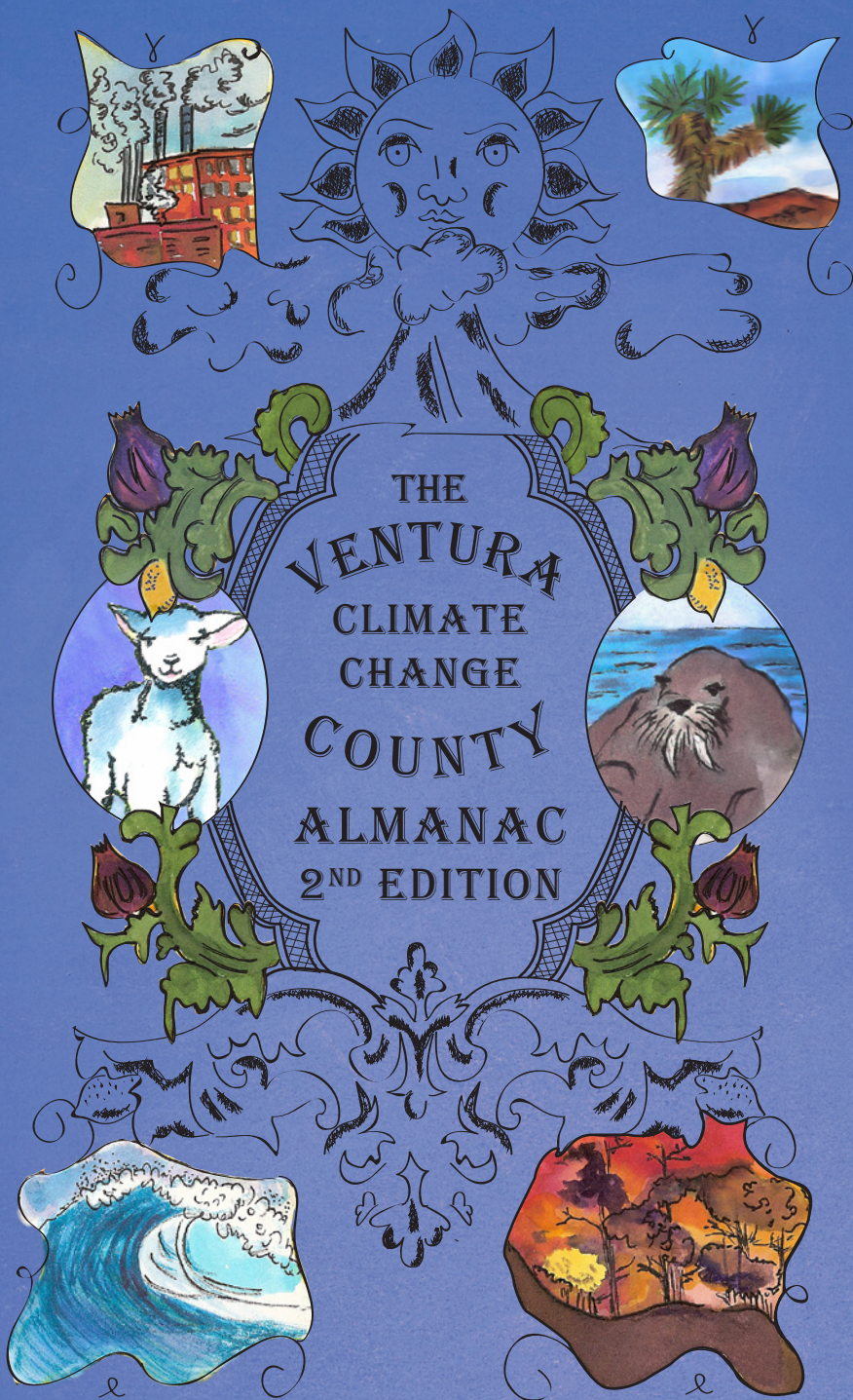


WITH LOTS OF INFORMATION AND A CALL TO ACTION.



TIMELINE AND LOCAL, NATIONAL AND INTERNATIONAL NEWS

THE 2ND

Ventura County Climate Change Almanac

Containing new, local and international information.

***“There is no ‘Plan B’ for
action. The world needs to
galvanize our action
and harness the people’s
power to change.”***

- U.N. Secretary-General Ban Ki-Moon, 9/21/14



**Ventura County
Air Pollution
Control District**

vcapcd.org facebook.com/TheAirZone

Concept, research & text:

Barbara L. Page, Public Information Manager

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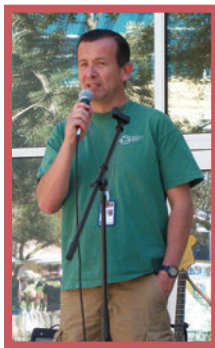
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Acronyms

AB32	California Assembly Bill 32, The Global Warming Solutions Act
ARB	California Air Resources Board
CAL EPA	California Environmental Protection Agency
CFC	chlorofluorocarbons
CO ₂	carbon dioxide
CPUC	California Public Utilities Commission
District	Ventura County Air Pollution Control District
EV	electric vehicle
GHG	greenhouse gas(es)
IPCC	Intergovernmental Panel on Climate Change
LCFS	Low carbon fuel standard
LEED	Leadership in Energy and Environmental Design
NOAA	National Oceanic and Atmospheric Administration
PPM	parts per million
U.S. EPA	United States Environmental Protection Agency
VCAPCD	Ventura County Air Pollution Control District

Preface



"Here at the District, we recently took action to begin assisting the California Air Resources Board in reducing greenhouse gas emissions from landfills, and we are working with the state to develop a regulation to reduce greenhouse gas emissions from oil and gas production facilities. However, our most important role may be to educate Ventura County citizens on the science of climate change so they can make informed decisions on programs to confront this issue."

—Mike Villegas, Ventura County Air Pollution Control Officer

Welcome to the 2nd edition of Ventura County's Climate Change Almanac

by Barbara L. Page, Public Information Manager

Since the first Ventura County Climate Change Almanac was published in 2010, we have distributed over 6,000 copies. But like the climate, things are changing and it's time to revise. So much has been written about climate change that it's impossible to include everything in this volume. You will find some of the basic technical information from the first edition, but new for this 2nd edition is the 2014 report from the IPCC as well as what's happening now in the local, state and federal climate change world. We know various terms are used for climate change: climate protection, climate crisis, climate disruption, and many others. But don't be confused. Whatever it's called, research indicates that climate change is already having impacts on people's lives. By looking at its causes and consequences at the local, state and international level, it is my hope that the more we know, the more we will make informed choices to slow the rate of climate change and anticipate, prepare and adapt to its impacts.

From the IPCC media release: Climate change threatens irreversible and dangerous impacts, but options exist to limit its effects

Who is the IPCC?

The IPCC is the world body for assessing the science related to climate change. It was set up in 1988 by the World Meteorological Organization and the United Nations Environment Programme to provide policymakers with regular assessments of the scientific basis of climate change, its impacts and future risks, and options for adaption and mitigation. This latest report draws from work by more than 830 coordinating lead authors and review editors from over 80 countries and covers a range of scientific, technical and socio-economic views and expertise.

The news

Human influence on the climate system is clear and growing, with impacts observed on all continents. If left unchecked, climate change will increase the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. However, options are available to adapt to climate change, and implementing stringent mitigation activities can ensure that the impacts of climate change remain within a manageable range, creating a brighter and more sustainable future.

Climate change is being registered around the world and warming of the climate system is unequivocal. The Synthesis Report is the most comprehensive



assessment of climate change ever undertaken. It confirms that climate change is being registered around the world and warming of the climate

system is unequivocal. Since the 1950s many of the observed changes are unprecedented over decades to the millennia. "Our assessment finds that the atmosphere and oceans have warmed, the amount of snow

and ice has diminished, sea level has risen and the concentration of carbon dioxide has increased to a level unprecedented in at least the last 800,000 years," said Thomas Stocker, co-chair of IPCC Working Group I.

The report expresses with greater certainty than in previous assessments the fact that emissions of GHG and other anthropogenic drivers have been the dominant

cause of observed warming since the mid-20th century.

The more human activity disrupts the climate, the greater the risks. Continued emissions of GHG will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of widespread and profound impacts affecting all levels of society and the natural world.



Global climate change is now recognized as an important concern for health and health policy.

The Centre on Global Change and Health, at the London School of Hygiene and Tropical Medicine, is one of the leading research groups on climate change and health in the world. Centre staff has contributed to national, regional and global assessments on the potential impacts of climate change,

including the Second, Third and Fourth Assessment Reports of the UN's IPCC. According to the Centre, "Current scientific evidence indicates that climate change will contribute to the global burden of disease through increases in extreme weather events, diarrheal disease, vector-borne disease and malnutrition. We are continuing to develop methods for quantifying the health risks associated with climate change at the national, regional and global level. Centre research has focused on improving the evidence base for developing effective public health responses on extreme weather events, particularly heat waves and flood events."

AMERICAN LUNG ASSOCIATION | LUNG FORCE

DOCTORS FOR CLIMATE HEALTH

Climate change is the most important environmental threat to health

John R. Balmes, MD
 PROFESSOR OF MEDICINE, UCSF;
 PROFESSOR OF ENVIRONMENTAL HEALTH SCIENCES, UC BERKELEY

#ClimateHealth

“As a physician and researcher, I know that climate change is an urgent health issue that affects my patients now and future generations. In fact, climate change is the most significant environmental threat to public

health of our century. A survey of American Thoracic Society members finds that the majority of doctors surveyed are already seeing health effects in their patients that they believe are linked to climate change. These include increased diseases related to air pollution, increased allergic reactions from plants and molds, and increased injuries related to severe weather. As physicians, we must raise our voices against the public health threat of climate change just like we did with cigarettes a generation ago.”

- John R. Balmes, MD, Professor of Medicine, UCSF, Professor of Environmental Health Sciences, UC Berkeley

What does the average American think about climate change?

The Yale Project on Climate Change report, *Climate Change in the American Mind*

(April 2014), shows that Americans' belief that the Earth is warming has increased over the past three years. Currently, of those who think global warming is happening, nearly two in three (62%) say they are either extremely (30%) or very (32%) sure that it is. Three years ago, in May 2011, fewer (54%) were as sure. And over the same three-year period, those who think global warming is not happening have become substantially less sure of their position (from 52% in May 2011, to 41% today).





We end this chapter with some observations on visiting Greenland in a T-Shirt.

We've heard of eco-tourism, but climate change tourism? Yes, it's happening.

Many summer tourists have discovered the latest and literally, hottest, travel destination: Greenland. What used to be one of the coldest places on the planet now has its ice melting at a rapid rate. In fact, this island, at the center of climate change conversation, welcomes about 30,000 cruise visitors per year, a four-fold increase in the past decade. The seasonal melting of the ice sheet has opened up places that were previously not available to the public. Newsweek Magazine's "100 Places to Explore Before They Disappear" (5-5-14) reports that Ilulissat, Greenland made the list. This massive wall of icebergs has broken off from the Jakobshavn (Sermeq Kujalleq) glacier. Ilulissat Icefjord, which stretches 37 miles from the town of Ilulissat to the ice cap of Greenland, is considered one of the most beautiful and impressive places in the world. It's also one of the fastest warming: since 1992 the glacier has retreated by 4.3 miles. According to the IPCC, were all of Greenland's ice to melt, the world's oceans would rise by nearly 24 feet!

Chapter 1

— The heat is on —



Our Earth is warming. The Earth's average temperature has risen by 1.4°F over the past century, and is projected to rise another 2°F to 11.5°F over the next hundred years. Small

changes in the average temperature of the planet can translate to large and potentially dangerous shifts in climate and weather.

Possible effects of a changing climate

- Shift in food production through increased unpredictability of rainfall.
- Rising sea levels that contaminate coastal freshwater reserves and increase the risk of catastrophic flooding.
- Warming of the atmosphere, which aids the spread of pests and diseases once limited to the tropics.
- Irreversible changes in major ecosystems.
- Retreating mountain glaciers.
- Reduced water supplies.

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Level of carbon CO₂ in the atmosphere, as later measured in ancient ice, is about 290 ppm (parts per million). Levels as of 2014 measure 398.78 ppm. (*In our first edition of the Almanac in 2010, levels were 385 ppm.*)

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

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

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Swedish chemist **Svante Arrhenius** blames the burning of fossil fuels for producing CO₂.

The news to date is bad and getting worse. Ice-loss from glaciers and ice sheets have continued, leading, for example, to the second straight year with an ice-free passage through Canada's Arctic islands, and accelerating rates of ice-loss from ice sheets in Greenland and Antarctica. Combined with thermal expansion—warm water occupies more volume than cold—the melting of ice sheets and glaciers around the world is contributing to rates and an ultimate extent of sea-level rise that could far outstrip those anticipated in the most recent global scientific assessment.

(Source: UN Environment Programme, unep.org/climatechange/introduction.aspx)

The difference between climate change and global warming

Global warming – the recent and ongoing rise in global average temperature near the Earth's surface. It is caused mostly by increasing concentrations of greenhouse gases in the atmosphere. Global warming is causing climate patterns to change. However, global warming itself represents only one aspect of climate change.

Climate change – any significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among other effects, that occur over several decades or longer.

(Source: U.S. EPA)

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Using records from 147 weather stations around the world, British engineer Guy Callendar shows that temperatures had risen over the previous century. He also shows that CO₂ concentrations had increased over the same period and suggests this has caused the warming. This is widely dismissed by meteorologists.

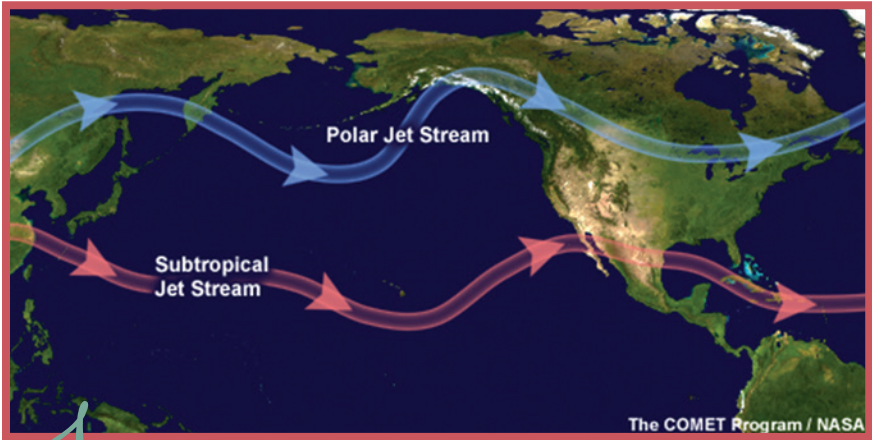
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Roger Revelle, a pioneer global warming scientist, finds that CO₂ produced by humans will not be readily absorbed by the oceans.

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Taking recordings at Hawaii's Mauna Loa Observatory, U.S. scientist **Charles David Keeling** detects a yearly rise in atmospheric CO₂. He 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.

Introducing wacky jet streams



Jet streams consist of ribbons of very strong winds which move weather systems around the globe. The strongest jet streams are the polar jets, around 23,000 – 39,000 ft. above sea level, just below the tropopause. (The tropopause is the transition between the troposphere and the stratosphere.) These winds can reach speeds of 200 mph. Meteorologists use the locations of some of the jet streams as an aid in weather forecasting. Commercially, the movement of jet streams is relevant in air travel, as flight time can be dramatically affected by flying with or against the flow of a jet stream.

How do jet streams affect the weather?

The position of a jet stream varies within the natural fluctuations of the environment caused by the temperature difference between tropical air masses and polar air masses. What happens in one part of the

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A U.S. President's Advisory Committee panel warns that the greenhouse effect is a matter of real concern.

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Analysis of deep-sea cores and ancient corals shows that the timing of ice ages was set by small orbital shifts, suggesting that the climate system is sensitive to small changes.

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

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

world depends on what is happening elsewhere – the atmosphere is a complete environment with numerous connections. Climate scientists suggest that the jet stream will gradually weaken as a result of global warming. This is due to Arctic sea ice decline, reduced snow cover and other anomalies that are expected to make the Arctic heat up faster than other parts of the globe. This in turn reduces the temperature gradient that drives the jet stream winds, causing it to become weaker and more variable in its course.

Climate scientists suggest that jet streams will gradually weaken as a result of global warming.

According to Scientific American

(December 2014): From November 2013 through January 2014, the jet stream took on a remarkably extreme and persistent shape over North America and Europe. This global river of eastward-flowing winds high in the atmosphere dipped farther south than usual across the eastern U.S., allowing the notorious “polar vortex” of frigid air swirling over the Arctic to plunge southward, putting the eastern two-thirds

of the country into a deep freeze. Ice cover on the Great Lakes reached its second-greatest extent on record, and two crippling snow-and-ice storms shut down Atlanta for multiple days. At the same time, a stubborn ridge of high pressure hunkered down over California, creating the warmest winter on record there. Although the balminess may sound nice, the resulting drought became the worst since recordkeeping began in the late 1800s, causing billions of dollars in agricultural losses.

No one knows what the future holds, but as of 2015, the drought is ongoing in California.

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US Scientist Wallace Broecker puts the term “global warming” into the public domain in the title of a scientific paper.

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

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

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Villach Conference experts say some global warming inevitable; they also declare governments need international agreements restricting emissions.

A place in 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. Greenhouse gases act like a blanket around Earth, trapping energy in the

atmosphere and causing it to warm. This phenomenon, called the greenhouse effect, is natural and necessary to support life. However, the build-up of greenhouse gases can change Earth's climate and result in dangerous effects to human health and welfare, and to ecosystems.

So, the concern is not with the fact that the greenhouse effect

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United Nations sets up a scientific authority to examine global warming, the Intergovernmental Panel on Climate Change (IPCC).

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

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

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UNFCCC countries sign the Kyoto Protocol. Industrialized countries are required to reduce emissions of six key greenhouse gases to 5.2 percent below their 1990 levels by the end of 2012.

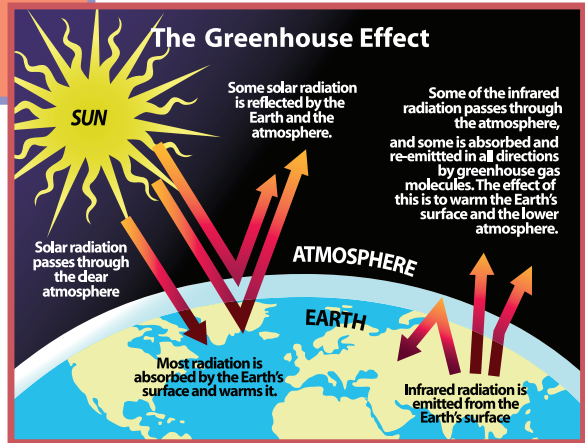
... the build-up of greenhouse gases can change Earth's climate and result in dangerous effects to human health and welfare, and to ecosystems.

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.

Human activities, over the past

century, have released large amounts of carbon dioxide and other greenhouse gases into the atmosphere.

The majority of greenhouse gases come from burning fossil fuels to produce energy, although deforestation, industrial processes, and some agricultural practices also emit gases into the atmosphere.



All of the world's top ten warmest years have occurred since 2000. Climate studies have shown the world is poised for more warmth as the amounts of carbon dioxide rise. In October 2014, figures revealed carbon dioxide levels rose by the highest amount in 30 years in 2013.

(Source: *The Guardian*, 10/20/14)

2001

1990s are named as the hottest decade on record.

IPCC's third report declares the evidence for man-made global warming to be incontrovertible although the effects on the climate are hard to pin down. Effective end of debate among all but a few scientists.

The United States, the biggest single greenhouse-gas polluter, abandons the Kyoto Protocol.

2004

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

2005

Kyoto Protocol takes effect on February 16. Awareness, and concern, of global warming surges in U.S. after an exceptional season for tropical storms, punctuated by Hurricane Katrina.

How can a change of one or two degrees in global average temperatures have an impact on our lives?



Changing the average global temperature by even a degree or two can lead to serious consequences around the globe. For about every 2°F of warming, we can expect to see:

- 5–15% reductions in the yields of crops as currently grown
- 3–10% increases in the amount of rain falling during the heaviest precipitation events, which can increase flooding risks
- 5–10% decreases in stream flow in some river basins
- 200–400% increases in the area burned by wildfire in parts of the western United States

Global average temperatures have increased more than 1.4 degrees Fahrenheit over the last 100 years.

Many of the recent extreme precipitation and heat events are consistent given this amount of warming. Scientists project that the Earth's average temperatures will rise between 2 and 12 degrees Fahrenheit by 2100.

(Source: U.S. EPA website: epa.gov/climatechange/basics/facts.html#ozonelayer)

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. (AB 32 – California Global Warming Solutions Act of 2006)

2007

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




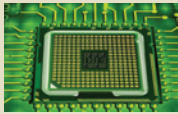
IPCC releases fourth assessment warning serious effects of warming are evident and cost of reducing emissions is less than the damage they will cause.

Ventura County Air Pollution Control District begins global climate change outreach.

2008

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

Ventura County Air Pollution Control District receives international Mercury Communications award for its Clean Air Today issue on global climate change.

Major Greenhouse Gases	Sources
	
Methane CH₄ 	<ul style="list-style-type: none"> • Fossil fuels • Animal husbandry (enteric fermentation in livestock and manure management) • Rice cultivation • Biomass burning • Waste management • Also occurs naturally in the atmosphere
Nitrous Oxide N₂O 	<ul style="list-style-type: none"> • Fertilizer • Industrial processes • Combustion • Also occurs naturally in the atmosphere
Hydrofluorocarbons HFCs	<ul style="list-style-type: none"> • Refrigerants and foam blowing operations
Perfluorocarbons PFCs 	<ul style="list-style-type: none"> • Refrigerants • Aluminum smelting • Semiconductor manufacturing
Sulfur Hexafluoride SF₆	<ul style="list-style-type: none"> • Dielectric fluid

(Source: Center for Climate and Energy Solutions)

2009

United Nations Climate Change Conference meets in Copenhagen, Denmark, but fails to negotiate binding agreements.

2030—Year which Glacier National Park will have no glaciers left according to the U.S. Geological Survey.

2010

First edition of The Ventura County Climate Change Almanac published.

2013

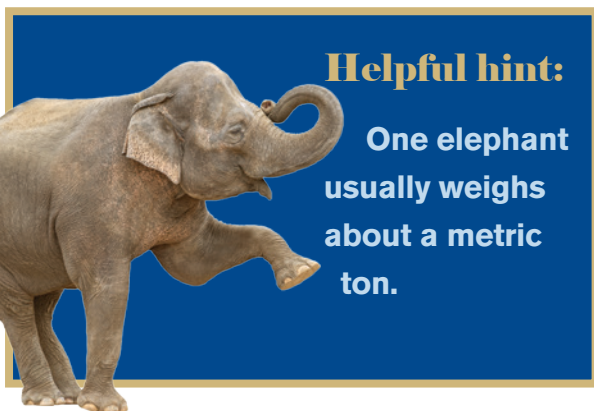
IPCC Fifth Assessment Report (Part 1) says scientists are 95 percent certain that humans are the “dominant” cause of global warming since the 1950s.

Hawaii’s Mauna Loa Observatory reports that the daily mean concentration of CO₂ in the atmosphere has surpassed 400 parts per million for the first time since measurements began in 1958.

From the climate change lab

In 2014, the U.S. EPA released its fourth year of GHG reporting data.

Over 8,000 large-emitters reported direct emissions to the program in 2013, representing about 50 percent of total U.S. emissions. Here's the breakdown:



1. **Power plants** – Over 1,550 facilities emitting over 2 billion metric tons of CO₂. Power plant emissions have declined by 9.8 percent since 2010.



2. **Petroleum and natural gas systems** – 224 million metric tons of GHG emissions, a decrease of 1 percent from 2012.

3. **Refineries** – 177 million metric tons of GHG emissions, up 1.6 percent from 2012.

2014

UN Secretary General's Climate Summit in New York City.

400,000 people participate in the People's Climate March in New York City, the day before the UN Climate Summit.

2015

The Bulletin of the Atomic Scientists moves the hand of the Doomsday Clock forward by two minutes, to 11:57 p.m. Richard Somerville, a member of the Bulletin's board who is a climate scientist at the Scripps Institution of Oceanography, said the trend in heat-trapping emissions from the burning of fossil fuels will "Lead to major climatic disruption globally. The urgency has nothing to do with politics or ideology. It arises from the laws of physics and biology and chemistry. These laws are non-negotiable."

2nd edition of The Ventura County Climate Change Almanac published.

Other sources

- **Methane** from petroleum and natural gas systems – down 12 percent since 2011, with the largest reductions coming from hydraulically fractured natural gas wells.
- **Other large sources** in the industrial and waste sectors – up by 7 million metric tons, 1 percent rise from 2012.

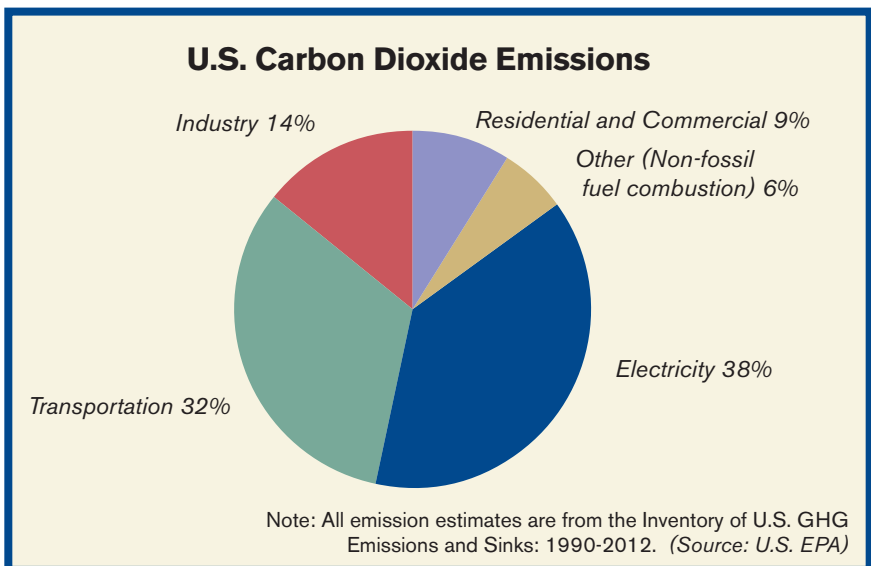
And from transportation

Transportation represented 27 percent of total U.S. GHG emissions in 2011. Cars, trucks, commercial aircraft, and railroads, among other sources, all contribute to transportation emissions.

(Source: Inventory of U.S. GHG Emissions and Sinks 1990-2012)

The CO₂ connection

Carbon dioxide is the primary GHG emitted through human activities. In 2012, CO₂ accounted for about 82 percent of all U.S. GHG emissions from human activities. Carbon dioxide is naturally present in the atmosphere as part of the Earth's carbon cycle (the natural circulation of carbon among the atmosphere, oceans, soil, plants, and animals). Human activities are altering the carbon cycle – both by adding more CO₂ to the atmosphere and by influencing the ability of natural sinks, like forests, to remove CO₂ from the atmosphere. While CO₂ emissions come from a variety of natural sources, human-related emissions are responsible for the increase that has occurred in the atmosphere since the Industrial Revolution.



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 GHG 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.

Although it's difficult to predict the exact impacts of climate change, what's clear is that past climate is no longer a reliable guide for what to expect in the future.

(Source: Science, 5/18/09)

Carbon dioxide can stay in the atmosphere for nearly a century, so the Earth will continue to warm in the coming decades. The warmer it gets, the greater the risk for more severe changes to the climate and the Earth's system. Although it's difficult to predict the exact impacts of climate change, what's clear is that past climate is no longer a reliable guide for what to expect in the future.

Methane is the second most prevalent GHG emitted in the United States from human activities.

Where is it coming from?

- Natural gas and petroleum systems are the largest source of methane emissions from industry in the United States. Methane is the primary component of natural gas. Some is emitted into the atmosphere during the production, processing, storage, transmission, and distribution of natural gas.
- Domestic livestock such as cattle, buffalo, sheep, and goats produce large amounts of CH_4 as part of their normal digestive process. Because humans raise these animals for food, the



emissions are considered human-related. Globally, the Agriculture sector is the primary source of methane emissions.

- Methane is generated in landfills as waste decomposes and in the treatment of wastewater. Landfills are the third largest source of CH_4 emissions in the United States.

Why are we concerned?

If methane is allowed to leak into the air before being used - from a leaky pipe, for instance – it absorbs the sun's heat, warming the atmosphere. For this reason, it's considered a GHG, like carbon dioxide.

While methane doesn't linger as long in the atmosphere as carbon dioxide, it is initially far more devastating to the climate because of how effectively it absorbs heat. In the first two decades after its release, methane is 84 times more potent than carbon dioxide. Both types of emissions must be addressed if we want to effectively reduce the impact of climate change.

(Source: U.S. EPA)

About 25 percent of the manmade global warming we're experiencing today is caused by methane emissions.

Mary had a little methane producer

This is a story about the ins and outs of climate change. When many animals, like sheep and cows, pass wind in either direction they release methane.



In Australia, about 74 million sheep produce roughly 540 thousand tons of methane rumbling its way into the atmosphere each year. But Australian scientists are on the problem. They are trying to measure exactly how much methane sheep produce. They set up tents where once they're in, sheep are encouraged to let 'em all out. The closed tent lets the sheep expel gas to their hearts' content. Then the gasses are sucked out of the tent and the methane is measured. (But don't go in there, PLEASE.)

But measuring how much they release doesn't stop them from doing it. So, scientists have been experimenting with different sheep foods to see if changing their diet changes the amount of methane they release.

A shrub that has been used for thousands of years as a traditional Aboriginal medicine is now showing promise as a sheep gas remedy. It can cut the methane in their eruptions by up to 80 percent. Now the scientists just have to work out what chemical in the plant makes it work so they can add it to all sheep feed.

This is interesting, right? Make sure to pass on this information.

(Source: The Telegraph, 9/29/09)

Chapter 2

— California leads on climate change —

**Dateline Georgetown Climate Center
Washington D.C., 2015**

California has completed the highest number of goals to prepare for climate change, followed by Massachusetts and New York, according to a first-of-its-kind, 50-state tracking tool.

California has been a leader, achieving 48 of its 345 self-described climate goals, says the new online tool developed

by the Center, a nonpartisan research group based at Georgetown University Law School. It

passed, for example, a "cool

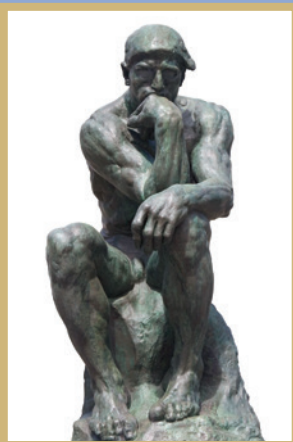
pavements" bill in 2012 to encourage lighter-colored paving materials that reduce the heat-island effect in urban areas. To access the tool, visit georgetownclimate.org/adaptation/state-and-local-plans.



Taking significant amounts of carbon out of the economy without hurting its vibrancy is exactly the sort of challenge at which California excels.

— Governor Jerry Brown,
January 5, 2015

What do Californians think of climate change?



In 2013, researchers at the Public Policy Institute of California, Yale University, Stanford University, and a partnership between Yale and George Mason University reported:

- 58% of Californians believe global warming is caused mostly by human activities.
- 82% of Californians think global warming will be a serious problem for the country.
- 63% of Californians say they are very or somewhat worried about global warming.
- 75% of Californians say it is necessary to take steps to counter the effects of global warming right away.

But here's the sobering statistic.

- Among Californians who believe global warming is happening, 89% say their own actions would reduce their personal contribution to global warming, yet only 12% of Californians are convinced that humans will successfully reduce global warming.

In other words, Californians want to reduce global warming emissions, but are doubtful that we can get the job done.

AB 32, California's Global Warming Solutions Act, Update

In 2006, California was at the national forefront to slow global warming with the passage of Assembly Bill 32, the Global Warming Solutions Act. It made ARB the lead state agency to reduce greenhouse gas emissions to 1990 levels. Almost a decade later, California has a suite of programs to reduce greenhouse gases and expand opportunities for sustainable economic growth while giving businesses the kind of regulatory certainty they require to thrive. AB

32 does have economic impacts and was designed to make sure that those impacts are positive. Getting to this point has required an enormous public process and a full state initiative drawing on a number of agencies from CAL EPA, the Natural Resources Agency and other departments.

Most of these actions have been bold, ambitious, and truly trail-blazing.

– *Climate Change Scoping Plan Update 2014*

AB 32 includes four primary programs all geared toward increased energy efficiency: advanced clean cars, the renewables portfolio standard, the low carbon fuel standard, and cap-and-trade.

Advanced clean cars



California's clean air rules have helped make today's passenger cars 99 percent cleaner than they were in the mid-1970s. The advanced clean car rules passed in 2012 continue that push, reduce greenhouse gas emissions and tailpipe emissions, and increase gas mileage.

- The enhanced zero-emission vehicle program (ZEV) drives the market for vehicles with no emissions. These vehicles are on the road now and will save consumers an estimated \$5 billion in 2025 and \$10 billion by 2030 while removing 52 million tons of greenhouse gas from the atmosphere by 2025. In fact, California will see 1.5 million ZEVs on the road by 2025.
- Vehicles, fuels, and land use policies will cut in half emissions from passenger transportation and drivers' fuel costs over the next 20 years. The plan reduces greenhouse gas emissions from new vehicles in 2025 by about 50 percent below today's average car.
- California's Low Carbon Fuel Standard is beginning to drive the production of a broad array of cleaner fuels. The legislation also requires transportation fuel producers to reduce the carbon intensity of their product by 10 percent by 2020. ARB is working with the U.S. EPA and the U.S. Department of Transportation's National Highway Traffic and Safety Administration on national GHG standards for medium- and heavy-duty trucks.

- California is also making major strides toward reducing the number of miles people drive, through more sustainable local and regional housing, land use, and transportation planning.

Renewables portfolio standard



The renewables portfolio standard requires that a third of electricity generated in California by 2020 be generated with cleaner renewable fuels. Reliable electricity is essential to the health of California's economy and a wider variety of fuels and fuel sources secures that supply while reducing emissions.

- Ongoing efficiency efforts (like new green building standards now in effect for homes and businesses and new standards for appliances, televisions, and other “plug loads”) continue to reduce energy use and emissions while maintaining efficiency and cost savings.
- Currently, about 23 percent of the state's electricity comes from renewable power. This will increase to at least 33 percent by 2020. Once thought of as exotic and alternative, renewable energy technologies have now become an integral part of California's energy mix.

The low carbon fuel standard (LCFS)

The LCFS requires a 10 percent reduction in carbon emissions by 2020 from transportation fuels sold in California. It will help make a wider choice of cleaner fuels available to Californians. Many are available now and the development of cleaner fuel has already drawn companies to the state. To view an informative video on the LCFS, visit arb.ca.gov/fuels/lcfs/lcfs.htm.

The cap-and-trade program

Cap-and-trade reduces emissions from the state's largest industrial sources, including energy generation. As the cap declines each year, greenhouse gas emissions must come down with it. Covered

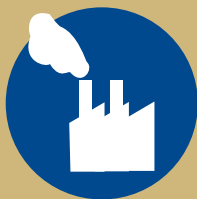
businesses must turn in a permit or allowance for every ton of carbon they emit. The more they reduce emissions, the fewer allowances they need. Buying and selling carbon allowances lets industry set the price on carbon. Industry received 90 percent of allowances free as the program began, with the number declining in later years. Utilities get 100 percent of allowances free with the money from their sale at auction used to protect rate payers. Allowances let businesses decide when to make actual emission reductions in a planned way as they incorporate greater efficiency into their business plans.

In 2014, the California cap-and-trade program linked with Quebec's carbon market so that allowances and offsets issued in one jurisdiction may be used for compliance in the other. This is why this allowance price forecast is for the combined Western Climate Initiative market, which covers California and the Canadian provinces of Ontario, Quebec, British Columbia and Manitoba.

(Source: ARB YouTube video; ARB's Climate Change Scoping Plan Update, May 2014)

How does carbon trading work?

The whole point of cap-and-trade is to raise the price of emitting carbon. Here's how:



1 TON
CO₂

\$12.10 per ton
As of May 11, 2015

\$\$\$

Clean
Energy

Without a price on carbon, big polluters don't pay for the CO₂ they emit. The real cost is borne by the planet in the form of climate change. An example that already exists is the EPA's Acid Rain Program.

In a trading scheme, polluters must purchase a permit, or an allowance, for every ton of CO₂ they emit. These can be government issued, or bid for at an auction. The total number of permits are "capped."

A market is created. Businesses are now able to trade carbon allowances (permits) on the free market. Companies that need to emit more can buy more permits from those who require less. Classic supply and demand.

The idea is pretty simple: the cost creates an incentive across the economy to reduce pollution and invest in cleaner forms of energy.

Up on a million rooftops

Every hour, the sun radiates more energy onto the earth than the entire human population uses in a whole year. By capturing just a tiny fraction of this energy, we can decrease our dependence on fossil



fuels like natural gas and coal, leading to cleaner air, reduced global warming pollution, and thousands of new jobs.

That's why Environment California created the Million Solar Roofs campaign in 2006. The goal? Reach a million solar roofs statewide by the year 2020.

Today, California is on pace to hit the Million Solar Roofs target ahead of schedule, and our state is unquestionably the nation's solar leader. The price of solar has dropped more than 45 percent since the program began in 2006, and California's solar industry now employs more than 43,000 people.

(Source: Environment California)

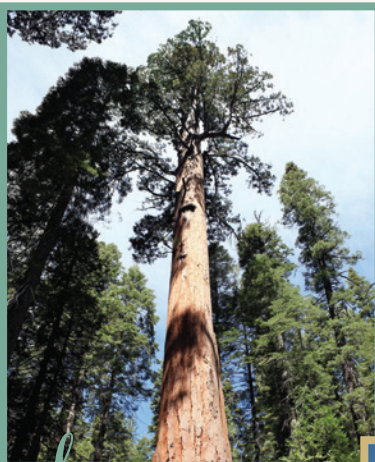


In August 2014, California reached an electrifying milestone: it became the first state to sell more than 100,000 plug-in electric vehicles. To put that into perspective, it's about 40 percent of all plug-in vehicles sold in the U.S. Driving the market are state incentives – cash rebates and permission for

people with plug-ins to drive in carpool lanes with just the driver. But the state has a loftier goal: one million electric vehicles in California by 2020. And here's a national EV factoid. In 2014, national sales of electric vehicles was almost 300,000.

(Source: ARB)

A tale of two California trees



At first glance, they seem radically opposed – the majestic Giant Sequoia, the world's tallest tree, and the skeleton-like desert Joshua Tree. But they do have one thing in common: both species are coping with the long-term effects of climate change. Scientists are worried that soon these trees will really start feeling the heat. According to Nature World News in 2014, Sequoia trees are not able to withstand decades of dry and warming weather. Their seedlings and saplings are vulnerable to forest fires, and constant drought will prevent them from developing a strong root system. In other words, the trees just won't reproduce in those conditions. Giant Sequoias, some of which are 2,000 to 3,000 years old, live in a 60-mile band of the Sierra

Nevada Mountains, many of them in Sequoia and Kings Canyon National Parks. Wildfires can pose great risk to these trees.

Over 300 miles south of the Sequoias, is Joshua Tree National Park, where many of these twisted trees are dying. The Desert Sun newspaper reported in May 2014 that "The knee-high young trees that once were plentiful have vanished from some areas."



Scientists say that it's one of the many examples of climate change affecting plants and that rising temperatures are likely to bring more dramatic changes to desert landscapes. This could alter plants and habitats, which will also affect communities of animals as well.

The National Park Service states, "Our national parks are laboratories for good science and informed management decisions and also for educating the public about how climate change affects us by impacting places we care about."

Chapter 3

— Ventura County: On the sustainable track —

Climate change could have numerous impacts on Ventura County. But actions are being taken by local government, organizations and individuals to combat the climate change beast.

As in other coastal zones, climate change in the County could have the following consequences to our area including:

- The inability to protect and the possible relocation of beaches and dunes, commercial developments, roadways, ports and docks, and other critical coastal buildings and facilities.
- The County's agricultural lands, coastal wetlands, and wildlife species.

Coastal Resilience is a global network of practitioners who apply a web-based mapping tool

A study from California's Climate Change Center estimates that sea level will rise 20 inches along our coasts by 2050.

to help communities understand their climate vulnerability. They are partnering with NOAA, the Natural Capital Project, the Association of State Floodplain Managers, and the University of Southern Mississippi. The tool allows users to visualize how climate change may impact the extent and quality of coastal habitats that critical species need. Here are some comments from Coastal Resilience about Ventura County.

- Climate change could alter the width of beaches in Southern California, including Ventura County. Sea level rise affects the patterns of beach erosion and accretion when severe storms combine with higher tides.



- The extensive wetlands at Ormond Beach provide habitat for a range of organisms. They also act as a buffer to help prevent coastal communities from storms and flooding. In addition, they serve as key stopping points for migrating birds.

(Source: [toolkit.climate.gov](https://www.climate.gov/toolkit))

For the birds



The **California Least Tern** is on the state and federal endangered species list. This seabird nests and forages on beaches during the summer breeding season, migrating to overwintering grounds in Central America in July and August. There are four major

nesting sites for California Least Terns found within the Coastal Resilience Ventura study area. They lay their eggs in the sand, sometimes near sparse protective vegetation. The birds feed in estuaries, lagoons, coastal ponds, and near shore waters.

The **Western Snowy Plover**, another small shorebird species, is found on the Pacific Coast, including Ventura County. Coastal populations of this bird are also federally listed as endangered, while inland populations are considered a species of special concern by the State of California. This species also nests and forages in the summertime on exposed local beaches, but does not migrate.



Because the nests of both bird species are so exposed, they are particularly vulnerable to threats from terrestrial predators and human disturbance. As sea level rise inundates beaches, critical habitat for these small creatures will be eaten away. Pressure on beach-nesting bird populations will mount as beaches become narrower and multiple uses of the shore compete for space.

The Ventura County test lab for climate solutions

PHOTO: Courtesy of The Nature Conservancy



The Santa Clara River

The Nature Conservancy selected a County project to protect wildlife and provide a flood plain for the larger river that is expected this century due to climate change. From high in the Angeles National Forest in Los Angeles County and flowing down into Ventura County and the Pacific Ocean, the Santa Clara River and its tributaries are surrounded by 12 million people. As the population soars, experts predict 19 million by 2020, urban sprawl bears down on the river and its watershed, delivering a triple threat impacting:

1. The supply and quality of the region's fresh water, including groundwater recharged by the river.
2. The farmers whose fields and groves line the river and surrounding lands, making a healthy contribution to the local economy and regional identity.
3. The plants and animals within the watershed that rely on the extensive freshwater and habitat of the river system, including a staggering 38 species on the state or federal threatened or endangered lists and hundreds more migratory and resident species.

Adding to the pressure, 95 percent of Southern California's river and wetland habitat has already been lost. In fact, this is one of the last rivers in Southern California that remains relatively natural.

The Santa Clara River Project was launched during the peak of a large real estate boom, with building plans being approved as fast as they were proposed. It became clear that protecting the 84-mile-long river and its numerous tributaries would not be enough to save them and their wetlands. To be truly effective, a buffer zone was needed between the river and the developed areas. The threatened farmland could provide that buffer.

The Nature Conservancy began partnering with the farmers and open-space advocates of the region to develop land-use policies that protected the farmers' livelihoods and explored ecologically compatible farming techniques that safeguarded the habitat and water supply. Working together, the Nature Conservancy and County agencies began discussing innovative flood-control policies that would prevent the river from suffering the channelized, concrete-lined fate of its sister rivers. Today, one-third of the river that winds through Ventura County has been protected. The goal is to protect close to 30,000 acres of river in the midst of one of the world's fastest growing metropolises.

(Source: nature.org/ourinitiatives/regions/northamerica/unitedstates/california/explore/santa-clara-river.xml)

Ventura County achievements

Fire stations go green

New stations integrate solar panels, recycled materials, drought tolerant plants, dual pane windows, electric car charging stations, tankless water heaters, and energy-efficient lighting. They use less energy and water, helping to reduce the County's carbon footprint. In addition, older fire stations are being retrofitted with similar energy-saving measures.

A whole lotta sun going on

The largest County solar project is at the Moorpark Water Reclamation Facility. The one megawatt system, funded in part by a Southern California Edison grant, covers 80 percent of the facility's energy needs and reduces the County's energy bill by the amount of energy needed to power 500 homes yearly. It also reduces greenhouse gas emissions on par with planting 175 trees.

Fleet of "low carbon" footprints

The County has decreased vehicle emissions by 5 percent since 2008 by adding eco-friendly vehicles, such as hybrids and partial zero emission vehicles to its fleet. Since 2002, it has saved over \$250,000 in fuel costs and reduced carbon dioxide emissions by 950 tons.

Going bananas over clean air

PHOTO: Barbara Page



Chiquita Banana at the District's booth at the 2014 Banana Festival at the Port of Hueneme.

Established in 1937, the Port of Hueneme is the only deep water port between Los Angeles and San Francisco. It encompasses 275 maritime acres and 294 industrial acres. The Port is a vital economic engine for California and Ventura County, with \$8 billion in goods movement, \$1.1 billion in economic activity, and 10,230 trade-related jobs.

The Port is also committed to protecting the environment. Here are some of its green actions:

- Daily use of clean-burning fuels in the vessels and equipment to move cargo.
- Use of a grid-based shore power system for ships to use instead of burning diesel fuel to run the on-ship refrigeration for perishable commodities.

In the next 30 years, the Port is expected to reduce greenhouse gas emissions by 55 percent and particulate matter by 92 percent.

(Source: The Port of Hueneme)

More tales from the VC low carbon community

These residents and projects are highlighted on the District's Air Streams video page at vcapcd.org/AirStreams/index.html.



Bambi "up on the roof" with her solar panels in Ventura.

Bambi Ruebe is a person of imagination and skill. Not only did she install the solar panels on the roof of her Ventura home herself, but she is planning on using the electricity they generate to power a 1961 MG that she is converting to an electric car. Again, by herself! The MG, by the way, is the same car she drove in high school. Talk about reuse!



Chuck Rogers, Superintendent of the City of Thousand Oaks' Hill Canyon Wastewater Treatment Plant, is standing in front of some of the 2,783 solar panels at the site.

The Hill Canyon Wastewater Treatment Plant sits on 51 acres of open space and provides wastewater treatment for the City of Thousand Oaks. The plant is well known for its energy management and sustainability efforts. Between solar and an onsite cogeneration facility, Hill Canyon provides 100 percent of its own electrical energy needs. The effort began in 2007 with a cogeneration project that could create up to 500 KW of renewable energy by burning methane gas created in the facility's

anaerobic digesters in two 250KW cogeneration units. Simultaneously, the solar panel array was turned on and produces electricity during the peak period of the day when it is most expensive.

Rincon Consultants, Inc. of Ventura was the first private office building in the Ventura County area to receive a LEED certification, and one of only two in the Ventura-Santa Barbara-San Luis Obispo tri-county region to do so. The LEED certification covers operational practices. Rincon's circa-1960s building presented upgrade challenges as it was built decades before green building techniques had become widely used. Rincon's in-house sustainability team devised a plan to significantly improve functionality through implementing waste stream reduction, water conservation, energy efficiency, and vehicle trip reduction.



Filming Steve Svete and Erik Feldman of Rincon Consultants, Inc. in front of their LEED Office, February 2014.

Electric vehicles on the move. According to ARB Chairman Mary D. Nichols in October 2014, "In only a few short years we have gone from virtually zero to a quarter-million zero-emission cars, and every day moves us closer to our combined goal of 3.3 million by 2025." In California, more than 100,000 EVs have been purchased or leased. Here in Ventura County, the electric vehicle infrastructure is



District engineer Stan Cowen at an EV Charging Station at The Collection in Oxnard. Contact Stan at the District for information on EV Grant programs.

beginning to get “up to speed” with over 100 local charging stations available. To locate an EV station visit recargo.com. And to learn more or to find the advanced technology vehicle that fits your life, check out driveclean.ca.gov.

Ventura's **Ohana Pet Hospital** was honored recently by the California Air Resources Board by receiving its CoolCalifornia Small Business Award. Ohana was recognized in the “Business of the Year” category with only four other businesses statewide. Some of Ohana's green practices include:

- Use of zero emission paints, natural and energy efficient lighting, and recycled glass countertops
- Use of Green Guard indoor air quality certified anti-microbial flooring and Green Guard indoor air quality certified recycled-content cabinet laminates
- Use of low-flow toilets, and Energy Star appliances
- Paperless recordkeeping and purchasing of recycled-content office supplies, promotional products and biodegradable pens
- Use of refillable cleaning products
- Recycling of medical supplies throughout the practice

For more information, visit ohanapethospital.com/ecofriendly-practices.



Left to right: LaRonda Bowen, California Air Resources Board Ombudsman; Dr. Jan Shinkawa, Jamie Gill, Laura Quinonez, Courtney Cedillo, Ohana Pet Hospital; John Brooks, City of Thousand Oaks

Chapter 4

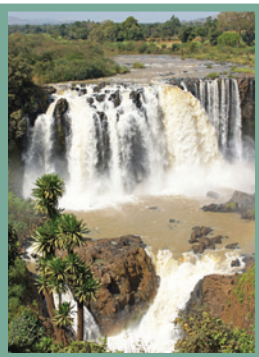
— Feeling the heat worldwide —

Human-caused climate change could have a devastating impact on the world in a matter of decades, or even years. Let's take a look internationally at what's happening.

Islands in the climate change stream

Pacific Island states are some of the most vulnerable to the devastating effects of climate change. The Maldives is the world's lowest-lying country, with more than 80 percent of its scattered islands less than one meter above sea level. It will be one of the first nations submerged. In 2009, then-President Mohamed Nasheed (the subject of a documentary called "The Island President" that deals with the subject of climate change) staged a cabinet meeting underwater to raise awareness about the future of the country if anthropogenic global warming was left unchecked. This archipelago in the Indian Ocean is not alone in gradually drowning: as many as 1,500 of Indonesia's islands could be underwater by 2050. In 2014, the United States Secretary of State John Kerry told students in Jakarta that climate change poses a threat to their "entire way of life" and that it was "perhaps the world's most fearsome weapon of mass destruction."

(Source: "Sinking States: Climate Change and the Pacific," *The Diplomat*, 5/22/2014)



Out of Africa

Scientists from the Potsdam Institute for Climate Impact in Germany published a 2014 study that tells the "where" of the climate change story. According to one of the authors, "We tried to identify the places where climate change really hurts most." The three regions they expect to be among those most at risk in a couple of decades are parts of Sudan and Ethiopia; the countries

surrounding Lake Victoria in central Africa; and the continent's south-eastern corner, especially parts of South Africa, Mozambique and Zimbabwe. The authors say that overlapping impacts of climate change – drought, floods, declining crop yields or ecosystem damage – create “hotspots of risk.”

The report recommends possible ways of adapting to such risks. These included better access to international agricultural markets; allowing herders to sell cattle before droughts; insurance systems to balance the changes in crop yields from one year to another; and water storage systems such as underground storage tanks.

(Source: Climate Central, 5/11/14)

Amazonia watch



The Amazon Basin contains the largest tropical rainforest on the planet – 1.4 billion acres. It is one of Earth's largest reservoirs of carbon dioxide and regulates global climate patterns through the taking and storing of carbon dioxide in biomass and soil. In fact, the world's tropical rainforests absorb about 20 percent of all the atmospheric carbon emitted by the burning of fossil fuels. And, as the

source of one-fifth of all fresh water on the planet, the Amazon Basin's water system is essential in regulating global and regional climate. Water condensation, evaporation, and transpiration over the Amazon are key drivers of global atmospheric circulation, affecting rainfall across South America and much of the Northern Hemisphere. The Amazon serves as a carbon sink only so long as the rainforest

Climate change may soon cause the Amazon to release more carbon into the atmosphere than it absorbs.

absorbs more carbon dioxide than it releases.

But here's the problem. Climate change may soon cause the Amazon

to release more carbon into the atmosphere than it absorbs. Scientists predict this change could occur as forests become less able to absorb atmospheric carbon as climate warming slows down plant growth there and causes trees to die more rapidly. This was the

case in 2005, when a prolonged drought in the Amazon released close to one billion tons of carbon dioxide into the atmosphere, more than it removed through absorption. As global temperatures rise, the Amazon could become caught in a potentially calamitous feedback loop. In this vicious cycle, warmer oceanic waters will continue to dry out the basin, which in turn will release more carbon into the atmosphere. Warmer temperatures and a dryer forest also increase forest fires, emitting more carbon and driving the process.

(Source: Amazon Watch, a nonprofit organization founded in 1996 to protect the rainforest and advance the rights of indigenous peoples in the Amazon Basin)



Wake-up call to national treasures

2014 report from the Union of Concerned Scientists: Rising seas and wildfires are threatening the United States' most cherished historic sites.

A visit to the Statue of Liberty via submarine? And no, it's not a scene from a movie. It's from the latest report from the Union of Concerned Scientists predicting what could happen sometime this century. "The range and scale of impacts are alarming. Many of the United States' iconic landmarks and heritage sites are at risk as never before. Sea level rise, coastal erosion, increased flooding, heavy rains, and more frequent large wildfires are damaging irreplaceable archaeological sites, historic buildings, and cultural landscapes."

Some of these locations include the Statue of Liberty and Ellis Island; Fort Monroe National Monument; Cape Hatteras Lighthouse; Historic Charleston, South Carolina; Mesa Verde National Park; Bandelier National Monument and Santa Clara Pueblo; and many others.

“The consequences are already happening, forcing federal and state agencies, park managers, archaeologists . . . and others to protect sites today and prepare for additional changes tomorrow. From the installation of breakwaters to protect against coastal erosion on Jamestown Island to the flood-proofing of electrical utilities at the Statue of Liberty, major efforts are now being launched to lessen the impacts of climate change on the national heritage of the United States.” To read the entire report, visit: ucsusa.org/global_warming/science_and_impacts/impacts/national-landmarks-at-risk-from-climate-change.html.

It's not just about polar bears



EcoWatch.com reported in 2014 that Arctic sea ice coverage was at its sixth lowest level

since 1978. Pacific walrus are dependent on ice surfaces for breeding and hunting. Record numbers of the walrus, an estimated 35,000, were spotted on a beach in northwest Alaska. They are coming ashore to find resting places. This onshore invasion can leave the animals vulnerable to stampedes caused by hunters, polar bears or airplanes.

“The massive concentration of walrus onshore – when they should be scattered broadly in ice-covered waters – is just one example of the impacts of climate change on the distribution of marine species in the Arctic.”

*–Margaret Williams,
managing director of
the Arctic program
at the World Wildlife
Fund*

Penguins too?



Yes. A study in the journal, *Nature Climate Change*, a monthly journal dedicated to publishing the most significant and cutting-edge research on climate change, suggests that Antarctica's emperor penguins, the tallest and heaviest of the species, are in trouble. In fact, the population

could decrease by a fifth by the end of the century as a result of changing climate. The greatest hazard comes from warming temperatures' impact on sea ice cover, which the penguins need for travel and hunting. Currently, there are about 600,000 emperor penguins in the region. Researchers encourage governments across the world to list the species as "endangered." Doing so would put restrictions on tourism, fishing and other activities that could be detrimental to their survival.

(Source: TIME.com)

Climate Connections

Climate Connections, launched in August 2014, is a daily public radio series produced by the Yale Center for Environmental Communication. The series aims to help radio listeners understand how climate change is impacting our world and what diverse people and organizations are doing to reduce the associated risks. The series "connects the dots" between climate change and a wide range of issues such as energy, extreme weather, public health, food and water, jobs and the economy, national security, the creative arts, and other themes. The program consists of 90-second segments for broadcast Monday through Friday, primarily on public, university, community, and alternative radio stations.

Visit yaleclimateconnections.org/about-climate-connections/ for sign-up information and how you can subscribe via iTunes.

Sending a powerful message

PHOTO: Don Price



On September 21, 2014, the largest call for climate action in history took place. From Manhattan to Melbourne, more than half a million people took to the streets in a unified move to demand measures from world leaders to

halt the advance of global climate change. By the end-of-day, the flagship march in New York City drew about 400,000 people, just two days before world leaders met for an emergency United Nations Climate Summit there.

The march was led by indigenous and frontline communities from across the globe to highlight the disproportionate impact of climate change. Worldwide, 162 countries participated, hosting 2,646 events, including one here in Ventura County that had 300 participants in downtown Ventura.

The organizers of the event write, "But the march wasn't just about size. It was also about sending a powerful message – that we are standing together for climate justice." And their slogan is a powerful one: To change everything, we need everyone.

(Source: UN Environment Programme; The People's Climate March website media page; Messages from the NYC People's Climate March: an analysis, Yale School of Climate Change Communications)

"A highlight of the event happened at 12:58 p.m., when a moment of silence was held in commemoration of the victims of climate change worldwide. Then, at 1:00 p.m., the climate alarm sounded, with every member of the march making as much noise as possible! There were so many people marching, the organizers asked us to start dispersing in mid-afternoon. With all this, the event was very peaceful, serious, fun and well worth the trip. Let's hope it does some good."

—Don Price, retired VCAPCD engineer and March participant

Chapter 5

— Low carbon practices—

There are thousands of climate change projects going on worldwide. The information here is just a sprinkling of the types of innovations, creative ideas, and new technologies available today.

What is the greenest commercial building in the United States?



The Seattle PI reports it's the six-story, 52,000-square foot Bullitt Center in Seattle. The Center was officially opened on Earth Day 2013 and is designed to have a 250-year lifespan. It was planned to be energy and carbon neutral with a large rooftop solar panel array that, along with other energy conservation measures, will cut the building's energy consumption to about 1/3 of an office building of a similar size. Although the building is connected to

the electricity grid and may at times use more power than it produces (especially during winter), at other times it should produce enough surplus to "repay" such withdrawals, making it energy neutral. Other features include space heating with warm water circulated in tubes embedded in concrete floor plans. In addition, the building was located in an area that provides access to over 20 bus routes, light rail, zip cars, and has a walking score of 100-100. Onsite bike parking, showers, and locker rooms on each floor support modes of alternative transportation. For more information on the building, visit bullittcenter.org.

Where is the world's largest solar power plant?

In 2014, that accolade went to the Ivanpah Solar Electric Generating System in California's Mojave Desert. Ivanpah, which began commercial operation in 2013, is delivering power to PG&E and Southern California Edison. The facility is a 377 megawatt net solar complex using mirrors to focus the power of the sun on solar receivers atop power towers.



- The facility is comprised of three separate plants built in phases between 2010 and 2013.
- The electricity generated by all three plants is enough to serve more than 140,000 homes in California during the peak hours of the day.

- The complex will reduce carbon dioxide (CO_2) emissions by more than 400,000 tons per year.

For more information, visit brightsourceenergy.com/ivanpah-solar-project.

Can you name the world's top ten green cities?

Green cities should make you think of strong recycling programs, green public spaces, use of renewable energy, green lifestyles and laws to protect the environment, robust public transportation and sustainable communities. According to Mother Nature Network (12/14), here's a list of the top ten green cities worldwide.

1. **Reykjavik, Iceland:** The city runs almost entirely on renewable energy from geothermal activity that is converted to clean energy and uses only 0.1% fossil fuels to power its electricity.
2. **San Francisco, California:** Since its mandatory recycling program in 2009, the city has kept 77 percent of discarded materials out of landfills, the highest percentage in the nation. It is also home to many green buildings, good public transportation systems, and was the first major U.S. city to ban plastic bags – saving about 100 million bags from the landfill annually.
3. **Malmö, Sweden:** The country's third-largest city is home to the third-largest wind energy park in the world and aims to be climate-neutral by 2020. It also has an abundance of public green spaces.



4. **Vancouver, Canada:** Aiming to be the greenest city in the world by 2020, it is a hub for clean-tech innovation, such as solar powered trash compactors. The city boasts low-carbon emissions and draws an impressive 90 percent of its power from renewable sources, mostly hydroelectric. And it has 200 parks!
5. **Portland, Oregon:** The first U.S. city to adopt a Climate Action Plan, it has the most LEED-certified buildings in the nation. One quarter of its workforce relies on public transportation, carpooling or bicycles for commuting. And the city has free plug-in parking spots for electric vehicles.

Curitiba, Brazil



6. **Curitiba, Brazil:** What can you say about a city with 16 parks and a flock of sheep that keeps the grass clipped! It also has 14 forests and 1,000 green public spaces. Legislation there protects local vegetation threatened by urban development. It recycles

seventy percent of its waste and the city has planted 1.5 million trees along its highways and byways.

7. **Copenhagen, Denmark:** One-third of the city's residents rely on a bicycle for commuting and the city wants to raise that to 50 percent by the end of 2015. It has coastal wind turbines and is known as a leader in its efforts to combat climate change. It won the European Green Capital designation in 2014.

Copenhagen, Denmark



Stockholm, Sweden



8. **Stockholm, Sweden:** Winner of the 2011 European Green Capital, 40 percent of the city is composed of green spaces and its carbon emissions are just 3.4 tons per capita, far below the European average of 10 tons.

9. **Hamburg, Germany:** Another European Green Capital in 2010, its new HafenCity Hamburg is Europe's largest city development project with 388 acres of rehabilitated former industrial land now full of housing, shops, parks, and other amenities. As a busy industrial port, Hamburg is greening its port operations to displace trucks to reduce pollution.
10. **Bogotá, Columbia:** This city has not only lowered its crime and poverty rates recently, but it now has a promising green future. Bogotá's transit system is highly efficient and the city also has hundreds of miles of bike trails and more than 1,200 urban green spaces. Bogotá has drastically improved its air quality, water supplies and has planted urban trees.



Can you name the world's first island to be powered 100% by renewable energy?



It's El Hierro, ("iron" in Spanish) an island off the Spanish coast. It has developed an independent energy grid, relying on wind and hydro-power and removing itself from the need of oil imports. The island, home to 10,000 people, has a wind-hydro power station that includes a wind farm with five wind turbines of 2.3 MW each, a hydroelectric plant, two dams and a desalination plant. Currently, the hydro energy produces enough to sustain the island, but the wind turbines will produce extra; allowing them to transport fresh-water to a reservoir 2,300 feet above sea-level. This reservoir can be used in times of need, releasing water through generators and producing extra electricity. The island is also interested in running its 6,000 vehicles entirely on electricity by 2020.

(Source: dailymail.co.uk/sciencetech/article-2614804/Spanish-island-world-powered-entirely-wind-water.html)

What is climate justice?



History proves even the most wrenching strains on justice can be unwound, with a committed, diverse, and vocal coalition of people calling for change.

Often, low-income neighborhoods and communities of color are disproportionately burdened by pollution and health risks. Those same communities are extremely vulnerable to the devastating floods, fires, storms, and heatwaves supercharged by climate change. To make matters worse, the carbon pollution fueling climate change comes packaged with other

dangerous pollutants that cause chronic disease and chase away local businesses and jobs. Power plants, large sources of carbon pollution, are often located in these areas, casting their shadow over communities already vulnerable to environmental health hazards.

According to U.S. EPA, climate justice is a spirit fueled by our moral obligation to leave our children a world safer and rich with opportunity. History proves even the most wrenching strains on justice can be unwound, with a committed, diverse, and vocal coalition of people calling for change. That's why U.S. EPA, the Hip Hop Caucus, and organizations around the country are fighting for climate justice – so we can further fairness and opportunity for all.

Sizzling Stats

- Percentage of the world's carbon dioxide emissions produced in the U.S.: **16.5%**
- Average solar panel size needed to power the average home: **600 sq. feet**
- Average cost to install 600 sq. feet of solar panels: **\$55,000**
- Number of homes in the U.S. with solar energy systems installed as of 2013: **400,000**
- Carbon dioxide saved annually by all solar energy users: **35 million tons**
- Number of electric vehicles sold nationally as of 2014: **260,000**
- Number of electric vehicle charging stations in Ventura County: **Over 100 with more planned in the future**
- According to Smartplanet, Asia's greenest city: **Singapore**



- Country with most bicycles per capita: **Netherlands**
- According to Bicycling Magazine, the top bicycle-friendly U.S. city in 2014: **New York City**
- Number of consumers globally who believe environmental problems are having a negative impact on their health: **4 out of 10**

- Total amount of light bulbs sold each year: **2 billion**
- Average yearly cost to operate an incandescent light bulb: **\$4.80**
- Average cost to operate a compact fluorescent light bulb: **\$1.75**



- Average commute time to work in the U.S.: **25.4 minutes**



- Percentage of people who carpool to work in the U.S. (2014): **12.19%**
- Percentage of people who carpool to work in Ventura County (2008-2012): **12.9%**
- Percentage of people who take

public transportation to work in Ventura County (2008-2012): **1.3%**



- Percentage of people who walk to work in Ventura County (2008-2012): **2.1%**
- Country whose residents are most likely to use public transportation: **Russia**
- Countries where consumers are most likely to use their own durable bags when they shop: **France & Germany**

• Country where consumers are least likely to use their own durable bags when they shop (unless mandated by law): **United States**



- Countries with at least 80% of residents who say they recycle "all of the time" or "often": **Canada, Britain & Australia**
- Percentage of energy saved by using an Energy Star qualified refrigerator over the conventional models built to federal standards: **15%**

(Sources: Statistic Brain, U.S. Department of Transportation, 2014 National Geographic Green Index, U.S. Census Bureau, Transportation Energy Data Book (Edition 33) 2015, VCAPCD)

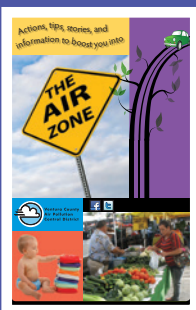
Almanac primary information sources

- BBC News
- California Air Resources Board
- Center for Climate and Energy Solutions
- Climate Central
- County of Ventura, California
- Environment California
- National Oceanic & Atmospheric Administration
- Mother Nature Network
- The Nature Conservancy
- Nature World News
- The Port of Hueneme
- Union of Concerned Scientists
- United Nations Intergovernmental Panel on Climate Change
- United States Environmental Protection Agency
- Yale Project on Climate Change

For more information on climate change

- **Build it smart – ventura.org/rma/planning/builditsmart/index.htm**
An information and news web site designed to encourage energy and resource-efficient building practices and land use decisions with a focus on Ventura County.
- **California Air Resources Board – arb.ca.gov/cc/cc.htm**
Provides information on implementing California's Scoping Plan. The Plan is a central requirement of Assembly Bill 32, the Global Warming Solutions Act.
- **Center for Climate and Energy Solutions – c2es.org**
The Center for Climate and Energy Solutions is an independent, non-partisan, nonprofit organization working to advance strong policy and action to address the twin challenges of energy and climate change. Launched in 2011, C2ES is the successor to the Pew Center on Global Climate Change, long recognized in the United States and abroad as an influential and pragmatic voice on climate issues.
- **Cool California – coolcalifornia.org**
Provides resources to all Californians so they can take action, reduce their environmental impact and be part of the climate change solution. Resources include information on calculating your carbon footprint; a funding wizard; climate change information for individuals, households, small businesses, local governments, schools, and teachers.
- **Go Solar California – gosolarcalifornia.ca.gov/about/csi.php**
The California Solar Initiative (CSI) is the solar rebate program for California.

- **Intergovernmental Panel on Climate Change - ipcc.ch/index.htm**
Latest reports and updates from the IPCC, part of the United Nations Environment Programme and the World Health Organization.
- **NASA – climate.nasa.gov**
Climate change page monitors the vital signs of the planet.
- **Plug-In Electric Vehicle Collaborative – pevcollaborative.org**
The California Plug-In Electric Vehicle Collaborative is a public/private organization comprised of 47 members that include key PEV stakeholders all working together to move the PEV market forward in California.
- **World Wildlife Fund – worldwildlife.org/initiatives/climate**
Includes overview, cause, impacts, what the WWF is doing and how individuals can help.
- **Union of Concerned Scientists – ucsusa.org/global_warming**
A UCS team published the award-winning book, Cooler Smarter: Practical Steps to Low-Carbon Living, challenging all Americans to cut their global warming emissions by 20 percent within a year and giving them the information needed to get the job done. The book won “best science book of the year” at the Green Book Festival.
- **United States Environmental Protection Agency - epa.gov/climatechange**
Contains basic information on greenhouse gas emissions nationwide, climate change science, what U.S. EPA is doing about climate change, and current climate change news.
- **Ventura County Regional Energy Alliance – vcenergy.org**
A Joint Powers Agency composed of public agencies working in collaboration to address good energy stewardship through integrated demand-side management practices in the Ventura County region.



For more information on actions you can take to help combat climate change and air pollution, download a copy of The Air Zone at vcapcd.org or call 805/645-1415 to receive a copy of the publication. You can also friend our facebook page, at facebook.com/TheAirZone.



Human influence on the climate system is clear and growing, with impacts observed on all continents. If left unchecked, climate change will increase the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. However, options are available to adapt to climate change, and implementing stringent mitigation activities can ensure that the impacts of climate change remain within a manageable range, creating a brighter and more sustainable future.

(Source: IPCC 2014)

