# Local Actions to Address Climate Change

## Originally prepared for the Sonoma County Community Target Setting Workshop May 21, 2005

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**Preface**

Our aim is for people in Sonoma County, enlivened by the prospect of creating a positive future for our children and all life, to achieve such resounding success that we inspire communities worldwide. We have already made great strides toward this aim. The County of Sonoma and its nine cities set a national precedent in 2002 when all pledged by resolution to protect the climate.

However, we recently studied Sonoma County's emissions and found that greenhouse gases increased 28 percent between 1990 and 2000 – double the national rate.

We offer this draft paper - a work in progress - as a vision of solutions that can lead to significant reductions in our greenhouse gas emissions. The draft is a starting point to stimulate discussion, debate, and ultimately, progress – a path negotiated between scientific and political realities. We will continue to develop the ideas in this paper, and invite your feedback, comments, and suggestions to help us do so.

A "brain trust" of local experts, whose names are shown at the conclusion of the paper, each generously wrote a section for this paper. Dave Erickson, Analyst for the Climate Protection Campaign, conceived of this paper, assembled and guided the contributors, and wrote many parts of this paper as well. Dave then condensed the whole paper to customize a draft for workshop participants. A longer version with more footnotes and other references will be available on our website.

We gratefully acknowledge the individual donors and local governments whose funding supported this paper as well as the overall community target setting process. - *Ann Hancock, Director*

*Big vision, bold action*
*www.climateprotectioncampaign.org*

*The mission of the Climate Protection Campaign is to create a positive future for our children and all life by inspiring action in response to the climate crisis. We advance practical, science-based solutions for significant greenhouse gas reductions.*

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## Introduction

Action is required on all levels from global to local to protect the climate. Sonoma's local governments follow the Cities for Climate Protection® program led by ICLEI – Cities for Sustainability. Over 600 local governments worldwide also follow this program whose motto is "local action moves the world."

The "scientific imperative," the goal dictated by current scientific evidence, indicates that greenhouse gas emission reductions of 50 to 70 percent from current levels are needed to assure that human societies remain in balance with the abilities of natural systems to sustain them. Reducing emissions by lesser amounts will not avert profound and destructive changes in the global climate, scientists tell us. Fossil fuel consumption and deforestation are changing the most basic element of our environment - our climate.

If a transition in the way energy is used and produced does not begin now, the damage to the atmosphere will produce dangerous and long-lasting changes in the climate. The goal of the energy transition is to emit no more carbon dioxide ($CO_2$) and other greenhouse gases than it can re-absorb.

Methods for using energy more intelligently, and for producing it cost-effectively without fossil fuels, exist today. Local initiatives are beginning the transition to these methods. The longer such action is delayed, the more destructive the changes to the climate will be, and the more expensive and draconian the required response will need to be. In contrast, climate protection benefits are plentiful and far-reaching. Solutions to climate change, rather than being a drag on the economy, will stimulate the economy in new ways.

The purpose of this white paper is to present and begin discussion of a comprehensive set of technically grounded, economically feasible, and locally appropriate solutions. These solutions suggest how a transition to zero carbon can be achieved in each Sonoma County carbon-emitting sector. The proposals embody a "lowest cost, least time" strategy for achieving "carbon neutrality," a state in which no net carbon increase will occur in the atmosphere due to human activities.

Actions we propose in this paper represent both technological solutions and policy actions. We address the demand side – consumption - and the supply side of fossil fuel use. We attempt to answer the question, "If we are to reduce our net GHG emissions to zero as quickly and completely as possible, what are the actions that we will need to take at the local level?"

## The Scientific Imperative:

### Scientific Support for Dramatic Reductions

The following is a summary of the findings of the Intergovernmental Panel on Climate Change (IPCC) that shape our program of recommendations.[i]

- The global average surface temperature increased over the 20th century by about 0.6°C.
- Temperatures have risen during the past four decades in the lowest eight kilometers of the atmosphere.
- Snow cover and ice quantities have decreased.
- Global average sea level has risen and ocean heat content has increased.
- Changes have also occurred in other important aspects of climate.
    - Increase in precipitation
    - Increase in heavy precipitation events
    - Increase in cloud cover
    - Decrease in extreme low temperatures, increase in extreme high temperatures

The IPCC has concluded that the warming described above is due to human activity. It states:

> "Emissions of greenhouse gases and aerosols due to human activities continue to alter the atmosphere in ways that are expected to affect the climate."[ii]

Among the most striking findings:

- The atmospheric concentration of carbon dioxide ($CO_2$) has increased by 31% since 1750. The present $CO_2$ concentration has not been exceeded during the past **420,000 years** and likely not during the past **20 million years**. The current rate of increase is unprecedented during at least the past **20,000 years**.[iii] (Emphasis added)

- About three-quarters of the anthropogenic emissions of $CO_2$ to the atmosphere during the past 20 years are **due to fossil fuel burning**. The rest is predominantly **due to land-use change, especially deforestation** [ii] (Emphasis added).

The IPCC states, "In the light of new evidence and taking into account the remaining uncertainties, most of the observed warming over the last 50 years is likely to have been due to the increase in greenhouse gas concentrations[iv]."

The IPCC uses scenarios to project possible stabilization levels for atmospheric $CO_2$. The most optimistic scenario predicts $CO_2$ levels to stabilize in the atmosphere at a level almost 50 percent higher than today, resulting in an increase of between one degree and three degrees Celsius by the year 2100. The lowest stabilization level is only attainable if annual emissions of $CO_2$ start to decline within the next 30-40 years.

The least optimistic scenario predicts a three to six degree Celsius increase by the year 2100. More recent experiments with more accurate models show that an even larger increase in temperature can be expected for a given concentration. In other words, greenhouse gas emitted into the atmosphere today will impact the climate long into the future.

To prevent unprecedented and unknown effects on the climate, actions must be taken to stabilize the concentration of $CO_2$ in the atmosphere. More specifically, the IPCC states that to prevent the future increase in $CO_2$ concentration due to human activities, human-caused $CO_2$ emissions would ultimately have to be reduced to the level of persistent natural sinks. This statement is referred to as the scientific or the ecological imperative.

## Conclusions

Data from the IPCC lead to the following conclusions:

- Anthropogenic greenhouse gas emissions are increasing concentrations of these gases in the atmosphere at an unprecedented rate.
- These emissions are responsible for most of the increase in the global average temperature that has occurred in the last 50 years.
- If emissions are unchecked, this temperature increase will cause major changes in the climate, sea level rises and increases in extreme weather events over the next 100 years.
- Fossil fuel combustion and deforestation must be minimized or stopped in order for atmospheric $CO_2$ concentration to stabilize.
- Stopping fossil fuel combustion and deforestation must happen as rapidly as possible in order to stabilize atmospheric $CO_2$ concentration at a safe level.

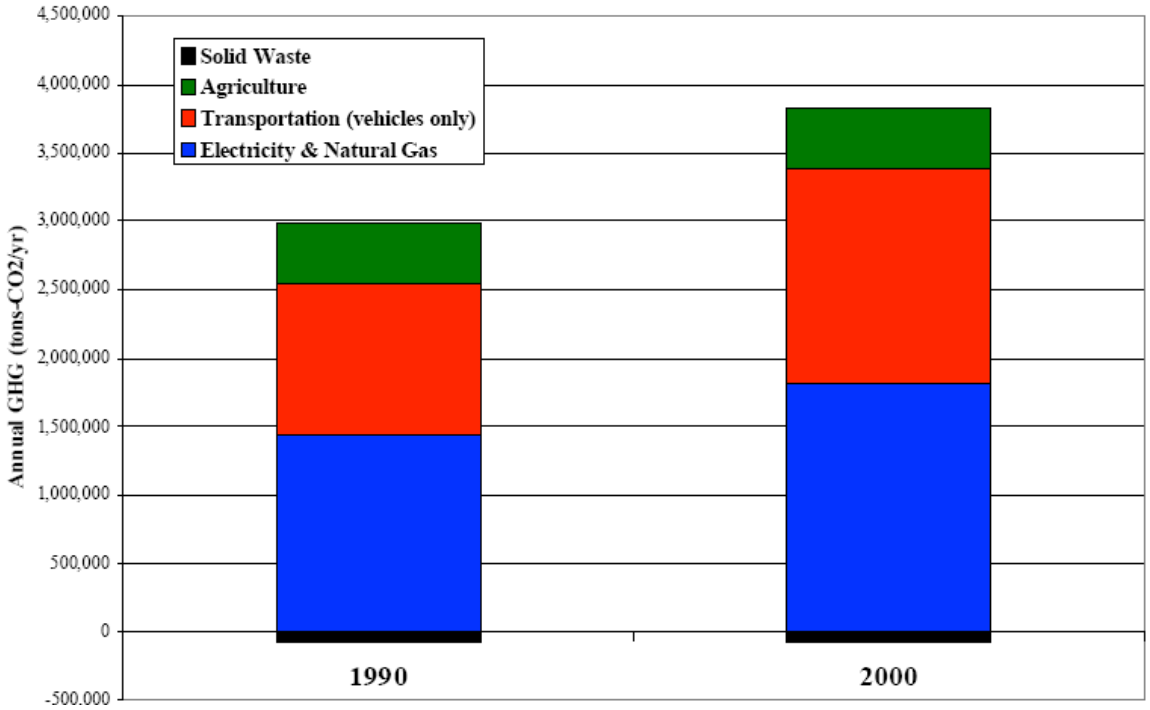
The IPCC recommends policies and practices at the international and national levels to bring about decreases in anthropogenic greenhouse gas emissions. There must also be a robust effort at the local level where implementation ultimately occurs.

Reducing our dependence on fossil fuel has broad benefits - improving public health, strengthening the local economy, safeguarding the environment, enhancing national security, and ensuring a vibrant future for our children and all life.

## Fundamental Drivers for Reductions:

### Sonoma County Baseline Emissions

The recently completed greenhouse gas inventory for Sonoma County identifies the growth trends and the largest emissions sources in the county. Summary results follow.




In the year 2000, electricity and natural gas use increased by **26%** from 1990. Emissions from electricity and natural gas use represent 47% of the total emissions from the county.

Electricity and natural gas use in both the industrial and commercial sectors increased by **36%**. Use in the residential sector was up **18%**. In the transportation sector, emissions increased by **43%** from the 1990 level. The transportation sector makes up 42% of total emissions. Emissions from agricultural operations decreased by 4% from the level in 1990. Agricultural emissions made up 11% of the total in 2000.

Overall, greenhouse gas emissions increased 28% in Sonoma County versus 14.2% nationwide. Sonoma County's population increased 18% during this same period, from 388,222 to 458,614.

Some other results from the inventory:

- Per capita emissions from residential electricity and natural gas use stayed constant at 2.1 tons.
- In the commercial sector, "per employee" electricity and natural gas use was up 12%, but "per establishment" use was up 27%.

- In the industrial sector, "Other" electricity and natural gas use was up 101%. This category includes street lighting. However, "Other" emissions are only 3% of the total from electricity and natural gas use.
- One major factor in the vehicle emissions is that Sonoma County has the highest single occupant vehicle transportation mode (72%) of any county in the Bay Area except Napa County.
- Sonoma County emissions from electricity and natural gas use were up 26% compared to 11.6% for Marin and 3% for San Francisco.
- Sonoma County emissions from transportation were up 43% compared to 7% for Marin and 4% for San Francisco.
- Marin and San Francisco populations both increased 7%, compared to 18% for Sonoma.

These results suggest how Sonoma County might prioritize efforts to approach its emissions reduction goals. Transportation, new development, and electricity and natural gas use in existing applications each have unique challenges to shift to non-fossil fuel energy sources.

## The Local Energy System:

### Powering Sonoma County with Innovation

#### Overview

Sonoma County's total greenhouse gas emissions increased 28% from 1990 to 2000. Electricity and natural gas use in the residential, commercial and industrial sectors account for 47% of the total. Emissions from both the commercial and industrial sectors grew by 36%, while emissions growth in the residential sector was in line with population growth for the county at 18%.

In Sonoma County today, most of the electricity used comes from large power plants located either in California or in neighboring states. Between 45% and 50% of the power delivered to Sonoma County comes from fossil fuel fired power plants. This electric power is delivered to homes and businesses using the transmission and distribution (T&D) infrastructure, also known as "the grid."

#### Strategy

There are two basic paths for removing carbon from the electricity and natural gas system: *reduce demand* and *transition supply to non-greenhouse gas emitting energy sources*. These are known as "demand side" and "supply side" solutions.

#### Possibilities for Action

- Aggressively deploy energy efficiency measures throughout the residential, commercial, industrial and government sectors.
- Implement demand management strategies to save money and reduce peak demand.
- Establish a Community Choice Aggregator (CCA), preferably including Marin County, encouraging the deployment of distributed generation capacity.

- Make county energy consumption information available to the public on a geographic or neighborhood basis. This will enable individuals to track and compare power consumption, giving needed feedback for effective energy management choices.
- Make real time pricing information available to the public. This system shows the true cost of electricity being used at every hour of the day. This is "feedback" that allows decisions to be made more intelligently about when to use power.

## New Development:

### Today's Construction Decisions Have Vast Reach into Tomorrow's Climate

### Climate Protecting Principles for New Development

- Build inside existing urban boundaries to reduce travel to services and amenities.
- Concentrate construction in existing downtown core areas.
- Incorporate mixed-use (live/work) new units or add residential units above existing commercial. Alternatively, fill-in (build next to) residential among existing commercial uses
- Make development pedestrian and bicycle oriented, which means wider sidewalks, dedicated bike paths, narrower streets, smaller turning radius, and "eyes on the street" orientation of living areas.
- Encourage higher densities in downtown core areas and near transit hubs.
- Redevelop core areas to replace on-grade parking that presently exists in downtown areas with high density residential.
- Require that new development outside downtown cores and inside urban boundaries include photovoltaic or other renewable energy generation systems that produce more than 100 percent of net new energy demand, thereby offsetting emissions from existing buildings.

### Possibilities for Energy Demand Reduction in New Residential Development

Requirements that follow are intended to create strong incentives for maximizing energy efficient design and construction, building orientation, and use of $CO_2$ neutral materials.

- Grant priority processing status to projects in which the entire development demonstrates a zero net energy demand from its buildings.
- Require zero net energy calculations for project approval.
- Require that the net $CO_2$ produced in the materials used in the buildings' construction be offset by energy (electric or thermal) produced by new projects.

## Commercial Buildings

Eliminating GHG emissions due to energy use in commercial buildings must involve two paths:

- Achieve no new net carbon emissions for new commercial buildings;
- Prepare the existing commercial building stock of all the county's cities for the installation of distributed renewable energy to replace fossil fuel power sources.

These paths can be most effectively realized as follows:

- Commercial buildings consist of a “warm shell” (meaning a building envelope with heating and cooling) and tenant improvements. In commercial building construction, cities should treat the shell the same as new residential construction, i.e. zero net energy demand for any new project’s buildings.
- Commercial buildings have large surface areas that can be put to immediate use for solar panel placement and thus renewable electricity generation. Such installations could be placed on roofs as well as on neighboring buildings from which they accept solar photovoltaic easements.
- Cities within the county should sell solar photovoltaic easements for all of their own available roof space.

## Existing Buildings:

### Enormous Opportunities for Rapid Reductions

To achieve maximum GHG reductions, ambitious energy efficiency measures must be immediately pursued for existing buildings, including residential, commercial and industrial structures. Existing grid-connected buildings use whatever fuel mix is available on the grid. Therefore, passive collection of solar light/heat, wind and "cool-th” is the most effective basis of design for zero carbon emissions.

A simple and obvious way to start using less energy in buildings is to encourage people to wear climate appropriate clothing instead of turning up the heat or air conditioning. People can do most of the energy efficiency tasks that are performed by automated control systems in large buildings. These tasks include turning off lights, computer monitors, equipment, furnaces, and air conditioners when not needed.

Some energy efficiency methods take more training and thought such as opening and closing windows at the appropriate time to cool and ventilate. Another effective energy-saving strategy is opening and closing existing blinds. Installation of new sunshades and light shelves can produce optimum daylighting and solar heat gain. Turning down ambient lighting and using display and task lighting can further decrease energy use.

The financial benefits of saving energy can result in immediate benefits for building occupants. Some cash strapped schools are using these methods and sharing the utility savings with the teacher's book and supply budgets.

We must design, build and operate our buildings (and live) as if energy is very precious. Photovoltaic (PV) and other renewable electricity generation is a key component in design because of our dependence on electrical devices. However, heating and air conditioning system energy can usually more efficiently use waste heat, cogeneration, or renewable biofuels than PV electricity. Therefore, the focus must be on demand side measures. Efficiency measures can reduce energy use by up to 70 percent. Natural gas must ultimately be replaced by a non-fossil alternative fuel, or by renewably generated electricity.

Operating buildings in a more climate responsive, resource and energy efficient manner is the lowest cost way to begin our quest for lowered carbon emissions. Effective operation of buildings requires the involvement of occupants, maintenance and operational staff. For example, just having students and teachers turn off the lights and shut the doors of unoccupied rooms has saved schools as much as 25% on their utility bills.

### Possibilities for Action

Make existing building structures more energy efficient. Building energy efficiency can be improved dramatically by simple and sensible retrofits. Improvements can be made when building ownership changes or when remodeled. Modifications could include:

- Add operable windows
- Add solar shading
- Add appropriate skylights
- Change windows to high performance
- Change to cool roof
- Add insulation
- Change to climate appropriate support systems such as natural ventilation, passive heating and cooling, and good daylighting
- Improve lighting, heating, ventilating, and air conditioning efficiency

Operate buildings more efficiently through measures such as:

- Onsite waste water treatment
- More trees planted to mitigate urban heat island
- Automated control systems or building operation policies, for example, open windows to cool and ventilate, sun shades and light shelves for daylighting control, and turning off lights when not needed.

Other measures to reduce energy use in existing buildings:

- Increase the use of energy efficient appliances and office equipment.
- Appoint an energy manager in commercial buildings.

## Government's Role:

### True Leadership Opportunities for Local Governments

Government policies can be instituted to affect both existing buildings and new development. As well, government operations can also move toward zero net carbon. The measures below, presented as bold ideas for broad discussion, would decrease energy use both in government operations and in the community as a whole.

### Possibilities for Action

- Initiate Community Choice Aggregation (CCA) and a regional energy authority to maximize energy purchasing power, planning and savings to government and the community. Renewable portfolio standards can also be implemented for local power

consumers via the CCA

- Initiate government workforce measures that reduce energy consumption and reward conservation, from commute habits to workplace energy use.
- Include as part of any environmental review for new projects the anticipated GHG emission impacts of the project and how they will be fully offset to result in zero net carbon emissions.
- Assess and reduce energy consumption by government operations including the water agency, sanitation districts, and general services and public works departments.
- Initiate policies in the General Plan and Zoning Ordinances and Codes that encourage energy efficiency.
- Consider instituting a local gas tax to raise revenue to implement public programs to address greenhouse gas emissions and energy saving.
- Plan with state and federal agencies that build projects in Sonoma County to increase energy efficiency and reduce GHG emissions.
- Initiate planning with local business to increase energy efficiency and decrease greenhouse gas emissions.

## Transportation:

### Tough Choices, Greatest Promise

Sonoma County residents are very dependent on vehicles circulate. People who would rather bike or take mass transit generally find it inconvenient and sometimes even impossible or dangerous to do so. Transportation accounts for 42% of GHG emissions in Sonoma County. There are several basic ways that carbon in the passenger transport system can be reduced or eliminated.

### Possibilities for Action

Encourage more efficient vehicle use

- Match vehicle types to passenger trips, encouraging the most efficient mode of travel for the type of trip taken.
- Encourage urban-centered growth that increases population density and makes mass transit such as bus and rail more feasible, efficient, and effective.
- Construct all planned bicycle paths to make Sonoma County more accessible by bicycles and walking.
- Correct transportation finance structures so single occupant vehicle travel is not subsidized, thus raising the price of fossil-fuel intensive travel.
    - Separate the cost of parking from commercial and residential leases and rentals.
    - Reduce requirements for on site parking for commercial and residential development. Permit conversion of current parking spaces to higher uses.
    - Levy tax per parking space, coupled with permission to land owners to pass costs through to drivers.
    - Allow neighborhoods, both residential and commercial, to rent out parking spaces at their curbside.

- Charge market rates for parking, even for access to transit.
- Segregate transportation related expenses within municipal budgets and offset them with taxes or fees paid by transportation users.
- Levy land taxes on the land underlying roadways, with the taxes paid by road user fees.
- Institute a county fuel tax increment.
- Change the way motorists pay for their travel: shift annual payments into payments "by the mile" or "by the hour" wherever practical.

Make Vehicles More Efficient

- Provide incentives to encourage individuals to choose fuel-efficient vehicles.
- Use a renewable carbon fuel, for example, biodiesel, ethanol, and hydrogen from renewable sources (electrolysis)
- Use electric vehicles powered by renewably generated electricity when possible.

## Water and Wastewater:

### Many Channels for Savings

Water distribution, storage, and end use and waste treatment/discharge are among the largest single users of energy for most municipalities.

Water pumping is energy intensive, with much of it occurring during peak electricity periods. Water use at the customer level requires energy for heating, and sometimes cooling and pumping. Wastewater treatment requires energy for aeration, pumping, and increasingly for ultraviolet disinfection. Water systems and wastewater treatment plants often represent older infrastructure, and were not designed with energy efficiency in mind

Water demand in Sonoma County, although positively impacted by water conserving measures, is increasing and so is the energy associated with its delivery. Energy use for wastewater is increasing much faster than the rise in water demand, because of increasingly stringent regulatory requirements for discharge and reclamation.

### Toward Lower Energy Requirements

Technical measures for reducing greenhouse gas emissions from water and wastewater systems fall into four basic categories:

- Reduce demand for water
- Maximize pumping energy efficiency
- Minimize energy intensity of wastewater treatment processes
- Maximize energy recovery
- Cut peak power demands

### Possibilities for action

- Maximize use of the most energy efficient technology and practices in all aspects of operations, primarily in water pumps and wastewater treatment aeration and disinfection.

- Shift to less energy intensive wastewater treatment processes as older plants are retired.
- Invest money earmarked for capital projects in demand reduction programs first. It is less expensive to pay for demand reduction measures than for new supply infrastructure.
- Maximize opportunities for energy recovery from waste water treatment and water system operation, including:
    - Installation of small-scale hydropower at strategic locations in water distribution systems.
    - Expansion of biogas cogeneration at wastewater treatment plants.
    - Integration of wastewater residuals management with energy recovery and composting at landfills.

## Solid Waste:

### Expand Sonoma County's Landfill Gas Conversion Program

Discards or solid wastes (non-wastewater) from human activities in Sonoma County can be classified into many categories. Discards are classified as

- Waste going to disposal, i.e., into a landfill;
- Discarded materials being recycled, i.e. bottles, cans, newspaper, etc., that are collected and then transferred out of the county for use as raw materials in manufacturing activities
- Organic wastes that are collected and transformed through composting into soil amendments locally
- Discards that are redistributed for re-use, i.e., clothing donated to thrift stores, or other reuse programs.

Recycling has been shown to reduce energy use when compared to production using virgin materials with substantial savings for materials such as aluminum. As well, there are significant environmental benefits from returning organic material to the soil. Reuse also reduces energy use.

### Possibilities for Action

- Increase productive use of the landfill gas generated by Sonoma County's Central Disposal Site by generating electricity and using the landfill gas for fuel in buses and other county vehicles
- In the Countywide Integrated Waste Management Plan adopted in 2003 is a provision for increased diversion of organic waste from the waste stream. Appropriate siting of an anaerobic digester facility would allow for methane recovery from this waste stream.
- Modification of city hauling franchises to enable collection of food waste

## Agriculture:

### Great Potential to "Close the Loop"

In no other area of our local economy is the correlation of carbon generation and carbon sequestering more direct than in agriculture. In Sonoma County, vineyards and dairies account for most agricultural activity, both for land used and for revenues generated.

While production processes of both wine and milk emit GHGs, rangeland and vineyards serve to sequester carbon. Much of the $CO_2$ that is released during the production process is "new" carbon, i.e., recently "fixed", as opposed to ancient carbon in fossil fuels such as petroleum.

Both the dairy and wine communities still view manure, pomace, lees, and vineyard canes as "waste" that has to be disposed of in the most cost-effective manner. Ideally they would instead "close the loop" by considering each of these "wastes" as a resource to recapture and utilize. This recapture and reuse can generate additional revenue.

### Possibilities for Action

Replace diesel with alternative fuels

- Encourage dairies and grape growers to use alternative fuels such as biodiesel.
- Decrease fuel use in irrigation operations by improving pump efficiency.

Use methane for power generation

- The wastewater storage ponds at dairies and wineries emit methane.
- Capture the methane for energy generation.
- Capture energy from burning agricultural waste. Promote development of biofuel electricity generating facilities where prunings from vineyards and orchards are burned.

Sequester carbon

- Carbon sequestration can be increased by:
- Maximizing and diversifying vegetation in and around the vineyard.
- For dairies, the increase in stream setbacks and restoration of riparian habitats can be permanent contribution to carbon sequestering
- Taking advantage of tax benefits by placing land in conservation easements.

Use alternative fuel sources

The current agricultural "waste" in the County has the potential to be collected, centralized and converted to renewable energy. This can be done either by bioconversion plants or by anaerobic digestion facilities.

## Forests:

### Minimize Disturbance and Loss of Sonoma County's Forests

Sonoma County's forest sector will play a significant role in the County's efforts to minimize its climate impacts. Forests are a source of $CO_2$ emissions as well as a $CO_2$ reservoir. Forests naturally absorb $CO_2$ from the atmosphere and store it as carbon in their biomass (e.g., branches, trunk, roots etc.). However, when forests are disturbed through activities such as deforestation and harvest, their carbon stocks are released as $CO_2$ back into the atmosphere both immediately and over time. On a global level, forests are responsible for at least 20% of the world's $CO_2$ emissions – largely due to forest loss.[1]

This pressure of forest loss, and the concurrent loss of forest-based climate benefits, will continue as the drivers of forest loss continue. The root causes of forest loss are a confluence of factors that include, but are not limited to, increasing management costs, rising real estate values, global competition, population pressure and high turnover of corporate and family forest ownership. These factors contribute to forestland fragmentation and parcelization, which is the one-way path to conversion. As these forests are lost to non-forest uses, their existing climate benefits, as well as their future capacity to achieve climate benefits are lost for the long-term, not to mention their other attendant benefits of water quality, habitat and biodiversity.

### Possibilities for action

Sonoma County can:

- Facilitate the sale of GHG emission reductions from private forestlands
- Require the creation of a $CO_2$ mitigation fund financed by developers for any new developments.
- Initiate planning with state and federal agencies to develop policies that facilitate forest activities in the County that achieve greenhouse gas reductions

[1] Millennium Ecosystem Assessment Synthesis Report (Pre-publication Final Draft, March 23, 2005)

## The Restorative Economy:

### Robust and Satisfying Business Activity that will be Here to Stay

Eliminating or offsetting greenhouse gas emissions associated with business activity in Sonoma County carries with it the promise of a stronger and more resilient local economy. We will export less wealth for the purchase of fossil fuel, and its support infrastructure, while investing more in the design of practically everything that we do and build. The economic ramifications of addressing the fundamental ecological imperative of mitigating rapid climate change are large and beneficial over the long run.

Foundations of a restorative economy are already present in Sonoma County. Exponential growth in green building, organic agriculture, and increasingly sophisticated discourse about public policy have raised awareness, competence, and expectations about our ability, if not responsibility, to design an economy that will endure for the long haul. Sonoma County may well be an incubator for new practices that will benefit both the climate and quality of life.

As a first step, business people, educated about sustainability principles and informed by the best work of their peers, could create a strong vision statement for Sonoma County that describes a future when economic activity generates no net GHG emissions. This statement would be an inspiration around which others may align. The next step would be for representatives of various sectors of Sonoma County's economy to convene separately and interpret the vision within their own area of experience: what would their future look like?

### Systems View of the Economic System

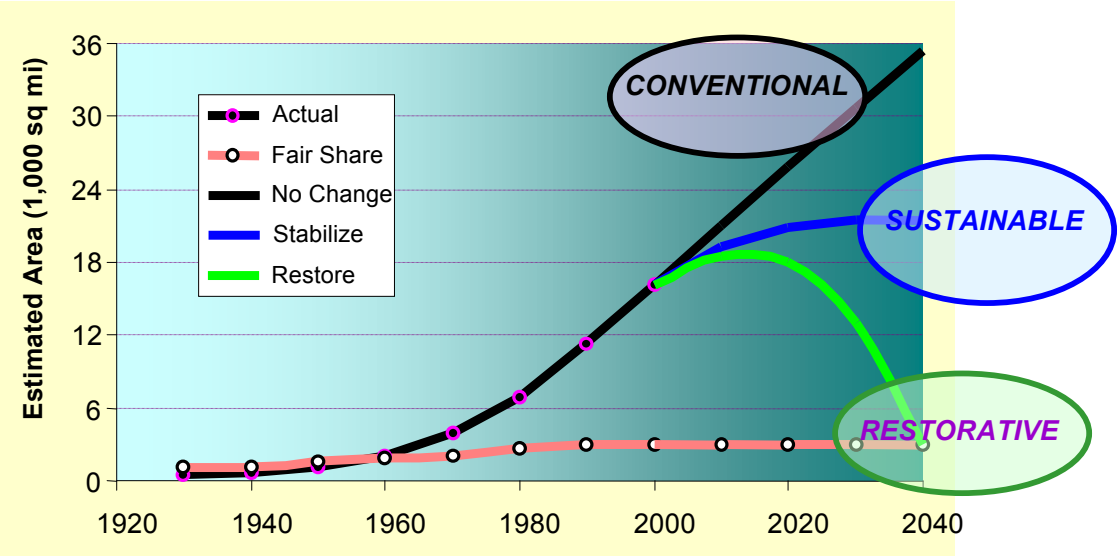
Local government authority, especially as expressed with well-designed, general plans, building codes and utility planning, can be utilized to support GHG emission reductions. Through the collaboration and alignment of public, private, and nongovernmental interests, aided by incentives designed to leverage market forces, significant results can be achieved.

With a systems view we can begin to "connect the dots" and manage the whole effectively. This approach entails designing and implementing strategies that reduce emissions across the entire economy over time.

The chart that follows depicts the Ecological Footprint for the County relative to the County's fair per person share of the Earth's natural resources, and provides a way to envision whole system management for Sonoma County. Greenhouse gas emissions constitute a large fraction of the County's Ecological Footprint. Three policy choices are depicted: Conventional, where the current trend remains unchanged; "Sustainable[2]," where growth in the County's demands on nature is arrested; and Restorative, in which consumption trends are reversed and reduced to a level that is workable for the long haul.

[2] where the idealized endpoint is to achieve zero environmental impact for, say, a new structure. This typically disregards pre-existing GHG sources, and follow-on GHG impacts perhaps generated by the new structure (e.g., transport).

*Policy Choices for Sonoma County relative to its Ecological Footprint*




## Possibilities for Action

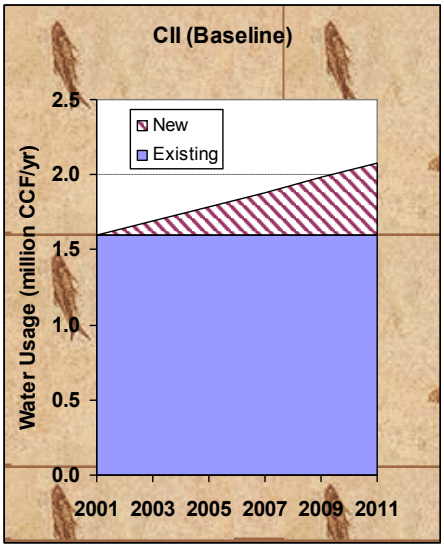
Community Choice Aggregation (CCA) is a novel and effective way to quickly reduce GHG emissions while simultaneously delivering economic benefit. This can succeed as a stand-alone project, and it may serve as the framework within which an extremely powerful and integrated suite of services evolves.

## New Housing

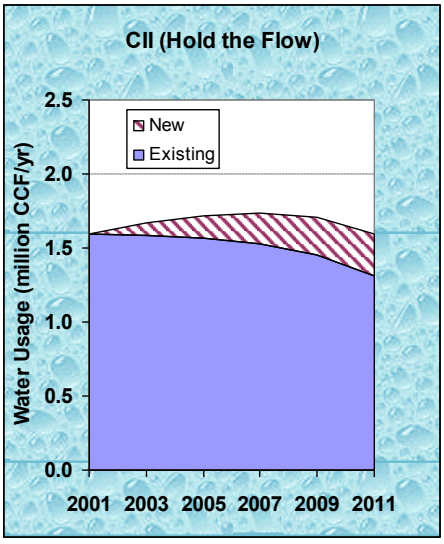
- Homes will generally be smaller than today, and will be primarily located in urban infill areas to minimize traditional transportation needs.
- Homes will be exceptionally well designed for both functionality and resource efficiency.
- Homes will be equipped with sufficient on-site renewable electric and thermal energy sources to offset GHG emissions created by occupants (home energy, transportation, and lifestyle needs).
- Excess electricity will feed the local grid, as new homes will be anticipated in the CCA's growing fleet of distributed generation resources.
- Developer teams will include stakeholders in addition to those who are normally part of the process: local employers, shared car service providers, civic groups, and so forth.
- Banks are likely to play an important role in the process, as these new housing products will be more affordable and attractive than existing stock.

## Water

- CCA provides an ideal opportunity to deploy water efficiency services to water users far more effectively than they have ever been offered before. The charts below show how through utilization of carefully-applied economic incentives, overall water use and costs can be reduced without curtailing services.




**Public Cost to Support:**
$17 million (Present Value)




**Public Cost to Support:**
$10 million (Present Value)

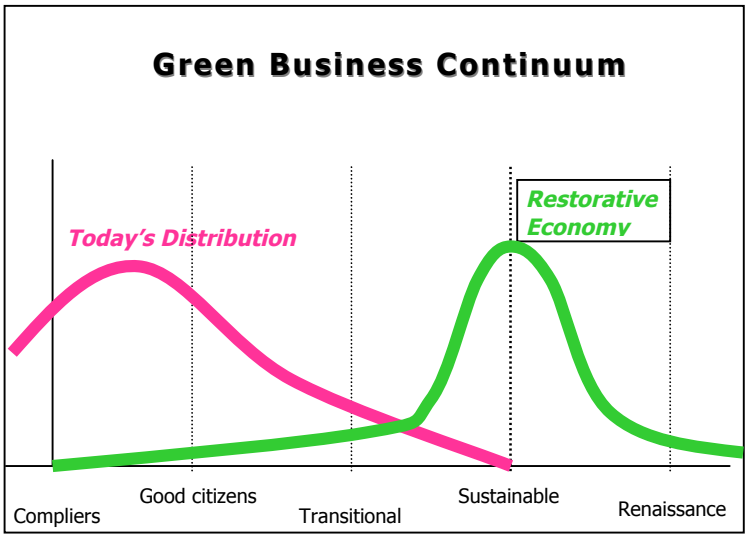
## Agriculture

Sonoma County's dairy farms provide one example of a unique opportunity to add a new source of renewable electricity for a local CCA that will simultaneously deliver a multitude of benefits, including:

- Eliminate a significant source of GHG emissions (methane, a powerful greenhouse gas, otherwise emitted from manure ponds);
- Eliminate manure odor, flies, and other nuisances;
- Assist local conversion to organic agriculture by improving the quality and handling ease of natural fertilizer, and the health of the soil;
- Further reduce the possibility of groundwater pollution and runoff into the Gulf of the Farallones National Marine Sanctuary; and
- Improve the profitability of local family-owned dairy ranches, thereby helping to preserve both a way of life and the open viewsheds they provide to passersby

### The Role of Business in a Restorative Economy

New businesses that deliver services while also restoring our environmental and social fabric are key to a healthy and prosperous future. The positive impacts of restorative businesses will offset the impact of businesses that continue to emit greenhouse gas. The following chart suggests how such business can evolve.




This chart is based on ideas created by economist Jim Haugland of EPA Region 5.

## Glossary of Terms and Phrases

**Atmospheric CO2 Stabilization:** Enabling the CO2 in the atmosphere to fluctuate normally at the level where it is not being driven by human activities. Accomplished by stopping or radically curtailing fossil fuel combustion and deforestation.

**Anthropogenic Emissions:** Emissions caused by human beings.

**Carbon Neutral:** Causing no increase of carbon in the carbon cycle.

**Carbon Sequestration:** Capturing and holding carbon in long term storage.

**Climate Change:** Long term change in the average temperature, rainfall and storm event pattern, including frequency and severity of storms.

**Community Choice Aggregation:** Community power buying arrangement created under state law AB 117. It allows communities to "aggregate" or combine their total electric use into a single unit, and bargain directly with power generators to purchase and sell electric power.

**Demand Side:** Referring to measures that change the demand for or the use of some resource. Usually refers to efficiency improvement measures or measures that affect consumption.

**Draconian:** Particularly severe.

**Ecological Footprint:** A measurement technique that quantifies human impact in terms of the area needed to sustain it.

**Fossil Fuel:** A fuel created from ancient deposits formed by decomposed organic matter that has been subjected to extreme pressure and temperature. Examples: crude oil, coal, natural gas.

**Greenhouse Gas:** Any of several gases including carbon dioxide, methane and water vapor that trap heat in the Earth's atmosphere. Increasing concentrations of these gases, particularly carbon dioxide, are causing climate change due to global warming. Carbon dioxide is given off when something containing carbon, such as fossil fuel, is burned.

**Intergovernmental Panel on Climate Change (IPCC):** An intergovernmental body comprised of over 2,000 scientists established by the World Meteorological Organization and the UN in 1988 to study human effects on the climate. The world authority on climate change.

**Natural Sink:** Something in nature that absorbs and holds. When applied to greenhouse gases, particularly carbon dioxide, natural sinks would include the ocean and most living things.

**Net Zero Carbon:** Describes a state of functioning where no new carbon is added to the Earth's carbon cycle. Similar to carbon neutral. Refers to the ability of activities to absorb or offset carbon as well as emit it.

**Photovoltaic:** Generating electricity when exposed to light. Refers to the technology behind solar electric panels.

**Restorative:** Going beyond simply preventing further damage to the environment, to repairing the damage already done. Returning to a natural state of healthy function.

**Scientific Imperative:** The scientifically proven and demonstrated need to achieve reductions of 50 to 70 percent or more in human generated greenhouse gas emissions, specifically from fossil fuel combustion, in order to avoid dangerous changes in the Earth's atmosphere.

**Supply Side:** Referring to measures that affect the production or generation of some resource. Usually refers to electric power generation or energy production or supply.

**Sustainable:** The characteristics or qualities of: 1) Being constantly renewed, not depleting or depending on non-renewable resources. 2) Ability to exist indefinitely. Not acting in a way that jeopardizes long term survival.

When applied to human development of the natural world, the most frequently quoted definition is from the report *Our Common Future* (also known as the Brundtland Report):

> **"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."**

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[i] http://www.grida.no/climate/ipcc_tar/wg1/005.htm
[ii] http://www.grida.no/climate/ipcc_tar/wg1/006.htm
[iii] http://www.grida.no/climate/ipcc_tar/wg1/096.htm
[iv] http://www.grida.no/climate/ipcc_tar/wg1/007.htm