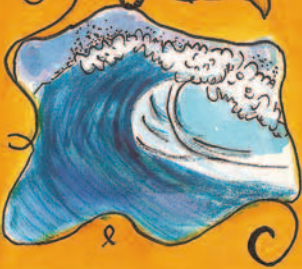


WITH LOTS OF INFORMATION AND A CALL TO ACTION.

INCLUDING A TIMELINE, TALES FROM THE CLIMATE CHANGE ZONE, ETC.



THE  
VENTURA  
CLIMATE  
CHANGE  
COUNTY  
ALMANAC





The Ventura County  
**CLIMATE CHANGE**  
ALMANAC



*"We know what the  
problem is. We know what  
we must do.*

*Now is the time to do it.*

*Now is our moment."*

- United Nations Secretary-General Ban Ki-moon


[www.vcapcd.org](http://www.vcapcd.org) • [www.airthefilm.org](http://www.airthefilm.org)

Concept, research & text: Barbara L. Page, Public Information Manager

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# Acronyms

AB32	California Global Warming Solutions Act of 2006
ARB	California Air Resources Board
BedZED	Beddington Zero Energy Development
CalEPA	California Environmental Protection Agency
CFCs	chlorofluorocarbons
CFLs	compact fluorescent light bulbs
CO <sub>2</sub>	carbon dioxide
District	Ventura County Air Pollution Control District
GCC	global climate change
GHG	greenhouse gas(es)
IPCC	Intergovernmental Panel on Climate Change
LE CZ	low elevation coastal zone
NASA	National Aeronautics and Space Administration
PPM	parts per million
SCAG	Southern California Association of Governments
UNFCCC	United Nations Framework Convention on Climate Change
U.S. EPA	United States Environmental Protection Agency
VCAPCD	Ventura County Air Pollution Control District



“Here at the District, we believe that climate change may be the most significant environmental challenge mankind has ever faced. An informed public will be critical to successfully implementing actions to deal with this issue.”

– Mike Villegas, Ventura County  
Air Pollution Control Officer

## What's in a name?

It's been called lots of things. Global climate change. Climate protection. Climate crisis. And, of course, the classic--global warming.

Seems no one can agree on what to call it. But no matter the name, one thing is certain: **it is an overwhelming issue that will require more political, community, and individual will than we've mustered in a long time--perhaps ever.**

How did climate change manage to hit all our national and international hot buttons in the last few years? After

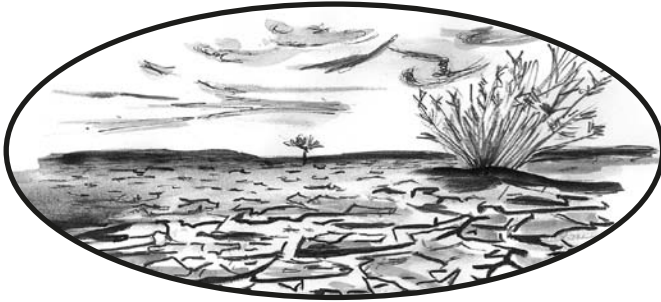
all, it isn't exactly a fast-breaking news feature.

Some reporters even say, as a story, “It oozes but doesn't break.” Since it occurs over long periods of time and often at great distances from

the United States, it lacks the dramatic appeal of other national issues. Unlike crime, there's no single highly-visible “bad guy (or gal).” It happens incrementally. News outlets don't report that climate change arrived at 4:47 a.m. yesterday. But as scientific experts from all over the world produce reports on the effects of climate change, international attention has moved from the back burner onto the worldwide stage. And by 2007, there seemed to be greater recognition of evidence that the world is warming and that we humans make a real contribution to it.

*Global climate change is one of the most serious threats to the environment, health, and economy of our nation. Recent scientific studies show that global warming is already causing environmental changes that will have significant global economic and social impacts.*

- League of Women Voters



Headlines like this are now appearing in newspapers and on the internet everyday:

*In May, a Commission Convened by the Scientific Journal Lancet and the University College London Issued a Report Calling Global Warming, “The Biggest Global Health Threat of the 21<sup>st</sup> Century.”*

What has put global climate change in the forefront lately?

1. **Hurricane Katrina** showed potential impact of severe storms in vulnerable areas.
2. **Release of “An Inconvenient Truth”** and Oscar win, and Al Gore’s 2007 Nobel Peace Prize.
3. **International Panel on Climate Change’s** straightforward reports--especially in 2006 and 2007.
4. **Release of updated global assessment reports** throughout 2007.
5. Growing interest among **state and local governments to pursue regulations** in the absence of federal law.
6. Talk in **2008 presidential campaigns.**

*Source: University of Rhode Island, Communicating on Climate Change*

*Devastation after Hurricane Katrina*





According to the Pew Center on Global Climate Change, “Science shows that climate change will continue, and accelerate, in the years ahead with significant impact on everything from our coastlines and our health to water supplies, ecosystems, and other natural resources.”

And Pew continues, “Limits on emissions will not be enough--or happen soon

enough to avoid all impacts. Reductions will decrease magnitude, but greenhouse gases can remain in the atmosphere for decades or centuries after they're produced. Because of this time lag--the Earth is committed to some additional warming no matter what happens now to reduce emissions.”

## So . . . people are getting involved.

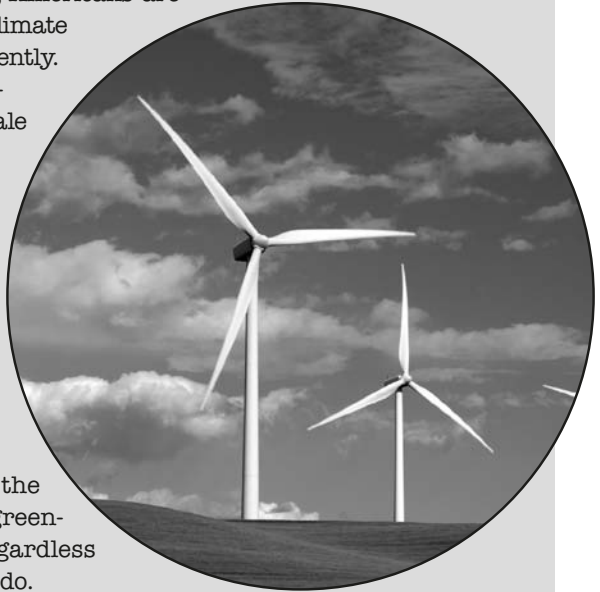
*- Survey Shows 90 percent of Americans Support Action on Global Warming*

DATELINE: Yale University, George Mason University, United States. New report published, *Climate Change and the American Mind*

Despite the economic crisis, Americans are ready and willing to fight climate change, a survey found recently.

According to the study, conducted by researchers at Yale and George Mason Universities, over 90 percent of Americans believe that the U.S. should act to reduce global warming, and 34 percent of respondents said the U.S. should make a large-scale effort, even if it has large economic costs. Other findings ...

- Two-thirds said that the U.S. should reduce its greenhouse gas emissions regardless of what other countries do.
- Almost 4 out of 5 supported a 45-mpg fuel-efficiency standard for cars, even if that meant a new vehicle would cost up to 1,000 U.S. dollars more to buy.
- Over 70 percent supported a requirement that utilities produce at least 20 percent of their electricity from renewable energy sources, even if it would cost the average household an extra 100 dollars a year.



## Special Report

*And yet* another survey shows Californians' concern about air issues has dropped. The poll, conducted by the non-partisan Public Policy Institute of California in 2009, reports that support for the state's landmark 2006 law to slash greenhouse gases has declined. Even though Californians care about environmental issues, fewer of them think that global warming is a serious threat to the economy and quality of life in the state. The survey found that this result could be linked to a poor economy. California Air Resources Board Chairman Mary D. Nichols comments, "But people understand that economic recovery depends on reducing our dependence on petroleum and developing new technologies."

On September 22, 2009, the United States Environmental Protection Agency issued a final rule for mandatory reporting of greenhouse gases from large emission sources in the United States. This rule will provide a better understanding of where GHGs are coming from and will guide development of the best possible policies and programs to reduce emissions. This comprehensive, nationwide emissions data will help in the fight against climate change.

For more information, visit the U.S. EPA website at [www.epa.gov/climatechange](http://www.epa.gov/climatechange).

*We end this chapter with some observations from a famous American.*

## THE THOREAU CONNECTION



A man who died almost 150 years ago seems an unlikely candidate for global warming research, but enter--Henry David Thoreau. This poet, author, philosopher, and naturalist, is currently helping scientists monitor global warming. As Smithsonian Magazine reported in October 2007, Thoreau organized his 8 years of botanical notes at Walden Pond into detailed monthly charts, listing the first flowering dates for hundreds of species. After his death, the charts were forgotten by all but his most devoted students. But well over a century later, Bradley Dean, an independent scholar, collected a full set of chart copies.

After Dean's death in 2006, Richard Primack of Boston University learned of the charts and began fieldwork on comparing the past to the present in an effort to study how the natural world was responding to global warming. Despite Thoreau's terrible handwriting, Dean had learned much since he began his fieldwork in 2003. The study has shown that some common plants, such as the highbush blueberry and a species of sorrel, were flowering at least three weeks earlier than in Thoreau's time. On average, Primack and his students found spring flowers were blooming a full week earlier than in the 1850s--and their statistics clearly showed a close relationship between flowering times and rising winter and spring temperatures.



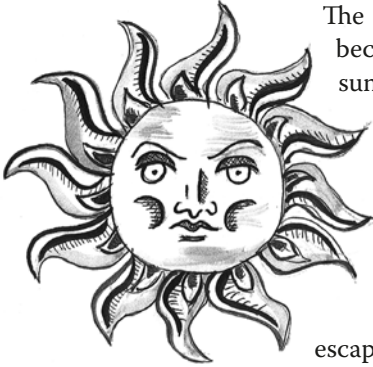
# Global climate change

**According to the IPCC, there are over 50 greenhouse gases!**

Global climate change refers to the Earth's weather patterns, including rising temperatures, due to an increase in heat-trapping, or "greenhouse" gases. Hundreds of scientists worldwide agree that warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures. A 2007 report from the Intergovernmental Panel on Climate Change (IPCC) states "Palaeo-climatic information supports the interpretation that the warmth of the last half-century is unusual in at least the previous 1,300 years. Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse-gas concentrations." And it continues, "The observed widespread warming of the atmosphere and ocean, together with ice mass loss, support the conclusion that it is extremely unlikely that global climate change of the past 50 years can be explained without external forcing, and very likely that it is not due to known natural causes alone."

**This is alarming.**

# Everything under the sun



The greenhouse effect is essential for life on Earth because it helps regulate temperature; it allows sunlight to heat the Earth and excess heat to radiate into outer space. Without a natural greenhouse effect, Earth would be **extremely cold**, around zero degrees Fahrenheit. So, the concern is not with the fact that the greenhouse effect exists but that a dramatic change is happening. Currently, increased amounts of heat-trapping gases are reducing the amount of radiated heat escaping into outer space, thus altering the Earth's climate.

## *The National Oceanic and Atmospheric Administration says this:*

Many chemical compounds present in the Earth's atmosphere behave as 'greenhouse gases'. These are gases which allow direct sunlight (relative shortwave energy) to reach the Earth's surface unimpeded. As the shortwave energy (that in the visible and ultraviolet portion of the spectra) heats the surface, longer-wave (infrared) energy (heat) is reradiated to the atmosphere. Greenhouse gases absorb this energy, thereby allowing less heat to escape back to space, and 'trapping' it in

the lower atmosphere. Many greenhouse gases occur naturally in the atmosphere, such as carbon dioxide, methane, water vapor, and nitrous oxide, while others are synthetic. Those that are man-made include the chlorofluorocarbons (CFCs), hydrofluorocarbons (HFC)s and Perfluorocarbons (PFCs), as well as sulfur hexafluoride (SF<sub>6</sub>). Atmospheric concentrations of both the natural and man-made gases have been rising over the last few centuries due to the industrial revolution.

1800-1870

Level of CO<sub>2</sub> in the atmosphere, as later measured in ancient ice, is about 290 ppm. 2010 measurements are 388 ppm.





1827

French scientist **Jean-Baptiste Fourier** first to consider the greenhouse effect.

1859

**John Tyndall** discovers some gases block infrared radiation and suggests that changes in the concentration of the gases could bring climate change.

The Major Greenhouse Gases	Sources
Carbon Dioxide CO <sub>2</sub> 	<ul style="list-style-type: none"> <li>• Fossil fuel (coal, oil &amp; gas) combustion</li> <li>• Land use conversion (deforestation)</li> <li>• Cement production</li> <li>• Mineral and metal production</li> <li>• Also occurs naturally in the atmosphere</li> </ul>
Methane CH <sub>4</sub> 	<ul style="list-style-type: none"> <li>• Fossil fuels</li> <li>• Animal husbandry (enteric fermentation in livestock and manure management)</li> <li>• Rice cultivation</li> <li>• Biomass burning</li> <li>• Waste management</li> <li>• Also occurs naturally in the atmosphere</li> </ul>
Nitrous Oxide N <sub>2</sub> O	<ul style="list-style-type: none"> <li>• Fertilizer</li> <li>• Industrial processes</li> <li>• Combustion</li> <li>• Also occurs naturally in the atmosphere</li> </ul>
Hydrofluorocarbons HFCs	<ul style="list-style-type: none"> <li>• Refrigerants in air conditioning systems</li> </ul>
Perfluorocarbons PFCs	<ul style="list-style-type: none"> <li>• Refrigerants</li> <li>• Aluminum smelting</li> <li>• Semiconductor manufacturing</li> </ul>
Sulfur Hexafluoride SF <sub>6</sub>	<ul style="list-style-type: none"> <li>• Dielectric fluid</li> </ul>

Source: Pew Center on Global Climate Change

As the global population has increased and our reliance on fossil fuels (such as coal, oil and natural gas) has been firmly solidified,

emissions of these gases have also risen.

Source: <http://lwf.ncdc.noaa.gov/oa/climate/gases.html>

**A**ccording to the U.S. EPA, ozone (O<sub>3</sub>) is also a greenhouse gas. And they add: Total U.S. emissions of greenhouse gases have risen 14.7 percent from 1990 to 2006.

1896



Swedish chemist **Svante Arrhenius** blames the burning of fossil fuels for producing CO<sub>2</sub>.

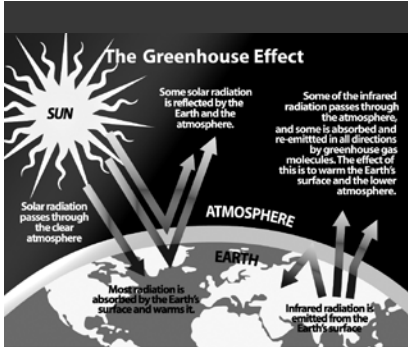
1945

**U.S. Office of Naval Research** begins funding many scientific fields, including some useful for understanding climate change.

1957

**Roger Revelle**, a pioneer global warming scientist, finds that CO<sub>2</sub> produced by humans will not be readily absorbed by the oceans.





“Each greenhouse gas molecule can absorb a tiny portion of upward-traveling heat, which it must release almost immediately. This release occurs in all directions, so that part of the heat, which was originally leaving the atmosphere, is redirected back down to the ground. This means that less heat escapes to outer space and more heat heads toward Earth, increasing surface temperatures.”

– IPCC, 2007. The panel represents hundreds of scientists worldwide under the umbrella of the United Nations and they have established the most recent climate observations and model results. The IPCC is currently starting to outline its Fifth Assessment Report, which will be finalized in 2014.

“Global atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased markedly as a result of human activities since 1850 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years.”

– IPCC

## The carbon connection

Billions of tons of carbon dioxide are absorbed by oceans and living biomass (i.e. sinks) and are emitted to the atmosphere

annually through natural processes. However, since the industrial revolution, around 1850, global atmospheric concentrations of

1958

Measuring CO<sub>2</sub> at Hawaii's **Mauna Loa Observatory** begins.

1965

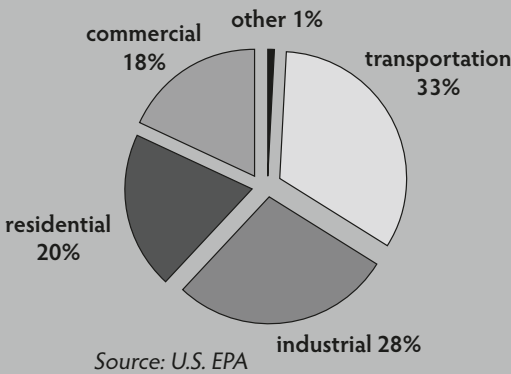
Studies suggest the possibility of a collapse of Antarctic ice sheets, which would raise sea levels catastrophically.

1968

Ice cores and other evidence show large climate shifts between stable modes in the space of a thousand years, especially around 11,000 years ago.



## SOURCES OF CO<sub>2</sub> EMISSIONS



**Energy use and climate change are intricately linked. Eighty-four percent of greenhouse gas emissions are CO<sub>2</sub> almost entirely from combustion of fossil fuels.**

Source: Pew Center on Global Climate Change

CO<sub>2</sub> have risen about 36 percent (IPCC 2007) principally due to the combustion of fossil fuels. In the U.S., fuel combustion accounted for 94 percent of CO<sub>2</sub> in 2006.

1976

Studies show that CFCs, methane, and ozone contribute to the greenhouse effect.

1982

Greenland ice cores reveal drastic temperature oscillations in the space of a century in the distant past.

1988



United Nations sets up a scientific committee to examine global warming: the IPCC.

## Coal facts

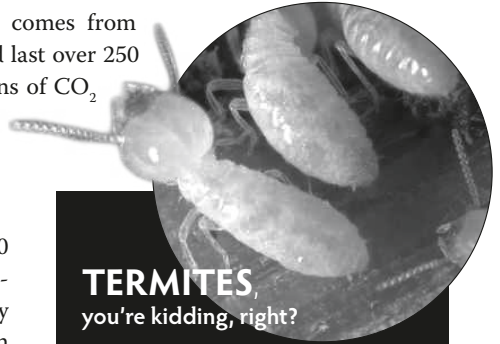
Coal is cheap but inherently higher-polluting and more carbon intensive than other energy alternatives. It is responsible for about 20 percent of global GHG emissions. In China, half of its coal is used for electricity and 80 percent of that electricity is fueled by coal. In India, 68 percent of CO<sub>2</sub> emissions are from coal.

In the U.S., 50 percent of our energy comes from coal. Our reserves, at current rate, could last over 250 years. Here, annually, about 2 billion tons of CO<sub>2</sub> emissions are from coal-burning power plants.

Source: U.S. EPA

## And methane?

According to the U.S. EPA, about 60 percent of methane comes from human-related activities. Emission levels vary significantly from one country or region to another, depending on factors such as climate; industrial, agricultural and energy production; and usage and waste management practices. In the U.S., the largest natural sources of methane emissions come from wetlands, gas hydrates, permafrost, termites (yes, really), oceans, freshwater bodies, non-wetland soils, and wildfires. Human-related sources include the decomposition of waste in landfills (34 percent of all methane emissions in the U.S.), ruminant digestion and manure management with domestic livestock, natural gas and oil systems, and coal mining.



**TERMITES,**  
you're kidding, right?

**NO.**

Global emissions of termites account for approximately 11 percent of the global methane emissions from natural sources. Methane is produced in termites as part of their normal digestive process, and the amount generated varies among different species. Ultimately, emissions from termites depend largely on the population of these insects, which can also vary significantly among different regions of the world.

Source: U.S. EPA

1990

First **IPCC report** says levels of man-made greenhouse gases are increasing and predicts these will cause global warming.

1992

**Creation of the United Nations Framework Convention on Climate Change (UNFCCC)** at the Rio Summit, which calls for voluntary cuts in greenhouse gas emissions.

1997

**UNFCCC** countries sign the Kyoto Protocol. Industrialized countries commit to reduce emissions of 6 key greenhouse gases by the end of 2012.



# TRUTH & CONSEQUENCES

Dr. James Hansen, head of the NASA Goddard Institute for Space Studies, began work in the 1970s on studies and computer simulations of the Earth's climate. He says the significant climate effects will only reveal themselves with time. But we do know temperature variations can cause increased damage from hurricanes, floods, fires, and infectious diseases. They can also cause sea level rise, shrinking glaciers, changes in the range and distribution of plants and animals, trees blooming earlier, lengthening of growing seasons, ice on rivers and lakes freezing later and breaking up earlier, and thawing of permafrost. According to Hansen, our planet has gone through a 0.6C rise in temperature since 1970, with the 10 hottest years occurring between 1997 and 2008.

*"I have been described as the grandfather of climate change. In fact, I am just a grandfather and I do not want my grandchildren to say that grandpa understood what was happening but didn't make it clear. We cannot now afford to put off change any longer ... America must take the lead."*

- James Hansen

Source: *The Guardian*, 1/19/09

2001

1990s is the hottest decade on record.

IPCC's 3<sup>rd</sup> report declares the evidence for man-made global warming to be incontrovertible.

Effective end of debate among all but a few scientists.

The U.S., the biggest single greenhouse-gas emitter, abandons the Kyoto Protocol.

2004

The **International Energy Agency** says China is now the world's second biggest carbon emitter, due to its rising use of fossil fuels.



# The sea also rises

According to the Earth Policy Institute, elevated global temperatures pose numerous threats, including rising seas. Columbia University's Center for International Earth Sciences and the London-based International Institute for Environment and Development released a report in March, 2009. The report contains some alarming facts about sea rise.

1. China
2. India
3. Bangladesh
4. Vietnam
5. Indonesia
6. Japan
7. Egypt
8. United States
9. Thailand
10. Philippines

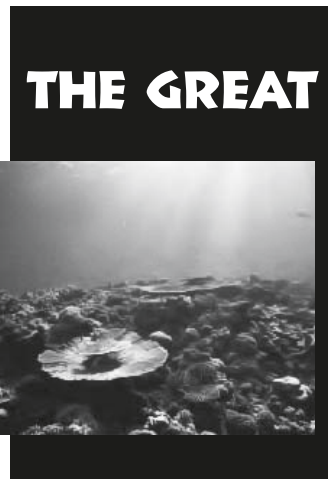
already created climate action plans. These plans include desalinating ocean water; protecting infrastructure and communities from flooding, erosion, and more severe weather events; and preparing for water shortages and droughts.

Source: Pew Climate Change 101

## In the cities

The world's largest cities, with populations over 5 million, have an average 1/5 of their residents and 1/6 of their land area within the LECZ. Cities such as Dhaka, Shanghai and Mumbai are some of the most susceptible to coastal, climate-related hazards such as floods, storms, and cyclones.

Some countries will adapt better than others. Hundreds of cities worldwide have



■ 1/10 of the Earth's population, 643 million people, live in low-lying coastal areas and are at great risk of ocean-related impacts of climate change.

■ 10 countries with the largest number of people living in the low elevation coastal zone (LECZ):

2005

Awareness and concern of global warming surges in U.S. after an exceptional season for tropical storms, punctuated by **Hurricane Katrina.**

2006

Former U.S. vice president Al Gore's docu-movie "**An Inconvenient Truth**" drives global warming up the U.S. political agenda.



California unveils plans for reducing its greenhouse gas emissions to 1990 levels by 2020.

# Aloha, CO<sub>2</sub>

*Beginning in 1958, U.S. scientist Dr. Charles David Keeling starts measuring CO<sub>2</sub> at Hawaii's Mauna Loa Observatory. He detects a yearly rise in atmospheric CO<sub>2</sub> and alerts the world to the anthropogenic contribution to the "greenhouse effect" and global warming. Keeling later receives the National Medal of Science and the Tyler Prize for Environmental Achievement for his research.*



SCRIPPS INSTITUTION OF OCEANOGRAPHY/UC SAN DIEGO

*Keeling's findings are, according to Scripps Institution of Oceanography, the single most important environmental data set taken in the 20th century.*

## BARRIER REEF & CO<sub>2</sub>

Carbon dioxide in the atmosphere can harm coral reefs--big time. When CO<sub>2</sub> dissolves in seawater, it makes it more acidic and reduces the levels of calcium carbonate, a mineral corals need to build their limestone skeletons. Already there is a decline in coral growth at Australia's Great Barrier Reef. Studies from the Australian Institute of Marine Sciences show that coral calcification has declined by 13 percent between 1990

and 2005. Researchers there say that such a severe and sudden decline in calcification is unprecedented in at least the past 400 years. While corals are not widely visible, their role is critical. The reefs supply the physical structure that thousands of species depend on. They are like trees in a forest. When corals die, so do the fish and other animals that live on these reefs.

*Source: Planet Ark*

2007

**The Bulletin of the Atomic Scientists** moves the hand of the Doomsday Clock forward by 2 minutes, to 11:55 p.m., citing global warming and nuclear proliferation.

**IPCC** releases 4<sup>th</sup> assessment, warning that serious effects of warming are evident and the cost of reducing emissions is less than the damage they will cause.

**VCAPCD** begins global climate change outreach.

# NATIONAL FORECASTS

Scientists expect the United States to experience increases in precipitation (with some decreases in areas such as the Southwest), including increases in the intensity of hurricanes and heavy rainfall. This includes declines in snowpack--earlier snow and ice melt, and more land affected by drought and wildfires. Sea levels, as mentioned, will rise, with the most severe predicted for the Gulf of Mexico and Atlantic coastlines. Food and water supplies, property, and plants and animals--as well as humans--could be affected.

Source: Pew Climate Change 101

## POSSIBLE IMPACTS ON SOME STATES.

Source: Next Generation Earth website

*Climate change has numerous impacts on every state. Here are just a few examples. Note: we are only highlighting some of the effects in a handful of states. There are many more than we mention here and all states could be impacted in some way.*



In **Wyoming**, a warmer climate could result in less winter snowfall, more winter rain, and faster, earlier spring snow melt. In the summer, without increases in rainfall of at least 15-20 percent, higher temperatures and increased evaporation could lower stream flows and lake levels. Less water would be available to support irrigation, hydropower generation, public supply, fish and wildlife habitat, recreation, and mining.

Competition for water could increase on the plains, where agricultural and industrial users compete for available water.



A preliminary modeling study of the Midwest, which included the area around **Pittsburgh, Pennsylvania**, found that a 4°F warming, with no other change in weather or emissions, could increase concentrations of ozone, a major component of smog, by as much as 8 percent.

2008

Extreme weather season--widespread flooding in the Midwest United States, severe wildfires, especially in California, and a harsh Atlantic hurricane season.

VCAPCD receives international **Mercury Communications Award** for its **Clean Air Today** issue on global climate change.





In **Alaska**, warming temperatures could mean earlier, more rapid snowmelts and earlier ice breakups. This could increase water availability in the winter, when supplies are traditionally limited. Warming is projected to be greater at high latitudes than elsewhere in the world and, with sufficient warming, tundra ecosystems are projected to significantly decline. Glacier retreat, melting permafrost, and reductions in pack ice are all projected to continue. These changes have serious implications for many arctic species.



Possible responses to sea level rise in **Florida** include building sea walls, allowing the sea to advance and adapting to it, and raising the land by replenishing beach sand and/or elevating houses and infrastructure. These responses could result in out-of-pocket costs or lost land and structures. For example, the cumulative cost of

sand replenishment to protect Florida's coast from a 20-inch rise in sea level is estimated at \$1.7 - \$8.8 billion.



In **Illinois**, agriculture is an \$8 billion annual industry, 3/4 of which comes from crops. Very little crop acreage is irrigated. Increases in climate variability could reduce some crop yields by as much as 32 percent.



Currently, there are more endangered species per square mile in **Hawaii** than any other place on the planet. Twenty-five percent of U.S. endangered species are found here, including 2 mammals, 30 birds, 5 reptiles and amphibians, and 279 plants. The estimated increases in temperature and changes in precipitation due to climate change add another threat to this situation.

2009

**U.N. Climate Change Conference** met in Copenhagen, Denmark. Concludes with no new treaty.

The District receives U.S. EPA's Clean Air Excellence Award for its film, **Air – the search for one clean breath**. Film includes many sequences on global climate change.

2030

Year in which **Glacier National Park** will have no glaciers left, according to the U.S. Geological Survey.

## Into a Warming World

According to Science Daily (4/17/08), the top 5 U.S. counties that are the worst offenders for CO<sub>2</sub> are:

1. Harris County, Texas
2. Los Angeles County, California
3. Cook County, Illinois
4. Cuyahoga County, Ohio
5. Wayne County, Michigan

The top 3 counties include the cities of Houston, Los Angeles, and Chicago.

## And then there's Texas.

As of 2009, Texas leads the nation in CO<sub>2</sub> emissions. And, it's right up there with some of the largest, most industrialized nations in the world. If Texas were a country, it would be the 8th largest emitter of carbon dioxide, just behind Canada.

Newsweek Magazine reported in February 2008, "Texas still outpaces the combined emissions of California and Pennsylvania--the states with the 2<sup>nd</sup> and 3<sup>rd</sup> ranking." **Why?**

- It has more oil refineries than any other state.
- It has more cattle than any other state. (Beef production produces a lot of CO<sub>2</sub> emissions.)
- It has the largest petro-chemical industry, making thousands of consumer products from make-up to motor oil.

But Texas also has many resources to help solve the problem. Its terrain of flat, windswept land with plenty of sunshine holds more potential for wind and solar energy than any other state.

### HELPFUL WEB SITES

**Pew Center on Global Climate Change 101**

[www.pewclimate.org](http://www.pewclimate.org)

**Realclimate.org**

[www.realclimate.org](http://www.realclimate.org)

**United Nations Environment Programme**

[www.unep.org](http://www.unep.org)

**U.S. EPA**

[www.epa.gov/climatechange](http://www.epa.gov/climatechange)



# Is Cali

*"Hi, and welcome to the future. San Dimas, California, 2688. And I'm telling you, it's great here. The air is clean. The water is clean. Even the dirt is clean."*

– Bill & Ted's Excellent Adventure  
MGM/UA Studios, 1989

CALIFORNIA. The stuff of dreams. Even for Bill & Ted.

California is now dreaming of new stuff as it has become the first state in America to take on global climate change. But even dreams need foundations, and California's landmark Global Warming Solutions Act of 2006 (AB32) mandates a statewide rollback of greenhouse gas emissions to 1990 levels by 2020 and a further 80 percent reduction by 2050. This is the most ambitious effort to address global climate change ever proposed by any political entity in the world.





# California Dreamin'?

## A perfect "climate change" storm

California is highly susceptible to the effects of climate change. Drought. Chronic water shortages. Rising sea levels.

*Costs for sand replacement to protect California's coastline from sea level rise through 2100 could be \$174 million to \$3.5 billion.*

According to the IPCC, water issues are the most critical. As the western United States warms, mountainous regions will receive rain rather than snow more often and be subject to earlier snowmelt, leading to reduced snow depth and less stored snow water in spring. As a result, there will likely be more flooding, and increased pressure will be placed on the state's reservoir systems. This affects not only the water allocation for communities, but for the state's priceless agricultural irrigation systems; water for crops in the Central Valley is vital as it produces about 20 percent of all the agricultural goods in the U.S.

Scientists also predict that California's temperatures could increase about 5°F by 2100, which could increase the number of heat-related deaths and illnesses, and the frequency and intensity of wildfires.

Predictions say that much of the California coast will be subject to sea level rise of 13 to 19 inches by 2100!

As the nation's second largest emitter of CO<sub>2</sub> emissions, California has what journalist Vijay Vaithuswaran has called a perfect "climate change" storm. The state has 24 million cars, and industries and businesses that produce massive amounts of greenhouse gases.

But, California also has many resources to reduce greenhouse gases, and the political will to act in the name of clean energy. It also has the technological base, with biotechnology and green industries, and scientific research laboratories. And, it has universities like Cal Tech, the place where then Professor Arie Haagen-Smit got to the bottom of what caused smog in the first place.

## The plan

In 2008, the California Air Resources Board (ARB) said "yes" to the Climate Action Plan required by AB32. It's a complicated plan (134 pages) consisting of many elements, including a complex cap and trade program which covers 85 percent of the state's emissions.

### THE NUTS-AND-BOLTS OF CAP AND TRADE

**T**he cap and trade program is a market-based approach to reducing greenhouse gas emissions and is a central part of AB32. In California, the ARB will determine which facilities or emissions are covered by the program and set an overall emission target or "cap." ARB will develop the first 2012 cap using information provided by the facilities. **Each year, the cap is decreased on a gradual and predictable schedule.** As a result, ARB estimates that its cap and trade program will prevent 34.4 million tons of GHG emissions per year by 2020, as compared to the "business as usual" case.

The **cap** is the amount of pollution that all facilities in the program may release each year, measured in millions of tons of carbon dioxide (equivalent) per year. The cap will cover many major sources of pollution and may include power generation, transportation, large manufacturing, agriculture, and forestry. By either auction or award, each facility will receive a decreasing number of "allowances" to emit greenhouse gases from the annual statewide cap. A company with extra allowances may sell them; a company needing additional allowances may trade for them on the open market.

**Trading**, according to the ARB, can lead to investment and innovation. For some companies, it will be easy to reduce pollution and meet their allowance limit; for others, it will be more difficult. Because the annual cap will be decreased on a gradual and predictable schedule, companies will be able to determine their allowance requirements well in advance.

**U**nlike some pollutants, GHGs go into the upper atmosphere and have a global --not local--effect. So, it doesn't matter where the facility making the emission cuts is located. If one company is able to cut its pollution easily and cheaply, it can end up with extra allowances. These can be sold to other companies, providing a strong incentive to turn pollution cuts into dollars.

Another company may have trouble reducing GHG emissions, or may want to make a long-term investment rather than a quick fix. Trading allowances give this company the ability to both meet its allowance requirement and plan for future emission reductions. Either way, there is less global warming pollution created each year.

Source: ARB, Pew Center on Global Climate Change

*"There's no physical law that says we can't be smart enough to use the limited resources we do have on Earth in a sustainable way, and that the population of 9 or 10 billion people that are predicted can't enjoy the standard of living you and I enjoy today."*

- Stephen Chu, U.S. Secretary of Energy from an interview conducted in the spring of 2008 at the Lawrence Berkeley National Laboratory

But, California's plan presents many strategies, not just market-based approaches like cap and trade. Its regulations to reduce greenhouse gas emissions are a creative, mixed bag of programs:

- High speed rail
- Ship electrification at ports
- Heavy duty vehicle aerodynamic efficiency
- Automotive air conditioning
- Reductions from semiconductor manufacturing
- Tire pressure program
- Low carbon fuel standard
- Landfill methane control measure
- Water-use efficiency
- Solar reflective auto parts
- Energy efficient programs & audits
- Sulfur hexafluoride reductions from the electricity sector
- Tire tread program



- Leak reduction from oil and gas transmission
- Low friction engine oil

*Incentive programs include:*

- Solar water heating
- Million solar roofs
- Residential refrigeration early retirement program
- Green buildings
- Clean ships & vessel speed reduction
- Forest management
- Greening public schools
- Methane capture at larger dairies
- Commercial harbor craft



In 2009, the Natural Resources Defense Council published a climate change fact sheet offering ways that AB32 can help California's economy. It states that the law will save consumers money and improve air quality and public health with its innovative regulations. Also, the law will create sustainable communities and expand transportation choices that will improve Californians' quality of life.

Source: [www.nrdc.org/policy](http://www.nrdc.org/policy)

**In California, we've already come a long way in the green revolution.**



- Los Angeles, Sacramento, and San Francisco combined accounted for over 20 percent of the nation's hybrid vehicle registration in 2007.
- From 2002-07, California led all states in patent registrations for green technologies.
- Over 1.5 million jobs have been created as a result of energy efficient policies in California over the last 35 years.
- Since 2003, wind power generation has increased 95 percent.
- From 2002-07, power generation from renewable sources increased 19 percent.
- California increased grid-connected photovoltaic solar capacity 41 percent from 2006-07.

Source: Next 10 website

# *The Transportation Connection*



We cannot close this chapter without mentioning California's relationship with the automobile. Freewheelin', independent, and fast. We love them. They fit our vast and dramatic lifestyle.

## *But ...*

the link between transportation and climate change is undeniable. Gasoline-burning cars and other vehicles are a major contributor to greenhouse gas emissions. In the next 20 years, predictions are that there will be 300 million new cars on American roads. In the United States, roughly 1/3 of all CO<sub>2</sub> emissions come from transportation sources. And in California, it's even larger--about 41 percent.

California is the 15th largest source of climate change emissions in the world, exceeding most nations. In 1990, California generated 427 million metric tons of CO<sub>2</sub> equivalents. Between 2002-04, that level increased to 469 and, 20 years from now, it is predicted to rise to 596, unless actions are taken now.

In 2002, we took action with AB1493, the California Clean Car Law. No other state or nation has previously adopted legislation to cut motor vehicle pollution that causes global warming. The law allows the ARB to adopt regulations to achieve the most feasible and cost-effective reductions from motor vehicles.

California is also addressing the transportation issue through community planning. Communities can be built so that people can spend more time walking or cycling than driving.

*Source: SCAG*

### HELPFUL WEB SITES

**California Air Resources Board**

[www.arb.ca.gov](http://www.arb.ca.gov)

**California Environmental Protection Agency**

[www.calepa.ca.gov](http://www.calepa.ca.gov)

**California Hydrogen Highway**

<http://hydrogenhighway.ca.gov>

**California Stationary Fuel Cell Collaborative**

<http://stationaryfuelcells.org>

**Cool California**

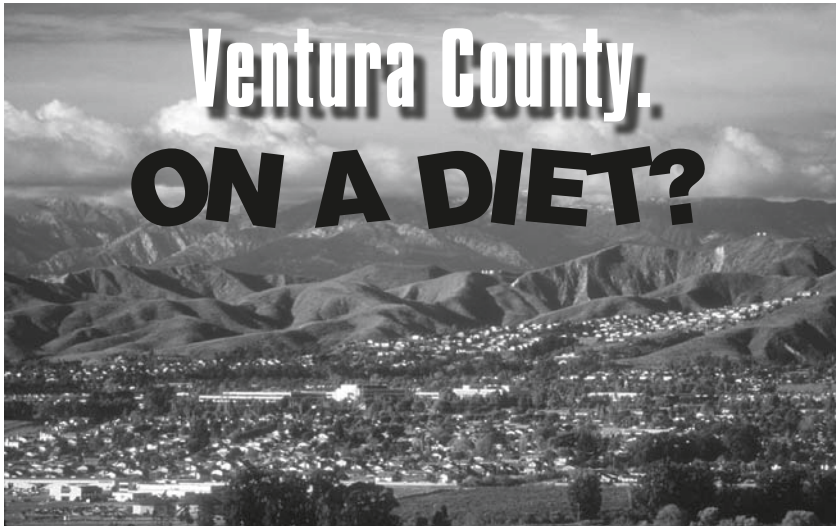
[www.coolcalifornia.org](http://www.coolcalifornia.org)

**Flex Your Power**

[www.flexyourpower.org](http://www.flexyourpower.org)

**SCAG**

[www.scag.ca.gov](http://www.scag.ca.gov)



**Yes.** Since 2007, Ventura County government has been on a low-carbon diet to reduce energy consumption and greenhouse gas emissions. The result? It has lost 1,230 metric tons of carbon dioxide emissions. And it's still losing.

Working with the Ventura County Regional Energy Alliance, 22 green projects have been completed. They include lighting retrofits, control systems, and efficiency modifications to heating and air conditioning systems. All combined, the projects have saved over 2,300,000 kWh yearly, translating to a reduction of over \$309,000 in electric charges. And, the County has received \$316,198 in rebates to help offset the initial project costs.

One green step at a time, the county is:

- Implementing a Government Services Agency and the Information Systems Department's **countywide project to turn off computers when not in use**, saving over 2 million kWh a year; \$212,000 in cost-savings; and 1,137 metric tons of CO<sub>2</sub>.

- **Purchasing high fuel-efficient and low-emission vehicles.** The County owns over 120 hybrid vehicles and over 60 partial zero emission vehicles. Fleet services has shifted to the use of ultra low sulfur diesel for its diesel vehicles, and is installing diesel particulate filters ahead of the California Air Resources Board's schedule.
- Scheduling **construction of a major solar photovoltaic project**--purchasing the solar energy produced from a company that will fund, install and maintain the system. The project could produce approximately 716,000 kWh a year of clean power, and save over 6,200 metric tons of CO<sub>2</sub>.
- **Reducing consumption of water, paper, chemicals**, and other office materials.
- **Aggressively recycling waste** to minimize items going to landfills.
- **Providing Dial-A-Ride services** for many local transit operators.

And the County is not done yet. It is always planning for new future energy programs because this diet is really working. For more information, contact Jeff Burgh at [jeff.burgh@ventura.org](mailto:jeff.burgh@ventura.org).

## *AIR—the search for one clean breath*



Since its premiere in 2008, this high definition film on the history of air has been seen by over 500,000 people worldwide. The film, created by the Ventura County Air Pollution Control District from an initial U.S. EPA grant,

won the international 2008 Mercury Communications Award for best educational film and the 2008 U.S. EPA Clean Air Excellence Award. It features: historical re-enactments of air quality pioneers; vintage footage of the London Air Disaster of 1952; greenhouse gas research at the British Antarctic Survey Core Program; the Iceland hydrogen program; the zero carbon community of BedZED;

and many other compelling scenes. A new teacher's guide is available for download on the film website, [www.airthefilm.org](http://www.airthefilm.org). Call 805/645-1415 for more information.



The Ventura County Board of Supervisors created the **Climate Action Awards** program to recognize individuals, organizations, businesses, schools, and others who are taking actions to reduce their carbon footprints. Award categories include: Organization Footprint Reduction; Planning or Research Project; Public Outreach/Education; School/Youth; and Sustainable Business Practice. The first awards were presented in 2009.

The Board recognizes the winners at the Board meeting closest to Earth Day each April. For information, contact **Supervisor Steve Bennett**, whose office coordinates the program for the County, at 805/654-2703.

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## ELECTRIC CHARIOTS



They are quiet but steady warriors. From a grant awarded by the Ventura County Clean Air Fund, the Ventura Police Department was able to purchase two "T3-Motion" electric scooters. These quiet and environmentally-friendly scooters have been used by police from Memphis, Tennessee to Gisborne, New Zealand. The scooter's near-silent operation makes it easier for patrol officers to spot trouble before a crime is committed. The scooters are versatile and can patrol the downtown corridor, mall, Promenade and beach area, schools, parking lots and structures, and special events. The T3 produces zero emissions and is highly efficient. According to Ventura Police Chief Pat Miller, "Our Department recognizes its responsibility in being good stewards of the environment and our strategic plan specifically calls for implementing alternative fuel vehicles in an effort to reduce gasoline consumption."



# Santa Paula company soaring with SOLAR



**COMPANY: Limoneira**

Santa Paula, California (*corporate office*)

**SIZE:** 7,000 acres in agricultural production of lemons, avocados, oranges, specialty citrus, pistachios, and cherries.



**SUSTAINABILITY HIGHLIGHTS:**

Limoneira recognizes its community responsibilities as a sustainable environmental corporate leader; this responsibility has been woven into its mission for over 116 years. Sustainability, with respect to farming operations, includes reduced water usage, erosion mitigation efforts, and reduced herbicide and pesticide usage. And, it strives to operate at non-peak energy to reduce energy consumption where possible. A partnership with Agromin, a leader in green waste recycling, helps Limoneira transform green waste into safe and cost-effective compost and mulches for use in agricultural production and community projects.

Limoneira's new Solar Orchard produces one megawatt of clean photovoltaic energy to power the company's processing plants in its southern operations, and an additional megawatt for its northern operations.

"Sound agriculture and sound energy management practice have converged. We call this *pragmatic green*. We expect that solar electricity is going to create one of the biggest value contributors for our shareholders."

- Harold S. Edwards,  
President & CEO, Limoneira

The project meets strict LEED (Leadership in Energy and Environmental Design) standards.

**COST SAVINGS:** \$700,000 annually on electricity from the solar orchard project

**AWARDS:** 2009 Ventura County Climate Change Action Award, CSUCI Business & Community Leader Award

Source: [limoneira.com](http://limoneira.com)

# My story

By Ventura County resident Jeff Bass

I live in Newbury Park. I commute and shop locally, mainly by bike. I ride my bike to work 3-4 days a week. I have a bike cart that I pull behind my bike for shopping. Since I feel unsafe using my bike at night or when it's raining, I also have an electric car for local travel. The electric car has an 80-mile range, so I use it all around the Conejo Valley, as well as for trips to the San Fernando Valley, Simi Valley, Moorpark, Oxnard and Ventura. It is a Myers Motors NmG and is the first one they have sold that has Lithium Polymer Iron Phosphate batteries (technically it is a Beta Test vehicle). The car is nimble and it easily merges and keeps up with the traffic on the local freeways, but I mainly use it on surface streets. I charge the car at home, using my solar panels.

I have 22kW of solar panels on my roof (5-7 times the size of a typical residential array), so I produce 400 percent of my household's electricity usage. I am hooked to the electric grid via the standard net metering arrangement, but my array is unusual in that I produce excess electricity every month, rain or shine. I sized my solar

array to produce excess power even on cloudy or rainy days, which means it produces a lot of excess power on sunny days. On a typical sunny day, my house produces 130 kilowatt hours and it uses less than 20 kilowatt hours. It takes 8 to 10 kilowatt hours to fully charge my electric car if it is empty; but most days it is never less than 20 percent below fully charged, because I only drive about 20 miles per day or less. So, my electric car does not use any electricity produced by coal or other centralized power plants. I am not just "moving" my CO<sub>2</sub> production to a power plant--I am

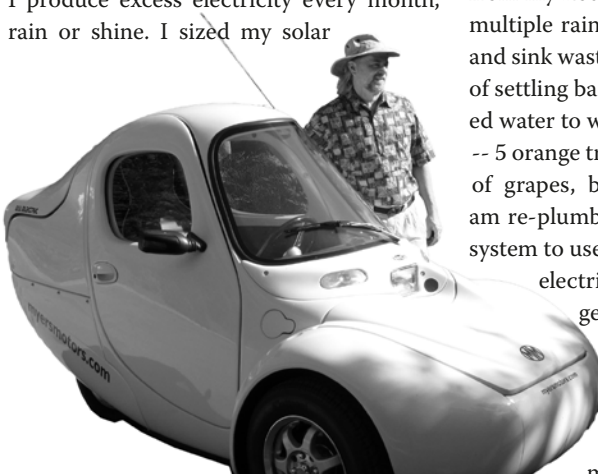
**"In questions of science, the authority of a thousand is not worth the humble reasoning of a single individual."**

-Galileo Galilei

using the sun to eliminate it. I monitor my solar panels from the internet (they are on the internet as well as the electric grid).

I have a low water, compost fertilized garden and fruit orchard on my two acres of land. I have two composting bins and I compost all my kitchen scraps. I collect rain from my house roof and my barn roof into multiple rain barrels. I also collect shower and sink waste water (gray water) in a series of settling barrels. I use this non-chlorinated water to water my garden and fruit trees -- 5 orange trees, 6 avocado trees and a mix of grapes, blueberries and raspberries. I am re-plumbing my gray water/rain barrel system to use a self-designed computerized electric pump system. My goal? To

get to zero irrigation water usage in three years. I will have several large water storage tanks installed over the next year or so. You can contact me at [Jeffbass@me.com](mailto:Jeffbass@me.com).





## Oxnard company shedding tears of joy

**COMPANY:** Gills Onions  
Oxnard, California

**SIZE:** 400 employees at 14-acre plant

**SUSTAINABILITY HIGHLIGHTS:** An Advanced Energy Recovery System (AERS) reduces up to 30,000 tons/year CO<sub>2</sub> equivalent emissions from its processing facility --roughly the annual GHG emissions from 5,000 cars. Juice from a pungent onion crop creates energy to run refrigerators and lighting. A system converts methane from fermented onion juice waste into energy burned in 2 on-site fuel cells. The program was recognized by the California Environmental Protection Agency for its advanced green technology.

**COST SAVINGS:** \$700,000 annually on electricity. \$400,000 a year on disposal costs.

**INCENTIVES:** \$3 million in government and power company grants to help fund the \$9.5 million project.

**“It’s a great sustainability story, but it was first a business decision to solve a waste problem.”**

- Steve Gill, co-owner, Gills Onions

Source: [gillsonions.com](http://gillsonions.com)

**"Discovery consists of seeing what everybody has seen and thinking what nobody has thought." - Albert Szent Gyorgi**

### HELPFUL WEB SITES

**Air – the search for one clean breath**  
[www.airthefilm.org](http://www.airthefilm.org)

**Build it Smart**  
[www.builditsmartvc.org](http://www.builditsmartvc.org)

**Kids vs. Global Warming**  
[www.kids-vs-global-warming.com](http://www.kids-vs-global-warming.com)

**Ojai Valley Green Coalition**  
[www.ojavalleygreencoalition.org](http://www.ojavalleygreencoalition.org)

**Surfrider Foundation**  
<http://surfrider.org/ventura>

**U.S. Green Building Council (C4)**  
<http://usgbcc4.clubwizard.com>

**VC Cool**  
[www.vccool.org](http://www.vccool.org)

**Ventura County Air Pollution Control District**  
[www.vcapcd.org](http://www.vcapcd.org)

**Ventura County Regional Energy Alliance**  
[www.vcenergy.org](http://www.vcenergy.org)

# Ice station zero

Belgium's Princess Elisabeth Base polar station opened in 2009 and seemed to be proof that alternative energy is feasible, even in the coldest area. The station is powered using only wind and solar energy. "If we can build such a station in Antarctica, we can do that elsewhere in our society. We have the capacity, the technology, the knowledge to change the world," states Alain Hubert, station project director.

*Source: Reuters, 2/15/09*



## Going Dutch

When you think of Holland, you automatically think of windmills, right? It has tradi-



tionally used windmills to pump out the low lying water and currently has the world's largest offshore wind farm, generating enough power to supply more than 100,000 homes. But that's not all. A new restaurant in Zeist has been working with a design company, Rau, to reduce their carbon footprint. They've come up with an innovative power generation system fueled by their own customers, a generator in their revolving door which converts the energy of people

passing through into electricity. Each time you pass through the door you create enough power to make a cup of coffee. Brilliant!

**Can you imagine how much power could be generated by such a system in a busy subway station in London or New York?**

*Source: ecoworldly.com*

## Some more good news

China is building wind farm complexes on a scale the world has not seen before ... two-thirds of the world's rooftop water heaters are in China, and it's now the world's leading producer of solar cells.

*Source: The Washington Post, 9/20/09*

# Home is where the green is

BedZED is a multi-award winning green housing development in South London. The name stands for Beddington Zero Energy Development and is the United Kingdom's largest eco-village. Homes need about 10 percent of the heat energy of a conventional house, and use locally produced renewable energy. Carbon free features include:

- Use of thermally massive construction materials that store heat during warm conditions and release heat at cooler times.
- Arrangement of houses in south facing terraces to maximize heat gain from the sun.
- Use of natural, recycled, or reclaimed materials wherever possible.
- Surrounding all buildings with a 300mm insulation jacket.
- Use of photovoltaic cells and wind cowls to produce and save energy.
- Use of low energy lighting and energy efficient appliances.
- Use of an on-site small-scale combined heat and power plant, powered by off-cuts from tree surgery waste that would otherwise go to a landfill. (Wood is a carbon neutral fuel because the CO<sub>2</sub> released when the wood is burned is equal to that absorbed by the tree as it grew.)
- Promoting environmental action by use of walking, cycling, public transit, and a carpool for residents as an alternative to personal car use.



Photo of housing unit at BedZED with colorful wind cowls that help provide energy to the community. BedZED was featured in the award-winning film by the Ventura County Air Pollution Control District, *Air – the search for one clean breath*.

Current plans are underway for other BedZED-type communities in Washington, D.C. and in Sonoma, California.

Source: [www.bioregional.com](http://www.bioregional.com)

In Ventura County, learn more about sustainable building practices at the California Central Coast Chapter of the U.S. Green Building Council. Visit <http://usgbcc4.clubwizard.com>.

# What is a carbon sink?



It's not in your kitchen or bathroom. Carbon sinks are natural systems that suck up and store carbon dioxide from the atmosphere. The main natural carbon sinks are plants, the ocean, and soil. But these sinks, critical in the effort to soak up some of our greenhouse gas emissions, may be stopping up, due to deforestation and human-

induced weather changes. Scientists worldwide are looking for ways to help nature along by devising ways to artificially sequester, or store, carbon dioxide underground.

*Source: Science 5/18/09*

"The golden toad was the first documented victim of global warming. We had killed it with our profligate use of coal-fired electricity and our oversized cars just as surely as if we had flattened its forest with bulldozers."

- Tim Flannery, author, *Weather Makers: How Man Is Changing the Climate and What It Means for Life on Earth*, Australian of the Year 2007



## Treasure island

You won't find Long John Silver on the 40 square mile Danish Isle of Samsø. But you will find the golden results of renewable energy. As CBS reported in 2008, 10 years ago the islanders, mostly farmers, took up a challenge from the Danish government. Could they run their farms, power their businesses, and live their lives in an energy self-sufficient and carbon neutral way?

YES.

Here are some ways the 4,000 residents on the island are doing it:

- Use of wind turbines and solar panels for power. Shares in the turbines are sold to the islanders so the machines produce local power and local profits.





## CORES GONE WILD

Dr. Robert Mulvaney is an international ice core expert. At the British Antarctic Survey Core Program in Cambridge, England, he investigates the relationship between the evolution of Antarctic ice and the changing global environment over hundreds of thousands of years. Analyzing gases trapped in ancient ice cores, Dr. Mulvaney can get a good record of past weather and air conditions. According to Mulvaney, “These samples trapped in the ice cores are the only record of past atmosphere we have.”

And what do the ice cores show us? Mulvaney says they show a lot. “There is frightening evidence in these cores that the atmosphere of this planet is changing drastically. We have proof here that air is significantly more polluted now than at any other time in our history. And greenhouse gases are going crazy. We have doubled CO<sub>2</sub> emissions in the past 20 years alone. This has sweeping consequences ... recent greenhouse gas concentrations are way out of the natural realm. The last 250 years have gone wild.”

### HELPFUL WEB SITES

**BedZED**

[www.bioregional.com](http://www.bioregional.com)

**British Antarctic Survey**

[www.antarctica.ac.uk](http://www.antarctica.ac.uk)

**Carbon sinks**

[www.sinkswatch.org](http://www.sinkswatch.org)

**Samsø Energy Academy**

[www.energiakademiet.dk](http://www.energiakademiet.dk)

### *The Merchant Algae of Venice*

According to the EcoWorldly web site, Venice, Italy has recently developed a plan to use algae for electricity. That’s right. The city wants to produce half of its electricity needs from an algae-based power plant instead of fossil fuels. It will use two types of algae that are brought in clinging to ships and regularly grow over the seaport. The algae will be cultivated and treated in laboratories to turn it into fuel. The fuel will then be used to power turbines in a new 40 mW power plant in the center of the city. To ensure the plant will be carbon neutral, any CO<sub>2</sub> produced by the process will be fed back to the algae. The cost? \$264 million. It will be operational in 2012.

- Burning straw in central plants that produce super hot water and pumping it through underground pipes into homes. Zero greenhouse gas emissions.

- Use of biomass for powering equipment.

Source: [cbsnews.com](http://cbsnews.com), [europeanislands.net](http://europeanislands.net)





# ECO DRIVEN

Hydrogen? Electricity? Biofuel? Sun? Wind? **WHY NOT?**

There are a variety of fuels out there. Here's a guide to the terminology.

CONVENTIONAL FUELS	Produced from petroleum
ALTERNATIVE FUELS	Produced from non-petroleum sources including other fossil sources (coal, natural gas)
RENEWABLE FUELS	Produced from modern biological precursors (plants & animals)
BIOFUELS	Synonymous with "renewable fuels"
2ND GENERATION BIOFUELS	Biofuels produced from non-food feedstock--especially lignocellulose (a combination of lignin and cellulose that strengthens woody plant cells)
BIODIESEL	Methyl esters produced from fats and oils
RENEWABLE DIESEL	Non-fossil hydrocarbon fuel produced via hydro processing of fats and oils
CELLULOSIC FUELS	Produced via biochemical or thermochemical conversion of lignocellulosic materials
CLEAN FUELS	Solar, wind, fuel-cell power, geothermal

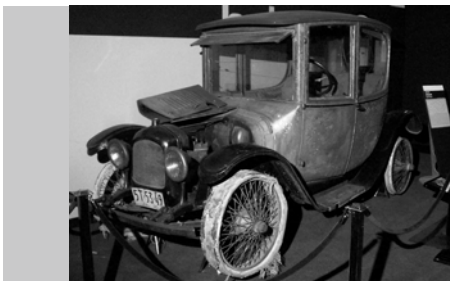
*Source: Desert Research Institute*

## But wait--there's more.

New technological ideas are presenting exciting ways to create energy. Wave power is one. Check out the Electrical Engineering Department at Oregon State University or at [www.Smithsonian.com/waveenergy](http://www.Smithsonian.com/waveenergy).

## And speaking of water.

Folks are finding new ways of harnessing hydropower for electricity without building new dams and harming rivers and wildlife. Check out the Hydropower Reform Coalition at [www.hydroreform.org](http://www.hydroreform.org).



*The first hybrid? This 1917 Woods Duel Power ran on gas and electricity. The car was only produced in 1917 and 1918. The one here is at the Petersen Automotive Museum in Los Angeles.*

# Polar bear update



PHOTO COURTESY OF DR. STEVEN C. AMSTRUP

**S**teven Amstrup is the senior polar bear scientist with the U.S. Geological Survey, Alaska Science Center, Anchorage, Alaska.

According to Dr. Amstrup, the effects of global warming on polar bears, if it continues as projected, will be severe. By mid-century, polar bears will most likely be limited to a small portion of their current range.

“Most of my research is in the Beaufort Sea of northern Alaska. We have already seen major changes in habitat. The sea ice still freezes in winter, but it’s retreating dramatically in the summer. Historically, polar bears followed

the ice. Now, they’re forced to stay on land or follow the ice farther north, where there’s less to eat. Humans caused the problem, and humans can fix the problem. We predict that there will be polar bears around to repopulate their territory if sea ice comes back. It’s an expression of hope.” *Source: Smithsonian Magazine, 11/07*

## Greensburg Greens

After a devastating tornado in 2007, the Kansas town of Greensburg decided to rebuild in an energy-efficient way. As they say on their website, “We’re better. Stronger. Greener.” Check out [www.greensburgks.org](http://www.greensburgks.org) for their amazing story.

## CONTENTED, BELCHING, GREEN BOVINES



The carbon footprint of cows comes, in very large doses, from the amount of gas the animals burp. Yep, it's true. The gas cows belch is the dairy industry's biggest contributor to greenhouse gas, with most of it emitted from the front and not the back end of the cow. Some farms in Vermont have reduced cows' intestinal methane by feeding them flaxseed, alfalfa, and grasses high in Omega-3 fatty acids.

The dairy industry contributes about 2 percent to the U.S. total greenhouse gas production. According to Dairy Management Inc., consumer demand for sustainable products is making the dairy industry look at everything it can do to reduce the industry's greenhouse gas emissions by 25 percent by 2020. That would be the equivalent of removing about 1.25 million cars from the nation's roads every year.

Since using this feeding program, participating farms have reduced the belches by between 13 and 18 percent. And the cows are now shinier and have fewer foot and stomach ailments. It hasn't cost the farms more for their custom-made grain, which the cows only get in the winter. And since vet bills have decreased, farmers are also more content. *Source: Associated Press*

**IF YOU DON'T  
CHANGE DIRECTION,  
YOU END UP WHERE  
YOU'RE HEADED.**

- Chinese Proverb



## CAN LAS VEGAS TAKE A BIG GAMBLE IN THE GREEN REVOLUTION? ONE RESIDENT THINKS SO.

*As reported in a letter to the editor in the Las Vegas Sun, July 22, 2008*

"It would require an array of solar panels about 11 miles square (i.e. about 120 square miles) to replace the entire generating capacity of Nevada Power. It would fit easily into the vacant land area north of the Speedway and south of the Valley of Fire. The start-up cost would be enormous, of course, but after that sunlight is free and the price will never go up." - John F.

# TROPICAL PARADISE?

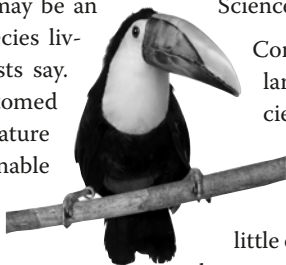
## Not for some critters.

While global warming is expected to be strongest at the poles, it may be an

even greater threat to species living in the tropics, scientists say.

Tropical species are accustomed to living in a small temperature range and thus may be unable to cope with changes

of even a few degrees, according to an analysis in a May 6, 2008 edition of the



Proceedings of the National Academy of Sciences.

Concern over global warming has largely focused on Arctic species like the polar bear. But such

animals may be accustomed to living in a wide range of temperatures. Since there is little change in the Tropics, there has been no need for species there to adapt.

Source: Associated Press

*Another Ventura County, California story*

## *Students plugging in... could be driving on sunshine*



Ventura Unified School District students will now ride in a state-of-the-art plug-in hybrid electric school bus, the first in Southern California. The new bus replaces a polluting, 1977 model, and is one of the first commercially available plug-in hybrids. The bus was unveiled in January 2010. The Ventura County Air Pollution Control District was the major funding source for the bus, which is part of the statewide California Lower Emission School Bus Replacement Program. According

to air pollution control officer Mike Villegas, "This bus represents the type of advanced technology that will be needed to address climate change. It will emit 40 percent less CO<sub>2</sub> than a conventional school bus."

Plug-in hybrids are like super-efficient regular hybrid vehicles, but with larger batteries, advanced electronics, and a capacity to plug into the grid, allowing for the vehicles to partially run on clean electricity. Electric motors are as much as three times as efficient as internal combustion engines and can be powered by renewable energy. Thus, a plug-in hybrid or electric vehicle that parks near and draws power from a building with solar panels can literally be "driving on sunshine."

Source: Ventura Unified School District; Community Environmental Council

Current use of every primary energy source is greater now than at any previous time in U.S. history. Source: U.S. EPA



## ON PINES AND BEETLES

*Dateline: Canada, present*



**Situation:** British Columbia is now experiencing a Mountain Pine Beetle outbreak beyond any beetle epidemic recorded in North American history. At this rate, 80 percent of the mature Lodgepole pines will be gone by 2013.

**Affected:** 52,000 square miles have already been affected. The Canadian Forest Service reports that by 2020, the beetles will have done so much damage that the forest is expected to release more CO<sub>2</sub> than it absorbs--990 megatons!

**Why:** When trees are killed, they no longer are able to take carbon from the atmosphere. When dead trees start to decompose, they release CO<sub>2</sub> into the atmosphere.

**Solutions:** The Canadian government is spending hundreds of millions of dollars trying to combat the infestation and its spread eastward. The program also includes recovering economic value and protecting forest resources and communities. Contact Natural Resources Canada for more information.

(Editor's note: Canada is not alone. Beetle infestation is killing millions of trees all over the western U.S., including Colorado, Utah, Wyoming, and California. Over 2,300 square miles of forest have been attacked by the pine beetle in Colorado alone.)



### DATELINE: SACRAMENTO VALLEY STATION



## The little engine that could go green.

The California Department of Transportation is taking one big step toward cleaning the air by introducing a new kind of locomotive into its Amtrak California services. This newly upgraded "green" locomotive uses cleaner diesel technology and fulfills a long time ambition of Caltrans in its quest to go green. "Commuters who are already helping air quality by leaving their cars at home can now be rest assured that their train is also fighting climate change," said California Air Resources Board Chairman Mary D. Nichols. The first Caltrans upgraded locomotive has the latest microprocessor-controlled locomotive engine technology, increased fuel economy, greater reliability, and predictable maintenance levels. It achieves EPA Tier 2 emissions performance--two levels cleaner than required for this model. The goal is to convert the entire Amtrak fleet to this new, cleaner performance level, eventually reducing operating emissions by nearly 50 percent.






*“The state of the environment is a living reflection of our daily choices.”*

-World Resources Institute, Decisions for the Earth

**There are three areas in which we can make the most impact in reducing greenhouse gas emissions--the electricity we use, the transportation we choose, and the waste we produce. Here are some suggestions to reduce GHG emissions and air pollution.**

1. Buy an energy-efficient car. Visit [www.driveclean.ca.gov](http://www.driveclean.ca.gov).
2.  Install solar electric panels on your home.
3. Use an energy-efficient hot water system.
4. Are you using compact fluorescent light bulbs (CFLs)?
5. Use an energy-efficient shower head.
6. Why not walk, bicycle, carpool or take public transit for short trips?



## **A Carbon Footprint**

**is a measure of the impact that human activities have on the environment in terms of the amount of greenhouse gases produced, measured in units of carbon dioxide.**

Source: [www.carbonfootprint.com](http://www.carbonfootprint.com)

7. Keep a transportation journal for a week--then try to drive less the next week--see option 6 above.
8. Can you travel at times when there is less traffic? If you can, you'll get better mileage and create less greenhouse gas emissions.
9. Calculate your carbon footprint. You can do this at [www.coolcalifornia.org](http://www.coolcalifornia.org).
10. Use a push or electric mower. In Ventura County, email [stan@vcapcd.org](mailto:stan@vcapcd.org) for information on the District's electric mower voucher program.
11. Teachers--visit [www.airthefilm.org](http://www.airthefilm.org) for classroom lessons on air quality.
12. Replace older appliances with ENERGY STAR appliances. Visit [www.energystar.gov](http://www.energystar.gov).
13. Buy locally grown food to reduce trucking emissions.



## What's a Person To Do?




If every home office product purchased in the United States this year were ENERGY STAR qualified, Americans would save \$200 million in annual energy costs while preventing almost 3 billion pounds of greenhouse gas emissions.

Source: U.S. EPA

14. For gift wrapping--use your own recycled paper and bows.
15. Buy online.
16. Turn off indoor lights.
17. Got stuff? Donate items to thrift stores.
18. Try fluid-applied roofing to extend roof life and increase reflectivity.
19. Use solar-control window film.
20. Have leaky ducts professionally serviced.
21. In winter, set thermostat to 68° F when at home and lower when you are away.



22. Use fans instead of air conditioning.
23. Don't let the vampire bite. Unplug electronics, battery chargers, and other items when not in use.
24. Turn your water heater down to 120°F or the "normal" setting when home, and the lowest setting when away.
25. Check tire pressure regularly.
26. Wash clothes in cold water.
27. Run your dishwasher and clothes washer only when fully loaded.
28. Clean your dryer's lint vent.
29. Only water your lawn when needed and do it during the coolest part of the day.
30. Do you turn off water while shaving or brushing your teeth?
31. Can you compost your food and yard waste?
32.  Recycle.
33. Use products in containers that can be recycled.
34. Buy products made from recycled materials.
35. Rent an energy-efficient car when traveling.
36. Use overdrive and cruise control while driving.



### Vampire Energy

Even when household appliances are turned off, most are still using some electricity. Radios, cordless phone base stations, LCD monitors, computers and laptops, laser printers, Plasma TVs, DVD players, game consoles, convection microwave ovens, and rechargeable toothbrushes, are all examples of appliances that suck energy.


- 37. Turn on the power management features on your computer and monitor.
- 38. Unplug laptop power cords when not in use.



39. Stop junk mail at [www.directmail.com/junk\\_mail](http://www.directmail.com/junk_mail).

40. Buy an electric bike.

41. Use less gas.

- 42. Paint your roof white.
- 43. Rethink vacation. Can you get away closer to home?
- 44. Cook with the lids on your pots and pans.
- 45. Sun dry your laundry. 
- 46. Use only 2 inches of water to wash your dishes.
- 47. Take shorter showers.

**“PAINTING** every roof and road white could be the equivalent of taking every car in every country off the road for 11 years.”

U.S. Energy Secretary Stephen Chu

**UNDER-INFLATION INCREASES TIRE WEAR,** reduces

your fuel economy by up to 3 percent and leads to higher greenhouse gas emissions and release of air pollutants.



Source: U.S. EPA

48. Schedule an air district presentation on global climate change for your organization. Email [don@vcapcd.org](mailto:don@vcapcd.org) or call 805/645-1407.

49. Check with local, state, and federal agencies for rebate offers on alternative energy programs, products, etc.

50. Participate in your neighborhood's planning effort to create more bike lanes and pedestrian walkways.

51. Get involved with local government to require builders to incorporate “green” building techniques and products into their proposals.

52. Do you and your kids “schoolpool?”

53. Teleconference.

54. Plant a garden.



55. If you need to use a professional printer, use one that has a FSC (Forest Stewardship Council) certification.

56. Buy products with the least amount of packaging.

57. Get the kids playing outside instead of sitting in front of a computer or TV for hours.



## What's a Person To Do?

Efforts to reduce fossil fuel use and cut carbon emissions are underway at every level of government--national, state and city--and in corporations, utilities and universities. Beyond this, millions of climate-conscious, cost-cutting Americans are altering their lifestyles to reduce energy use and carbon emissions.

- The Washington Post, 9/20/09

58. Call 805/645-1415 to schedule a screening of the APCD award-winning film ***Air – the search for one clean breath.***
59. Do you carry cloth bags to the store?
60. Investigate using a solar oven.
61. When traveling, choose green hotels. Visit [www.greenhotels.com](http://www.greenhotels.com).
62. Purchase an LCD rather than a plasma screen for your large-format TV.
63. Reconfigure your home and office to make better use of natural light.

**“If civilization has risen from the Stone Age, it can rise again from the Wastepaper Age.”**

- Jacques Barzun , The House of Intellect, 1959

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### ALMANAC PRIMARY INFORMATION SOURCES

California Air Resources Board	NOVA
California Agriculture website	Pew Center on Global Climate Change
Cosmos Magazine	Planet Ark
County of Ventura, California	Samsø Energy Agency
Dr. Steven C. Amstrup, U.S. Geological Survey	Southern California Association of Governments
Earth Policy Institute	Union of Concerned Scientists
EcoWorldly	United Nations Intergovernmental Panel on Climate Change
Los Angeles Times	United States Environmental Protection Agency
National Oceanic & Atmospheric Administration	Verde Xchange
National Wildlife Federation	
Natural Resources Defense Council	



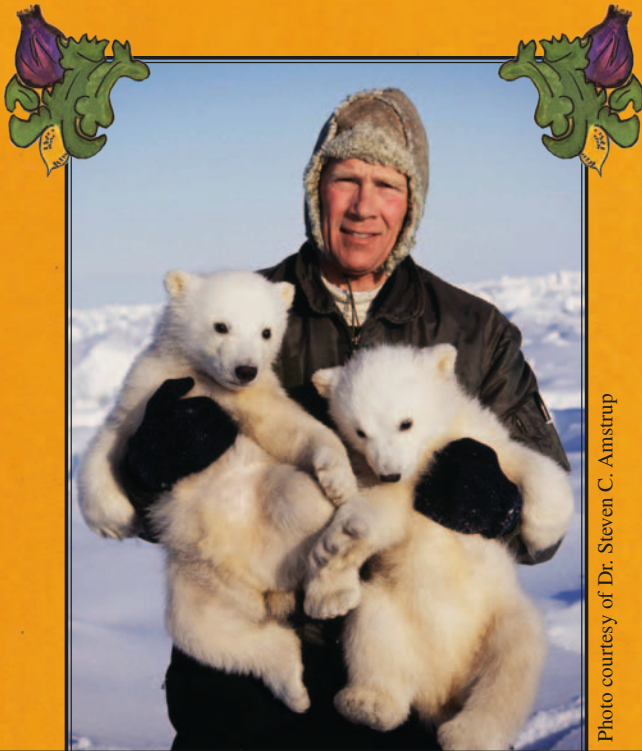


Photo courtesy of Dr. Steven C. Amstrup

Dr. Stephen Amstrup, a wildlife biologist in Alaska, is featured in “*Tales from the Climate Change Zone*” section of the Almanac. He gives an update on what’s happening with polar bears and climate change in the Arctic regions.

**From carbon sinks to sinking oceans; from lemon groves to onion juice; from Kyoto to Copenhagen, find out what’s happening on the global climate change front in The Ventura County Climate Change Almanac.**



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