TO READ THIS REPORT

If you want to quickly know project findings, read the key points listed above, then look at the results on pages 2 & 3 and at recommendations on page 5. Otherwise, meander and skip around. Go to the topics that interest you. Check out the photos and quotes from community members shown throughout the report. We hope you find passages and facts here that make you think, give you something to talk about, offer you hope, and inspire you to action.

What we can't do alone, we can do together.

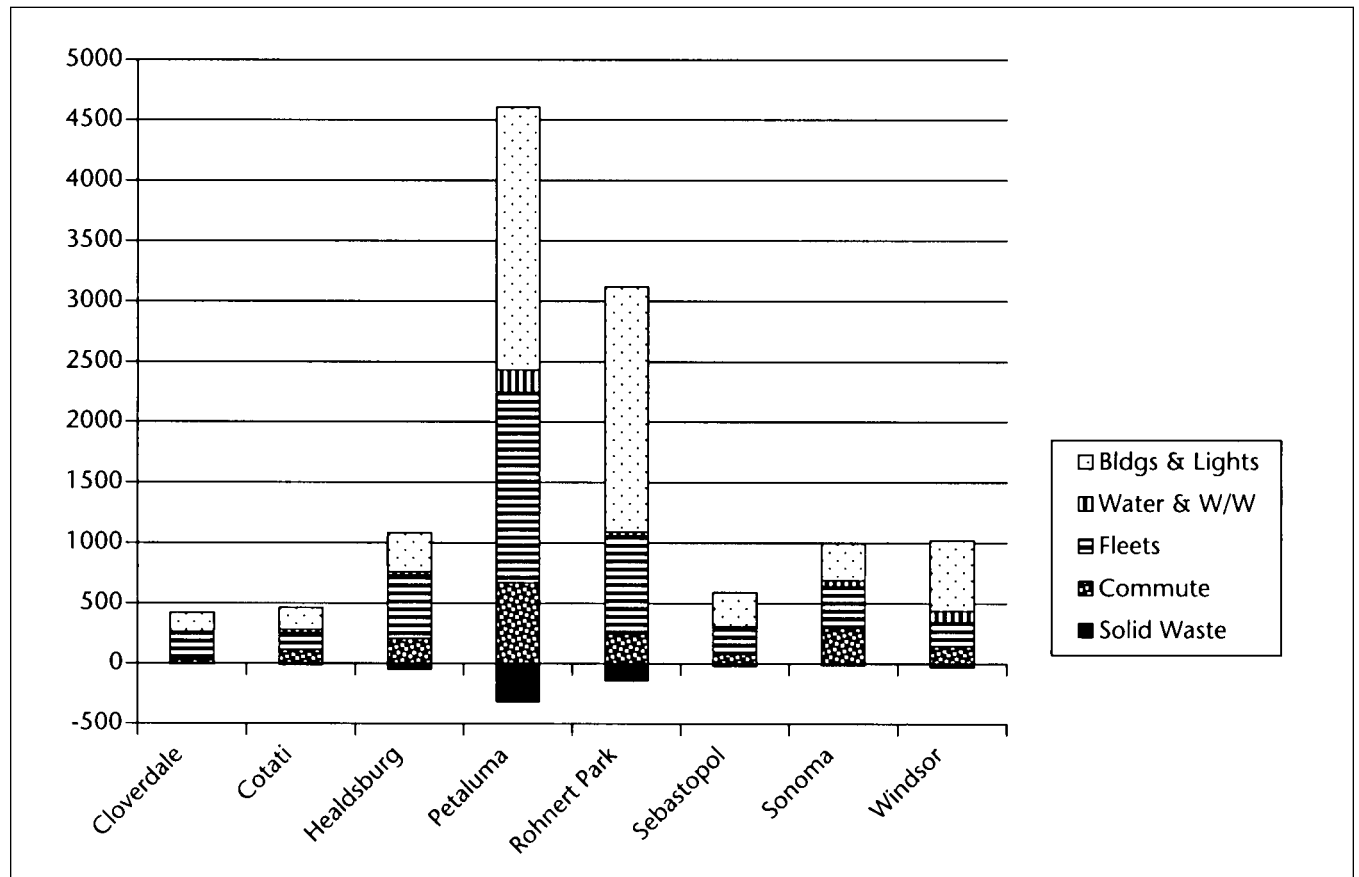
The people of Sonoma County can be very proud that their municipal and County leaders are taking the problem of global climate change seriously, and are providing exemplary leadership to the rest of the state, the country, and future generations.



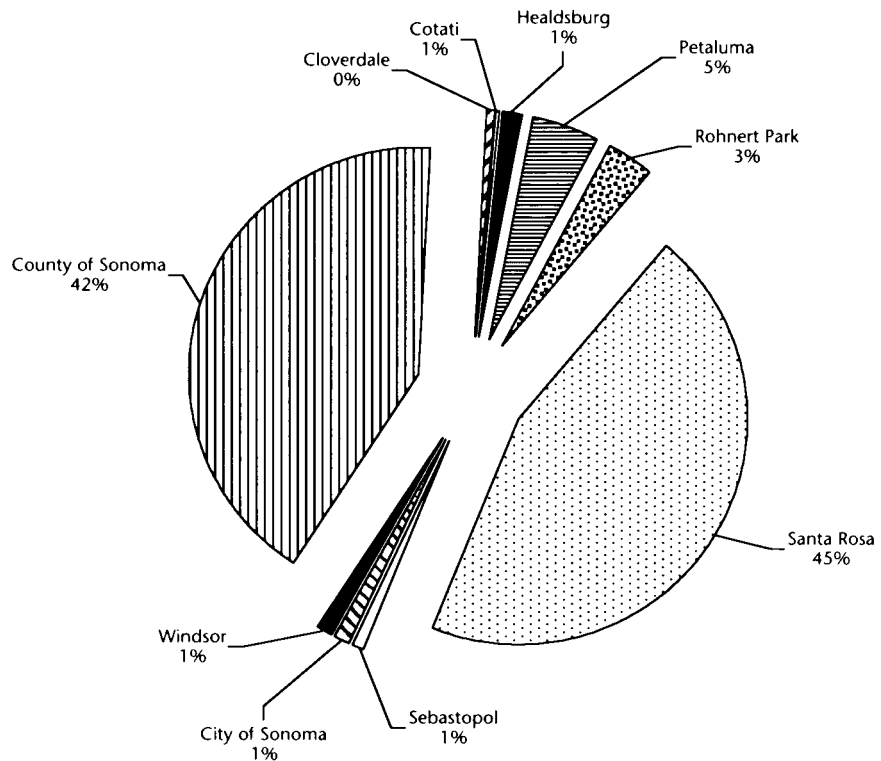
—Abby Young, Director, U.S. Cities for Climate Protection, ICLEI

SUMMARY OF RESULTS

GHG emissions by city and sector July 1, 2000 – June 30, 2001



88,700 tons eCO₂ total
City and County operations
July 1, 2000 – June 30, 2001



SUMMARY OF RESULTS *continued*

Municipal operations—GHG emissions—tons equivalent CO₂

	Cloverdale	Cotati	Healdsburg	Petaluma	Rohnert Park	Santa Rosa ¹	Sebastopol	City of Sonoma	Windsor	County of Sonoma ¹ (unincorporated)	Total
Population ²	6,831	6,471	10,722	54,548	42,236	147,595	7,774	9,128	22,744	150,565	458,614
Percent of total County population	1	1	2	12	9	32	2	2	5	34	100
Number of employees											
FY 2000-01	42	39	117	317	175	1161	53	121	112	4900	
FY 2001-02	40	41	117	308	177	NA	53	123	117	NA	
Buildings, lights											
FY 2000-01	159	185	326	2173	2024	10,221	285	309	583	15,408	
FY 2001-02	188	177	336	2139	2166	NA	262	288	565	NA	
Water/wastewater ³											
FY 2000-01	3	28	26	185	36	20,492 ⁴	12	48	96	168	
FY 2001-02	3	28	26	181	36	NA	11	48	95	NA	
Fleets											
FY 2000-01	231	138	527	1578	812	6554	213	343	201	7657	
FY 2001-02	259	117	488	1411	805	NA	207	332	201	NA	
Employee Commutes											
FY 2000-01	28	112	206	669	245	2712	79	298	142	14,000	
FY 2001-02	27	118	206	650	249	NA	79	302	148	NA	
Solid Waste	-11	-13	-50	-321	-145	80	-23	-13	-29	NA	
Total											
FY 2000-01	410	450	1035	4284	2972	40,000	566	985	993	37,000	
FY 2001-02	466	427	1006	4060	3111	NA	536	957	980	NA	
Recommended GHG reduction target: 20% from 2000 by 2010	330	360	830	3430	2380	32,000	450	790	790	30,000 ⁵	

¹Santa Rosa and the County of Sonoma followed the Cities for Climate Protection® protocol when they inventoried their GHG emissions last year. The 8 cities whose inventories are reported used an updated protocol. Therefore, figures from the County of Sonoma and Santa Rosa aren't exactly comparable, but are included here for reference. When the County of Sonoma and Santa Rosa conducted their inventories, data wasn't available for FY 01-02. The County of Sonoma's inventory included an emissions analysis for the County's landfill; such figures are not comparable with the GHG emissions associated with figures for cities' solid waste reported in the above table.

²Figures from 2000 U.S. census data

³These water/wastewater figures represent usage by cities' facilities and operations only – not by the whole jurisdiction. This approach differs from the one often followed in the Cities for Climate Protec-

tion® protocol for corporate GHG inventories. Through this project we also made analyses of water/wastewater usage for most Sonoma cities.

⁴Figures include all emissions from Laguna Treatment Facility that serves Santa Rosa, Sebastopol, Cotati, and Rohnert Park. Therefore, double counting of GHG emissions for Sebastopol, Cotati, and Rohnert Park's wastewater occurs when GHG for all cities is added; the overall impact of this double counting is small.

⁵The County has already adopted 30,000 tons as its target for 2010.

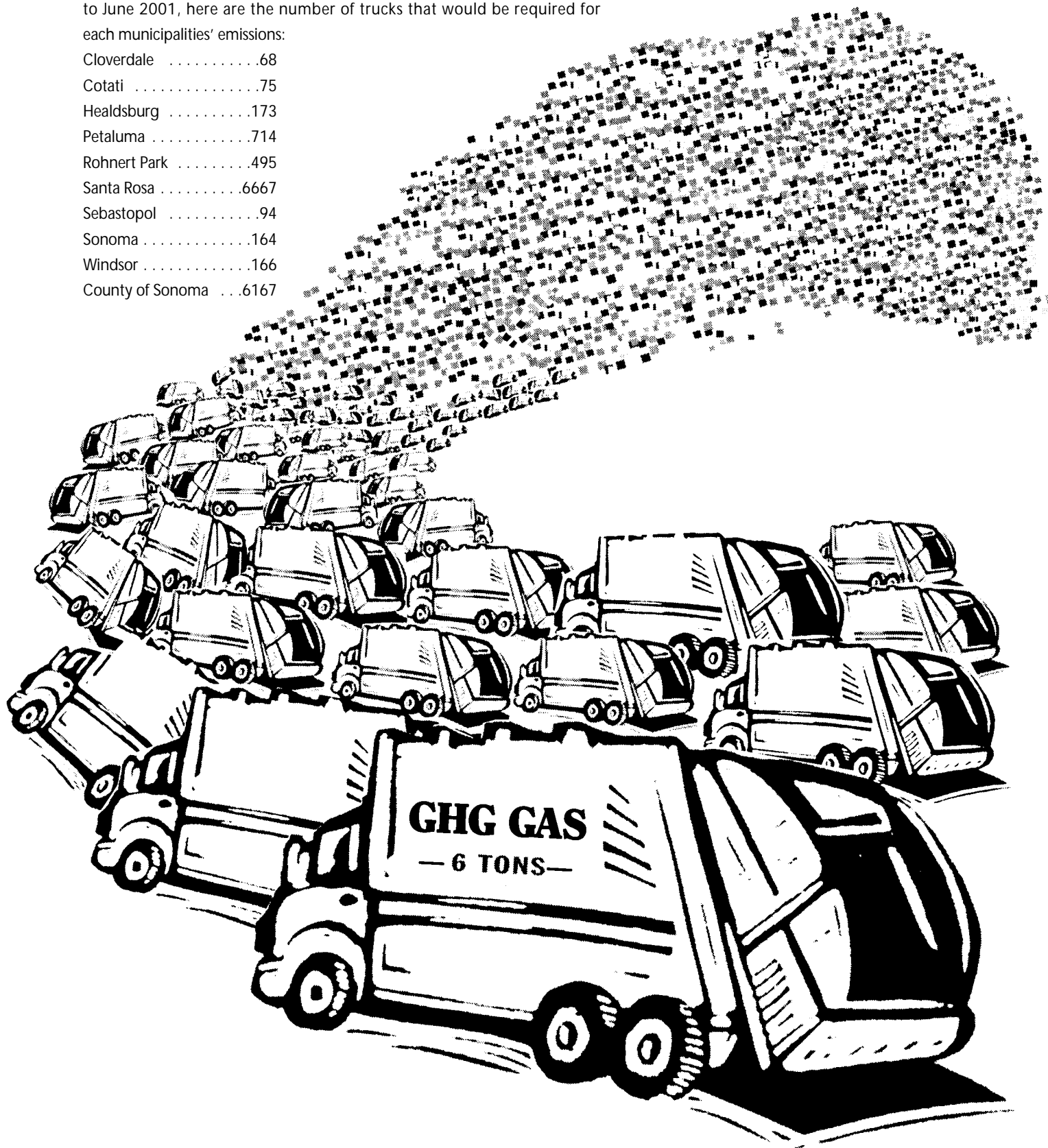
*"As for the future, your task is not to foresee,
but to enable it."*

—Antoine de Saint-Exupéry

IF GARBAGE TRUCKS COULD HAUL OUR GREENHOUSE GAS AWAY, HOW MANY TRUCKS WOULD IT TAKE?

ANSWER: About 14,783 trucks. Each truck hauls about 6 tons. For July 2000 to June 2001, here are the number of trucks that would be required for each municipalities' emissions:

Cloverdale	.....68
Cotati	.....75
Healdsburg	.....173
Petaluma	.....714
Rohnert Park	.....495
Santa Rosa	.....6667
Sebastopol	.....94
Sonoma	.....164
Windsor	.....166
County of Sonoma	...6167



RECOMMENDATIONS

All nine cities and the County have now completed their GHG inventories for their internal operations—the first step of this climate protection endeavor. The second step is to set reduction targets. In considering how bold to be in setting targets, here is some food for thought.

- Although the campaign we follow doesn't prescribe, Cities for Climate Protection® encourages municipalities to consider a 20 percent reduction target.
- The Kyoto Protocol set a 7 percent U.S. emission reductions from 1990 levels by 2012. (Because of emission increases, a small decrease from an earlier year can be more ambitious than a large decrease from a more recent year.)
- Salt Lake City has pledged to meet the Kyoto target, to reduce GHG by 7 percent below 1990 levels by the year 2012.
- Scientists say that we need to reduce GHG emissions by at least 60 percent to avoid grave repercussions.
- Many promising opportunities exist for achieving ambitious GHG reductions in Sonoma County.
- To lead by example, cities must continue their bold and visionary action, especially when facing a big challenge.

Recommendation #1: City councils adopt a 20% GHG reduction target from 2000 to 2010 for their internal operations.

Once the target is set, the next step is for jurisdictions to develop a plan for achieving their targets. County of Sonoma staff has been engaged in creating a plan for meeting their 20 percent reduction target for several months. They have done this under the auspices of the County's Sustainability Planning and Practices Program - SP3 - initiated by the Economic Development Board. No additional staff or consultants were hired for creating the GHG reduction plan. County staff will provide this plan to cities to use as a template in creating their own plans.

Recommendation #2: City councils direct staff to develop city-specific plans for achieving the cities' GHG reduction targets, and by June 30, 2004, adopt a plan for doing so.

Last year the Sonoma County Mayors' and Councilmembers' Association of Sonoma County sent a letter to the Chairperson of the Board of the Bay Area Air Quality Management District encouraging the Air District to support climate protection in Sonoma County and regionally. This generated a request to the Air District for financial support for the Sonoma County Waste Management Agency to implement a GHG inventory for all of Sonoma County (not just the municipalities' internal operations), and to study the relationship between clean air and climate protection. Thanks to leader-

ship from Sonoma County Supervisor Tim Smith and Petaluma Councilmember Pam Torliatt – both are members of the Air District's Board of Directors – on June 4, 2003, the Air District approved \$25,000 in funding for the project, scheduled to begin in Fall 2003.

Recommendation #3: All Sonoma County jurisdictions cooperate with the Air District-supported Countywide GHG Inventory Project.

Sonoma's cities and the County are engaged in a wide variety of energy reduction strategies. Careful GHG tracking provides a means to gauge the impact of their efforts. ICLEI's GHG emissions software is useful and user-friendly. For comprehensive and day-to-day tracking, other desirable features of a data system would likely 1) be web-based so it's readily accessible, 2) facilitate comparisons between cities, and 3) support as closely as possible "real time" energy and emissions monitoring.

RECOMMENDATION #4: All Sonoma County jurisdictions coordinate tracking of GHG emissions, and by June 30, 2004, adopt a standard emissions measurement approach that supports energy efficiency and climate protection efforts.

Recommendations that reach community-wide

The general plan is the basic development blueprint for counties and cities, addressing all aspects of housing, traffic, natural resources, open space, safety, land use, and public facilities. General Plans for Sonoma County and its cities should reflect our commitment to climate protection.

RECOMMENDATION #5: All Sonoma County jurisdictions direct staff to evaluate actions necessary to ensure their general plan reflect their commitment to climate protection, and target September 30, 2004, to report to the government bodies the results of these evaluations.

More than the previous steps, setting targets, creating plans, and implementing programs for community-wide GHG reduction involves a greater commitment from residents, business, and government because it expands climate protection efforts from internal municipal operations to the larger community. Fortunately, there are many encouraging examples. Santa Rosa's water conservation program significantly reduced per capita water consumption. During California's most recent energy crisis, residents rapidly reduced energy usage up to 20 percent. Expanding to the community level requires a greater financial investment than the previous steps because of the need to involve a larger and broader constituency.

RECOMMENDATION #6: All Sonoma County jurisdictions cooperate to identify a process and actions necessary to establish community-wide targets, plans, and programs, and target September 30, 2004, as the date by which the approach for doing so is identified.

LOCAL ACTION MOVES THE WORLD

On August 20, 2002, Sonoma became the first county in the nation where 100 percent of the local governments—the County and all nine cities—pledged to measure and reduce their greenhouse gas emissions. These local elected officials acted with vision and boldness for present and future generations. They are part of *Cities for Climate Protection*®, a campaign led by the *International Council for Local Environmental Initiatives - ICLEI*. Over 550 cities and counties participate in this campaign worldwide, with over 140 of them in the United States. They are proving that, “Local action moves the world.”

Local governments follow a program with five steps or milestones as part of Cities for Climate Change:

- Milestone 1:** Inventory greenhouse gas emission production
- Milestone 2:** Set a target for emission reduction
- Milestone 3:** Create a plan for meeting the target
- Milestone 4:** Implement the plan
- Milestone 5:** Monitor progress and adjust as appropriate

Using a personal weight program as a metaphor, a GHG inventory is like stepping on the scale to find out how much you weigh as the starting point for a diet and exercise program.

Municipalities can focus their climate protection efforts on emissions produced by their internal governmental operations, on

emissions produced by all sectors in the jurisdiction, or first one and then the other. Sonoma jurisdictions have chosen to “lead by example,” focusing on internal governmental operations first.

The County of Sonoma and the City of Santa Rosa completed their GHG inventories—Milestone One—in 2002. The County also set a target—Milestone Two—to reduce the emissions produced by its internal operations by 20% from 2000 to 2010.

The remaining eight Sonoma cities decided to work together on their GHG inventories. The County of Sonoma provided \$25,000 for this effort. All cities contributed to the collaboration, too, by purchasing custom inventory software and committing staff time. Seven cities also spent on average \$4000 each for the project for ICLEI membership, interns, consultants, etc. The Sonoma County Waste Management Agency, a joint powers authority in which all Sonoma cities and the County participate, served as project administrator. SCWMA contracted with Sustainable North Bay which assembled a team of consultants and Sonoma State University interns to implement the project. SSU’s Environmental Technology Center served as the project’s home base.

This close and effective collaboration among all jurisdictions in a County to conduct their GHG inventories is unique, and serves as a springboard for further collaboration to reduce GHG emissions and save money.

ENERGY: THE INVISIBLE, ESSENTIAL LIFE FORCE

Energy is like spirit. It is the invisible, essential life force that affects every part of our lives. Energy is the nexus between the economy, environment, and security. If we get energy right, many significant benefits will follow—for ourselves and for future generations.

Economic impacts

Climate protection helps ensure our local economy’s vitality. It retards the outflow of millions of dollars residents spend every year on energy such as electricity and gasoline, never to return.

On a state level, energy plays a prominent role in California’s current economic woes. According to a study released at the beginning of this year, California’s energy crisis cost the state as much as \$45 billion over two years in higher electricity costs, lost business due to blackouts, and a slowdown in economic growth.

Nationwide, reducing global warming pollution can save Americans billions of dollars, according to economic analysts at the Telus Institute who released a study of proposed cap-and-trade energy legislation this summer. Similarly, our GHG analyses show that selected projects in this County are saving up to \$320 for every ton of GHG reduced. Climate protection’s cumulative benefits are vast.

Environmental impacts

Energy consumption constitutes a major part of human impact on Earth. For Sonoma County, a study done last year found that it takes about 13.9 acres of biologically productive land to meet the energy needs of each county resident. Energy accounts for about 62% of Sonomans’ overall Ecological Footprint, a measure of our impact on natural resources. *For information about the Ecological Footprint Project report, please see Resources, page 20.*

continued on page 7

Putting this in context, if everyone in the world consumed like the average person in Sonoma County, we would need about four more Earths. In France, the average person consumes 55 percent of the energy we do, suggesting that we can both reduce our energy consumption and preserve or improve our quality of life.



To me the question of the environment is more ominous than that of peace and war...I'm more worried about global warming than I am of any major military conflict.

—Hans Blix, former U.N. Inspector in Iraq, March 13, 2003

Our oil imports cause us to export ecological damage elsewhere. As an example, California receives from 20 to 40 million barrels of oil per year from Ecuador. Ironically, the scale of pollution and misery

caused by the oil industry in Ecuador would never be tolerated in California.

Security impacts

The U.S. dependency on foreign oil is immense; we consume 25 percent of the world's oil while owning only 3 percent of global reserves. Reducing our dependency will increase our security.

Although California produces oil—about 300 million barrels per year—our supply does not keep pace with our appetite. In just a decade, California has increased its reliance on foreign oil from 6 percent to 31 percent. Of the foreign oil California imported in 2001, more than a quarter of it—approximately 15 million barrels—came from Iraq. Between 1980 and 2002, Californians increased their vehicle miles driven from 88 billion to 173 billion per year. By 2020, Californian's demand for oil is expected to increase by 38 percent.

HOW ARE GREENHOUSE GAS EMISSIONS CALCULATED?

Some people suppose we take air samples to measure greenhouse gas (GHG) emissions. In fact, cities' GHG estimates are derived from two main calculations. We total the various forms of energy used to support city operations, either directly or indirectly, and convert fuel totals to GHG emissions. We also estimate any carbon that is sequestered—kept or taken out of the atmosphere—by city operations. For municipalities, sequestration primarily occurs when their solid waste is landfilled.

We selected fiscal year 2000-2001 and fiscal year 2001-2002 for our inventories. We wanted to use the same year—FY 2000-2001—as the County of Sonoma and Santa Rosa used for their inventories. We added the second year to capture the most recent full year of data available.

We took several steps to assure the quality of our work.

- * We followed the protocols, used the software, and received technical assistance from ICLEI's Cities for Climate Protection.
- * Experienced project consultants oversaw and/or implemented inventory protocol, data collection, analyses, and report generation, and reviewed each other's work. Both consultants who performed the inventories for the County of Sonoma and the City of Santa Rosa were on our project team. Our SSU interns were very conscientious. We sought and received advice from SSU professors regarding technical questions.
- * Accounting staff in the subject cities checked the results of the electricity and natural gas analyses for their cities.
- * We compared cities' results to each other to reveal and correct data anomalies.

Caveat

This is the first time Sonoma cities have calculated their GHG emissions. The project team relentlessly pursued data to produce solid results. However, sometimes data was simply unavailable. Cities' record keeping differed, making cross-city comparisons problematic. If anything, these GHG emission estimates are conservative because not all municipal activities were included, for example, travel to conferences. We aimed for accuracy, but still expect some errors. As accounting for energy and GHG emission improves, GHG inventory results will also improve.

Converting energy usage to GHG emissions

To determine the amount of GHG emissions from electricity, we first compiled the number of kilowatt-hours (KWH) consumed by each city. Then we multiplied the KWH by an emissions coefficient, a measure of the GHG produced when electricity is generated. We used the U.S. Department of Energy's emissions coefficient specific for California's electricity. The result of the multiplication is the pounds equivalent carbon dioxide (lbs eCO₂), the standard measure for GHG.

California's emissions coefficient for our base years was 0.73 lbs eCO₂/KWH, low relative to the rest of the nation because our power plants use little coal and oil, the fuels that emit the most GHG pollution. The coefficient for the City of Healdsburg is lower still because most of its power comes from the local geothermal source known as the Geysers, and from hydroelectric sources. The emission coefficient for Healdsburg's electricity is about 0.3 lbs eCO₂/KWH, a

continued on page 8

Continued from page 8

calculation we performed for the city especially for this project. Healdsburg is the only city in the county that is part of a Northern California Power Agency municipally-owned electric utility.

Unlike electricity, converting natural gas, gasoline and others fuels to GHG emissions requires no location-specific coefficient. Regardless of where this fuel originates, when it combusts, the proportionate amount of GHG it yields is fairly standard. Each fuel type has a corresponding emissions coefficient.

Pacific Gas and Electric supplied records for cities' electricity and natural gas use and their corresponding costs—a massive amount of data. Using a database program we created for this project, this utility data was digested into summary reports customized for each city. Our goal in designing the reports was to give cities information that enables them to easily pinpoint areas to both lower their utility bills and their GHG emissions.

BUILDINGS, TRAFFIC SIGNALS, AND STREETLIGHTS

Interns categorized the electricity and natural gas accounts we received from PG&E so that they could give us the data we needed in a form we could use. Every account was classed using three designations: item, facility, and administrative class. In this way, we could determine which accounts applied, for example, to buildings, signals, streetlights, etc.

Strategies to reduce costs and GHG emissions associated with buildings, traffic signals, and street lights include such approaches as retrofitting buildings and switching to light emitting diode traffic signals.

Full report on Electricity and Natural Gas by Edward C. Myers, Provi-metrics, posted online at www.skymetrics.us

GHG emissions associated with buildings, traffic lights and streetlights

	Cloverdale	Cotati	Healdsburg	Petaluma	Rohnert Park	Sebastopol	Sonoma	Windsor
Buildings								
FY 00-01	72	95	292	1208	1532	144	163	246
FY 01-02	94	88	301	1276	1696	133	141	228
Lights								
FY 00-01	87	90	34	965	492	141	146	337
FY 01-02	94	89	35	863	470	129	147	337

WATER AND WASTEWATER

The water and wastewater analyses done for this project were more extensive than those done for the other sectors. We needed water and wastewater data for the overall community in order to derive figures for internal municipal usage. We capitalized on this situation and constructed a comprehensive water and wastewater systems database. Our energy and water efficiency experience enabled us to use the database to produce sophisticated information that illuminates ways to reduce water and energy use, costs, and GHG emissions.

To calculate GHG emissions associated with water and wastewater—mostly for powering pumps and treatment—we determined how much energy is used to supply water and treat and dispose of wastewater for each city as a whole. Then we determined the portion that is attributable to its municipal operations—administration buildings, police and fire stations, and parks. We found, not unexpectedly, that water and wastewater-related emissions for municipal operations are very small compared with those for the entire city. Thus, city de-

This project's analysis will transform the way we look at water, energy, GHG, and costs. The work carries important implications not only for Sonoma County, but also for California and the nation. —Michael Stanley-Jones, California Director, Clean Water Fund



isions about water and wastewater systems will have a far greater impact than decisions about water use in municipal facilities. For example, a decision about replacing an older well pump with a new high-efficiency pump will have a far greater impact than replacing the toilets in City Hall.

We calculated figures for cities' municipal facilities using Sebastopol data because only this city provided records of water usage for its

GHG emissions associated with water and wastewater used by cities' facilities

	Cloverdale	Cotati	Healdsburg	Petaluma	Rohnert Park	Sebastopol	Sonoma	Windsor
FY 00-01	3	28	26	185	36	12	48	96
FY 01-02	3	28	26	181	36	11	48	95

municipal operations' buildings and parks. We used the proportion of each city's indoor and outdoor water usage to estimate the volume of wastewater each produced. For those cities receiving water from the Sonoma County Water Agency, a portion of SCWA's energy was allocated to them, based on volume. Similarly, for the cities that send wastewater to the Laguna Wastewater Plant, a portion of the plant's energy was allocated, also based on volume.

Regarding ways to reduce GHG emissions associated with water and wastewater, metering and record keeping at municipal facilities is recommended to help track the impact of efficiency improvements, and help reduce waste, costs, and emissions. Looking beyond cities' internal operations to the community level, a relatively easy and cost-effective way to reduce emissions is to replace energy-inefficient equipment. The database created for this project



To protect the environment, I think adults need to think more about their children and each other. Now people are too focused on themselves.

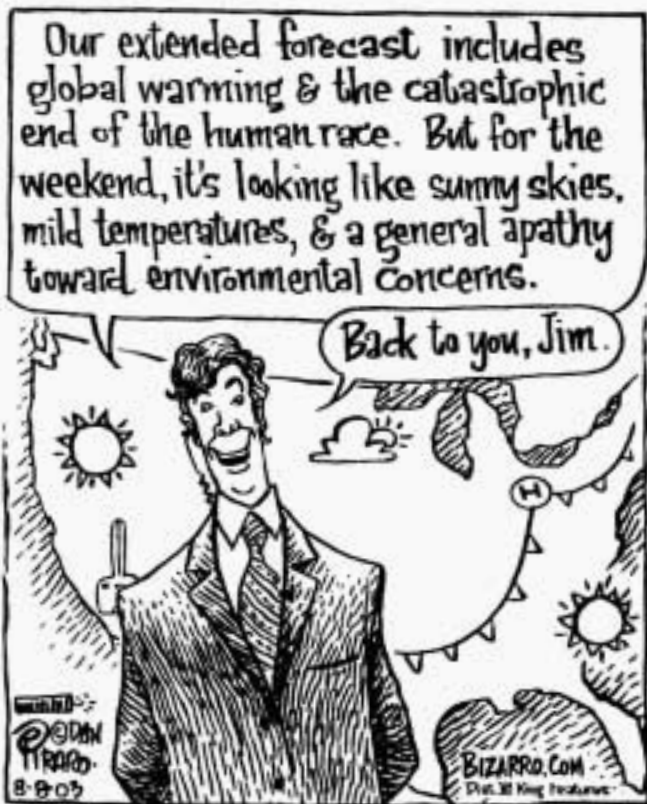
—Geoff Fisher, Sebastopol, age 14

can help estimate the cost-effectiveness of replacements, and support applications for low interest loans from the California Energy Commission.

Examples of projects that can both reduce GHG emissions and generate considerable savings follow. Upgrades to the aeration blowers at the Laguna Wastewater Treatment Plant are already saving \$175 per ton of GHG reduced. Another Laguna Treatment project to upgrade pumps could save \$290-320 per ton of GHG. Upgrading the efficiency of the main Sonoma County Water Agency pumps could save an estimated \$320 per ton of GHG. Our analyses also show that landscape irrigation efficiency offers another huge opportunity for reducing energy use and GHG emissions. Were SCWA to implement such energy-efficiency projects, the Agency could be a stellar model for GHG reduction among water agencies nationwide.

Even larger reductions in GHG emissions and costs can be realized by stepping up to an arena with greater impact—infrastructure. As is true with any construction, optimum performance is realized first in the project's design phase. Our database and analyses offer an opportunity to conduct a comprehensive evaluation of options for both SCWA's water supply plans and the Laguna Plant's water capacity projects. In particular, analysis of the data could help identify optimum ways to balance water efficiency, wastewater treatment capacity, water supply, and wastewater reclamation, while simultaneously reducing energy costs and GHG emissions. A joint effort to consider these infrastructure plans with the goal of identifying cost-effective reductions in GHG emissions could help cut through the complexity of these massive undertakings.

BIZARRO Dan Piraro



Full report on Water and Wastewater by John Rosenblum, Ph.D, Provimetrics, posted online at www.skymetrics.us

FLEETS

To estimate GHG emissions from city-operated vehicles, we compiled and analyzed data from cities' fleet records including numbers of vehicles, miles traveled, and gallons of fuel used. For those cities that didn't have complete records, we extrapolated to fill in the gaps. For example, if a city had fuel records for only a portion of a year, we determined a monthly average and multiplied by twelve to use for the year.

Once we totaled the amount of fuel by type, we applied standard coefficients to convert amount of fuel by type to GHG emissions. As a point of interest, for every gallon of fuel burned, about 20 pounds of carbon dioxide are released- see FAQs for an explanation. Emissions from fleets were relatively unchanged from one year to the next, as the table below reflects.

GHG emissions associated with fleets

	Cloverdale	Cotati	Healdsburg	Petaluma	Rohnert Park	Sebastopol	Sonoma	Windsor
GHG								
FY 00-01	231	138	527	1578	812	213	343	201
FY 01-02	259	117	488	1411	805	207	332	201
Fuel costs								
FY 00-01	\$31,450	\$24,178	\$66,800	\$226,846	\$112,650	\$31,800	\$51,447	\$25,442
FY 01-02	31,866	16,821	61,660	\$172,753	102,062	31,147	\$51,451	\$23,361

From July 2000 to June 2002, cities' fleets consumed a total of 628,733 gallons of fuel—the same amount carried by 496 gasoline tankers! This fuel cost a total of \$912,507 for an average of \$1.45 per gallon.

Many strategies exist for reducing fleet-generated GHG emissions. Examples include downsizing vehicles, optimizing vehicle use, incorporating efficiency into bid specifications, maximizing efficiency, eliminating some fleet vehicles, buying vehicles that run on alternative fuels, utilizing public transit, biking, walking, and telecommuting. ICLEI's publication, *Green Your Fleets*, describes strategies to help cities and counties reduce GHG emissions from their fleets.

Full report on fleets by Simon Wooley, SSU intern, posted online at www.skymetrics.us

We Americans each have 300 energy slaves, meaning that the work now being done by machines for each of us equals the human power of 300 people. We are all profoundly dependent on fossil fuels, more so than we realize; but the most important of those fuels—oil and natural gas—are about to become more costly due to depletion.



During the next century industrial societies will have no choice but to run the movie of globalization in reverse: production, distribution, and decision-making will again become local. The sooner we start, the less pain and strain we'll endure in the process. Reducing greenhouse gas emissions will help us make the necessary shift.—Richard Heinberg, Santa Rosa resident, Professor of Human Ecology at New College of California, and author of The Party's Over: Oil, War and the Fate of Industrial Societies.

EMPLOYEE COMMUTES

We designed, implemented, and analyzed an online survey to obtain employee commutes information. We randomly selected a sample of employees from each city, excepting Cloverdale where employees self-selected to take the survey. All surveys were taken in spring 2003 using the Internet. The survey included questions about modes of transportation, length of commute, and number of days per year that employees commute. Our aim was to arrive at the total gallons of fuel by type used to commute.

From the data, we computed an average fuel use per employee per

year. We multiplied this average by the total number of city employees to estimate the total amount of fuel used by employees in that city. We then multiplied the number of gallons by the GHG factor for the particular fuel to calculate the total amount of GHG emitted per year by employees commuting to work for the city. We used the commute characteristics and distribution of fuels used from our 2003 survey for our base years because we had no practical way of obtaining accurate commute data for past years.

Changes in GHG emissions FY 00-01 to FY 01-02 are solely due to changes in employee counts. The slight reduction in GHG emissions

for Petaluma results from the decrease in this city's employees, who as a group are high diesel users. Cloverdale's lower percentage of drive alone commuters, and those with short commutes, may reflect this city's survey self-selection process.

We compared our results with other commute surveys. One survey of Sonoma County commuters shows they average 19 miles roundtrip and drive alone 75 percent of the time. Our survey showed an average 16 miles roundtrip and drive alone 92 percent of the time. Nationwide average fuel efficiency is 20 miles per gallon; our respondents' vehicles average 19 miles per gallon.

To check another way, we compared our results with figures from the County of Sonoma's and Santa Rosa's GHG inventories. Our results probably more closely approximate actual emissions because we developed our survey based on lessons from the County of Sonoma study, and our approach was also more rigorous than those

	GHG	# employees	tons/employee
Co. of Sonoma	14,000	4,899	2.9
Santa Rosa	2,712	1,161	2.3
8 subject cities	1,777	926	1.9



To our supervisors and council members, I extend my appreciation for your foresighted action to protect the climate. Climate protection is our gift to the future.
—Jean Schulz, Santa Rosa resident and philanthropist

used by the County and Santa Rosa. We designed the online employee commute survey so that other entities wanting to track commute-generated emissions could use it.

Employers are challenged to reduce GHG from commutes because it seems they have little control over how employees get to work. However, there really is much they can do, especially by using incentives. In one study, for example, 31 percent of Bay Area employees who received vouchers to offset costs increased their transit use. Ultimately, to reduce GHG from employee commutes we must gradually shift taxpayer subsidies—most of them hidden—from present GHG-intensive travel modes to more climate-friendly options.

GHG emissions associated with employee commutes

	YEAR	Cloverdale	Cotati	Healdsburg	Petaluma	Rohnert Park	Sebastopol	Sonoma	Windsor	TOTAL
Number of employees	00-01	42	39	117	317	125	53	121	112	926
	01-02	40	41	117	308	127	53	123	117	926
Ave. # days commuting per year per employee – all modes		221	210	212	206	232	202	210	192	211 average
Percent commute days – driving alone		74	90	92	99	97	88	97	99	92 average
Length commute in mi. roundtrip - drive alone		5	26	15	16	16	13	23	10	16 average
Ave. vehicle fuel efficiency – MPG, gasoline		18	21	17	17	21	18	20	19	19 average
Total gallons of gasoline used for commute per year – all modes	00-01	2408	10263	18436	56167	22449	7229	27099	12923	156974
	01-02	2293	10789	18436	54572	22808	7229	27547	13500	157174
Total gallons of diesel used for commute per year – all modes	00-01	155	0	476	5306	0	0	184	90	6211
	01-02	147	0	476	5156	0	0	187	94	6060
TOTAL tons GHG per year – all modes, all fuels	00-01	28	112	206	669	245	79	298	142	1777
	01-02	27	118	205	650	245	79	302	148	1774

Full report on Employee Commutes by Dave Erickson, SSU intern, posted online at www.skymetrics.us

SOLID WASTE

Local government's solid waste consists primarily of office waste such as paper, and waste collected in receptacles at parks. Another source is greenwaste—grass, leaves, and wood—from parks and other city landscapes. Too little data was available to make credible estimates for cities' greenwaste, although we made preliminary estimates and determined that greenwaste is probably a very small part of cities' overall GHG emissions.

The underlying protocol for converting solid waste to GHG emissions is the most complex of the municipal sectors studied. ICLEI's inventory approach purposely considers municipalities' GHG contribution of landfilling the solid waste stream only, and not the GHG produced in manufacturing or transporting the material. Landfilling can result in a positive or negative contribution to a city's inventory, depending primarily on how the landfill is operated. When materials containing carbon, such as paper, are buried in a landfill, part of the carbon is sequestered, meaning it does not release greenhouse gas. The remainder of the carbon decomposes to methane, a potent greenhouse gas, and carbon dioxide. If the methane were allowed to escape to the atmosphere, the net greenhouse emissions from landfilling would be positive and substantial. However, an estimated 70 percent of the Sonoma County landfill's methane is captured and combusted. The net effect, according to ICLEI's approach, is that the solid waste sent to the landfill is a reduction, or negative contribution, to each city's GHG emissions inventory.

To calculate the amount of GHG produced by cities' solid waste streams, we need to know how much and what type of solid waste each city produces from its operations. But this data was mostly unavailable. Sonoma had lump sum tonnage for all buildings. Rohnert Park had the most detailed solid waste information, so we used it to compute a ratio of the amount of waste generated per square foot of facility. We applied this ratio to the other cities to estimate the volume of solid waste each produces. We used the same approach to estimate the amount of refuse from city parks, but this method produced unreasonably large GHG volumes, so we excluded park refuse from this analysis. Because we had only 2003 data, we used it for the two base years for our study, FY 2000-01 and FY 2001-02.

We characterized the composition of cities' waste using information from the California Integrated Waste Management Board. Using coefficients in the ICLEI software, we converted cities' solid waste to GHG emissions. We adjusted these coefficients to reflect that 70 percent of the methane coming off the landfill used by the cities is converted to electricity. Results of our calculations are shown in the table below.

It may appear that sending solid waste to the landfill helps reduce greenhouse gas emissions. In fact, this is an artifact of the GHG accounting system we used. Considerably more GHG is emitted by manufacturing most solid goods than the reduction from landfilling. For instance, manufacturing a ton of office paper generates 3 tons eCO₂. Landfilling that ton of office paper will only offset about 0.5 tons of the emissions from manufacture, depending again on the landfill operation. However, cities do not count the emissions of manufacture in their inventory; this accrues to the manufacturer. This is done to avoid double counting of the manufacturing emissions when an economy-wide GHG inventory is made. Therefore, the negative values shown above need to be coupled with the emissions of manufacture to provide a complete picture of the impact of solid waste. With ICLEI's system, the emissions of manufacture are accounted for later, when cities take measures to reduce their tons of landfilled solid waste, by either using less or diverting more to recycling. Either action will then give cities credit for reducing the emissions of manufacture, and reduce their overall GHG emissions accordingly.

The solid waste GHG reduction strategy of using less, also called source reduction, saves the purchase cost of supplies in addition to avoiding GHG emissions associated with manufacture and transport. Recycling and buying recycled-content items also helps because the manufacture of most solids from recycled stock produces fewer GHGs than from virgin raw materials. Any city that decides to include solid waste reduction and recycling as part of its overall GHG reduction strategy should first establish a measurement methodology and a more precise baseline than determined here. Measurements should include both weight and composition of the affected solid waste streams. Better measurement means better data for effectively tracking progress.

Estimates of solid waste generated by cities and associated GHG emissions in tons eCO₂

	Cloverdale	Cotati	Healdsburg	Petaluma	Rohnert Park	Sebastopol	Sonoma	Windsor
Buildings Sq. ft.	16,100	20,000	74,780	479,446	215,879	34,390	79,507	43,400
Refuse tons/yr	46	58	216	1382	622	99	55	125
GHG, tons eCO ₂ /yr	-11	-14	-50	-321	-145	-23	-13	-29

Full report on Solid Waste by Edward C, Myers, Provimetrics, posted online at www.skymetrics.us

CLIMATE-FRIENDLY PRACTICES: EXAMPLES FROM SONOMA'S LOCAL GOVERNMENTS



I think people will work hard to make this a beautiful planet. Some things may happen that I'm afraid of, but I think people will work hard to keep it safe for us.

—*Maya Lopez-Sanchez, age 10, Mark West Elementary*

- Cloverdale replaced conventional traffic signal light bulbs with energy-efficient light emitting diodes.
- Cotati's new police facility meets some of the highest energy efficiency standards in the nation.
- Healdsburg is part of a municipally-owned electric utility whose power generation produces little GHG per kilowatt-hour compared with power generators throughout the state and nation.
- Petaluma encourages city-centered growth that curbs sprawl and reduces GHG emissions from driving, and employs minimum GHG emissions as a primary design criterion for its forthcoming wastewater treatment plant.
- Rohnert Park's Public Works Department uses compressed natural gas trucks.
- Santa Rosa's new blowers at the wastewater treatment facility significantly reduce GHG emissions and energy bills.
- Sebastopol, committed to generating power from the sun, is installing solar panels on its city buildings.
- The City of Sonoma has a \$30,000 fund for small businesses to help them become more energy efficient.
- Windsor's employees work four ten-hour days thereby reducing commutes, hours of business operation, and utilization of its heating, ventilation and air conditioning system.
- When reroofing County buildings, the County of Sonoma installed "cool roofs" to increase buildings' cooling efficiency, and incorporated skylight tubes where appropriate.
- Sonoma County Water Agency is replacing gas guzzlers in its fleet with more energy-efficient vehicles.
- The Sonoma County Waste Management Agency has raised recycling rates community-wide.



If we want energy security, then we have to reduce our appetite for fossil fuels. There's no other way. Other issues may crowd the headlines, but this is our fundamental challenge. Big challenges require bold action and leadership. To get the United States off fossil fuels in this uneasy national climate of terrorism and conflict in the Persian Gulf, we must treat the issue with the urgency and persistence it deserves. The measure of our success will be the condition in which we leave the world for the next generation.—Robert Redford shown with City of Sonoma Council member Ken Brown and Petaluma Council member Pam Torliatt at GHG bill signing, San Francisco, Summer 2002 .

BUILDING BLOCKS FOR SUCCESS

Commitment

Americans invest in their children's education because of their commitment to help them succeed in the future. For exactly the same reason, we must invest in climate protection. Our children's long-term well being requires our commitment today. As a community, Sonoma County has embraced climate protection as our responsibility to the next generation.

Sweet spot

Fulfillment of our commitment entails action. The key to effective action is intelligent design. A whole-systems approach that produces significant multiple benefits promises the most positive, significant impact. The bold ideas described on the next page are examples of whole-systems intelligent design, in which multiple, synergistic benefits are produced simultaneously—saving money, improving community well being, and protecting the environment.

Without taking a whole systems view, we will likely produce unintended, negative consequences. Three examples follow. By switching from chlorine to ultra-violet light to treat wastewater at Santa Rosa's Laguna facility, chemical use was reduced but energy use increased dramatically. If the Marin Municipal Water District uses energy-intensive desalination to augment their water supply as they

*Local governments
build the future when we all
fight global storming.*

—CO₂ Haiku by Susan Ode

are now considering, they will reduce the draw on the Russian River but will significantly increase their system-wide GHG emissions unless they develop offsets or employ renewable energy. If we only focus on reducing GHG emissions, we may resort to nuclear power whose waste remains toxic for at least 250,000 years. We mustn't settle for flawed solutions. Our standard must be the "sweet spot"—intelligent whole systems design.

Price signals

Municipalities rightly lead by example. However, the amount of GHG emissions they can reduce by exerting influence community wide through policy making is much, much greater than the amount of emissions they can reduce by focusing only on their internal op-



God gave man dominion over the land. I believe it is our responsibility to cherish and preserve His gift . . . our children are depending on us. It gives me great pride to be involved with the effort to reduce greenhouse gases and conserve energy, while at the same time making a sound business decision—finding cost saving measures to keep our utility bills in check.

—Lynn Morehouse, Town of Windsor Council member

erations. As described above, intelligent design can produce the change desired—particularly when combined with the strategic application of the power of money. The fundamental formula is to charge polluters, and apply the collected funds to reward desirable behavior. Many compelling examples are given in ICLEI's book, "Changing the Price Signal: How local governments can use economic instruments to cut traffic and pollution."

Virtuous cycle

Another essential part of intelligent design is funding continuous improvement—in this case mastering ways to reduce GHG pollution and save money. Once again, intelligent design can create a virtuous cycle—the opposite of a vicious cycle—where improvement feeds on itself and produces more improvement. This can be done by specifying that a percentage of any money saved through reducing energy and associated costs goes into a fund to help prospect for more energy savings. The City of Ann Arbor does just this, with exemplary results.

Follow the carbon!

For years people have searched for ways to measure sustainability. Following the carbon and reducing GHG emissions guide us toward a sustainable future. The more we integrate climate protection into local government general plans, budgets, redevelopment criteria, codes, management systems, and contracting, the swifter we will be at bringing forth a positive future for our children.

Inspiring others

As a member of Cities for Climate Protection, Sonoma County and its cities are part of an international effort to think and act locally and globally. Just as we were inspired to become a part of this effort, we can inspire other sectors of our community—schools, churches, businesses, residents—and can inspire other municipalities to join, too. What we can't do alone, we can do together.

BOLD IDEAS

The whole-system ideas highlighted below go beyond incremental change to deliver the dramatic GHG reductions climate scientists call for. Whole system design predominantly considers the space *between* disciplines and institutions rather than within them. The examples that follow are just a few of the unlimited strategies and money-saving opportunities available to us.

Community Choice

Last year the California legislature passed a bill called Community Choice that allows municipalities to aggregate customers within their jurisdiction for the purpose of negotiating cost-effective competitive bids from energy service providers. These municipalities can also purchase green power from those service providers who offer such energy. Through Community Choice, local government acts as a buying agent for its citizens. Companies like PG&E would still deliver energy and collect revenue. Jurisdictions that have implemented Community Choice have both reduced their energy bills and increased their green power supplies. Community Choice also enables municipalities to use their authority to sell bonds to finance supplemental energy efficiency and on-site generation projects. This approach represents an unprecedented opportunity for local governments—especially those that join together for greater market power—to enact GHG reductions that equal or exceed Kyoto-scale levels.

Water efficiency for the future

New technologies, initial design support, delivery methods, financing and incentive schemes create great opportunities for municipalities. The key, as with all whole-systems approaches, is intelligent, integrative design, open minds, and a long-term view. Such efficiency projects are more cost effective than increasing water supplies and expanding wastewater systems. Combining water and energy efficiency promises dramatic reductions in GHG emissions, water use, and expenditures across our local economy, especially when integrated with a Community Choice initiative.

Cow-powered climate protection

There are approximately 30,000 milking cows in the North Bay. Most of their manure is collected and stored in ponds. The methane emitted from these ponds represents approximately 170,000 tons of GHG per year—far more than the collective emissions from all of Sonoma's municipal operations. A well-established biotechnology is available to convert the manure to climate-neutral energy, stabilized nutrients, and other useful products. This

strategy offers many ways to improve our local agricultural economy while protecting open space and significantly reducing GHG emissions.

Climate-neutral power generation

On Earth Day 2000, Seattle's public utility committed to meeting all new power needs with zero-net GHG emissions, using energy efficiency and renewable resources such as wind. If fossil fuels are used, the utility offsets the equivalent GHG emissions by, for example, offering incentives to reduce car trips. This climate neutral approach reduces consumers' energy bills. The utility estimates that its efficiency investments alone saved its customers about one million dollars per day during the power market turmoil, with no reduction in the quantity or quality of energy service.

Wind-powered mass transit

Calgary's Ride the Wind C-train is the first wind-powered public transit system in North America since sailboats. Before the switch to wind, the train's energy produced about 20,000 tons of GHG per year. With Ride the Wind, emissions are practically zero, making this one of the world's most environmentally friendly forms of transportation.



Greenhouse gas emissions are one of the most serious threats to our environment. The decision to support this project is a no-brainer. I'm proud to be part of this proactive movement.
—Bob Jehn, City of Cloverdale Council member

Using market forces to protect the climate

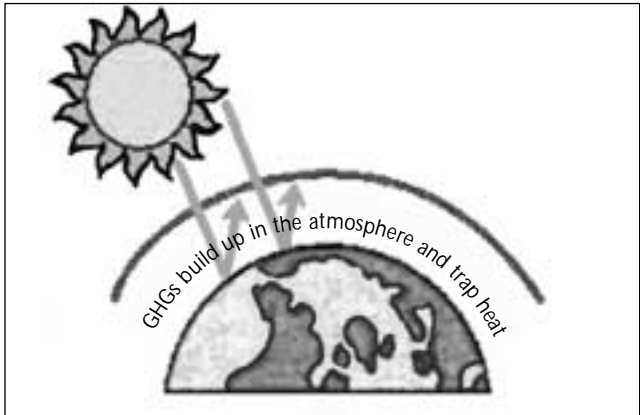
Author and entrepreneur Peter Barnes created the Sky Trust, a proposal that caps and auctions off the right to emit GHG pollution. This proposal's fundamental premise is that we all own the sky, and those who pollute it should pay. Money collected by the Sky Trust would be distributed equally among U.S. residents. Auctioning off emission rights allows market forces to obtain the highest economic value from the atmosphere's limited capacity to absorb carbon. The Climate Stewardship Act of 2003, legislation now being debated in Congress, embodies many of the ideas in Barnes' proposal.

High Performance Climate Protection: Systems Solutions for Systems Problems, Edwin Orrett, Resource Performance Partners, offers a more extensive description of the first three examples—posted online at www.skymetrics.us

WHAT CAUSES CLIMATE CHANGE?

The debate is over. Scientists confirm the climate is changing due to the increasing amount of greenhouse gas in the atmosphere. Americans on the whole believe that climate change is real. A vast majority thinks the U.S. should reduce its GHG emissions. They also want a clear explanation of what causes climate change.

CLIMATE CHANGE is caused by a manmade blanket of carbon dioxide that surrounds the earth and traps in heat.



The greenhouse effect keeps Earth's average surface temperature a hospitable 60°. Without it, the average temperature would be about 0.4°. The greenhouse effect is caused by gases in the atmosphere, such as water vapor, methane, and carbon dioxide, that trap much of the sun's incoming energy.



"If I could get adults and politicians to do one thing, I'd have them break our dependence on oil and coal."

—Kirk Tolfa, Occidental, 11 years old

For nearly all of life on Earth, a balance between energy entering and leaving Earth's atmosphere has existed. However, since the industrial revolution, the balance has been disrupted, mostly by increased amounts of carbon dioxide from fossil fuel combustion. In the last century alone, carbon dioxide levels have increased by 25%. At current rates of fossil fuel use, scientists predict that the carbon in the atmosphere will double by 2050. They also say that we need to reduce our emissions by at least 60 percent in less than one hundred years.

Global CO2 emissions

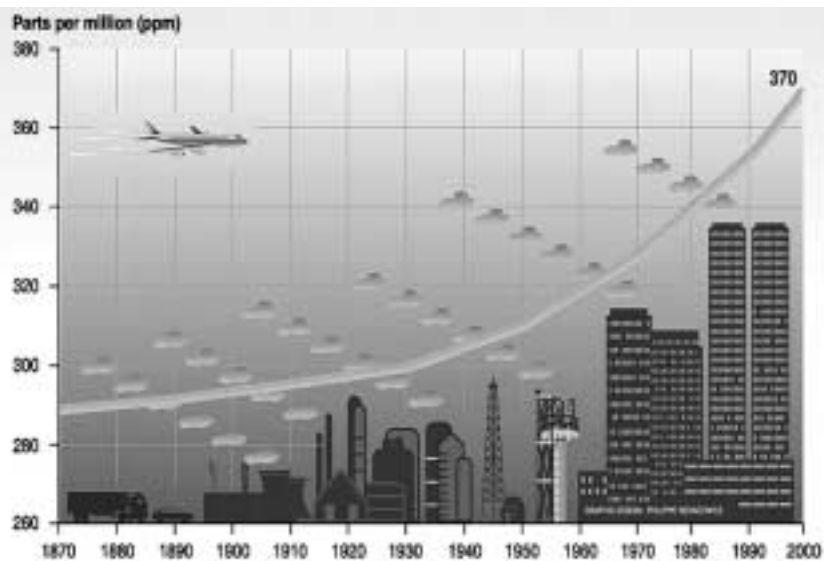
Year	(million tonnes)
1990	.20 878
1997	.22 561
2010	.29 575
2020	.36 102

World Energy Outlook 2000, International Energy Agency

The U.S. is responsible for approximately 25 percent of current worldwide GHG emissions.

Scientists predict many changes as a result of the rise in greenhouse gas. For example, by the year 2100 California temperatures are forecast to increase between 2 - 9°F. Sea levels will rise. In fact, many changes are already happening. Alaska's winter temperatures have risen 8 degrees since the 1960s. Sea levels are already rising along coastlines worldwide, including California's. Some economists foresee that the costs of mitigating the catastrophic impacts of global climate change will quickly outstrip our financial resources. Although we must adapt to changes already underway, we also must focus on reversing the manmade causes of global climate change. The sooner we begin, the better.

Global atmospheric concentration of CO₂



7Source: TP World Scripps, Mauna Loa Observatory, Hawaii, Institution of Oceanography (SIO), University of California La Jolla, California 1999

FREQUENTLY ASKED QUESTIONS

If a gallon of gasoline weighs only 5 pounds, how can it produce about 20 pounds of carbon dioxide when it combusts? Gasoline consists mostly of carbon, plus a small amount of hydrogen and a few impurities. When gasoline combusts, each carbon atom combines with two atoms of heavier oxygen atoms, producing about 20 pounds of carbon dioxide.

How can carbon dioxide that weighs tons float in the atmosphere and disappear?

All substances, including gases, have weight. The molecules of carbon dioxide are relatively light, and as a gas, have lots of space between them and disperse easily throughout the atmosphere. Although carbon dioxide gas seems invisible and weightless, it is real matter that comprises a huge portion of modern society's waste. Because we can't see, feel, smell, or taste carbon dioxide gas, we have difficulty realizing that it's even there, let alone a serious problem.

Why are greenhouse gases measured in equivalent tons of CO₂?

Greenhouse gases have different strengths or effects in their ability to trap heat. Converting emissions to the equivalent amount of carbon dioxide allows for comparisons between greenhouse gases of varying strengths. For instance, methane is twenty-one times more powerful than carbon dioxide in its capacity to trap heat. Therefore 1 ton of methane is considered equal to 21 tons of carbon dioxide.

What are the primary greenhouse gases humans emit?

They are carbon dioxide, methane, nitrous oxide, chlorofluorocarbons, perfluorocarbons, and sulphur hexafluoride. Carbon dioxide is the most prevalent and has the most cumulative impact of these gases. It represents over 80 percent of GHG emissions in the U.S.

What human activities contribute to climate change?

The combustion of coal, oil, and natural gas, as well as deforestation and various agricultural and industrial practices, are altering the composition of the atmosphere and changing the climate.

Sources of U.S. GHG emissions

Electricity generation	37%
Vehicles	31%
Industry	21%
Other	11%

How much of the carbon dioxide being added to the atmosphere is from the use of fossil fuel?

About 80 to 85% of the CO₂ being added to the atmosphere comes from current fossil fuel use.

How long do greenhouse gases stay in the atmosphere and trap heat?

The amount of time GHG stays in the atmosphere

varies depending on the type of gas. Methane, for example, lasts about twelve years, while carbon dioxide lasts for over a century.

Average CO ₂ emissions per year	
SUV	15 mpg 10 tons
Compact	27.5 mpg 5.5 tons
Fuel efficient	40 mpg 3.5 tons
Bicycle	0 tons

Are extreme weather events due to global warming?

As the world warms, some extreme climate events, like the frequency of heat waves and very heavy precipitation, are expected to increase. It is not possible to link any particular weather or climate event definitively to global warming.

What is the difference between the greenhouse effect and the hole in the ozone layer?

The greenhouse effect is a warming of the Earth by the gases in the atmosphere that surround the Earth and hold in heat like a blanket. Greenhouse gas makes our Earth habitable, but too much greenhouse gas, like too many blankets, can make the Earth unbearable. The hole in the ozone layer, also known as global depletion of stratospheric ozone, is caused by a type of greenhouse gas called chlorofluorocarbons (CFCs), used in refrigeration, air conditioning, and as solvents. CFCs are being phased out under the Montreal Protocol, an international agreement. Because of the success of the Montreal Protocol, many scientists predict that the hole in the ozone layer will shrink. The Montreal Protocol is a good example of what countries can do when they work together for mutual benefit. The same can be done for global climate change.

What is the Kyoto Protocol?

In 1997, at Kyoto, Japan, representatives of leading industrialized countries responsible for over 90 per cent of global warming, agreed to reduce their GHG emissions by five per cent from 1990 levels. The U.S., responsible for one-quarter of the world's total greenhouse gas emissions, initially accepted but later rejected the agreement. Many experts believe that without U.S. participation, the Kyoto Protocol cannot accomplish its objectives.

If the U.S. were to sign the Kyoto Protocol, by how much would we need to reduce our GHG emissions?

Under terms of the Kyoto Protocol, the U.S. would reduce its emissions by 7 percent below 1990 levels by the year 2012. This would be quite a challenge because, according to the U.S. Environmental Protection Agency, this country's emissions increased by 14.2 percent from 1990 to 2000.

continued on page 18

FREQUENTLY ASKED QUESTIONS *continued from page 17*

How does climate change differ from other environmental problems?

Unlike most environmental issues where we usually have to pay to clean up things, with climate change, we can attack the problem and save money at the same time.

How does California's electric use compare with the rest of the nation?

Before 1976 Californians used almost as much electricity per capita as the rest of the country. These days we use 40 percent less, largely the result of appliance and building efficiency standards developed and implemented by the California Energy Commission since 1976. This example demonstrates what is possible when there is concerted action to achieve a goal.

If these GHG inventories are for municipalities' internal operation only, what about the emissions for Sonoma County as a whole?

The Climate Protection Campaign will soon be conducting a GHG inventory for Sonoma County as a whole, thanks to the support of the Bay Area Air Quality Management District.

40,000 tons of CO2—the approximate amount of GHG emitted by Santa Rosa's municipal operations in one year—represents a volume a mile in diameter and nearly 6 feet thick.

Can businesses, schools, churches, households, and individuals calculate their GHG emissions?

Yes. *Find resources for doing so on page 20 of this report.*

Is climate protection a local issue?

What can local action really do?

Municipalities have regulatory authority over many direct and indirect sources of greenhouse gas emissions, for example, land-use, zoning, transportation, parking, landfills, building codes, and procurement policies. Cumulatively, cities exert great influence over the amount of GHG emitted worldwide.

Average CO2 emissions per year	
SUV	15 mpg 10 tons
Compact	27.5 mpg ... 5.5 tons
Fuel efficient ...	40 mpg 3.5 tons
Bicycle .....	..... 0 tons



We should take global warming seriously, but ourselves lightly. Doom and gloom is no fun. Doing right by the planet can be.

—Bob Anderson, Sebastopol City Council member. Shown with him is Ann Hancock, Project Manager. Both are Certified Laughter Club Leaders.

Why should we do anything about climate change? Isn't it all hopeless?

It often seems hopeless. However, there are many compelling reasons to take action.

- Action is the antidote for negative feelings.
- Action helps protect us from irreversible environmental impacts.
- Responsible leadership requires action.
- Climate protection saves money.
- Climate protection leaves a legacy for future generations who otherwise will bear unconscionable consequences.
- The burdens of climate change fall on the poorest while its causes are mostly from the wealthiest. Therefore, climate protection helps rectify social inequity.
- Climate protection helps species impacted by global warming worldwide.
- Climate protection produces many side benefits, for example, cleaner air, more walkable and livable cities, more investment in public transportation and public health, and more beneficial technological innovation.
- Why settle for small? Take on one of the biggest challenges ever.

—Ingenuity, vision, stewardship—

These American values enable us to tackle climate change. Our goal is to apply practical solutions to prevent and protect, not just adapt. Future generations will thank us tomorrow for what we do today.

WHAT CAN I DO?

Congratulate yourself and anyone else who asks this question. History shows that individuals can make a difference. In fact, it's only individuals who change the world. We do so by inspiring others to act.

The list below focuses on whole-system strategies for climate protection to emphasize their importance, and because those that focus on changing individual consumption habits, like recycling and using compact fluorescent bulbs, are already relatively well known. Shifting our focus from individual consumption habits to the large-scale system changes is needed to dramatically reduce GHG pollution. Whether you have a little or a lot of time, everyone can do something.

Learn and reflect, talk and listen

- Check out resources listed at end of this report
- Talk to others about climate protection—talk is not cheap
- Join or form study groups; help educate others

Speak up

- Write letters to the editor of newspapers and to elected representatives
- Make presentations
- Ask people for money and give it to groups making a difference
- Encourage others, especially young people, to speak up

Schools

- Help schools reduce their energy use, and measure and reduce their GHG emissions
- Encourage your district to have all its schools participate in energy-saving programs
- Help school building and remodeling demonstrate the highest standards for energy and water efficiency
- Green your fleet (This applies to business and government, too.)
- Create programs that offer staff and students incentives for walking, bicycling, riding the bus, etc.; enact parking fees (This applies to all sectors on this page.)

Business

- Develop a company-wide Environmental Management System
- Form a water and energy efficiency task force
- Make a pledge to reduce GHG emissions, meet a target, then set a new target; encourage other companies to do the same
- Adopt policies to require suppliers and vendors to adhere to energy efficiency practices
- Ask your bank to favor projects that emit fewer GHGs

- Make presentations to groups like the Chamber of Commerce and Rotary Club about how businesses can save money, lower energy bills, and protect the climate
- Join the California Climate Registry
- Lobby your industry to change its practices; encourage GHG accounting



Sonoma County is in the midst of making history.

—Bogdan Vasi, Cornell University climate protection researcher

Government

- Thank jurisdictions for joining Cities for Climate Protection, and encourage others to do so
- Help elect people who will protect the climate
- Encourage walkable, mixed use development with nearby public transportation, stores, schools, etc.—to minimize sprawl and the need to drive
- Adopt green building guidelines and codes, and reward development teams who follow them
- Reward resource efficiency and conservation among utility users
- Develop local control over your energy system and make the shift to energy efficiency and renewable power
- Encourage public entities to mandate a Renewable Portfolio Standard (RPS) of at least 20% renewable electricity
- Help eliminate government subsidies for fossil fuel and increase subsidies for energy efficiency and renewable energy
- Encourage the U.S. government to ratify the Kyoto Protocol
- Change the tax system to reward actions that protect the climate, and penalize those that don't

*What is essential
is invisible to the eye.*

—Antoine de Saint-Exupéry

REFERENCES & RESOURCES

The International Council for Local Environmental Initiatives—ICLEI, Cities for Climate Protection, www.iclei.org/us Premier resource and leader for local governments involved in climate protection. Examples of some of their publications include, *Best Practices for Climate Protection: A Local Government Guide*; *Changing the Price Signal: How local governments can use economic instruments to cut traffic and pollution*; and *Green Your Fleet*.

Climate Protection Campaign www.skymetrics.us Hub for climate protection activities in Sonoma County.

Sonoma County Waste Management Agency www.recyclenow.org Administrator for municipalities' climate protection collaboration

Sonoma County Business Environmental Alliance www.sonoma-county.org/bea Promotes economic benefits of responsible environmental practices

U.S. Environmental Protection Agency's State and Local Government's Global Warming web page: <http://yosemite.epa.gov/OAR/globalwarming.nsf/content/VisitorCenterPublicOfficialsRole.html>

Summary for Policymakers, Climate Change 2001-Impacts, Adaptation and Vulnerability Intergovernmental Panel on Climate Change (IPCC), Third Assessment Report (TAR), *Climate Change 2001* <http://ipcc-ddc.cru.uea.ac.uk/>

California Energy Commission: Climate Change and California http://www.energy.ca.gov/global_climate_change/index.html

United Nations Environmental Programme, www.grida.no/climate Excellent source for information and graphics, including a *CO2 meter* showing the current estimated annual rate of global anthropogenic emissions of carbon dioxide, based on projections made by the International Energy Agency.

Alliance to Save Energy www.ase.org An organization that promotes energy efficiency worldwide

Watergy www.watergy.org Resource for the water–energy efficiency connection

California Climate Registry—www.climateregistry.org State institution for businesses to register their GHG reductions

Clean Air-Cool Planet www.cleanair-coolplanet.org Resources for colleges and universities

Interfaith Power and Light www.interfaithpower.org—Resources for faith-based institutions

Calculator to determine your personal greenhouse gas emissions www.americanforests.org

BOOKS, REPORTS, AND OTHER WEBSITES

Contraction and Convergence: The Global Solution to Climate Change, Aubrey Meyer, © 2000, Schumacher Briefings

The Party's Over: Oil, War, and the Fate of Industrial Societies, Richard Heinberg, © 2003, New Society Publishers

Power Shift, a special edition of *Grist*, an online magazine that looks at efforts to combat climate change, July 31, 2002, www.gristmagazine.com/maindish/powershift073102.asp

Report on the Sonoma County Ecological Footprint Project: Time to Lighten Up? May 2002, Sustainable Sonoma County, www.sustainable-sonoma.org

State of Denial, a special supplement of The Sacramento Bee, Tom Knutson, lead writer, April 27, 2003. An in-depth look at the way world resources—including oil—feed California's growing appetite. www.sacbee.com/denial

Veridians www.viridiandesign.org For global warming with attitude, this is the site!

Who Owns the Sky? Our Common Assets and the Future of Capitalism, by Peter Barnes, © 2001, Island Press. See also www.skyowners.org

FACTS AND FIGURES

Intergovernmental Panel on Climate Change www.ipcc.ch

Pew Center on Global Climate Change www.pewclimate.org

*Energy consumption is
the most significant environmental metric.*

—Alan Durning, Director,
Northwest Environmental Watch

PROJECT TEAM



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(L to R) Amy Bonczewski—Healdsburg and Windsor intern; Gary Albright—City of Sonoma intern; **Simon Wooley**—Petaluma intern and analyst for fleet data; Hyun Moon—Rohnert Park intern; Dave Erickson—Sebastopol intern, IT expert, number-crunching yeoman, and analyst for employee commute survey; Nettie Lane—project consultant and intern supervisor; Monika Villanueva—Cotati intern.

OTHER TEAM MEMBERS



(L to R) Ryan Bell, ICLEI Technical Assistance Associate , www.iclei.org; Kendra Markle, Skymetrics webmaster & online software designer www.kendramarkle.com; Steve Holsinger, Cloverdale Assistant City Manager; Mike Sandler, Writing assistance & all-purpose inspiration, intelligence, & support; Armando Navarro, Coordinator, Environmental Technology Center, Sonoma State University

CLIMATE PROTECTION CAMPAIGN ELECTED LIAISONS

All are shown in cover photograph with the exception of Dick Ashford, Mayor of the City of Sonoma, who was unavailable for the photo.

GHG INVENTORY PROJECT STAFF LIAISONS

Cloverdale—Steve Holsinger, Assistant City Manager
Steve also conducted the inventory for his city.

Cotati—Dennis Dorch, Assistant City Manager

Healdsburg—Barbara Jason-White,
Assistant City Manager

Petaluma—Mike Moore,
Director, Community Development Department

Rohnert Park—Marlyn Keller, Housing Specialist

Santa Rosa—Marc Richardson,
Assistant City Manager

Sebastopol—Sue Kelly,
Assistant City Manager and Engineering Director

City of Sonoma—Mike Fuson, City Manager

Windsor—Matt Mullan, Assistant Town Manager

County of Sonoma—Chris Thomas,
County Administrative Analyst

WHO'S STANDING FOR CLIMATE PROTECTION?

Let's stop the cynicism and get on with what is possible. We are part of a growing number of government and business people, scientists, clergy, youth, and community people around the globe who see that solutions exist. We don't have to let the world turn to toast.—City of Sonoma Council member Ken Brown, and daughter Eden, 21 months



It is really inspiring when all nine cities and the County can work together on a cause that will make a difference for our future generations. It's all about good planning and having good data, so policymakers can make good decisions.—Petaluma Council member Pam Torliatt, and niece Savannah Torliatt, age 3



I'm for anything we can do to save the climate; every bit helps. The campaign is working in Cloverdale. It's especially important for our children so they will inherit a better place.—Cloverdale Council member Gail Pardini-Plass, and Tallon D'Amico, age 7



The precedent of tackling climate change on a regional basis is so fundamentally important toward solving an issue that is larger than any one of us. Sonoma County's commitment and example of unified leadership has created a common-sense model for this country and beyond. This project proves that a regional approach does make a difference.—Cotati Council member Janet Orchard, and Katie Arnold, age 15

I'd like to see a cooperative effort from government, the community at large and the private sector, first to realize that there is a problem and then work cooperatively to help resolve it. I see my role as helping local government lead the way.—County of Sonoma Supervisor Tim Smith, granddaughter Hailey Mason, age 8



I am confident we can significantly reduce greenhouse gas emissions in Sebastopol, and demonstrate to other communities that sustainable policy is affordable and achievable.—Sebastopol Council member Sam Spooner, and children: Sierra, age 18, Aaron, age 13, and Rowan, age 8



It's really important that we take action now to reduce greenhouse gases so the future generations can enjoy the same quality of life that we have. I don't understand how anyone would be willing to take a risk that they are harming their children or grandchildren by ignoring the signs of climate change, and not try to do something about it—Windsor Council member Debora Fudge, and Florencia Sund, age 15

Council member Debora Fudge, and Florencia Sund, age 15



It all comes down to the legacy we want to leave our kids. If we want them to have the same opportunities we do and if we want to leave the world a better place for them, then we need to take climate protection seriously.

We can act now and make a difference. We can create a legacy of health and hope that is worthy of the effort.—Vicki Videk-Martinez, Rohnert Park and Diane D'Amico, age 10

The inventory is a good thing to help us know our starting point. This program seems reasonable and balanced. Anything radical is too scary for people. I feel we can do a little bit and build on it, and that change will happen slowly and steadily.—Healdsburg Council member Lisa Schaffner, and daughter McKenzie, age 7



It's an issue that is going to involve all of us, each doing our part.—Santa Rosa Council member Jane Bender, and grandson Devon Koons, age 3



On the Front Cover: The photographs above and on the front cover were taken at Luther Burbank's Home and Gardens in downtown Santa Rosa. Luther Burbank was an extraordinary horticulturist of the early twentieth century who called Sonoma County "the chosen spot as far as nature is concerned." Solar panels, hybrid and electric vehicles represent some of the technologies to help us create a positive future.