Napa Climate NOW!
How to Talk About Climate Science
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Should we change?
Can we change?
Will we change?
Should we change?
Solar radiation in the form of lightwaves passes through the atmosphere.
Most of this radiation is absorbed by the Earth and warms it.
Some energy is radiated back into space by the earth in the form of infrared waves.
Some of this outgoing infrared radiation is trapped by the earth’s atmosphere and warms it.
We are spewing 152 million tons of manmade global warming pollution into the thin shell of our atmosphere every 24 hours — as if it were an open sewer.
As the pollutant concentration increases, more of the outgoing infrared radiation is trapped.
SHORT-LIVED CLIMATE POLLUTANTS
Near-term response to mitigation

<table>
<thead>
<tr>
<th>SUBSTANCE</th>
<th>ANTHROPOGENIC SOURCES</th>
<th>LIFETIME IN ATMOSPHERE</th>
<th>IMPACTS/MITIGATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLACK CARBON (BC)</td>
<td></td>
<td>DAYS</td>
<td>LOCAL ○, REGIONAL ○, GLOBAL ○</td>
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<tr>
<td>METHANE (CH₄)</td>
<td></td>
<td>12 YEARS</td>
<td>○</td>
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<tr>
<td>TROPOSPHERIC OZONE (O₃)</td>
<td></td>
<td>WEEKS</td>
<td>○</td>
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<tr>
<td>HYDROFLUORO-CARBONS (HFCs)</td>
<td></td>
<td>15 YEARS (WEIGHTED BY USAGE)</td>
<td>○</td>
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</tbody>
</table>

- Ag burning
- Cock lines
- Vehicle emissions
- Industrial emissions
- Wood burning fireplaces
- Livestock production
- Agriculture
- Gas line leaks
- Oil/gas production
- Solid waste
- Industrial emissions
- Chemical production
- Volatile organics
- Refrigeration
- Air conditioning
- Aerosols
Contribution to Global Warming by Pollutant
Time is of the essence

Source: Climate Central
The energy trapped by man-made global warming pollution is now “…equivalent to exploding 500,000 First-generation atomic bombs per day 365 days per year.”

James Hansen
Former Director, NASA Goddard Institute for Space Studies
The hottest 20 years have been the last five years occurred since the year 2001.

Data: NASA/GISS
January 2020 was the warmest January on record.
Ocean Temperatures Set a New Record in 2019

Data: Cheng, L. J., and J. Zhu, 2018: “2017 was the warmest year on record for the global ocean,” Advances in Atmospheric Sciences, 34(3)

Change in Heat Content (Upper 2,000 m) Relative to 1981-2010 Avg. (ZJ)

Data: Cheng, L. J., and J. Zhu, 2018: “2017 was the warmest year on record for the global ocean,” Advances in Atmospheric Sciences, 34(3)
Risk of Hurricane Sandy-Intensity Events in New York

One in 500 Years

One in 25 Years

One in 5 Years

Year

1880

2017

2030–2045


Image: 2012 NASA
“...the gravest effects of all attacks on the environment are suffered by the poorest.”

Encyclical Letter of
His Holiness, Pope Francis
On Care for our Common Home
June 18, 2015
Evaporation

Precipitation

The Hydrological Cycle

Water Returns to the Sea

Sources: Oak Ridge National Laboratory, U.S. Dept. of Energy; © Getty Images; © Pond5
As Temperatures Increase, the Oceans Evaporate More Moisture into the Sky
So the downpours get bigger
Worldwide Extreme Weather Catastrophes

1980 – 2019

- Extreme temperatures, droughts, fires
- Floods, mudslides
- Storms

Data: 2017 Munich Re, Geo Risks Research, NatCatSERVICE. As of January 2018.
Extreme weather disasters cost the global economy $2.5 trillion in the last decade, an increase of almost $1 trillion over the previous ten years.
Hotter Years Typically Have More Fires

Western U.S. Large Fires and May – September Temperatures

Data: Westerling, et al.; Climate Central, “The Age of Western Wildfires,” Fig. 9, September, 2012 - Updated 2016
By early January 2020, the Australia bushfires had burned an area that could span from Las Vegas to Los Angeles.
Since 1972, the average area burned each year in California has increased 500%.

Data: A. Park Williams, et al., “Observed impacts of anthropogenic climate change on wildfire in California,” AGU 100, July 2019
Global Tree Cover Loss, 2001 – 2015

Map: World Resources Institute

Commodity-driven Deforestation
Agriculture
Forestry
Wildfire
Urbanization
Amazon deforestation is at its highest rate in more than a decade.
Climate change “will likely lead to food and water shortages, pandemic disease, disputes over refugees and resources, and destruction by natural disasters in regions across the globe.”
The world could see up to 1 billion climate migrants.

The Lancet Countdown Report 2018
The rate of ice melt in the Himalayas has doubled since the year 2000.
The Cost of Carbon

- Political Instability
- Floods & Mudslides
- Wildfires
- Drought
- Storm Damage
- Ocean Acidification
- Infrastructure Loss
- Climate Refugees
- Species Extinction
- Melting Glaciers
- Famine
- Water Scarcity
- Ecosystem Loss
- Our Way of Life
- Infectious Diseases
- Sea Level Rise

... And much, much more

“The #1 Threat to the Global Economy”
The Reality of Climate Grief

- Knowing that you’re not alone
- Learning the basics
- Recognizing that you can make a difference
- Envisioning a future that works for people & the planet
- Taking action to bring that vision into reality
Can we change?
We have the solutions at hand...
Food scraps in landfills generate methane, a greenhouse gas with a global warming potential 84x more potent than CO₂ in the short term.

...but when converted into compost and applied to the land, compost sequesters carbon.
2.3% of global CO2 emissions come from cookstoves... but they also emit black carbon.
We must phase out these cookstoves in 20 years with cleaner alternatives.
Solar Energy Progress
How Do Projections Compare With Reality?

2002 Projection
The solar energy market will grow one gigawatt per year by 2010.

Reality
The reality is that goal was exceeded by 121x.

Source: Fresh-Energy; Bloomberg New Energy Finance
World Solar PV Installations
1980 – 2019

U.S. Solar PV Capacity

Cumulative Gigawatts Installed

Data: Greentech Media
Cost of Crystalline Silicon Solar Cell Modules

1976: $79.40/watt

2019: $0.25/watt

Data: Bloomberg New Energy Finance
The museum estimates they will save $8,000 to $10,000 per year in energy costs.
Is there any precedent for such a rapid adoption of a new technology?
In 1980 AT&T commissioned a study to forecast cell phone use by the year 2000. They projected 900,000 users. The actual figure was 109 million, 120 x higher.
There are now 9.5 Billion cell-phone connections
So why were they not only wrong, but **WAY** wrong?
The Cost Dropped Sharply, as

The Quality Improved Dramatically, and

All the Low-Income Nations With No Land-Line Grids Leap-frogged the Old Technology.
Mobile Phone Subscriptions (Billions)

- Subscriptions
- Developed Countries
- Developing Countries

Data: World Bank
The Chilean Solar Market

Chile has an additional 16.67 GW of solar projects approved or under construction.

Data: La Comisión Nacional de Energía, Chile
By 2030, India plans to have 450 gigawatts of renewable electricity capacity in place.
Energy storage deployments doubled from 2017 to 2018 and are projected to have doubled again in 2019.
Lithium-ion Battery Prices

Data: Bloomberg New Energy Finance (volume-weighted averages)

USD Per Kilowatt Hour

- 2010: $1,000
- 2011: $800
- 2012: $600
- 2013: $500
- 2014: $400
- 2015: $300
- 2016: $200
- 2017: $100
- 2018: $50

Data: Bloomberg New Energy Finance (volume-weighted averages)
“Solar-plus-batteries is set to begin a dramatic transformation of human civilization.”

Bloomberg View
April 8, 2015
Over the last five years, U.S. solar energy jobs have grown 6x faster than the overall economy.
“Countries should double their protected zones to 30 percent of the Earth’s land area and add 20 percent more as climate stabilization areas.”
Will we change?
Agricultural Revolution
Centralized food production led to the emergence of cities and stimulated more rapid population growth

Industrial Revolution
The invention and use of power-driven machines dramatically increased productivity

Digital Revolution
Spread of new information and communications technologies, leading to outsourced production and widespread data consumption

Sustainability Revolution
Reorganization of the economy around new forms of zero-emission, healthy, equitable, sustainable growth
“We expect innovation and global markets, rather than politics, to continue to be the primary driver for the growth in low-carbon technologies. In our view, prices for batteries and solar panels will continue to drop, and global market-share gains will continue for wind, solar, EVs and LEDs, regardless of who occupies the White House.”

Goldman Sachs
November 28, 2016
Twenty-four states representing 55% of the American people have formed the United States Climate Alliance.

<table>
<thead>
<tr>
<th>Founding Members</th>
<th>California</th>
<th>New York</th>
<th>Washington</th>
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<tbody>
<tr>
<td>Additional States</td>
<td>Connecticut</td>
<td>Delaware</td>
<td>Hawaii</td>
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<td></td>
<td>Massachusetts</td>
<td>Oregon</td>
<td>Minnesota</td>
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<td></td>
<td>Rhode Island</td>
<td>Vermont</td>
<td>Virginia</td>
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<tr>
<td></td>
<td>North Carolina</td>
<td>Colorado</td>
<td>Maryland</td>
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<td></td>
<td>New Jersey</td>
<td>Illinois</td>
<td>New Mexico</td>
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<td></td>
<td>Michigan</td>
<td>Wisconsin</td>
<td>Maine</td>
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<tr>
<td></td>
<td>Nevada</td>
<td>Pennsylvania</td>
<td>Montana</td>
</tr>
</tbody>
</table>

*and Puerto Rico*
In the U.S., California, Connecticut, Hawaii, Maine, Nevada, New Jersey, New Mexico, New York, Washington state, Washington, D.C., Wisconsin and Puerto Rico have all committed to using 100% clean electricity by 2050 at the latest.
More than 70 percent of voters support requiring 100% of electricity in their state to come from wind and solar by the year 2050.
U.S. Commitments to 100% Renewable Electricity

Data: The Sierra Club
Over 220 global companies have made a commitment to go 100% renewable
THE SIX STEPS

WORLD SCIENTISTS' WARNING
OF A CLIMATE EMERGENCY
So what can we do starting here close to Napa?
Help others understand the problem
ISO/AWI 14082
Radiative Forcing Management—Guidance for the quantification and reporting of radiative forcing-based climate footprints and mitigation efforts

GENERAL INFORMATION
Status: © Under development
Edition: 1
Technical Committee: ISO/TC 207/SC 7 Greenhouse gas management and related activities
ICS:
Reduce or eliminate waste & pollutants
The Napa Climate NOW! Waste Reduction Committee is updating Napa’s current plastic bag ordinance and then addressing single use plastics and styrofoam. They are also supporting Up Valley and American Canyon in providing residential composting.
Shift away from non-renewable energy sources
The Napa Climate NOW! Built Environment Committee is working on adopting **all-electric reach codes** in Napa County and all five cities.
Adopt carbon-free transportation
The Napa Climate NOW! Carbon Free Transportation is working on adopting a Slow Streets proposal.
Increase reflectivity
Napa Climate NOW! advocates for the Cool Roof 2040 in the General Plan
Adopt new agricultural practices
The Napa Climate NOW! Carbon Farming Committee is working on educating the public about regenerative carbon farming & gardening to help drawdown carbon in the atmosphere.
Protect our forests and grow new ones
The Napa Climate NOW! Forest Protection Committee is working on passing a “Time Out for Trees” resolution at municipal and county levels and partners with Napa Green and the Master Gardeners.
Better serve one another
The Napa Climate NOW! Environmental Justice Committee is forming to better understand at-risk populations and find new ways to collaborate.
Climate change is a multivariate problem with an array of influencing factors and contributing problems - which also means we have multiple ways to be a part of the solution. The problems and solutions that we’ve listed here are not exhaustive.