

Urgency and Action: Drawdown to Reverse Global Warming

A report on climate change, prepared by the Environmental Working Group of

Florida Veterans for Common Sense

Third Edition

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NOAA's GOES - East satellite captured this infrared image of Hurricane Irma approaching Florida in September 2017

Zach Murdock and Elizabeth Djinis, writing in the Sarasota [Herald Tribune](#), explain that Irma represents the new normal: the strongest hurricanes should get stronger in the coming decades as the ocean temperatures warm; creeping sea level rise will make storm surges and inundation worse, particularly for already low-lying areas; and storms that do form are likely to bring more precipitation with them.

About the Third Edition

We are happy and proud to release the third edition of the original article which was released in the fall of 2014. Our purpose remains the same -- to explain the urgency and need for action on climate change and to provide citizens with a practical guide for what we can do.

Major upgrades in the second edition included:

- A description of the causes of climate change. We offered this because we recognize that the first step in solving a complex problem is to understand its causes.
- Specific and practical suggestions for reducing one's carbon footprint. We offered ideas and knowledge from a variety of sources to help the reader decide which actions will be most beneficial in his/her unique situation.
- Going beyond energy management (the heat trapping gases we put into the atmosphere) to also include re-forestation and care of the land (taking carbon out of the atmosphere and storing it in the soil).

This third edition offers several upgrades:

- Additional urgency from an assessment of where we stand as of the Bonn climate conference (COP23) in November 2017 and release of the UN Intergovernmental Panel on climate Change *Global Warming of 1.5 °C*. and the US Fourth Climate Assessment in the fall of 2018.
- Adapting the work of [Project Drawdown](#) into our presentation. Drawdown is the point in time when greenhouse gas concentrations peak in the atmosphere and begin to go down on a year-to-year basis.¹ The concept of drawdown takes us beyond the idea of "mitigating" (slowing, reducing) climate change. *Drawdown* takes it to the next level- reversing global warming. *Drawdown* is the result of researchers from around the world who identified, researched, and modeled the 100 most substantive, existing solutions to address climate change. What they offer is a path forward that can roll back global warming within thirty years. We include some of their findings in our offering of specific actions you can take to do your part.
- A more thorough explanation of why energy conservation is so important. Reducing our energy consumption is an essential ingredient in the formula for achieving zero net emission of heat trapping gases.
- An upgrade to the description of how carbon farming and regenerative agriculture can have a real impact on the fight against climate change. These solutions are especially relevant because they impact not only climate change but also food and water security.
- Expanded treatment of motivation, interests and skeptics: We must get most of the nation motivated to take action. It can help to understand that it is no accident we have so many deniers and skeptics, and how we can overcome their corrupt influence.

We hope you find this third edition to be useful as you work to reverse climate change. Your feedback is welcomed. You can contact us at FLVCS, PO Box 2311, Sarasota, FL 34230. 941-349-5131. Email us at flveterans@aol.com.

¹ *Drawdown*'s editor Paul Hawken in an [interview with David Roberts in July 2017](#).

Acknowledgements

[Florida Veterans for Common Sense](#) president, Gene Jones, challenged us by saying, “Climate change is the most important challenge facing humanity. We need a report that tells us what we should do about it.” Thanks, Gene for putting us to work on this project.

Our research has introduced us to real climate heroes. It’s been a joy to see the creative work of farmers, who are not only reducing the emissions of greenhouse gases, but also pulling carbon out of the atmosphere and storing it in the soil. Here they are: Ira Haspel- owner of [KK's The Farm](#), a biodynamic farm in Southold NY; Elli Sparks-small farm owner in south central Virginia, and leader of the [Citizens' Climate Lobby](#) task force on Agriculture and Farming; Camille Van Sant, manager of the [Green Path Veteran’s Farm](#) in Sarasota, FL.; and Maggie Wood, owner of the [Golden Earthworm](#), an organic farm in Jamesport, NY.

We met business owners who are growing our economy, creating local jobs and transforming our energy systems from old fashioned, unhealthy relics to modern, clean and healthy ones. Dr. Barry Jacobson and Tom Harriman are pioneers, and successful solar installers in Florida. Barry is President of [Solar Impact](#) in Gainesville; Tom is president of [Harriman’s, Inc](#) in Venice.

Local government managers are taking action to reverse global warming. Lee Hayes Byron and Stevie Freeman-Montes are the Sustainability Managers for [Sarasota County](#) and the [City of Sarasota](#) respectively. Their leadership is moving the community toward a green and prosperous future.

Ira, Elli, Camille, Maggie, Tom, Barry, Lee and Stevie ---thank you for the inspiration and showing by example that we can achieve a stable climate while producing healthy food, improving the economy, and creating local jobs.

We owe our wives, Susan Darovec and Marge Keller, for many things including hours of work reviewing, commenting and marking up drafts of this project over the last four years. Last but not least, we owe a debt of gratitude to Meigs Glidewell, professional editor from Sarasota, Florida. Meigs put the finishing touches on the final draft of this third edition. Thank you, Susan, Marge and Meigs for making this important work more readable.

Urgency and Action: Drawdown to Reverse Global Warming

Florida Veterans for Common Sense

Environmental Working Group: John Darovec and Coty Keller

Executive Summary

The members of *Florida Veterans for Common Sense* are committed to creating a stable climate. This report provides our vision of the problem and solutions, together with concrete and practical actions that citizens can take.

Global warming is real, it's bad, and it's caused by us. There are solutions which are not costly – in fact, if we act wisely, we will realize economic benefits. But we must act now.

Time is running out; the situation is urgent. Scientists, faith leaders, economists, physicians, and our military strategists make clear the urgency of the situation. Unless individuals, businesses and governments take immediate action to reduce greenhouse gas emissions and remove heat trapping gases from our atmosphere, our heirs will be impacted by the gruesome consequences of climate change:

- ***severe food shortages*** as warming makes it harder to grow crops,
- an accelerating ***rise of the sea*** that would inundate coastlines,
- ***extreme weather events, heat waves, droughts and floods,***
- a large-scale ***extinction of plants and animals,*** and
- of special note to us veterans, disruption of ***national security*** due to massive refuge movements and other increases in conflict.

There is ***reason for hope.*** We have much of the technology and know-how today to meet the challenge. The economic benefits of making the transition to a carbon free society make it financially worthwhile. Most of all, the tide of public opinion has shifted toward the people wanting action on climate change, which means the political will for a stable climate is within our grasp. What remains to be done is to convert these favorable circumstances into effective and timely action.

Our report lays out a ***practical and concrete action plan*** to reverse global warming. It starts with understanding the ***nature of the problem in terms of its causes.*** An often-heard phrase is, "All we need to do is replace fossil fuels with renewables, and the problem will be solved." This is a dangerous oversimplification that does not take into account that removing carbon from the atmosphere and storing it in the soil is part of the solution. Also, anything that burns will emit greenhouse gases (GHGs), and we have some sources of energy that are referred to as "renewable" that are burned and hence are contributors to GHG emissions. Another important concept is our food system's contribution to climate change - as much as 20-30% of the total. Understanding and correcting the inefficiency of our food system is essential to dealing effectively with the problem.

Armed with an understanding of the problem, one can take stock of the ***carbon footprint in one's own realm,*** that is, in your family's activity and at your business. Once you estimate your carbon footprint you can assess your impact from buildings (including houses), transportation, diet and by what you

buy. Our guide will help you take the food system into account and help you see that while carbon in the atmosphere is the problem, storing carbon in the soil is a solution. This leads one to support native landscapes, community sponsored agriculture (CSA), organic, and biodynamic farming.

Moving others to join us in the effort to mitigate climate change is essential if we are to achieve our goals for reducing emissions and re-forestation. While we do want to convey the urgency of the situation, we should avoid frightening people so much that they are frozen and incapable of action. The general message should be that, yes, the situation is urgent and timely action is needed, but there is good news:

- we possess most of the technology and knowledge;
- solutions have economic benefits;
- we will be better off all around if only we act now.

The workplace offers a great opportunity to magnify efficiencies many times over. Villages, HOAs, condo associations and other community entities can be wonderful platforms from which to stabilize the climate. We can also vote in the marketplace by divesting ourselves and our organizations of holdings (stocks/bonds) in companies responsible for carbon emissions.

We can and must take action by communicating to elected officials what kinds of changes we want to see: energy saving local building codes, natural (chemical free) landscape rules that re-forest our communities, state energy portfolios and virtual net metering (which allows utility customers to share the electricity output from a single solar power generator). Most important, we must make clear to our people in congress that we want a steadily rising price on carbon, with all the revenues going back to the people. By joining and/or supporting [Citizens' Climate Lobby](#) and the [Move to Amend Coalition](#), we can nudge our federal government towards a stable climate and a restoration of our democracy.

Clearly it is time for individual citizens, businesses and governments to take action. Our task is clear: to reduce greenhouse gas emissions by 40-50% by 2025 in the near term and achieve zero emissions by mid-century, and at the same time increase the carbon we remove from the atmosphere and store in the soil.

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Introduction

Most Americans want to do something about climate change, but many are unsure of what can/should be done. This booklet is designed to provide a practical guide for what **you** can do as an individual, business owner or manager/executive, and as a citizen.

The table of contents can help you see our roadmap. First, we have an explanation of why we (the human race) are at such a crucial moment in our existence. We do our best to make clear the problem in terms of the urgency of the situation and explain why we cannot delay taking action. It is indeed clear that this situation is urgent - we have less than a decade to turn it around. The situation is grave, but not hopeless. To the contrary. Solutions are available, and affordable. Not only that, wise choices can make us money. Thankfully the tide of public opinion has turned in favor of action on climate change. What remains to be done is convert these favorable circumstances into effective action.

Our article next moves to the causes of global warming. We feel that an understanding of the root causes of the problem is important for generating solutions. We hope it helps to see that the problem is two sided. We have too much greenhouse gas being emitted, and too little of the heat trapping gases being removed from the atmosphere. This leads to our solution that aims to work on both sides of the "up/down" model.

The nuts and bolts come next in terms of practical ways each person can work in his/her own realm to achieve the goals of zero net emissions, and at the same time, increase the amount of photosynthesis so we are taking more carbon out of the atmosphere and storing it in the soil. "Practical" means feasible, reasonable and affordable. In fact, our experience is that individuals and families can make money (as in saving dollars and earning a return on investments) at the same time they are reducing their carbon footprint.

We outline a plan of action that each citizen can take to influence others. Until we have a universal movement with **everyone** doing his/her part, we will not be able to achieve a stable climate. Many citizens are already doing more than their share, and some will begin to work on the problem once they are informed as to the urgency of the problem and the actions needed. However, others will need more motivation and explanation before they will get onboard. We present some ideas for how to expand one's influence to family/friends, on the job, and in the community. The idea is to help everyone see how they can reduce their carbon footprint, save money and earn a nice return on investment at the same time.

Finally, we offer insights and suggestions for getting our government (federal, state and local) to work toward the global goal of getting heat trapping gasses below 350 parts per million.

Urgency

To help us recognize the gravity of the problem, we will look at the problem of climate change/global warming from four perspectives: the history of life on earth, the threat to national security, a moral view, and from the point of view of scientists.

The Anthropocene Extinction

Biologist and Air Force veteran John Darovec, like many scientists, is concerned that life on Earth is being eliminated. Here, John shares his view of our present situation:

Last year I was surprised to see Neil deGrasse Tyson explaining evolution on the Fox TV Network. Of course, the program was *Cosmos*, not Fox News or a commentary, and he eased into the subject beginning with artificial selection in dog breeding. Nevertheless, Tyson not only explained how species originate as they develop beneficial adaptations, he explained how they become extinct as the environment changes and those once beneficial adaptations become detrimental.

In the history of life on Earth there have several periods of mass extinction. One was caused by cold, one was caused by heat, and another was caused by an asteroid impact. We are living in, and are the cause of the latest, the Anthropocene extinction. By its rate, if not yet its extent, it promises to be the worst. We disrupt environmental balance; we pollute; we irradiate; we poison; and we heat the world enough to overwhelm the astronomical cycles that determine our climate.

We know what's happening. The sea is acidifying, and its level, due to ice melt, is rising. Permafrost is melting and releasing methane or carbon dioxide, and weather (from droughts to floods) is becoming more severe. As these processes progress, feedback mechanisms cause them to go even faster and worsen.

The living things with which man has shared the Earth evolved in a cooler climate. Many of them have not been able to adapt to the heating that has already taken place, and they are now extinct. The current rate of extinction is higher than ever before. Even the great Permian extinction, which eliminated over ninety percent of the sea and land creatures, happened over a much longer period than our current extinction.

I did not hear many frogs this spring, and frogs are possibly the hardest hit group at the time of this writing. Man's turn will come. Something must be done, and soon.

The National Audubon Society issued a startling report in 2015 that puts the magnitude of this extinction pattern into perspective. Since the industrial revolution, nine (9) species of birds have gone extinct. Unless something is done to dramatically and immediately reduce the effects of climate change, more than half (314 of 588) of North American bird species will be severely threatened by the end of this century.²

Threat to National Security

According to Admiral Samuel Locklear, Commander of the Pacific Theater, significant upheaval caused by the warming planet "is probably the most likely thing that is going to happen . . . that will cripple the security environment, probably more likely than the other scenarios we all often talk about."

Rather than highlighting Chinese ballistic missiles, the new Chinese Navy aircraft carrier, North Korean nuclear weapons, or other traditional military threats, Admiral Locklear looked to a larger definition of national security when addressing a 2013 meeting of security experts at Harvard. People are surprised sometimes that he highlights climate change -- given his ability to discuss a wide-range of threats, from

² Matt Anderson, Director of National Audubon Society Climate Initiative, speaking to Citizens' Climate Lobby monthly meeting July 9, 2016.

cyber-war to the North Koreans. However, it is the risks to Pacific nations of long-term sea-level rise that has the Admiral's attention. "You have the real potential here in the not-too-distant future of nations displaced by rising sea level. The ice is melting and sea is getting higher," Locklear said, noting that 80 percent of the world's population lives within 200 miles of the coast. "I'm into the consequence management side of it. I'm not a scientist, but on the island of Tarawa in Kiribati, they're contemplating moving their entire population to another country because [it] is not going to exist anymore." (Siegel).

The threat from climate change has been recognized for some time by the defense establishment. The 2010 U.S. *National Security Strategy* states, "The danger from climate change is real, urgent, and severe. The change wrought by a warming planet will lead to new conflicts over refugees and resources; new suffering from drought and famine; catastrophic natural disasters; and the degradation of land across the globe." (Mullen). The 2014 Quadrennial Defense Review speaks directly to the impact of climate change on national security:

Climate change poses another significant challenge for the United States and the world at large. As greenhouse gas emissions increase, sea levels are rising, average global temperatures are increasing, and severe weather patterns are accelerating. These changes, coupled with other global dynamics, including growing, urbanizing, more affluent populations, and substantial economic growth in India, China, Brazil, and other nations, will devastate homes, land, and infrastructure. Climate change may exacerbate water scarcity and lead to sharp increases in food costs. The pressures caused by climate change will influence resource competition while placing additional burdens on economies, societies, and governance institutions around the world. These effects are threat multipliers that will aggravate stressors abroad such as poverty, environmental degradation, political instability, and social tensions – conditions that can enable terrorist activity and other forms of violence. (Hagel, Chapter 1, Pg 8)

Sea level rise threatens many of the Navy's coastal installations. Norfolk, Virginia, vulnerable to damage by rising sea levels, is home to the world's largest naval base as well as a nuclear submarine construction yard. (CNA)

Secretary of Defense James Mattis sums it up in testimony to Congress. He says climate change is real, and a threat to American interests abroad and the Pentagon's assets everywhere. Mattis believes it is incumbent on the U.S. military to consider how changes like open-water routes in the thawing Arctic and drought in global trouble spots can pose challenges for troops and defense planners. He also stressed this is a real-time issue, not some distant what-if scenario. "Climate change is impacting stability in areas of the world where our troops are operating today," Mattis said in written answers to questions posed after the public hearing by Democratic members of the senate committee. "It is appropriate for the Combatant Commands to incorporate drivers of instability that impact the security environment in their areas into their planning." (Revkin, 2017)

Morality

With the release of his much-anticipated encyclical, *Laudato Si*,³ Pope Francis has raised the stakes on climate change, reframing the issue as a moral imperative for which all, especially wealthy nations, are responsible. The Pope is telling the world that we are called upon to be good stewards of God's

³ The title of Pope Francis' encyclical, "Laudato Si" or "Praised Be," comes from St. Francis' Canticle of the Sun, which gives praise to God for such creations as "Brother Fire," "Sister Water," "Mother Earth," and so on.

creation and turn away from behavior that alters the Earth's climate and puts the world's poor and most vulnerable at risk. The pope makes clear that the urgency to act falls on all humanity:

The natural environment is a collective good, the patrimony of all humanity and the responsibility of everyone. If we make something our own, it is only to administer it for the good of all. If we do not, we burden our consciences with the weight of having denied the existence of others. Many things have to change course, but it is we human beings above all who need to change. We lack an awareness of our common origin, of our mutual belonging and of a future to be shared with everyone. (Excerpted from *Laudato Si*)

On social media and in formal statements, Protestant, Jewish, Buddhist and Muslim leaders have backed the pope's call for strong action to address climate change. In a statement to *TIME*, Imam Mohamed Magid of the Islamic Society of North America said that Muslims should heed the Pope's call: "People of all faiths can come together for this cause because the concept of stewardship on Earth is a shared belief," he said. "Appreciating the blessings bestowed upon us by our Creator is a value that we all take great care to respect."⁴

As the Pope says, what needs to be done is to develop policy so that in the coming years, we drastically reduce carbon dioxide and other highly polluting gas emissions, by, for example, replacing fossil fuels with non-combustible energy sources.

Urgent indeed – we are past the point of being out of time

As of the spring of 2019, it's come down to this: We are already suffering the ravages of climate change, and we only have a decade (until 2030) to dramatically change the way we live and draw down the resident greenhouse gasses (GHGs) in the atmosphere, or face almost certain extinction of life as we know it. The evidence is overwhelming. Consider five recent reports.

1. UN Intergovernmental Panel on Climate Change (IPCC)⁵

This report — authored by 91 researchers and editors from 40 countries citing more than 6,000 scientific references details how difficult it will be to keep the planet from warming beyond the 1.5-degree target, considered the aspirational goal of the 2015 Paris climate accord. Scientists say that allowing warming of 1.5 degrees Celsius would spur dramatic consequences. Sea levels will continue to rise. Flooding, drought and extreme weather events will wreak havoc on communities around the globe. Many species will continue to be driven toward extinction and marine ecosystems could face "irreversible loss."⁶

⁴ Aisha Bhooi in [Time](#) June 17, 2015

⁵ UN Intergovernmental Panel on climate Change. 2018. *Global Warming of 1.5 °C*. <http://www.ipcc.ch/report/sr15/>

⁶ Kaufman, Alexander C. and Chris D'Angelo. 2018. "New UN Climate Report Dims Hope For Averting Catastrophic Global Warming." *Huffington Post* October 7. https://www.huffingtonpost.com/entry/ipcc-report_us_5bba177be4b0876eda9ef1d7?utm_medium=email&utm_campaign=TheMorningEmail_100818&utm_content=TheMorningEmail_100818+CID_72ea3e8e14aad8aefec584c6eb4e84f4&utm_source=Email%20marketing%20software&utm_term=HuffPost&ncid=newsltushpmsgnews_TheMorningEmail_100818

Absent radical changes in energy policy and human behavior, we should expect severe economic and humanitarian crises by as early as 2030.

2. US Fourth Climate Assessment⁷

The fourth National Climate Assessment is the culmination of years of research and analysis by hundreds of top climate scientists in the USA – in government agencies and beyond. The massive report details the many ways in which global climate change is already affecting American communities, from hurricanes to wildfires to floods to drought. The new report, mandated by Congress and published by the U.S. Global Change Research Program, is the latest and most detailed confirmation that humans are driving climate change and that Americans are already adapting to and suffering from its effects. Climate change is "an immediate threat, not a far-off possibility," it says.⁸

In direct language, the 1,656-page assessment lays out the devastating effects of a changing climate on the economy, health and environment, including record wildfires in California, crop failures in the Midwest and crumbling infrastructure in the South. Going forward, American trade, exports and supply chains will be disrupted, agricultural yields will fall and fire season could spread to the Southeast. We can expect draughts, flooding and extreme weather.⁹

The Fourth Climate Assessment estimates that more than 90 percent of the current warming is caused by humans. And therein lies the solution- radical and immediate changes in energy policy and human behavior.¹⁰

3. The Sixth Global Environment Outlook.¹¹

The sixth Global Environment Outlook, released in March 2019 painted a dire picture of a planet where environmental problems interact with each other to make things even more dangerous for people. It uses the word "risk" 561 times in a 740-page report.

The GEO 6 report concludes "unsustainable human activities globally have degraded the Earth's ecosystems, endangering the ecological foundations of society." "Time is running out to prevent the irreversible and dangerous impacts of climate change," the report says, noting that unless something changes, global temperatures will exceed the threshold of warming that international agreements call dangerous. The report also details climate change impacts on human health, air, water, land and biodiversity. Almost all coastal cities and small island nations are increasingly vulnerable to flooding

⁷ Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.) 2018: *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* . U.S. Global Change Research Program, Washington, DC. <https://nca2018.globalchange.gov/chapter/front-matter-guide/>

⁸ Hersher, Rebecca 2018. "Climate Change Is Already Hurting U.S. Communities, Federal Report Says." *All Things Considered*. NPR. November 23.

⁹ Davenport, Doral and Kendra Pierre-Louis. 2018. U.S. Climate Report Warns of Damaged Environment and Shrinking Economy. NY Times November 23. <https://www.nytimes.com/2018/11/23/climate/us-climate-report.html?action=click&module=Top%20Stories&pgtype=Homepage>

¹⁰ Borenstein, Seth. 2018. Government report warns of worsening US disasters. Charlotte Sun November 24 (From AP) <https://apnews.com/36804b092691442ebffff6ed0ba516f2>

¹¹ UN Environment Secretariat. 2019. *The Global Environment Outlook (GEO 6): Healthy Planet, Healthy People*. <https://www.unenvironment.org/resources/global-environment-outlook-6> March 13

from rising seas and extreme weather. What needs to change, to avoid the crisis, is the way the world eats, buys things, gets its energy and handles its waste.¹²

4. Intergovernmental Panel on Biodiversity and Ecosystems Service (IPBES)¹³

In May, a United Nations report projected the extinction of one-eighth of all animal and plant species, putting things in a sharper perspective. While climate change is wreaking havoc, there is even more at stake when we consider all that humans are doing to destroy life on earth.

The IPBES study says the felling of forests, the over-exploitation of seas and soils, and the pollution of air and water are together driving the living world to the brink.¹⁴ “For a long time, people just thought of biodiversity as saving nature for its own sake,” said Robert Watson, chair of the IPBES. “But this report makes clear the links between biodiversity and nature and things like food security and clean water in both rich and poor countries.”¹⁵

Fighting climate change and saving species are equally important, the report said, and working on both environmental problems should go hand in hand. Both problems exacerbate each other because a warmer world means fewer species, and a less biodiverse world means fewer trees and plants to remove heat-trapping carbon dioxide from the air. The world’s coral reefs are a perfect example of where climate change and species loss intersect. If the world warms another 0.9 degrees, which other reports say is likely, coral reefs will probably dwindle by 70% to 90%. At 1.8 degrees, the report said, 99% of the world’s coral will be in trouble.¹⁶

The IPBES report says many of the worst effects of biodiversity loss can be prevented with actions similar to those for drawing down global warming: changing how we grow food, produce and use energy, use our land, dispose of waste, etc. It is action required by people, companies and governments. Above all, the IPBES report helps us see that we must stop treating our ecosystems as if they will service humans forever.

¹² Borenstein, Seth and Christina Larson. 2019. UN: Environment is deadly, worsening mess, but not hopeless. AP News March 13. <https://apnews.com/36804b092691442ebffff6ed0ba516f2>

¹³ United Nations Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). 2019. Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. May. <https://www.ipbes.net/news/ipbes-global-assessment-summary-policymakers-pdf>

¹⁴ Vidal, John. 2019. “The Rapid Decline Of The Natural World Is A Crisis Even Bigger Than Climate Change.” *Huffington Post*. March 15. https://www.huffpost.com/entry/nature-destruction-climate-change-world-biodiversity_n_5c49e78ce4b06ba6d3bb2d44?ncid=engmodushpimg00000003&fbclid=IwAR2DQDIzC1imT5WLV1bM_Qq_7-eB3oFmDgk_MGxiiVyo6Q4HZR6syHtkU

¹⁵ Plumer, Brad 2019. ‘Humans Are Speeding Extinction and Altering the Natural World at an ‘Unprecedented’ Pace.’ *NY Times* May 6. <https://www.nytimes.com/2019/05/06/climate/biodiversity-extinction-united-nations.html?searchResultPosition=1>

¹⁶ Borenstein, Seth. 2019. “UN report: Humans accelerating extinction of other species.” *AP News* May 6. <https://www.apnews.com/aaf1091c5aae40b0a110daaf04950672>

5. Killer Heat in the United States

What are we facing from extreme heat alone?

The Union of Concerned Scientists issued a detailed report with interactive computer graphics that can help one “get the picture.”

The United States is facing a potentially staggering expansion of dangerous heat over the coming decades. This analysis shows the rapid, widespread increases in extreme heat that are projected to occur across the country due to climate change, including conditions so extreme that a heat index cannot be measured. The analysis also finds that the intensity of the coming heat depends heavily on how quickly we act now to reduce heat-trapping emissions. The results highlight a stark choice: We can continue on our current path, where we fail to reduce emissions and extreme heat soars. Or we can take bold action *now* to dramatically reduce emissions and prevent the worst from becoming reality.¹⁷

This kind of extreme heat is more than uncomfortable, inconvenient and expensive, it is a major health risk. “When extreme heat conditions prevent our bodies from adequately cooling, our core temperatures rise, especially during periods of prolonged exposure. Heat stress and then heat exhaustion follow as body temperature rises upward. Once the body's core temperature reaches 104°F or higher, heat stroke—the most severe heat-related illness—can result. The implications of this analysis are profound: in many places, extreme heat will lead to an increase in deaths or illnesses, disrupt long-standing ways of life, force people to stay indoors to keep cool, and perhaps even drive large numbers of people away from areas that become too unpleasant or impractical to live.”⁹

Writing in the Sarasota Herald Tribune, Carlos Munoz give us a local perspective. These climate impacts could dramatically alter life in Florida — and affect nearly 120 million Americans, in our lifetime. Today, only one place in the country experiences this kind of heat: the Sonoran Desert in Arizona. “We would be seeing people — climate refugees — fleeing Florida,” said Mark Paul, a professor of economics at New College of Florida. “A lot of barrier islands will not be inhabitable within our lifetime unless we take drastic measures to reverse course.” The Sarasota-Bradenton area could be in for more than two months a year with a heat index over 100 degrees by mid-century if no action is taken.¹⁸

By using the [interactive feature](#) of this report, we can gain insights into the consequences of our choices. This interactive mapping tool shows the rapid, widespread increases in extreme heat projected to occur across the United States due to climate change. Information is presented by county and includes all 3,109 counties in the contiguous US. For this national analysis, extreme heat is measured according to the heat index, the combination of temperature and humidity that together create a “feels like” temperature.

Four different heat index thresholds are featured, each of which brings increasingly dangerous health risks: above 90°F, above 100°F, above 105°F, and “off the charts.” (Off-the-charts days are so extreme

¹⁷ Dahl, Christina, et al. 2019. *Killer Heat in the United States: Climate Choices and the Future of Dangerously Hot Days*. Union of Concerned Scientists. July. www.ucsusa.org/killer-heat.

¹⁸ Munoz, Carlos. 2019. “Killer heat could alter Florida living.” *Herald Tribune* July 19. <https://www.heraldtribune.com/news/20190719/killer-heat-could-alter-florida-living>

they exceed the upper limits of the National Weather Service heat index scale, which starts topping out at or above a heat index of 127°F, depending on the combination of temperature and humidity.)

Three different time frames are featured—historical, midcentury, and late century—and three different scenarios of climate action are considered: no action, slow action and rapid action.¹⁹

Let’s use Port Charlotte Florida, where one of the authors lives, as an example. A few clicks on the interactive map tool gives us the projections shown in the table on the next page.

What we see for Charlotte County is representative of the Sun Belt. As spelled out in the UCS report, were we to take no action to reduce heat-trapping emissions, the **Sunbelt**, stretching from the Carolinas across the South to Southern California, would see the most dramatic and life-threatening jump in the frequency of high heat index days of all regions of the United States. Broad swaths of the Sunbelt are projected to experience an average of 100 or more days per year—the equivalent of more than three months—with a heat index above 100°F, whereas parts of southern Florida would experience 170 such days in an average year.

But, Steep, rapid emissions reductions that result in future global warming of 2°C or less would result in roughly half as many days with a heat index above 105°F nationwide. **Rapid action to reduce global emissions could make a significant difference in exposure to extreme heat by midcentury.**²⁰

Table 1 - Killer Heat Consequences of Choices in Charlotte County Florida

Historically , Charlotte County has experienced an average of 3 days per year with a heat index above 105°F
Consequences of no action. If we fail to reduce heat-trapping emissions, <ul style="list-style-type: none"> • by midcentury Charlotte County would experience an average of 78 days per year with a heat index above 105°F. This includes 1 day with an off-the-charts heat index. • by late century Charlotte County would experience an average of 130 days per year with a heat index above 105°F. This includes 17 days with an off-the-charts heat index
Consequences of slow action: <ul style="list-style-type: none"> • If we take slow action on climate change and heat-trapping emissions start to decline midcentury, by late century Charlotte County would experience an average of 68 days per year with a heat index above 105°F.
Consequences of Rapid action: <ul style="list-style-type: none"> • If we take bold and rapid action NOW to reduce heat-trapping emissions, we can limit the increase in extreme heat in Charlotte County to an average of 50 days per year with a heat index above 105°F.

We are in for increasingly hot weather, no matter what we do. Our choice is do we want to accept the status quo (no action) and really be fried by mid and late century? Or do we choose to be half-cooked by taking slow action? We do have another option- rapid and bold action – that will minimize the damage to half as many days above 105°F.

¹⁹ To access the interactive map, go to <https://ucsusa.maps.arcgis.com/apps/MapSeries/index.html?appid=e4e9082a1ec343c794d27f3e12dd006d>

²⁰ Dahl, Christina, et al. 2019 pp. 18, 20

Our choice is to be made NOW

The reports tell us that no matter what we do, earth will warm to the 1.5 degree C threshold established for life as we know it. Humanity must act now so as to not allow warming beyond that. Futurist David Houle describes our situation as one of *immediate and present danger*:

At this juncture, in 2019, we face two futures. We dramatically reduce our use of fossil fuels and resource consumption by 2030... or we do not. If we do, we will still spend decades on a warming planet and live in a less than optimal reality; one less pleasant than what we are used to. If we don't, civilization as we know it will no longer exist by 2100, maybe earlier.²¹

For our now global society to survive it must foresee and forestall dangers to it. It must also be willing to abandon those of its values that no longer serve. In both, it has been far too slow and ineffective, thereby creating the current URGENT need for change.

Clearly, we must act and now. By not moving immediately we are forgoing the option of preserving civilization as we know it. But how? In the next section we will deal with solutions. They involve radical and immediate changes in energy policy and human behavior. To avoid the worst of the crisis we must change the way we eat and buy things, how we get our energy and how we handle our waste. It will require a different economy, new ways of thinking and new sets of values.

Toward Solutions

Climate change, and biodiversity loss are indeed scary, but we don't aim to paralyze you with fear. The prospects for practical solutions are good. We have the knowledge and most of the technology to meet the challenge and succeed. Plus, the economic benefits of energy efficiency, transitioning to non-GHG emitting sources of energy, and improving the use of our land will help ensure that our future is prosperous and healthy.

Reasons for hope

The bad news is that unless we humans change our behavior, life as we know it will cease to exist. The good news is that solutions are within reach. As the UCS tells us, we have plenty of technology and know-how today to meet the challenge. There are economic benefits of energy efficiency. Making the transition to low-carbon sources of energy will help ensure that our future is prosperous and healthy.

²²

Technology and economics favor the transition from old fashioned (GHG emitting) sources of energy to modern, zero emission ways. As former NY City Mayor Michael Bloomberg and Sierra Club chairman Carl Pope note, market forces, popular demand, public sentiment are driving the United States towards a climate-friendly economic future and a more prosperous economic future.²³ Futurist Tony Sepa offers strong arguments for technologies such as solar, electric vehicles, and autonomous (self-driving) cars growing exponentially and sweeping away the energy and transportation industries as we

²¹ Houle, David with Bob Leonard. 2019 *Moving to a Finite Earth Economy – Crew Manual: The Three Economies. Finite Earth Economy.* <https://finiteearthconomy.com/> Chapter 2.

²² Cooler, Smarter p. 183

²³ Bloomberg, Michael and Carl Pope. 2017. *Climate of Hope: How Cities, Businesses and Citizens Can Save the Planet.* St. Martin's Press.

know them. Based on technology cost curves, business model innovation as well as product innovation Sepa projects that by 2030:

- All new energy will be provided by solar or wind.
- All new mass-market vehicles will be electric (and self-driving)
- Gasoline, natural gas and coal will be obsolete. Nuclear is already obsolete.²⁴

Historically, economic growth has come hand in hand with higher greenhouse gas emissions. More human activity resulted in more emissions from that activity. Drops in emissions had historically come as a result of economic recession or depression. This is no longer the case according to research done at the Brookings Institution. In recent years, data confirm that it is actually possible to address global climate challenges while preserving economic growth and prosperity. At least 35 countries, including the United States, have increased their real gross domestic product (GDP) while reducing their carbon dioxide (CO₂) emissions.²⁵

Economic forces are driving us forward. "Oklahoma moved from being a coal-based state to a wind-based state despite (former state attorney general and now EPA chief) Scott Pruitt. He didn't like it but everyone else did because of the cost." ²⁶

The tide of public opinion has turned in favor of action on climate change. A confluence of factors is causing people to change their minds. Business people are including climate risk in their planning and decision-making, which brings all of us consumers closer to the issue. For example, insurance prices are increasing as actuaries take into account sea level rise and more frequent/violent weather events. Faith based organizations are weighing in. The Pope and other leaders are saying we should be better stewards of God's creation. Evangelicals are reminding us that God so loved us he created for us a pure, clean home here on Earth, vibrant with healthy nature to provide for us. Climate change is now a moral issue instead of, or in addition to, a matter of science. Our military leaders have been making clear that climate change, if not abated, will have negative effects on our national security. It's been called a "threat multiplier," an onerous term that gets a lot of folks' attention. Here in southwest Florida we see the Miami and the keys area as ground zero for sea level rise. The close proximity of problems, seeing them firsthand and reading/seeing them in the news, can be a motivator. East coast politicians are initiating a movement towards action on climate change. And finally, it seems that people are recognizing that taking action on climate change is not a job killer; to the contrary it's becoming clear that a shift to economically sound policies will actually make us better off, financially as well as health wise.

A poll released in early 2016 by St. Leo's University shows that three out of four Americans register concern over global climate change. In Florida, the concern is even higher, with over 81% of Floridians concerned. These results are up dramatically from last year when 67% were concerned about climate change. President Trump has questioned the reality of global warming and cast doubt on America's participation in global efforts to address the problem. But Trump's supporters are, for the most part, in

²⁴ Sepa, Tony. 2014. *Clean Disruption of Energy and Transportation: How Silicon Valley Will Make Oil, Nuclear, Natural Gas, Coal, Electric Utilities and Conventional Cars Obsolete by 2030*. Tony Sepa Publishing. A presentation by Tony Sepa is available at <https://www.youtube.com/watch?v=2b3ttqYDwF0&feature=youtu.be>

²⁵ <https://www.brookings.edu/research/growth-carbon-and-trump-state-progress-and-drift-on-economic-growth-and-emissions-decoupling/>

²⁶ Carl Pope, former Sierra Club director, speaking in Pittsburg at the November 2017 of THINC30 summit. <https://www.nextpittsburgh.com/features/carl-pope-on-climate-change/#?fullarticle=true>

favor of action on climate change. Polling done by the [Yale Project on Climate Communications](#) indicates that about half of Trump voters (49%) think global warming is happening, while fewer than one in three (30%) think global warming is not happening. About half of Trump voters (47%) also say the U.S. should participate in the international agreement to limit global warming. By contrast, only 28% say the U.S. should not participate. More than six in ten Trump voters (62%) support taxing and/or regulating the pollution that causes global warming, with nearly one in three (31%) supporting both approaches. In contrast, only about one in five (21%) support doing neither. Public opinion is a prerequisite for political will. And the political will for a stable climate is an essential ingredient for success.

The Climate Solutions Caucus is a bipartisan group in the US House of Representatives which will explore policy options that address the impacts, causes, and challenges of our changing climate. The caucus was founded in February of 2016 by two south-Florida representatives, Rep. Carlos Curbelo (R-FL) and Rep. Ted Deutch (D-FL), who serve as co-chairs of the caucus.

Economics, technology and public opinion have shifted in favor of positive action on climate. What remains to be done is to convert these favorable circumstances into effective and timely action to overcome the deadly inertia of the status quo. And time is of the essence.

What kind of action? Mitigation vs. Adaptation

Staff Writers Zach Murdock and Elizabeth Djinis did a nice job in the [Herald Tribune](#) (*Preparing for More Irmas*, 9/17/2017) explaining that hurricane Irma represents the new normal: the strongest storms should get stronger in the coming decades as the ocean temperatures warm; creeping sea level rise will make storm surges and inundation worse, particularly for low-lying areas; and storms that do form are likely to bring more precipitation with them.

Now that the likelihood of increasing catastrophic weather events is on people's minds, taking action becomes more of a priority. As Tom Barwin, Sarasota City Manager said "Perhaps IRMA is the kick in the shins we needed to begin a more pro-active response to climate change in Florida... and around the world for that matter."

What kind of action? There are two strategies for dealing with the climate change crisis: *Adaptation* and *Mitigation*. Examples of adaptation are building dikes and elevating buildings. These are the kinds of action the City Manager may have in mind for protecting the 220 Sarasota city assets identified as vulnerable to sea level rise. *Adaptation* gets a lot of attention, in part because there is money to be made. *National Geographic* explains how some are profiting on the threat of rising seas. A proposal for floating islands in the Miami area is an example. "We will dredge to prop everything up," one Miami land use attorney says. "The watchwords are protect, accommodate, and retreat, which sound a lot like a civil engineer's version of the stages of grief."²⁷ While adaptation may be profitable for contractors, it is costly for consumers. Elevating a \$300,000 home can cost well over \$100,000.

Mitigation has to do with slowing and/or reversing global warming, and therefore reducing the likelihood of severe weather events and catastrophic sea level rise. *Mitigation* actions attempt to draw down the excess greenhouse gases in the atmosphere, which are the cause of climate change. Drawdown has two components: (1) eliminating the cause of the problem by reducing/eliminating

²⁷ Laura Parker, "Treading Water," *National Geographic* February 2013 p107-125

emissions of greenhouse gases, and (2) increasing photosynthesis, the process by which plants remove carbon dioxide (the principle greenhouse gas) from the atmosphere and store it in the soil.

Unlike *adaptation*, which is costly, *mitigation* can provide a near term return on investment - if done right. For example, a family investing in a solar water heater can reduce a household's emissions from electrical energy by as much as 30%. That investment can pay a handsome return of 25-30%.²⁸ On a larger scale, the transition to zero emission energy will serve as an economic boost. Solar jobs in the United States have increased at least 20 percent per year for the past four years. The solar industry added \$84 billion to the US GDP in 2016.²⁹ A 2016 Goldman Sachs research paper says wind provides the lowest cost source of electricity (2.9 cents/kwh compared to 3.8 cents for Fracked natural gas).³⁰ Less carbon pollution saves lives as well as money. Stanford research estimates that converting to zero emission energy will eliminate about 65,000 premature deaths caused by air pollution in the United States each year and save about \$2,600/person/yr in health costs.³¹

John Darovec, a Bradenton biologist and group leader with Citizens' Climate Lobby, says *adaptation* is trying to manage what you cannot avoid, and *mitigation* is trying to avoid what you cannot manage. Given the cost of the former and the benefits of the latter, it makes plenty of sense to focus on *mitigation*. Michael Oppenheimer, one of the co-author's of the UN report on climate change says, "Everyone agrees that if we don't slow the warming down, our prospects for *adaptation* are not good."³²

Writing in *Forbes Magazine*, Jeffery Ravens explains that focusing exclusively on adaptation, is short-sighted. The climate will continue changing and the long-term impact of climate change will be too severe to manage by simply adapting. Cities that embrace "adaptive mitigation" (those that reduce CO₂ emissions while also helping their residents adapt to a changing climate) are better positioned to remain livable in the years ahead.³³

So how do we prepare for more Irmas? *Adaptation*, which aims to protect us from the problem, may make sense, and make life more comfortable, for those who can afford it. *Mitigation* makes sense for all because it works to solve the problem and pays a return. We cannot afford not to *mitigate*... and the sooner we do, the better our chances for a stable climate and a livable world.

We shall, therefore, respond to the challenge of climate change by working to mitigate thru emission reduction and carbon sequestration and leave the work of adaptation to others.³⁴

²⁸ 40,000 lb. Carbon Diet: how a middle class American Family cut its carbon footprint by 75% and made money doing it. <http://www.ecopapak.org/ecology/What%20to%20Do/40,000%20lb.%20carbon%20diet.pdf>

²⁹ Solar Jobs Census <https://www.thesolarfoundation.org/solar-jobs-census/>

³⁰ *Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming*. Penguin Books, p 2-4.

See detailed references at <http://www.drawdown.org/solutions/energy/wind-turbines-onshore> and

<http://www.drawdown.org/solutions/energy/wind-turbines-offshore>

³¹ The Solutions Project. <http://thesolutionsproject.org>.

³² Mufson, Steven. 2014. "U.N. climate panel: Governments, businesses need to take action now against growing risks." *Washington Post*, March 30.

³³ Ravens, Jeffery. 2017 "To Curb Climate Change, Cities Need The Right Design" *Forbes Magazine*. Dec 4. <https://www.forbes.com/sites/realspin/2017/12/04/to-curb-climate-change-cities-need-the-right-design/2/>

³⁴ Credit for this terminology goes to Conner Stedman presenting to Citizens' Climate Lobby October 2, 2017. Carbon Farming, Regenerative Agriculture for Climate Stabilization.

Solutions/Action Framework

Our program begins with citizens taking the action needed to accomplish our goal of reducing emissions to near zero. But it's not all about energy. "There's an assumption that if you get 100 percent renewable [energy], you basically have a hall pass to the 22nd century. That's simply not true. It's a scientific howler."³⁵ As we have learned, we must change our diets and what we buy. We must also take carbon out of the atmosphere, so our program involves re-forestation and soil management. And the greatest impacts on climate can come from solutions in other areas such as family planning and educating girls. When combined, these two solutions alone can reduce 120 Gigatons of CO₂-equivalent by 2050 — more than all wind power solutions combined (99 GT). (Hawken, 2017)

Ours is a proactive approach which is decidedly unlike the skeptical, excuse laden, "if only government did something" way of looking at this problem. Our program calls for active involvement by each of us as citizens of the US and inhabitants of the planet. Action involves working in three interrelated areas:

1. Reducing your own GHG footprint by energy management, diet and purchasing habits, taking action at re-forestation, soil management and divesting from fossil fuel providers.
2. Motivating others and your community to take similar actions.
3. Influencing government at the polling place and through lobbying.

The complete action framework is presented in Table 11 at the end of the paper. This is our model, our framework, our strategic plan for how to attack what we feel is the most serious problem facing mankind and indeed all forms of life on our planet. It is a three-pronged approach, all based on each of us taking responsibility and acting proactively.

Before we get into the details of what we can and should do to work in our own realm and to influence others, let's deal with two important prerequisites: Conserving energy and understanding the causes of global warming.

Conserving Energy

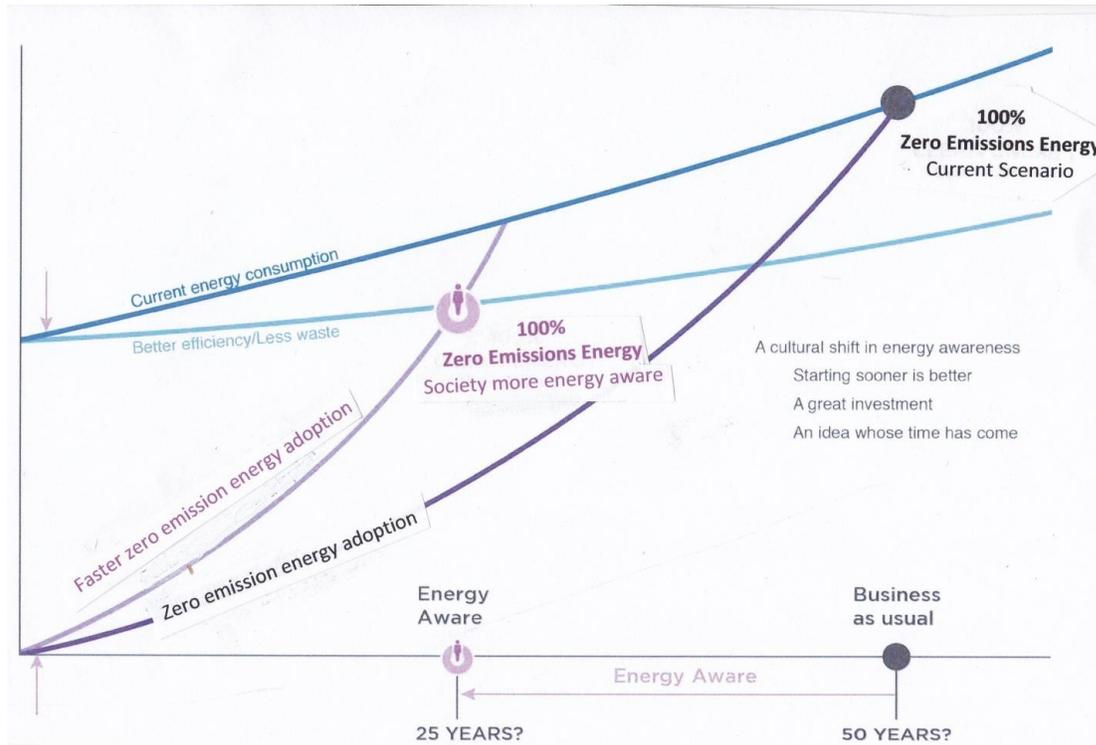
Using less energy is essential if we are to put less GHGs into the atmosphere. Let's try to get a handle on the importance of this concept.

The illustration shown on the next page, *Bending the Curves*, can help us see the importance of energy conservation. The concept is based on two curves- *Consumption* and *Transition*. If we continue to consume as much energy as we presently do (the curve labeled "Current energy consumption") we may be able to achieve zero emissions in the way distant future. But we are chasing a moving (and illusive) target in the form of our current energy consumption trend. This is too risky a strategy; and we cannot wait that long.

A key to achieving our goals sooner, and in time to fend off the worst effects of climate change, is to dramatically reduce the amount of energy we consume. As one can see in the illustration, by lowering the *consumption curve* (the curve labeled "Better efficiency/less waste"), we can achieve our 100% Zero Emission goal much sooner (perhaps 25 years sooner).

³⁵Paul Hawken, editor of *Drawdown*, interview with David Roberts July 2017

Figure 1 - Bending the Curves



(Credit: this illustration has been adapted from [Generation 180.org](http://Generation180.org) presentations to Citizens' Climate Lobby January and June 2017)

Making the transition from emitting sources of energy to non-emitters (the *transition curve* "Zero emission energy adaption") in the illustration is critical. But we must also change behavior, be more efficient and create less waste to bend *the consumption curve*. Ramping up our efforts to adopt zero emission energy (the curve labeled "Faster Zero Emissions Energy Adaption") is even better, but it must be accompanied by radical reductions in energy consumption if we are to have hope for a stable climate and a livable world.

Conservation will be a common theme as we examine what we (as citizens, business owners, community leaders, power companies, builders and developers, governments) can and must do. At the lowest level, citizens (like the FLVCS authors) can achieve net carbon zero homes by investing in solar electric generators- but not without significant conservation efforts such as insulation, altering behaviors, etc. (More on this in the section on *acting in our own realm*). At the highest level, the community's emissions from the generation of electrical power must involve not only a shift to wind and solar power plants. It must also include REDUCTION of total electrical energy consumption. Utility companies must work change the way they do business to reduce the amount of energy they generate by helping the community reduce demand thru extreme conservation methods including a dramatic increase in the use of distributed power (lots of net carbon zero, roof top solar homes like the FLVCS authors). More on this when we get to the section on *Action to Influence Government/State Governments should encourage Conservation*.

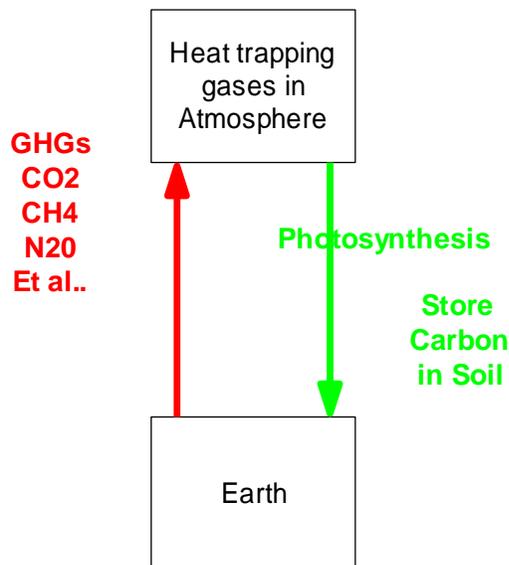
Understanding the Causes

Understanding the causes of the problem is the first step towards taking action.

A logical way to solve a problem is to attack the cause. So we begin with an examination of the causes of global warming. The IPCC and the UCS explain that heat trapping gases in the atmosphere have exceeded a concentration of 400 parts per million (ppm). This is way beyond the "safe" level of 350 ppm. By "safe" we mean a level that would allow the planet to stay below the 2-degree centigrade threshold for global temperature rise. Exceeding 2 degrees will likely make life on earth disappear as we know it. The IPCC and the UCS make clear that this unacceptable level of heat trapping gases in the atmosphere is caused by the emission of heat trapping ("greenhouse") gases and deforestation.³⁶

Figure 2 illustrates the two sides to the problem. On the left we see the "up" side of the situation in the emission of the various GHGs into the atmosphere. On the right - the "down" - is the removal of carbon by photosynthesis and its storage in the soil. The destruction of our forests and topsoil has weakened the earth's ability to remove carbon from the atmosphere, which together with the enormous amount of emissions, has put us in the present situation.

Figure 2 - Up/Down Model



We can sum up the problem with a little math:

- Current levels of CO₂ in the atmosphere exceed 400 ppm
- Levels of CO₂ needed to limit average global temperature of 2 degrees C: less than 350 ppm

³⁶ UN Intergovernmental Panel on Climate Change (IPCC), 2014 and Union of Concerned Scientists

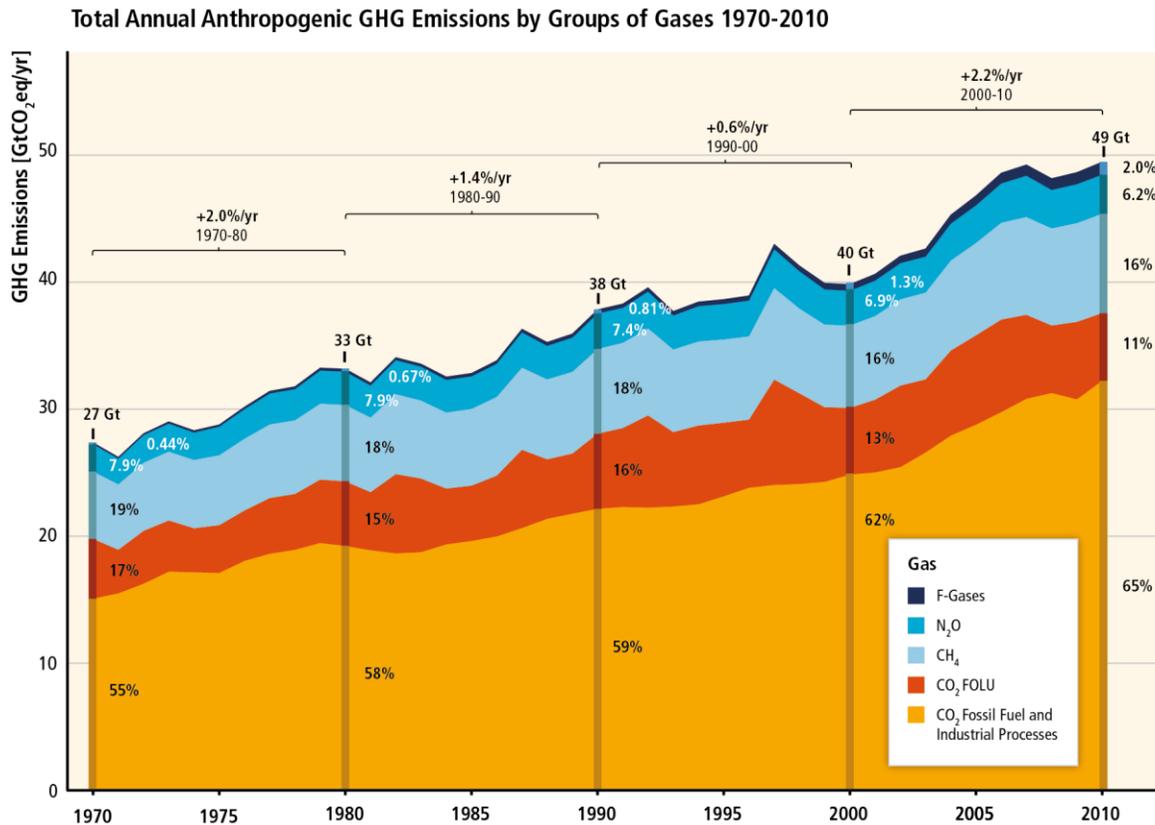
- To get below 350 ppm, 130 billion tons of carbon will need to be removed from the atmosphere, plus ZERO net additional emissions

Currently 5 billion tons of carbon are emitted globally each year.³⁷

CO₂ is important, but it is only part of the story

Let's focus for now on the left side (the "up") part of the problem. Figure 3, from the IPCC report,³⁸ shown on the next page, illustrates the steady rise of emissions since 1970 and the relative contributions of the various culprits. It offers a good place to begin to get a grasp of what the gases are and where they come from.

Figure 3 - Total Annual Anthropogenic GHG Emissions by Groups of Gases 1970-2010



What gets our attention right away are the orange and red areas - the major contributions from two sources of carbon dioxide (CO₂) emissions:

- Fossil fuel & industrial processes (65% of the total in 2010)
- Farming & other land use (11%). FOLU includes emissions mainly from deforestation, agricultural emissions from soil and nutrient management (fertilizers).

³⁷ Conner Stedman presenting to Citizens' Climate Lobby October 2, 2017. Carbon Farming, Regenerative Agriculture for Climate Stabilization.

³⁸ UN IPCC 2014

The UCS explains that the major greenhouse gas, in terms of volume, is indeed carbon dioxide (CO₂, about 76% of GHG). Methane (CH₄) and nitrous Oxide (N₂O) are relatively low compared to CO₂, but they are more potent GHGs. CH₄ (natural gas is methane) accounts for about 16% of GHG. CH₄ comes from Fracking and other natural gas leaks, agriculture, and from landfills. While methane does not stay around as long as carbon dioxide, its impact is far more dramatic. **Methane is 25 times more potent as a global warming gas** in the atmosphere.

Nitrous oxide (N₂O -a bit over 6% of GHG) is known by some of us from the dentist's office. But more common sources are from the combustion of fossil fuels and from chemical fertilizers used on crops. N₂O is also released naturally by the soil. **Each pound of N₂O has a global warming equivalent to roughly 300 pounds of carbon dioxide.** Like CO₂, N₂O stays around a long time in the atmosphere.³⁹

Several other gases play a significant role in global warming. Among the "F-Gases" (2% of total GHG in 2010) are hydrochlorofluorocarbons such as refrigerants which are potent heat trappers.

Electrical Power

The carbon footprint of present-day power plants is enormous. As two former Environmental Protection Agency (EPA) administrators say:

..these plants emit more carbon dioxide than our cars, planes and homes combined, and it is this greenhouse gas that is the principal culprit behind the alarming warming of our planet.⁴⁰

You won't be surprised that when we get to solutions, electrical power will be a key target area.

Food System Contributions

We tend to think of GHG emissions as coming out of tailpipes and smokestacks. If we look deeper, we can see that our food systems account for much of the total emissions. While the EPA reports that 9% of U.S. GHG emissions are from agriculture, they are only talking about **crop production** and **animal agriculture**. An analysis by Earthjustice's Peter Lehner gives us a more meaningful assessment of the impact because it includes emissions from the whole of the food system which includes:

- **crop production,**
- **animal agriculture,**
- **fertilizer production,**
- **on-farm energy use,**
- **cropland soils,**
- the **supply chain** (transport, wastewater treatment, processing, refrigeration and composting),
- **residential cooking and refrigeration** and
- **food waste.**

Using data from EPA and the Food and Agricultural Organization of the UN (FAO), Lehner estimates that 21% of U.S. GHG emissions are from the food system, and this does not include the emissions

³⁹ Shulman, Seth, Jeff Deyette, Brenda Ekwurzel, et. al. 2012. *Cooler, Smarter: practical steps for low-carbon living*. The Union of Concerned Scientists. Island Press

⁴⁰ William D. Ruckelshaus served Richard Nixon and Ronald Reagan. William K. Reilly ran the EPA for George H.W. Bush.

attributable to imported food, or emissions driven by deforestation to make way for commodity crops like palm oil. Earthjustice estimates that total **GHG emissions from the food system are 20-30% of the U.S. total.**

While some of the food system emissions are CO₂, a majority are other GHGs such as methane and nitrous oxide.

Methane was mentioned earlier as a potent GHG, with 25 times the global warming potential of CO₂. “**Enteric fermentation**” or, more simply, cow belching is a major source of CH₄ (22% of CH₄), second only to natural gas systems (24% of CH₄). Bacteria in the stomachs of cattle and other ruminant animals produce CH₄ as they help animals digest. The CH₄ is released as cattle exhale and burp. CH₄ is also released by **animal manure** (8% of CH₄, the sixth largest source), especially when it’s stored in giant waste lagoons, as in industrial swine production. **Rice cultivation** accounts for 2% of CH₄ emissions.

Nitrous oxide has about 300 times the global warming potential of CO₂. The dominant source of N₂O emissions (79%) is **agricultural soil management**, including the *application of nitrogen-based synthetic fertilizers*. In the soil, nitrogen in fertilizer that isn’t taken up (“assimilated”) by crops is processed by bacteria back to the N₂ gas that is abundant in our atmosphere. However, this process also results in the production of N₂O. It is very important to balance nitrogen in the soil with the nitrogen needed by plants to reduce the amount of N₂O produced.

CO₂ is also emitted by activities in the food system, including fossil fuel combustion involved in the production of inputs like fertilizers and pesticides, food processing, transportation, and refrigeration, among many others. Nevertheless, CO₂ emissions are a relatively small proportion of emissions in the food system.⁴¹

Deforestation and soil management

In addition to commodity crops like palm oil, tropical forests are being destroyed in large part to support animal agriculture: to provide grazing land and for growing animal feed.⁴² The UCS informs us that deforestation is happening at a rate of an acre of tropical forest lost every second, and that emissions from tropical deforestation account for some **15% of the world's total emissions** - an enormous and largely preventable share.⁴³

Deforestation has a four-fold impact. First, by removing trees, carbon in the soil is released into the atmosphere (adding to GHGs). Second, the machinery used to destroy the forests are probably burning

⁴¹ Peter Lehner presented this analysis to Citizens’ Climate Lobby annual conference in Washington DC June 20, 2016.

⁴² 2006 report by Food and Agricultural Organization of the UN (FAO) analyzed data on livestock globally and determined that the *production of red meat accounts for about 18 percent of total global warming emissions* and that meat is nearly 50 times more emissions intensive than any other food. This includes emissions caused by deforestation, especially in the Amazon basin where vast area of rainforest are destroyed to make room for grazing cattle and grow their feed. See p. 142, *Cooler, Smarter*

⁴³ *Cooler, Smarter* p. 165.

some sort of fuel and thereby emitting GHGs. Third, often the dug-up trees are then burned causing more emissions. Finally, we have lost healthy trees and plants who would otherwise be taking CO₂ from *the atmosphere*, using it to produce valuable food for our ecosystem and storing (sequestering) CO₂ in the soil- keeping it out of the atmosphere - thereby reducing global warming.

We don't have to go to the Amazon or Indonesia to witness similar impacts. The practice of soil tilling causes the release of carbon into the air. Not using cover crops forgoes an opportunity to take carbon from the air and store it in the soil. Our Secretary of Agriculture points out these two examples of how changing simple farming practices (i.e, using no-till and cover crops) can help mitigate the effects of climate change. (Biello). We will come back to soil management when we get into the Solutions section.

"Renewables" and "clean" are misleading terms. Let's just say we strive for Zero Emissions.

An often-heard phrase goes something like, "All we need to do is replace fossil fuels with renewables, and the GHG problem will be solved." We think this is a dangerous oversimplification that does not take into account the fact we have some sources of energy that are referred to as "renewable" that are burned and hence are contributors to GHG.

"Renewable" energy is produced using the sun, wind, water, etc. or from crops rather than using fossil fuels. But the term "renewable" can be an unnecessary distraction in our quest to reduce GHGs because some renewable fuels are GHG emitters. The biofuels ethanol and biodiesel are examples. Made from corn and soybeans (or other vegetable oils, animal fats, or recycled restaurant grease) respectively, these fuels have been used to replace gasoline and petroleum diesel. While ethanol and biodiesel may produce less GHG, they still emit some.⁴⁴

The driving idea behind biofuels is that they can - in theory- offer a carbon neutral fuel source because the emissions caused by burning them are offset by the carbon dioxide taken up by the crops grown to make the fuel in the first place. The UCS points out, however that the farm machinery used to harvest and take crops to market, and the facilities used to produce fertilizers and pesticides emit more GHGs than the corn and soybeans take from the air (Shulman, et. al. p 71, 72). Renewable energy in the form of biofuels is not a solution to global warming. Instead it has become part of the problem.

We say let the corn and soybeans grow, capture carbon, and then let's eat them instead of burn them.

"Clean" is a relative term with a positive connotation. Advocates of natural gas like to call it a "clean" energy source, implying it is less "dirty" than coal. When we think of natural gas, we should also consider that it is methane, and when leaked (for example at the well, or during transportation in a pipe line) it will be 25 times more potent a GHG as CO₂. Natural gas is mined by Fracking, which injects

⁴⁴ According to the US Energy Information Agency:

- A gallon of pure gasoline emits 19.64 pounds of CO₂. A gallon of E10 (gasoline with 10% ethanol content) emits 18.95 pounds of CO₂. About 12.73 pounds of CO₂ are produced when a gallon of pure ethanol is combusted.
- 22.28 pounds of CO₂ are emitted when a gallon of petroleum diesel is combusted. B20 is a commonly sold biodiesel fuel, which contains 20% biodiesel and 80% petroleum diesel fuel. Burning a gallon of B20 results in the emission of about 22.06 pounds of CO₂. About 20.77 pounds of CO₂ are produced from burning a gallon of pure biodiesel. <http://www.eia.gov/tools/faqs/faq.cfm?id=307&t=10>

poisonous fluids into the earth. Fracking is also responsible for methane leaks and earthquakes. In our view, Fracked natural gas is not clean by any stretch of the imagination. We suggest deleting the terms "renewable" and "clean" from the energy vocabulary.

Zero Emissions are what we need to strive for. This means transitioning to 100% solar, wind, nuclear, hydro and geothermal energy.

Recap on the Causes and Solutions

As we go about the work of creating solutions to our global warming crisis, it will serve us well to think of the two sides of the problem- we have to stop contributing by not emitting heat trapping gases, and at the same time we must remove the excess carbon from the atmosphere. Recognizing the sources of the culprit GHG emissions, deforestation and ineffective soil management, is a key to effective problem-solving. We need to understand the causes so we know where to attack from both sides of the up/down model.

While a large portion of the heat trapping gases is carbon dioxide from burning fossil fuels and industrial processes, farming and other land use are responsible for a great deal of CO₂. We cannot overlook the more potent methane and nitrous oxide. And we must look carefully at our food systems, which are responsible for as much as a third of GHG emissions and some of our failure to capture carbon and store it in the soil.

We have to be careful not to get caught in dangerous semantics by assuming that so-called "renewable" energy sources are not going to emit GHGs. When we burn wood and other biofuels, we get GHG emissions. If it burns, it's bad. Our goal should be to consider only non-combustible sources of energy when determining how we supply our energy needs in the future. We also suggest avoiding the adjective "clean" when we describe fuels, because "clean" is often used to describe GHG emitters like natural gas (methane in its chemical state). We can do better to avoid confusion by describing sources of energy as being emitters of GHGs or non-emitters.

What we put in the air (our GHG emissions) is only half the story. What we fail to take out of the atmosphere is the other half. Deforestation and poor soil management rob us of the opportunity to capture and store carbon by natural means.

The goal is zero net emissions plus pulling excess carbon from the atmosphere for an overall net carbon negative. This is the only way to achieve drawdown from our current level of 400+ parts per million carbon in the atmosphere to the 300-350 ppm needed to sustain life as we know it.

Action in your Own Sphere

Leadership by example is something that many veterans can vouch for as being effective, if not essential for success in difficult ventures. This is one reason we believe that each of us each should be taking direct **action** where we control things - in our households and in our businesses (if we are owners or in top management). You may also have a leadership role at a non-profit organization, religious institution or agency. These are the first places to act on carbon emission reduction and re-forestation. There are other reasons to act, of course. It's the right thing to do to have a marked impact on atmospheric carbon while we are waiting for the government to act. Plus, wise investments in modern energy can make us money. Finally, it can make us feel good. For these reasons, each of us should take effective action in our own realm.

Technology does not provide the whole answer to our problem. We also need to change our behaviors so that our energy needs are less, and we need to begin using alternative sources of energy. This will require changes in our daily lives, such as being willing to live in warmer buildings during the summer and cooler ones during the winter, altering our means of transportation, changing our eating habits, and monitoring our energy use to assure we are actually achieving the outcomes we hoped for.

Figure 4 - US Emissions Compared Globally

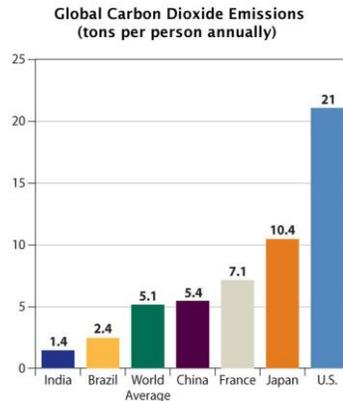


Illustration source- Cooler, Smarter p.8

The UCS tells us that we in the USA have a special responsibility, because on average, Americans cause 21 tons of CO₂ to be emitted into the atmosphere annually. That's four times the global average and more than twice the amount emitted per person in most industrialized western European countries with high standards of living. We have the tools and the technology we need. The key is for each of us to begin to work towards solutions.⁴⁵

For those of us who have already taken some initiatives (solar panels on the roof, a Prius in the garage, an efficient fleet of trucks for the business) we need to make sure our green lifestyle actually has a meaningful impact. Let's keep in mind the target. What needs to be done is to reduce net emissions about 50% immediately (by 2025) and by 100% before midcentury. These goals come from the hundreds of scientists who contributed to the IPCC reports, and they coincide with the reductions that the UCS has advocated for years.

Guide to action in your own realm

To help you decide what actions you could take, and how to follow up on your choices, we offer a decision process over the next 20 pages or so. The guide is based on the economic principle of *getting the most bang for the buck*. In other words, if you do some homework, you will be better able to determine where your efforts, and your limited resources, will have the most impact. Here's the roadmap:

- **Estimating your carbon footprint**- in this section, we explain how you can, with the aid of some online tools, determine the sources of your GHG emission, and create your own baseline.

⁴⁵ Cooler, Smarter p.8

This will help you determine your priorities for action, and serve as a point of reference for your progress.

- **Where do our emissions come from, and how can we reduce?** In this section, we tap into the wisdom of the UCS and others to learn specific sources of GHG emissions, with ideas for how you can manage energy better in these areas.
- **Food System.** This section is for folks whose business is connected to the food system.
- **The Soil Will Save Us.** This section explains the importance of removing carbon from the atmosphere and storing it in the soil. It applies to all of us.
- **Finance and economics** - Here we offer some thoughts on deciding what energy initiatives to invest in.
- **Offsets** - This brief section offers some philosophy on the practice of paying someone else to save the planet.

Establishing a baseline - estimating your carbon footprint

One way to start is to figure out how much you (your family, business, religious institution or agency) are emitting now and to use that estimate as a baseline for your decision making and problem solving process.

This evaluation is done by first counting the amounts of the various energy sources you are presently using (gallons of heating oil/gasoline/diesel, kilowatt hours of electricity, therms of natural gas) over the course of a year. You then convert these measures to equivalent pounds of carbon dioxide, so you can see how much you are emitting each year.

There are two general ways to make the conversions:

1. Do the research to find out how much carbon is emitted by each energy source. Then do the math.⁴⁶
2. Use an online program. The *Household CO₂ Calculator* can be found at <http://www.empowermentinstitute.net/index.php/community/low-carbon-diet/household-co2-calculator>. This program asks you to enter the miles driven in your cars, gallons of heating oil used, kilowatt hours of electricity used, therms of natural gas, bags of garbage put to the curb, etc. This basic program estimates the pounds of carbon you emitted in a year by **direct energy consumption**. *CoolClimate* is a more sophisticated program from UC Berkeley that can be found at <http://coolclimate.berkeley.edu/carboncalculator>. This program accounts for **indirect emissions** (what you eat, what you buy) as well.

For a frame of reference, the "typical" American household emits about 60,000 pounds of CO₂ each year by **direct energy consumption** by Low Carbon Diet thinking. (Gershon). To achieve the "typical" family's part to curb global warming, you want to reduce that by at least 24,000 pounds (40%) in the near term and by least 42,000 pounds (70%) in the long term. But it's more complicated than that, because more than half of our emissions are caused by **indirect activity** like eating and buying stuff. The UCS estimates that the average American is responsible for about 21 tons of GHG emissions (that's 42,000 lbs) annually. By this more complete measure, the average American should strive to reduce his or her emissions by about 17,000 pounds annually in the short term and by over 31,000 pounds

⁴⁶ For example, burning a gallon of gasoline releases 19.6 pounds of carbon dioxide. See Energy Information Agency resources in the Reference section.

annually in the long term. But none of us is "average," so we need to do the calculation for our own realm.

After establishing the baseline of current emissions, and the goal for reductions, the fun part of the process begins. How do you reduce your contribution to global warming by what may seem like an unrealistic amount? What are the options?

Everyone's solution will be different. But the ends will be similar in that they will involve changing behaviors and substituting non-combustible sources of energy for combustible fuels. The solutions will also involve significantly altering one's means of transportation.

Where do our emissions come from, and how can we reduce?

We learned earlier about the world-wide sources of GHG emissions and deforestation. They include CO₂ from burning fossil fuels and industrial processes, farming and other land uses. We should not overlook the potent methane and nitrous oxide. And we must look carefully at our food systems, which are responsible for as much as a third of GHG emissions. We have to be careful not to get trapped into assuming that "renewable" energy sources are not going to emit GHGs. If it burns, it's bad. With this background in mind, we can tackle our own GHG footprint.

The UCS, in *Cooler, Smarter: practical steps for low-carbon living*, offers expert insights and options, beginning with an overview of where the average American's emissions come from. See the pie chart in Figure 7.

Figure 5 - Where Average American's Emissions Come From

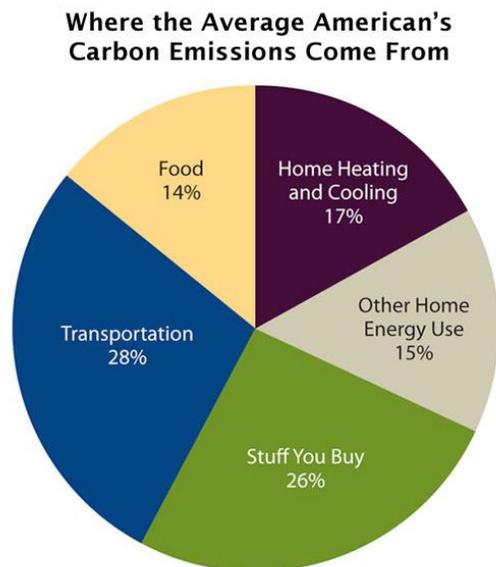


Illustration credit: *Cooler, Smarter* p. 16

While none of us is average, we can use this data as a baseline when considering alternatives for reductions. Use the knowledge of the causes of the problem, together with this average American baseline, and the make-up of your GHG footprint to evaluate and brainstorm possible action steps. You will find that many options will not only reduce your emissions, they will save you money.

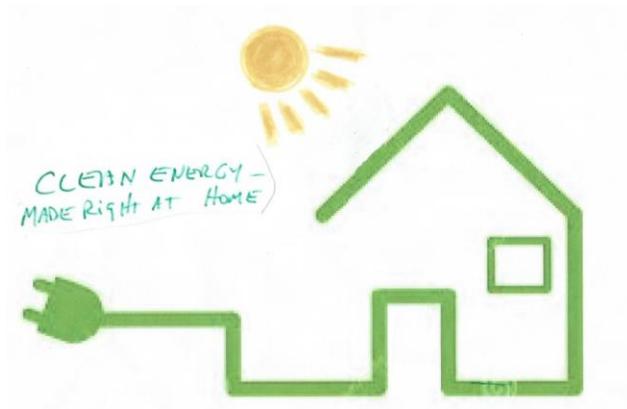
There are lots of ideas for you to consider, including these. Keep in mind the general prescription:

- **Use less energy – conserve.**
- **Shift from combustion sources of energy** (fossil fuels, wood, bio fuels, etc.) **to sources that don't burn things** (wind, water, solar, nuclear).
- Reverse the trend of de-forestation directly (by **what we plant and nurture** on our land) and indirectly by **what we buy and what we eat**. If we are in the business of food production, we have much control over how much carbon is stored by our choice of soil management practices.

Buildings - Our homes and other buildings are a good place to start because they are the cause of most of our direct emissions. Here are some proven strategies for reducing building emissions:

- **Conserve.** Invest in improved insulation and reducing air leaks. Upgrade heating and cooling systems and appliances to more efficient versions. Use a programmable thermostat. Live with warmer temperatures in summer, and a cooler home in the winter. Join the lighting revolution: switch to LED bulbs.
- **Shift from combustion sources of energy to non-combustion.** Use the power of the sun and wind to generate your electricity and heat your water. Our personal experience with solar hot water is an annual reduction of almost 7,000 pounds of carbon and a return on investment of 29%. Our solar electrical systems avoid 11,000 pounds of emissions annually and pays a 9% return on investment.⁴⁷

Figure 6 – Zero emission (free) energy made at home



⁴⁷ Calculation of 9% return on investment is based on investment of \$14,500, a useful life of 25 years, our PV system producing an average of 7,832 kwh annually, savings based on a current price of 12 cents/kwh escalating at an annual rate of 5%. See Keller, *40,000 Carbon Diet*.

Transportation - Transportation accounts for 28% of the average American's carbon footprint, and according to the UCS, 92% of that comes from motor vehicles.

Reducing transportation emissions can be achieved in two ways:

1. **Conserve:** Don't drive -take public transit; Replace inefficient vehicles; Reduce (better yet eliminate) long distance travel. Choose your means of long-distance travel to minimize the damage to the climate. For single travelers, trains are best, planes are worst.

The trip in the illustration on the next page, across Sweden, cost a little more than 5 pounds of carbon emitted if it's taken by train. This compares to almost 135 lbs. by car and 260 pounds by plane. Such amounts quickly take a big chunk out of the annual carbon budget of 4,409 pounds per person that scientists say would be sustainable.⁴⁸

Figure 7 - Flight Shame - comparing train, car and plane emissions

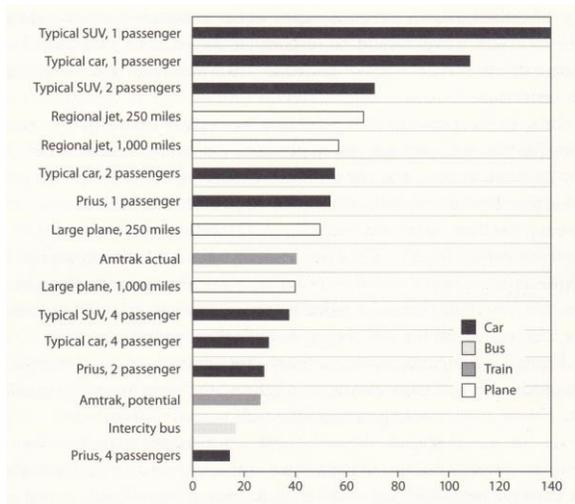


⁴⁸ Jordans, Frank and David Keyton. 2019 "Climate of guilt: Flying no longer the high road for some." AP News June 20. <https://www.apnews.com/cc1b2e6310fc4a31808058c7c0c72d79>

If you are traveling with a group, packing a number of people into a high MPG vehicle can make car travel more efficient. The Union of Concerned Scientists calculate that 4 people in a Prius is the most climate friendly way to travel (among choices that emit carbon)

Figure 8 - CO2 Emissions per 100 Passenger Miles

Illustration from: *Cooler, Smarter* p.76



Of course, **the best way to travel anywhere is by zero emission vehicle. This leads us to #2**

2. **Shift from combustion sources of energy to non-combustible sources.** Bicycles and electric vehicles (EVs) emit zero emissions. And, if you are **making electricity from the sun or wind** and using that energy to charge your EV, your footprint can be close to zero. Plug-in Hybrid Electric Vehicles (PHEVs) also reduce greenhouse gases and other emissions, even if the source of electricity is mostly coal.⁴⁹

Think of ways to abandon your gas car and use a bike. In my case, the environmental and financial benefits were enormous, with savings of over 6,000 pounds of carbon emissions and almost \$2,000 each year.⁵⁰

Avoid vehicles that use combustibles, as discussed previously.

⁴⁹ Union of Concerned Scientists' electric vehicle [life cycle analysis](#).

⁵⁰ The \$1,949 cost savings is the Equivalent Annual Cost (EAC) difference between owning/operating our Honda Accord and owning/operating the folding bike and taking the train. EAC is the net present value of the life cycle cost divided by the years the asset is owned. The calculations are based on the following assumptions: cost of capital (5%), purchase price (Accord \$20,000; Bike \$500), price of gas (\$4.25/gallon), train tickets (\$12.90 round trip), annual maintenance (\$500 for the Accord, \$50 for the bike), and life span (Accord 10 years, Bike 15 years). The undiscounted costs would be \$3,826 for commuting by car and \$2,045 for the bike/train option (a difference of \$1,780). 6,113 Pounds of CO2 is calculated as the result of 8,887 grams of CO2 emitted per gallon of gas, as per the EPA. I am estimating our Accord achieved 30 MPG. See Keller, *40,000 lb. Carbon Diet*.

My EV avoids about 7,000 pounds of carbon emissions annually and a dollar savings of about \$500 annually when compared to an equivalent gas car.⁵¹ The downside (if you want to call it that) is on the behavioral side. It takes time and energy to plan longer trips. Emotionally these “inconveniences” are well worth the good feelings we get by running clean and passing gas stations by.

Diet - What we eat (and what we buy and throw away) accounts for 14% or about 6,000 pounds of GHG emissions annually for the "typical" American Family. If you are anything like the "average" American, your best option is to reduce your consumption of meat, especially beef. That’s because a pound of beef is responsible for some 18 times the emissions of a pound of pasta.⁵² The only food that comes close to the emissions intensity of red meat is cheese. An average family of four that cuts their meat intake in half could avoid roughly three tons of emissions annually (nearly half as much as a year's worth of driving).

If you must eat red meat, let us suggest that you avoid feedlot beef. As eco farmer Elli Sparks explains, animals raised on land also used for crops add to soil fertility and rebuild topsoil. This would also help reduce GHG by reducing the need to remove forests in order to provide feedlots.⁵³

A diet rich in grains, vegetables and fruits will result in dramatically lower emissions than one heavy in meat. If you must eat meat, chicken and fish are the best choice from a climate standpoint.⁵⁴ What about from a health standpoint? More on that in a bit.

Table 2 - Meat Eater's Guide

Excerpts from the <i>Meat Eater's Guide</i> ⁵⁵	
•	If you eat one fewer burger a week, it’s like taking your car off the road for 320 miles/year or line-drying your clothes half the time.
•	If your four-person family skips meat and cheese one day a week, it’s like taking your car off the road for five weeks or reducing everyone’s daily showers by 3 minutes
•	If your four-person family skips steak once a week, it’s like taking your car off the road for nearly three months.
•	If everyone in the U.S. ate no meat or cheese just one day a week, it would be like not driving 91 billion miles – or taking 7.6 million cars off the road for a year.

Drawdown explains that a plant rich diet is ranked #4 out of 100 solutions to climate change. It can result in 66.11 Gigatons of reduced CO₂ through 2050.

⁵¹ These calculations are based on driving the Leaf 11,711 miles in 2012, assuming that gas costs \$3.75/gallon and a gas car gets 28.5 mpg (the average of what we get on our Honda Civic and Odyssey). The carbon calculation allows for the “dirty” electricity we used (assumes the 981 kwh we purchased from FPL emits 1.4 pounds per kwh, assumes the charging station at our home in Freeport, New York is clean since 85% of the power there is supplied from renewable sources). See Keller, *40,000 Carbon Diet*.

⁵² ⁵² Hamerschlag, Kari 2011. *Meat Eater's Guide to Climate Change and Health*. Environmental Working Group

⁵³ Elli Sparks is a small farm owner in south central Virginia, and leader of the [Citizens' Climate Lobby](#) task force on Agriculture and Farming

⁵⁴ *Cooler, Smarter* pp. 141-145.

⁵⁵ Kari Hamerschlag, EWG Senior Analyst and author, *Meat Eater's Guide* pp.12

Table 3- Plant Rich Diet - Drawdown #4

Shifting to a diet rich in plants is a demand-side solution to global warming that runs counter to the meat-centric Western diet on the rise globally. That diet comes with a steep climate price tag: one-fifth of global emissions. If cattle were their own nation, they would be the world's third-largest emitter of greenhouse gases.

Plant-rich diets reduce emissions and also tend to be healthier, leading to lower rates of chronic disease. According to a 2016 study by the University of Oxford, business-as-usual emissions could be reduced by as much as 70 percent through adopting a vegan diet and 63 percent for a vegetarian diet, which includes cheese, milk, and eggs. \$1 Trillion in annual health-care costs and lost productivity would be saved.

Bringing about dietary change is not simple because eating is profoundly personal and cultural, but promising strategies abound. Plant-based options must be available, visible, and enticing, including high-quality meat substitutes. Also critical: ending price-distorting government subsidies, such as those benefiting the U.S. livestock industry, so that the prices of animal protein more accurately reflect their true cost. As Zen master Thich Nhat Hanh has said, making the transition to a plant-based diet may be the most effective way an individual can stop climate change.⁵⁶

We have focused on the climate benefits of shifting to a plant-based diet. **What about the health benefits?** Dr. Joel Furman summarizes contemporary research by saying that high consumption of animal foods such as dairy, meat, chicken and fish leads to premature death in America. He points out that what is also critical, is what is missing in our diet by not eating enough produce.⁵⁷ Dr. Caldwell Esselstyn, author of *Prevent and Reverse Heart Disease*, explains that eating meat, dairy, and oils injures the lining of our blood vessels, causing heart disease, heart attack or stroke. Dr. Colin Campbell, in his book *The China Study*, revealed how cancer and other diseases skyrocketed when eating meat and dairy is the norm - and plummeted when a traditional plant-based diet persists.⁵⁸

Going meatless more often, including fish, can reduce the risk of breast cancer. As explained by Dr. Kristi Funk, red meat increased risk by 41% in one study, while even poultry increased risk by 22%. Yes, she says, fish contains omega 3 that generally are beneficial, but fish-like meat and poultry-causes the body to produce insulin-like growth factor- I (IGF-1), which has the primary job of promoting cell growth. That's great when you are a child. Once you are an adult, you need some IGF-1 to repair cells after exercise, for example, but an excess is going to send cell production into overdrive, including production of cancer cells.⁵⁹

⁵⁶ Hawken, Paul (editor), 2017. *Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming*. Penguin Books, p. 38-40. References and Technical assessment:

<http://www.drawdown.org/solutions/food/plant-rich-diet>

⁵⁷ Fuhrman, Joel 2003, 2011. *Eat to Live*. Little, Brown and Company.

⁵⁸ Campbell, T. Colin and Caldwell B. Esselstyn. 2011 *Forks over Knives*. The Experimental. LLC.

⁵⁹ Funk, Kristi 2019. "What Matters Most When It Comes to Breast Cancer Risk (Hint: it's not your genes)." *Bottom Line Personal*. April 1.

Reducing one's consumption of meat and adapting a plant-based diet is good for the climate and good for your health.

Support Local Community Sponsored Agriculture (CSA). Buying and eating crops from a local CSA is a good step toward not only a healthy diet, but a sustainable food system. A typical CSA implements many of the strategies that result in fewer carbon emissions and more storage of carbon in the soil. This includes cover cropping, farm partitioning (allowing for areas of forest, wetlands, etc.) between the fields, on-farm composting, drip irrigation, as well as investing in solar panels to generate electricity and upgrading the farm fleet to run more efficiently. If the CSA is organic, which means they also do not use chemicals, they are not supporting the chemical manufacturing processes with all their GHG emissions.

Avoid Palm Oil. Palm oil is a highly saturated fat found in thousands of products. According to the UCS, palm oil is found in everything from shampoo to donuts. Palm oil is now the most common vegetable oil in the world—and also one of the world's leading drivers of tropical deforestation. Tropical forests in Indonesia and Malaysia are being cleared at a rapid pace to make room for new palm oil plantations. The trees and soils in these forests contain enormous amounts of carbon which is released to the atmosphere when the trees are cut and burned- at the rate of hundreds of tons of CO₂ for every acre that is cleared. The fact that tropical deforestation accounts for some 15% of global warming pollution should be reason alone to avoid palm oil products.⁶⁰

Food waste. As described earlier in the "causes" of the problem section, the food system, including wasted food, accounts for somewhere between 20-30% of US emissions. The National Resources Defense Council reports that American shoppers are collectively responsible for more wasted food than farmers, grocery stores, or any other part of the food-supply chain. The "average" family spends about \$2,225 every year on food they don't eat. This problem is so massive that if food waste were a country, it would have the third-largest environmental footprint after the United States and China.⁶¹ About one in four bags of groceries that comes home winds up in the trash. Food waste is the largest component of municipal solid waste, where it contributes to methane emissions. Reduced food waste ranks #3 out of the 100 solutions to Drawdown, with 70.53 Gigatons reduced CO₂ through 2050.

Table 4 - Reduced Food Waste - Drawdown #3

A third of the food raised or prepared does not make it from farm or factory to fork. Producing uneaten food squanders a whole host of resources—seeds, water, energy, land, fertilizer, hours of labor, financial capital—and generates greenhouse gases at every stage—including methane when organic matter lands in the global rubbish bin. The food we waste is responsible for roughly 8 percent of global emissions.

Losing food to one waste heap or another is an issue in both high- and low-income countries. In places where income is low, wastage is generally unintentional and occurs earlier in the supply chain—food rots on farms or spoils during storage or distribution. In regions of higher income, willful food waste dominates farther along the supply chain. Retailers and consumers reject food based on bumps, bruises, and coloring, or simply order, buy, and serve too much.

⁶⁰ Cooler, Smarter p143.

⁶¹ NRDC food waste handbook. <http://www.nrdc.org/food/wastefreekitchen/>

There are numerous and varied ways to address key waste points. In lower-income countries, improving infrastructure for storage, processing, and transportation is essential. In higher-income regions, major interventions are needed at the retail and consumer levels. National food-waste targets and policies can encourage widespread change. Beyond addressing emissions, these efforts can also help to meet future food demand.⁶²

There are four effective strategies to reduce the negative impact of food waste. (1) **Buy less.** (2) **Compost** what you don't eat. For every ton composted, one ton of CO₂ equivalent does not go to the atmosphere. Kitchen scraps can be an important part of our efforts to sustain our soils. And if we manage it right, *the soil will save us* by storing carbon taken from the air, thwarting climate change – and, yes, at the same time feeding us.⁶³ (3) **Participate in food recovery programs.** This involves recovering perishable food that would otherwise go to waste and donating it to people in need. (4) **Measure what goes to the trash** to assure you are reducing your waste.

Purchases - This category includes tangible items like clothes and furniture and services like haircuts and healthcare. About half these emissions associated with these goods and services are out of our immediate control. Good strategies are to simply buy less stuff and/or purchase recycled or reclaimed (used) items. Pay particular attention to how goods are manufactured. For example, things made of concrete or steel will involve greater emissions than sustainably grown wood.⁶⁴

Plastic bags and single use water bottles. Consider that 3/4 of the bottles wind up in landfills. Production (not counting transportation) of the bottles puts the equivalent of 2.5 million tons of CO₂ into the atmosphere annually. Bottled water offers no clear benefit to your health. If you are concerned about the quality of your tap water, add a filter to your faucet or convenience pitcher - a far better choice for your carbon "footprint" than drinking bottled water. If you find you must use plastic bags, then recycle them.

Native Plants and elimination of pesticides. Native trees, shrubs and grasses are able to tolerate natural soils and local rainfall patterns, salt air, etc. Through photosynthesis, they sequester carbon. Replacing lawns that use fertilizers can reduce harmful GHG emissions. Nitrous oxide emissions (including those from fertilizer) are 300 times more potent than carbon dioxide!

Jacques Leslie (2017) reminds us that until the advent of synthetics in the late 1800s, fertilizer consisted chiefly of carbon-rich manure or compost. But synthetic fertilizers contain no carbon, and as their use spread along with tillage practices to incorporate them, soil carbon content declined. The process accelerated after World War II, when America's nitrogen-based munition plants were converted into nitrogen-based fertilizer factories. Most agricultural colleges still teach soil fertility

⁶² Hawken, Paul (editor), 2017. *Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming*. Penguin Books, p. 42, 43. References and Technical assessment:

<http://www.drawdown.org/solutions/food/reduced-food-waste>

⁶³ To learn how to compost, even if you don't have a garden see the *Climate Friendly Gardener: a guide to combating global warming from the ground up* at www.uscusa.org. Cooler, Smarter pp. 149-140.

⁶⁴ Wood is a low-energy and low-emission material (compared with steel, concrete, plastic and brick) for packaging and building - but only when it is not the cause of deforestation. Buy wood products certified as sustainably grown (FSC -Forest Stewardship Council). Certified wood helps fight illegal deforestation by rewarding landowners who are managing their forests sustainably. *Cooler, Smarter* p. 165

chiefly as an exercise in applying inorganic chemical fertilizer, while overlooking soil's biological role (and its carbon content).

Figure 9 - Native Friendly Landscape



Pesticides and herbicides also damage our eco-systems. Native landscaping practices can extend beyond what you plant and how you feed them.

The disappearance of creepy, crawly, buzzing insects doesn't elicit the kind of emotional response that, say, global warming's threat to polar bears does. Many may be quick to say, "Good riddance!" But we cannot survive in a world without insects, as they are critical for pollinating our food and are themselves a food source for many fish, birds and reptiles. Insects are also nature's scavengers and soil aerators.⁶⁵

Reducing or eliminating the use of pesticides and herbicides limits the GHGs created in their production. It is also a step towards reversing the rapid decline in insect populations, which threatens our own human well-being. (Schwägerl 2016)

Recycling reduces global warming in two ways. First recycling reduces the need for virgin material and thereby reduces emissions that result from their manufacture. This is especially true with recycled paper which reduces the need to cut down more trees, which leads to more carbon sequestration.⁶⁶

Second, recycling reduces emissions from waste disposal, particularly methane from landfills. According to the UCS and the EPA, Americans throw away an enormous amount of stuff- the average American creates about 4 or 5 pounds of trash each day. Waste is packed so densely in landfills that no air circulates except at the surface. Landfill waste decomposes without oxygen, giving rise to methane gas.⁶⁷

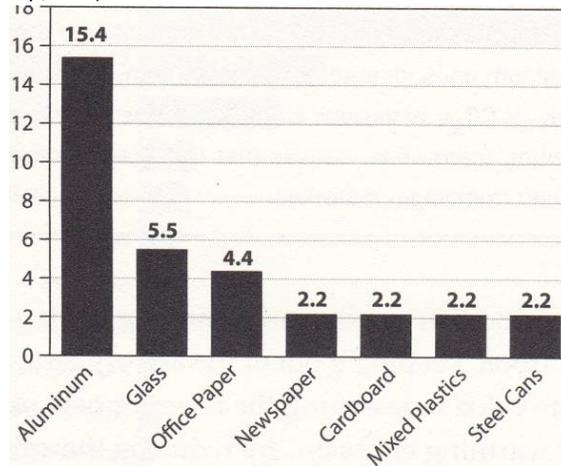
⁶⁵ Editorial Board. 2017. "Insect Armageddon" *NY Times* Oct 30.

⁶⁶ Cooler, Smarter p. 168

⁶⁷ EPA findings published in the journal *Nature Climate Change*. September 21, 2015. See *Cooler, Smarter* pp. 167-168.

Figure 10 - Pounds of CO₂ Equivalent Emissions Saved per Pound of Recycling

(Illustration is from *Cooler, Smarter* p, 167)



Each pound of waste you recycle keeps more than twice its weight in CO₂e emissions out of the atmosphere. This graph shows the emissions saved by recycling one pound of material, as considered from a life cycle perspective, including reductions in the need for virgin materials and avoidance of potential methane emissions from disposal in a landfill.

The UCS estimates that each pound of waste you recycle keeps more than twice its weight in CO₂ equivalent emissions out of the atmosphere. Another benefit of recycling is that it can save money, especially in places with high trash disposal costs.⁶⁸

Food System

As discussed earlier in the report, the Food System accounts for 20-30% of the total GHG emissions in the US. This section is devoted to tackling emissions generated by our food system, and equally important - the opportunities to remove heat trapping gases from the atmosphere and storing them in the soil.

We can all chip in by reducing **food waste** (discussed in detail earlier) and cutting emissions generated by cooking and refrigeration. If you own or operate a restaurant, or just prepare food at home, the two pronged strategy discussed earlier for buildings can work in these areas - conserving with behavior modifications and using more efficient equipment. Powering your appliances with non-combustion sources of power is the best plan (from a climate point of view). ***A stove or fridge plugged into a building with solar power generates zero emissions.***

Businesses, including farmers, can, and must, make changes.

Carbon Farming is an emerging concept that views agriculture as part of a global solution to avert climate disaster and provide real food security. Carbon Farming includes a set of agricultural practices and crops that sequester carbon in the soil and in aboveground biomass (trees, shrubs, forests).

⁶⁸ *Cooler Smarter*, P. 166, 167

Carbon Farming includes modifications to current cropping systems, the use of perennial crops, new approaches to animal grazing and agroforestry. Agroforestry (also called farm partitioning) is the intentional integration of trees and shrubs into crop and animal farming systems to create environmental, economic, and social benefits. (Toensmeier).

Organic and **Biodynamic farming** are closely related concepts that focus on feeding and caring for the soil by natural -organic/carbon based means, instead of feeding the crops with synthetic chemicals. This kind of farming does not contribute to pollution in the manufacture, transportation or application of these harmful products so heavily relied upon by “conventional” chemical farming.⁶⁹

Reducing or eliminating the use of pesticides and herbicides limits the GHGs created in their production. It is also a step towards reversing the rapid decline in insect populations, which threatens our own human well-being. (Schwägerl 2016; NY Times Editorial Board 2017). Organic/biodynamic farming makes sense for so many reasons.

An ancient method of integrating livestock and forest is being revived. It's called Silvopasture and it ranks #9 of 100 Drawdown practices. Silvopasture can reduce 31.19 Gigatons of carbon with \$699 Billion in net savings.

Table 5 - Silvopasture- Drawdown #9

Silvopasture is an ancient practice that integrates trees and pasture into a single system for raising livestock. Research suggests silvopasture far outpaces any grassland technique for counteracting the methane emissions of livestock and sequestering carbon under-hoof. Pastures strewn or crisscrossed with trees sequester five to ten times as much carbon as those of the same size that are treeless, storing it in both biomass and soil.

Carbon aside, the advantages of silvopasture are considerable, with financial benefits for farmers and ranchers. Livestock, trees, and any additional forestry products, such as nuts, fruit, and mushrooms, generate income on different time horizons. The health and productivity of both animals and the land improve. Because silvopasture systems are diversely productive and more resilient, farmers are better insulated from risk.

⁶⁹ As explained by farmer Ira Haspel (of [KK's The Farm](#) in Southold, NY), organic and biodynamic farming is a way of fertilizing the earth without the use of any harmful or toxic chemicals. A biodynamic calendar indicates which times are good for working with each part of the plant (root, flower, leaf, fruit) and which times one should not harvest or plant. These times are scientifically based on the energy coming to our planet from the sun and the other billions of suns in the universe. The leaf is a solar panel, and the type and quantity of energy it receives is affected by many factors - our sun having the greatest influence, moonlight which is reflected sunlight, reflected light off the planets and more subtly the light or energy (in many forms) coming from the cosmos. As this energy comes to earth it is modified by the planets, moon and our sun depending on their position relative to the background constellations (cosmos). Biodynamics is about attracting and working with positive cosmic forces. Another major component in biodynamic farming is the homeopathic use of natural materials as amendments and catalysts to the soil (i.e., dandelion, valerian, stinging nettle, oak bark, silica, horned cow manure, horsetail). These preparations are intended to create the right environment for the creation of healthy soil by the microbes, earthworms and other live creatures which transform organic matter into a form that the plants can take up organic nutrients and trace minerals. Thru organic and biodynamic methods, farming can take place for centuries on the same soil as compost is put out on the land and the amount of humus and organic matter is increased with every crop.

Silvopasture often runs counter to farming norms and can be costly and slow to implement. Peer-to-peer education has proven effective for spreading it. As the impacts of global warming progress, appeal will likely grow, because silvopasture can help farmers and their livestock adapt to erratic weather and increased drought. That is the climatic win-win of this solution: Silvopasture averts and sequesters emissions, while protecting against changes that are now inevitable.

We estimate that silvopasture is currently practiced on 351 million acres of land globally. If adoption expands to 554 million acres by 2050—out of the 2.7 billion acres theoretically suitable for silvopasture—carbon dioxide emissions can be reduced by 31.2 gigatons. This reduction is a result of the high annual carbon sequestration rate of 1.95 tons of carbon per acre per year in soil and biomass. Farmers could realize financial gains from revenue diversification of \$699 billion, on investment of \$42 billion to implement.⁷⁰

While CO₂ emissions are the smallest portion of GHGs from the Food System, they need to be curtailed. Peter Lehner of Earthjustice offers these strategies for reducing CO₂ emissions in the Food System:

- **Land use change:** Preventing the conversion of forests and other important carbon sinks into cropland.
- **Increase carbon sequestration** in existing cropland by enhancing agricultural biomass. Using compost, manure and biochar (charcoal used as a soil amendment) can help store carbon and increase soil health.
- **No-till agriculture.** Reduction of tillage avoids the release of previously sequestered carbon in soil organic matter.
- Improving **energy efficiency** and the use of **non-emitting energy sources** in all food system processes.

Nitrous oxide (N₂O) and Methane (CH₄) are more potent as heat trapping gasses than CO₂ and they are the biggest culprits associated with the Food System. We must work to reduce their emission.

Peter Lehner tell us that **reducing N₂O** requires that we **avoid adding excess nitrogen (N) to the soil**. Of course, if we are farming by organic or biodynamic methods, we are totally avoiding the use of chemical fertilizers. There is a good case to be made for the soil health created without chemicals. Here are Lehner's prescriptions for reducing N₂O:

- **Agro-ecology** refers to using ecologic principles to manage agricultural systems. This often involves substituting natural ecological processes (organic, biodynamic) for synthetic inputs.
- **Cover crop rotation.** Planting legumes or other cover crops that 'fix' atmospheric nitrogen and make it available to crops can be done in place of using nitrogen-based synthetic fertilizers.
- **Precision agriculture** refers to applying inputs when and where they're needed and avoiding them when and where they're not. For example, over a large field, the amount of nitrogen available in the soil at the start of the season can vary widely. Where adequate nitrogen is already available, applying fertilizer increases N₂O emissions without benefiting the farmer. By understanding this variability, farmers can apply nitrogen more efficiently.

⁷⁰ Hawken, Paul (editor), 2017. *Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming*. Penguin Books, p. 50, 51. <http://www.drawdown.org/solutions/food/silvopasture>

- **Multi-band fertilizer** application ensures that fertilizer is more evenly distributed within a field and therefore more evenly available for plant assimilation.
- **Slow-release fertilizers** are designed so that nitrogen becomes available to crops as they need it rather than all at once.
- **Surface drip irrigation** means running long tubes that deliver both irrigation water and fertilizer directly to crop roots when needed. This saves water and reduces nitrogen-based synthetic fertilizer use.

Earthjustice also prescribes specific strategies for **reducing methane (CH₄) emissions**. Lehner tells us that 2 key steps to reducing methane emissions are changing the amount of beef we consume and how we produce what we do consume. **Reducing feedlot beef production** is a clearly effective (if not popular) strategy. Most folks understand, that from a general health point of view, Americans and much of the rest of the world consume too much beef. To meet this demand, a massive number of beef cattle are now produced in feedlots. These cattle emit CH₄ as they exhale and burp. Less beef consumption and fewer beef cattle would help reduce these emissions. With animals roaming pastures, orchards and vineyards, instead of living in feedlots, the animals water the plants as they urinate. Animals incorporated into the land, while they still burp methane, add to soil fertility (with their manure), promoting re-forestation and soil health.

Altering rice paddy irrigation can help too. Much rice is grown in flooded fields, and the flooding results in anaerobic conditions that result in CH₄ generation. With correct timing of flooding and drainage over the growing season, CH₄ emissions can be reduced.^{71 72}

The Soil Will Save us

Imagine for a moment that we (climate activists) have been overlooking a solution to climate change that is not only viable, but so close to us it is literally right below our feet. [Biodiversity for a Livable Climate](#) was founded in 2013 by Jim Laurie, Karl Thidemann, Helen D. Silver, Jane Hammer and Adam Sacks. They saw an urgent need to expand the climate conversation to include the seriously underestimated positive impacts of the biosphere on the climate and physical world. They worked to remedy what they see as an information gap in mainstream climate advocacy which tells us that virtually the only practical effective action we can take is to reduce fossil fuel emissions. They are

⁷¹ The jury is out on several other possible strategies for methane emissions reduction. According to Lehner, all of these strategies need more study:

- **Pasture-based beef production.** An important caveat is that there is some evidence that, because pasture can serve as a carbon sink, net emissions from pasture-raised beef production may be lower. This requires further investigation.
- **Reduce antibiotic use:** A recent study also suggested that feeding antibiotics to cattle, which is a common practice, increases CH₄ emissions by altering cattle's gut microbiomes. This also requires further investigation.
- **Feed additives:** Some believe that certain feed additives may reduce CH₄ emissions from beef cattle. We not only need to investigate whether this is true, but also carefully consider the human health impacts of anything added to animal feed.
- **Biodigesters.** It may be possible to capture CH₄ emissions for reuse as fuel.

⁷² Peter Lehner presented this analysis to the Citizens' Climate Lobby annual conference in Washington DC June 20, 2016.

telling us there is another way. They say that climate scientists, whose work is based mostly in the physical sciences, "generally do not yet recognize what life scientists and ecologists have long known: the power of life has molded almost every aspect of the physical earth, including the climate. Wise human management of the biosphere can undo the eco-mess we have created, and regenerate a planet that we can live on."

While reducing emissions is of critical importance, there is far more that we can and must do, especially considering that emissions reductions efforts have to date been insufficient – and even if emissions were to go to zero today, we would still be faced with catastrophic effects of climate change.

We know now that the safest and most effective approach to reducing atmospheric carbon is to capture it with millions of species of green plants, animals, insects, fungi and micro-organisms, which bury it deep in soils in carbon-rich molecules that are stable for centuries or longer. In the process, because complex organic carbon molecules retain many times their weight in water, we restore vibrant life to billions of acres of parched, desertified areas that were once healthy forests or grasslands. (<http://bio4climate.org/>)

Tools for "eco-restoration" include many concepts being applied in carbon, organic and biodynamic farming, along with others we must pursue: permaculture (using features of natural ecosystems), holistic planned grazing, wetland restoration, reintroduction of native keystone species (e.g., otters, kelp, prairie dogs, mangrove forests, beaver), innovative water cycle management, reforestation, biochar, rock powders, coastline and fisheries restoration, and regenerative agriculture.

Figure 11- The Soil Will Save Us

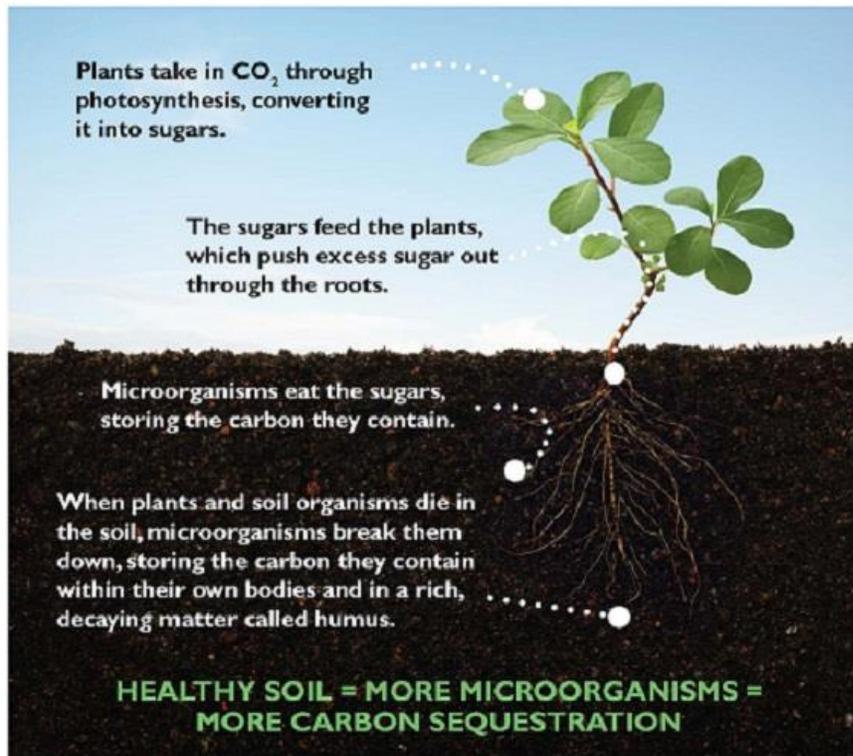


Photo Credit- This Spaceship Earth [Crew Commentary](#)

Journalist and bestselling author Kristin Ohlson sums up her research and says thousands of years of poor farming and ranching practices—and, especially, modern industrial agriculture—have led to the loss of up to 80 percent of carbon from the world’s soils. That carbon is now floating in the atmosphere, and even if we stopped using fossil fuels today, it would continue warming the planet. In *The Soil Will Save Us* (2014) she makes a case for healing the land by turning atmospheric carbon into beneficial soil carbon- a major gain in our effort to reverse climate change. Ohlson is not inventing new science - much of what she says helps reveal and emphasize the concept of *carbon farming* discussed earlier. It represents a shift in mindset from an artificial solution to a natural one, from feeding the plants to feeding the soil, as organic and biodynamic farmers have been doing for decades.

The earth possesses five major pools of carbon. Of those pools, the atmosphere is already overloaded with the stuff; the oceans are turning acidic as they become saturated with it; the forests are diminishing; and underground fossil fuel reserves are being emptied. That leaves soil as the most likely repository for immense quantities of carbon.

Plant leaves were our first solar panels. We learned in elementary science, "photosynthesis is the process by which the chlorophyll bodies found in the cells of the green leaves take in carbon dioxide and manufacture sugars and starches, in the presence of sunlight and give off oxygen." Without photosynthesis, there would be no life. By upgrading our soil management practices, nature's solar panels can help us capture greenhouse gases and store them in the soil as sugars and starches. We enrich the soil (more food, water retention, less erosion, etc.) and at the same time remove life threatening CO₂ from the atmosphere. Combined with man-made solar panels to replace GHG emitting energy sources, we count on nature's solar panels to help us achieve a stable climate.

Jacques Leslie writing in the NY Times in 2017 explains that many scientists and farmers believe the emerging understanding of soil’s role in climate stability and agricultural productivity will prompt a paradigm shift in agriculture, triggering the abandonment of conventional practices like tillage, crop residue removal, mono-cropping, excessive grazing and blanket use of chemical fertilizer and pesticide. Even cattle, usually considered climate change culprits because they belch at least 25 gallons of methane a day, are being studied as a potential part of the climate change solution because of their role in naturally fertilizing soil and cycling nutrients.⁷³

Effective soil management practices aim to return carbon to the soil and keep the excess carbon out of the air. This concept is nicely explained in a 4-minute video, [Soil Solutions to Climate Problems](#), Narrated by Michael Pollan. (<https://youtu.be/NxqBzrx9yIE>). Strategies such as keeping soil covered by plants, increasing the diversity of crops and composting can replenish soil's carbon stocks.

At the Paris climate summit in late 2015, the French government launched an international initiative called [4 Pour 1000](#),⁷⁴ which calls on nations to increase soil carbon by 0.4 percent every year. If the

⁷³ Leslie, Jacques 2017. "Soil Power! The Dirty Way to a Green Planet" *NY Times*. December 3. <https://www.nytimes.com/2017/12/02/opinion/sunday/soil-power-the-dirty-way-to-a-green-planet.html>

⁷⁴ Website for 4 por 100 is at <http://4p1000.org/understand>

entire world got on board, Pollan explains in the video, we could capture and store about three-quarters of our annual GHG emissions (Peoples).⁷⁵

We can work in our own yards, and/or on our farms to put these ideas to work. Increased soil fertility leads to less carbon in the atmosphere and more in the soil.

Composting - discussed earlier as a way to reduce the food waste going to landfills- is an essential element of eco-friendly soil management. Kitchen scraps are only part of what can be used to enrich and sustain our soil. Organic and biodynamic farmers have for ages been composting on a large scale. While the organic content of compost enriches the soil, sometimes it is also used to fight critters. For example, heavily mulching large weedy areas with "lasagna" compost (alternate layers of brown or dry stuff - dead leaves/newspapers- with layer of green stuff like mown grass or plant trimmings) can eliminate the need for chemical herbicides.⁷⁶

Composting is part of a sustainable system. When composting is used together with keeping soil covered by plants and increasing the diversity of crops, it eliminates the use of chemical fertilizers, pesticides, herbicides, hormones, antibiotics and other chemicals. Together these practices help us restore carbon to the soil and reduce it in the air - exactly what the process of photosynthesis was designed by nature to achieve.

Excess carbon in the atmosphere is the problem; carbon in the soil is part of the solution. [This Spaceship Earth](#) sums it up nicely:

Sequestering carbon in soil produces a triple dividend: it reduces climate change by extracting carbon from the atmosphere, it restores the health of degraded soil, and it increases agricultural yields.⁷⁷

Soil is common denominator for Food, Water, Climate Change concerns

Let's think about the interrelationships between and among three of our greatest concerns: food, water, and climate change. One way to do this is to use a Venn diagram showing the overlapping areas of these three subsystems. See the figure on the next page.

- **Food><Water.** Water is needed for plants and animals to live and grow into food. Water is made available to plants and animals via rain and irrigation from aquifers and reservoirs. Our food systems also affect our water, primarily by the use of chemicals. For example, using more nitrogen than the soil and plants can absorb leads to algae blooms in our water. If we are using pesticides, their residue can run off and poison water supplies.

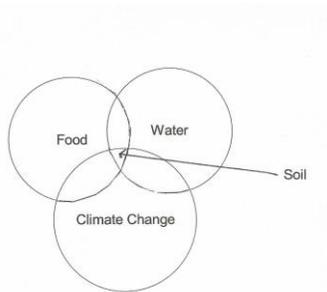
⁷⁵ In a follow on to Michael Pollan Video, a 28 minute production by [Sustainable World Media](#), ***The Soil Solution to Climate Change Film*** goes into more detail how the soil is a living universe beneath our feet. As important to our lives as clean air and water, soil also holds a potential solution to the global warming. <https://www.youtube.com/watch?v=BxiJnZraxk>

⁷⁶ Bob Streitmatter uses lasagna compost in the Luthy Botanical Garden in Peoria (See *The Soil Will Save Us* chapter 8)

⁷⁷ *Is Soil Our Last Great Hope in Avoiding Catastrophic Climate Change?* This Spaceship Earth crew commentary on Jacques Leslie article *Soil Power! The Dirty Way to a Clean Planet*. December 15, 2017. <https://thisspaceshipearth.org/2017/12/soil-last-great-hope-avoiding-catastrophic-climate-change/>

- **Water>>Climate Change.** Most of the heat in global warming is absorbed by water. Superstorm Sandy was able to remain a hurricane because the ocean was 3 degrees warmer than normal.⁷⁸ Water is affected by climate change in more ways than we can imagine including the threat of drinking water by salt water intrusion from rising sea levels. And we have the impact of extreme weather-draughts threatening the re-supply of aquifers and reservoirs

Figure 12 - Soil at heart of climate, food and water issues



- **Climate Change>>Food.** Eating certain foods (red meat and cheese in particular) drives up GHG emissions. Deforestation for animal agriculture is a leading cause of climate change. On the positive side, plants can sequester carbon and take GHGs out of the air. Climate change if not mitigated significantly is going to have dramatic negative impacts on our food supply. Increasingly frequent droughts and floods from extreme weather, sea level rise and rising temperatures will make farming a nightmare.

Healthy soil (with lots of trees, shrub and plants enjoying its bounty) is an essential ingredient that can improve all of these relationships. The greater the organic content and richness (in terms of its micro-organisms) of soil, the greater its capacity to store water, sequester carbon and sustain plants (they thrive in carbon rich soil as opposed to chemically fertilized soils) which not only feed us, but take in CO₂ and keep it out of the air. Healthy soil enables re-forestation. Healthy soil is an essential ingredient for water security, food safety and the mitigation of climate change.

Finance and economics

It makes sense to use time tested economic principles to help us decide among alternatives for our energy systems.

You should be putting your money where you will get the biggest reduction in emissions, and where the financial return is greatest. For example, for many households a great return on investment and large emissions reduction was gained by the investment in a solar domestic hot water heating system. Transportation accounts for much of the emissions for the average American. Choosing a vehicle with the best possible gas mileage (or better yet, a zero-emission electric vehicle) that meets your family's needs offers one of your biggest opportunities to cut emissions.

⁷⁸ James Hansen (Columbia professor, NASA scientist, author of *Storms of our Grandchildren*) speaking to Citizens' Climate Lobby May 14, 2016

The **payback** method, while useful for prioritizing projects, ignores benefits gained after one's investment is recovered and does not take into account the time value of money. We think that making choices on energy investments using the payback method is shortsighted. If you are going to use financial math to help make your decisions, we suggest you use the **return on investment** (ROI) method to aid your decision-making.⁷⁹

Following up to Assure Success

Reducing our emissions is too important a venture (adventure?) to let it fall victim to neglect or ineffective implementation. Follow up is in order to verify that our decisions are solving the problems.

It is perfectly fitting that periodically (annually perhaps) we would assess our energy consumption to assure that our conservation goals are met. One can use the baseline established by estimating one's carbon footprint as a reference point. Have we reduced our energy use as planned? We should also measure our GHG emissions to see if we are indeed achieving the reductions we are striving for - 50% by 2025; zero emissions by mid-century. If we are, we can celebrate our success. If not, it's time to revisit the circumstances and brainstorm our options - re-think or adjust our plan.

Follow up can happen more frequently as well. I was taking a tour to see a home's solar photovoltaic (electric generating) system. When the proud owner took me to the basement to see the control center (switches, inverters and system displays) the warning lights were flashing. Nothing dangerous, but the system was not working correctly and had to be reset. When asked how long it had been since the owner had seen all green lights on the displays, he replied "a few weeks." Imagine investing in a large energy generator and not having it in operation for perhaps several weeks. Instead of free homemade energy, the homeowner was paying the utility for GHG emitting electricity. A daily trip to the control center could have prevented this.

Carbon Offsets

The idea behind offsets is to pay an organization engaged in some carbon reducing activity to compensate (offset) the emissions created in a given activity. For example, if you are flying long distance, you can purchase carbon offsets (to plant trees perhaps) to equal the emissions caused by the flight.

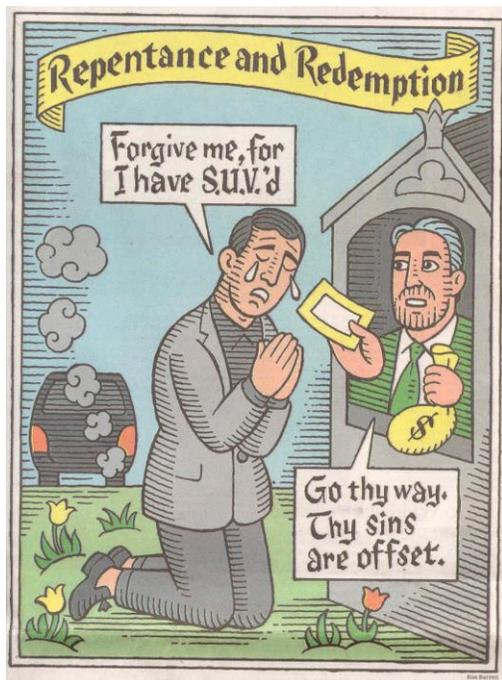
In terms of our up/down model (Figure 3), we sin on the left side of the diagram (our emissions) and then hope for redemption by helping carbon storage on the right side of the picture.

Offset fans argue that carbon offsetting will help us make the transition to a more sustainable future. We think one should keep in mind that that offsets cannot replace the good you do by reducing your own emissions. Offsets don't alter the fact that the gallon of fuel not burned, or the megawatt of energy not used is the surest carbon reduction strategy of all.⁸⁰

⁷⁹ For examples of the ROI calculation for solar hot water, pool heat and PV see "40,000 pound Carbon Diet: How a middle class American family reduced their carbon footprint by 75% (and made money doing it)" *Current Events*, May/June. Available online at <http://faculty.sjcnyc.edu/~keller/ecology/40,000%20carbon%20diet.pdf>

⁸⁰ Illustration in Figure 14 is by Andrew Revkin, *New York Times* Week in Review April 29, 2007, *The Carbon-cutting business*

Figure 13 - Repentance and Redemption by Carbon Offset



Recap - action in our own realm

Leading by example is the way to get others to follow. Meanwhile we can have a marked impact on atmospheric carbon while we are waiting for the government to act. Such actions can be profitable, and finally, it can make us feel good. For these reasons, each of us should take effective action in our own realm.

While everyone has a different situation, we all can achieve our goal of net zero emissions if we calculate what we emit in GHGs and then adapt our lifestyles and behaviors to drastically reduce – and eventually eliminate- those emissions.

Buildings, including our homes, account for about one third of our emissions. There are lots of opportunities and options: Improve insulation and reduce air leaks. Change heating and cooling practices. Upgrade heating and cooling systems and appliances. Join the lighting revolution. Heat your water with the sun. Generate your own power with non-combustible energy sources like solar or wind.

Transportation accounts for 28% of the average American's emissions. Think 20 pounds per gallon of gas or diesel. We can save by thinking before we drive, drive smarter, or better yet - not drive! We can replace inefficient vehicles. Electric autos emit zero emissions. Reducing long distance travel will save lots of emissions.

Indirect emissions can be reduced by carefully choosing what we eat, what we buy and what we don't buy. Because of the inordinate amount of emissions, and loss of forests caused by animal agriculture, we can make great strides towards a stable climate by reducing (or eliminating) red meat and cheese in

our diet. A great strategy is simply buying less stuff and/or purchasing recycled or reclaimed items. We can also pay particular attention to emission intensive activities such as construction, remodeling and yard care. Fertilizer is a prime contributor of N₂O emissions. Most regular lawns cause far more emissions than climate friendly natural alternatives. Don't use plastic bags or single use water bottles.

Reducing emissions is only half the picture. Taking excess carbon out of the air is the other half. We need to promote re-forestation and manage the soil so it can save us. Around our homes or businesses, trees and shrubs can sequester carbon. If one is in the food system business, one can move towards carbon farming as a way to take carbon out of the air and invest (store) it in the soil. As consumers, we enable good soil management (and reduce the emissions and pollution caused by chemical fertilizers) by supporting organic/ biodynamic farms and CSAs.

Think of what goes on your curb (or in the trash collection of your apartment building or business) on garbage day. You are doing well if most of what you put out is for recycling. Pat yourself on the back if most of your kitchen scraps have been composted and are now enriching the soil.

This may sound difficult, but these kinds of actions will be a small amount of inconvenience for the benefit gained. A small price to pay for a stabilized climate. In a financial sense, there is little cost -in fact you can make money -if you choose your investments wisely, and you follow up to assure success.

Action to Influence Others

What we do as individuals is the first step. However, until we have a universal movement with almost **everyone** doing his/her part, we will not be able to achieve a stable climate. As the UCS puts it, "effectively addressing global warming will take concerted action by citizens, corporations and governments over the course of a generation."⁸¹ Many citizens have started and others will begin to work on the problem as soon as they are informed of the urgency and the actions needed. However, others will need more motivation and explanation before they will begin.

In this section, we will present some ideas for how to expand our influence to others- among family and friends, on the job, and in our community. First, we will offer insights on people's motivations and interests because the psychological aspects of our relationships, and the risks can play an important role in the outcomes. Finally we will offer advice on talking about climate change, which may be the most important consideration as we try to influence others.

Motivation and Interests

According to Anthony Leiserowitz of the Yale program on climate communications, only 19% of people are really worried about climate change. This low number is caused in part by the fact that many people are too busy with their lives to learn the situation. Another reason is the limitation of the human mind. We only have so much space in our heads to store and integrate the information on global warming. All together this accounts for many people not having the information that could lead them to a sense of greater urgency. For most (about 80%) folks, climate change is, in a sense, a distant problem.⁸² Many of our friends, neighbors and family think it is something that may happen in the future, and far away from us. Professor Joanne Huxster at Eckerd College explains that many people

⁸¹ Shulman, et al. *Cooler, Smarter*. pp 184

⁸² Tony Leiserowitz from the [Yale Project on Climate Change Communication](#) addressing Citizens' Climate Lobby in June 2017.

don't think of the relationship of climate change with concrete aspects of their lives. Many think that the problem is just too hard to solve, so why get involved? The result for most is that climate change is low on the list of priorities.⁸³

This presents a psychological challenge in that we must motivate more people to learn about climate change and adopt the notion that taking action on global warming is a high priority. Until enough people are moved to take action, as individuals and as a political body in our democracy, all our good thoughts and ideas may go for naught.

In general, what we hope to do is to provide the information people can use to become intrinsically motivated - moved from within, by the value of the work itself- to get onboard. The ideal situation is for people to see it is in their own best interest to adapt drawdown behavior. But by nature, not all humans are motivated intrinsically. Many good and "normal" people need to be motivated extrinsically, nudged into action by external rewards and/ or threat of punishment for not adapting a certain behavior. This is sometimes referred to as the *Carrot and Stick* strategy for behavior modification. Someone who would trade in his/her Hummer for a Prius, after learning of the cost of fuel avoided, would fit into this category. At the extreme, we can have regulations that coerce people with the force of law. For example, there are fines for disabling the emissions controls on a vehicle.

Resistance from Special Interests

Having a relatively small number of people understand the threat of climate change, and that it is human caused, is not an accident. *Merchants of Doubt* was one of the most talked-about climate change books of recent years. It tells the controversial story of how a loose-knit group of high-level scientists and scientific advisers, with deep connections in politics and industry, ran effective campaigns to mislead the public and deny well-established scientific knowledge over four decades. The same individuals who claim the science of global warming is "not settled" have also denied the truth about studies linking smoking to lung cancer, coal smoke to acid rain, and CFCs to the ozone hole. (Oreskes and Conway, 2011)

We cannot underestimate the challenge presented by the resistance from special interest groups who view the shift from the use of combustible sources of energy to non-combustible sources as a threat to their profits or even their existence. Naomi Klein, in *This Changes Everything-Capitalism vs. The Climate*, explains that many people would rather kill off life as we know it, instead of leaving potential profits in the ground. This is the thinking of many oil and gas companies, and utilities who have had their way for decades. Think about nations like Saudi Arabia, whose status has been determined by the oil reserves it sits on. These entities have enormous resources and powerful lobbies in our halls of government. While they cannot vote, they buy influence, and they have little trouble making some people believe that alternative sources of energy are a waste of money. These interests also move climate deniers to try to stifle action on climate change.

Here in the Sunshine State, we face especially formidable obstacles because of the extraordinary influence the special interests hold. As an editorial in the *Tampa Bay Times* explains, in Florida, the utilities call the shots:

Utilities such as Florida Power & Light, Duke Energy and Tampa Electric Co. have long dominated the Public Service Commission, where there is a history of commissioners and top staffers siding with the industry and magically winding up with lucrative utility

⁸³ Dr. Joanne Huxster presenting *Communicating Beyond the Choir: public understanding, denial and climate change communications*. to Florida Veterans for Common Sense. January 18, 2018.

jobs later. One clean-energy group recently counted one utility lobbyist for every two legislators and five former PSC commissioners working for FPL. On the rare occasion when more independent minds were on the PSC and voted against a rate increase, industry lobbyists pressured the Senate not to confirm them and forced them out...This is a state where the electric utilities have done everything they can to thwart the development of solar power..... And this is a state where the PSC is listening only to utility companies and is likely to reduce energy conservation goals. (July 22, 2014)

Skeptics and Deniers are an interesting group. And we should understand their motives to help us deal with them. Some are driven by what they perceive as their financial interests - for example, someone whose pension fund holds large amounts of oil and gas stock. Others have established a worldview created and perpetuated in part by special interests, who want the truth to be obscured by doubt. People who have been "sold" the lies are going to be hard to convert to reality. Thankfully, they are becoming a minority, and the general public has come to see that climate change is really a problem that needs to be dealt with. The Yale project on climate communications estimates that 7 in 10 (71%) Americans think climate change is happening, and 2 in 3 (67%) say the issue of global warming is either extremely (12%), very (19%) or somewhat (37%) important to them.⁸⁴

John Cook is the Climate Communication Fellow for the Global Change Institute at the University of Queensland. He says that climate deniers and conspiracy theorists are immune to scientific evidence, as any evidence conflicting with their beliefs is considered part of a conspiracy. The implication is that the most effective approach is not changing the mind of the unchangeable. Cook thinks a more fruitful approach is communicating the realities of climate change to the large, undecided majority who are open to scientific evidence. A crucial part of the puzzle is explaining the techniques of science denial. This has the powerful effect of [inoculating people](#) against the misinformation of climate science deniers. Cook's prescription includes understanding about the fake experts, logical fallacies, impossible expectations, cherry-picking and conspiracy theories. Excerpts from his work are found in an appendix to this booklet.

How should we deal with the people who continue to deny that climate change exists, or that it is not caused by human activity? One approach is to avoid giving credence to the denier's narrative by not offering them a debate. Another is to explain to people how the denier's narrative can be dismissed by reason as explained here in the section on reasonable uncertainties.

Reasonable uncertainties

For decades, people have been expending incredible amounts of time and energy debating and arguing about the nature of the problem, about who is at fault, and about what the dangers are. Does carbon dioxide have an impact on the environment? Do man-made carbon emissions hasten climate change? The scientific consensus is yes, this is ninety seven percent likely. But let's consider the small chance that carbon emissions can continue without hurting the planet.

Some will cling to the slight possibility that greenhouse gasses are not actually approaching a crisis level or that human activity is not contributing to the pending calamity. They will ask, why go to all this trouble and expense when it may not be needed or it may not do any good?

⁸⁴ Leiserowitz, A, E. Mailbeck, et. al. *Climate Change in the American Mind: October 2017*. Yale University and George Mason University. Yale Program on Climate Communications.

Our choice is to act or to do nothing. Let's put the choices and the uncertainties into a decision matrix (Table 6), so we can examine the consequences of our choices.

Table 6- Our Choices

Decision Matrix		Uncertainties	
		Manmade carbon emissions can hasten climate change	Carbon emissions can continue without hurting the planet
A L T E R N A T I V E S	Status Quo : Do nothing significant to reduce carbon emissions	The worst-case forecasts include severe food shortages as warming makes it harder to grow crops; an accelerating rise of the sea that would inundate coastlines too rapidly for humanity to adjust; extreme heat waves, droughts and floods; and a large-scale extinction of plants and animals (UN/IPPC).	Life should continue as we know it
	Take action to drastically reduce carbon emissions	We will have taken the lead, and set an example for the rest of the world to follow thereby making it possible to save the planet, and life as we know it.	We will have invested lots of money in unnecessary alternative sources of energy and sacrificed many conveniences. However, these investments would make money in the long run, and we would have created lots of jobs and new businesses. The environment would be cleaner. Fossil fuel company profits will suffer.

The right choice is straightforward if we examine the worst things that can happen. If we do nothing, and, as expected, we hasten the disastrous effects of climate change, we are doomed. If it works out that we can get away with carbon emissions, and we have taken serious action, the consequences would be mostly positive anyway.

There is an oft-heard excuse for not taking serious action to reduce carbon emission. Why should we invest and give up convenience when the rest of the world could fail to take similar action to curb emissions?

According to economist and Nobel Laureate Paul Krugman, it is likely that China, for example, will find it in her best interest to reduce emissions.

China is enormously dependent on access to advanced-country markets -- a lot of the coal it burns can be directly/indirectly attributed to its export businesses --and it knows that it would put this access at risk if it refuses to play any role in protecting the planet. If and when wealthy countries take serious action to limit greenhouse emissions, they are very likely to start imposing "carbon tariffs" on goods imported from countries that are not taking similar action. (Krugman, June 2014).

While it is unlikely that China and others will not play fair, we do need to take that possibility into account in our decision making. We are only able to control our own choices, and we should strive to make the best decision we can, given the uncertainties and the consequences.

The decision matrix in Table 7 lays out the choices and the uncertainties.

Table 7 - What If China and Others Don't Play?

Decision Matrix		Uncertainties	
		Other countries take action to reduce emissions	Other countries do not reduce emissions
A L T E R N A T I V E S	Status Quo: We do nothing significant to reduce emissions	We will not have done our part to save the planet	We will have no hope of saving life as we know it
	We take action to drastically reduce carbon emissions	We may be able to save the planet and life as we know it	Alternative energy investments would make money in the long run, and we would have created jobs. The environment would be somewhat cleaner because (according to USIA) the US is responsible for 17% of worldwide emissions. Our actions may incentivize other countries to take action also.

As before, we can see that it makes sense to pursue drastic action, in spite of the possibility that others will not cooperate. Taking action can lead to saving the planet.

In all, there is no reasonable or logical alternative to taking action to reduce carbon emissions, and there is nothing to lose. The challenge is helping others come to this conclusion.

Family and Friends

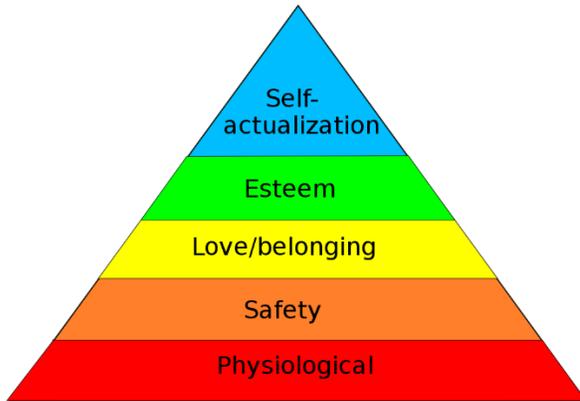
A dilemma we face when trying to motivate other folks is we are dealing with an urgent and important issue, but human nature causes people to shut down their listening when they feel someone is trying to alarm or frighten them.

Primal physiological and safety needs

A basic psychological theory holds that people are moved to act to a set of priorities with the most basic needs as the foundation. Food, water (physiological needs) are most important, followed by

safety. It is only after we have these satisfied that we begin to worry about higher level needs such as belonging, esteem and finally self-actualization.⁸⁵

Figure 14- Maslow's Hierarchy of Needs



If people could experience, first hand, sea level rising, and crops being devastated by drought, there is little doubt they would be moved to act. But for most of us, the major effects of global warming lie in the future, so we don't easily associate it with primal physiological and safety needs. But, is it reasonable to try to get people's attention by comparing refugees from world conflicts today with what climate change might bring?

The dream shakes me to the bone. It is 2025 and my grandchildren (they will range in age from 16 to 28) know they are facing a life not unlike what we are seeing among the child refugees in Europe, the middle east and Africa in 2015 and 2016. In my nightmare, the images we see now in the media - the hungry, displaced and frightened children are replaced with a vision of my grandchildren.

"Papa, " they are saying. "You knew! The United Nations scientists told everyone in 2014 that if you did not act, we would be facing severe food shortages as warming made it harder to grow crops; an accelerated rise of the sea that is inundating coastlines too rapidly for humanity to adjust; extreme heat waves, droughts and floods; and a large-scale extinction of plants and animals. The pope and other religious leaders raised the alarm too. Military leaders also told you that climate change was a threat to our security. Why didn't you listen?

"Instead of acting you pursued the alleged 'great American Dream,' and in your zest to achieve prosperity you overlooked what we want for now- basic physiological needs and security. You did not act, and we are going to be hungry, displaced and frightened. We can die because you did not act on climate change," (Personal notes of one of the authors)

Current events support this theory. People in Miami Beach, Florida can feel the heat, so to speak, in the form of rising sea level. What used to be normal high tides are now bringing water (and fish) into

⁸⁵ Abraham Maslow, a mid 20th century psychologist, introduced this idea which remains very popular in sociology, management, and psychology.

the downtown streets. Many there fear for their livelihood from firsthand experiences, and are becoming activists in the fight against climate change.

On the other hand, to the vast numbers of Americans who have not personally felt the impacts, global warming is at best an abstract concept. Even if they believe what they see and hear about the impending threat, they don't yet feel a clear and present danger to their basic security or physiological needs. For these folks, some other form of motivation is called for.

Inspiring instead of frightening

The UCS suggests that we try to motivate people by inspiring instead of frightening. Researchers found that people feel most inclined to work to address climate change when they understand 3 things:

1. *The basics behind global warming:* we are overloading the atmosphere with GHG when we burn fuels and cut down forests and that this gas is blanketing the Earth and trapping more and more heat.
2. *The prospects for achieving practical solutions:* that we have plenty of technology and know-how today to meet the challenge.
3. *The economic benefits of energy efficiency and non-emitting energy:* making the transition to low-carbon sources of energy will help ensure that our future is prosperous and healthy.⁸⁶

When you will have lowered your own carbon emission, you can speak with authority when you approach your family and friends. The UCS suggest that you not approach your conversations as a know-it-all. Instead try to put yourself in their shoes - approach them the way it will be most effective for them. Keep in mind that deluging people with facts and figures rarely changes opinions or motivates - it often has an opposite effect. For those less concerned about emissions, explain the thousands of dollars saved. Figure out what motivates the audience, and they will be more willing to have the conversation and engage the issue. Try to meet them where they are, tapping into their present concerns and values.

Or you could talk about the changes you made and how they:

- Saved you thousands of dollars at the pump or on your heating/cooling bills
- Were surprisingly easy (and/or fun) to accomplish
- Will help the country be less dependent on foreign oil
- Make you feel better about the world you are passing on to future generations
- Are helping to reduce health problems related to air pollution, such as asthma
- Are part of your faith's teaching to care for God's creation and help those who are most vulnerable
- Are good examples to teach your children about the value of efficiency and chipping in
- Are interesting because they showcase some fascinating new (and cleaner) technologies⁸⁷

Once people are interested in what you have done, you can offer to help them get started. For example, you can introduce them to the plumber who installed your solar hot water system. You might offer to help design their native landscape, which may seem a daunting task. The idea is to not only plant the ideas, but to help them get started.

⁸⁶ *Cooler, Smarter* p. 183

⁸⁷ This list is verbatim from Ask the Experts on page 182, *Cooler, Smarter*.

On the Job

Opportunities of scale

Think about what you can achieve at the family level and multiply it ten, a hundred, a thousand or a million times. This gives you an idea of the opportunities presented in the workplace. Companywide changes at organizations large and small can make a huge difference in GHG emissions, and if done right, shareholder profits too. DuPont invested in more energy efficient processes and equipment and non-emitting energy sources. They were able to cut GHG emissions 72% and reduce energy use 7% while production expanded 30%. DuPont saved about \$2 billion in energy costs over a 16 year period. A worker at Google got co-workers to sign a petition, and now the company has eliminated the use of 13,000 single use water bottles every day.

Opportunities abound in the healthcare industry. Our nation's 6,000 hospitals use nearly twice as much energy per square foot as most commercial buildings, and they generate 7,000 tons of waste per day. Many healthcare organizations have interdisciplinary green teams for you to join. ⁸⁸

Where to start?

The UCS provides us with ideas on how to take the initiative and follow through to ensure good ideas get implemented and rewarded. Here is some of their wisdom:

First you can make a psychological adjustment. A frequent mistake is to think that organizations have to choose between economic and environmental considerations. Think about making changes that help the bottom line while at the same time reducing emissions.

Ask your boss or the HR if there is an energy or sustainability task force.

Next, try thinking about the tasks you perform each day. Imagine how you might do them with less energy or resources. Then think about processes done by your immediate work group or department. If you can, expand out from there, thinking about other functional areas. For example:

- **Marketing:** can you reduce packaging, or reward bulk purchases?
- **Operations:** can you reduce transportation emissions from product shipping and staff travel? How about reducing packaging, storage or waste? Can you reuse, recycle and/or compost waste? Can you purchase recycled paper and/or promote measures to reduce paper use like 2 sided printing?
- **Real Estate/Facilities:** Can you improve energy efficiency in lighting, heating and cooling? Can you invest in green building improvements?
- **Human Resource:** Can you improve employee incentives for behavior changes such as telecommuting, ridesharing, mass transit use?
- **IT:** Can you adopt Energy Star requirements for purchasing computers and electronic equipment? Can you improve practices for disposal/recycling of outdated computers and electronic equipment? ⁸⁹

Assess energy usage. Once you and your co-workers identify areas or processes ripe for improvements in efficiency, it will help to get information on how much the organization currently spends for energy in those areas. This information will help you build a case for reducing energy use and will become a

⁸⁸ Examples of emission savings and efficiencies, profit gains are from "Stepping Up at Work," *Cooler/Smarter* chapter 10. Also see *Green Guide for Health Care* (www.gghc.org)

⁸⁹ Thinking Thru Your Organization's Environmental Practices, *Cooler/Smarter* p. 201

baseline upon which to gauge your success. Keep in mind, our target is to reduce your emissions by 40% by 2025 and 80% by mid century.

Energy audits, done by utilities and private contractors, are a good way to gather data on energy usage and put it to use. Bacon's Furniture in Port Charlotte, Florida used an energy audit to make decisions that saved the company \$40,000 annually.⁹⁰

Think buildings. The UCS say that forty percent of our nation's GHG emissions are from buildings. It costs little or no more to build them so they are efficient. Meanwhile building it green will pay dividends over its life and enhance its value. Leadership in Energy and Environmental Design (LEED) is a certification program that encourages builders, architects and home buyers to adopt environmentally sustainable building practices.⁹¹ Creating green buildings has 3 benefits. It saves money, reduces emissions and makes a public statement about the company's commitment to sustainability.

Facilitating change.

People at work are already busy, with demands on their time and energy. The last thing you want to do is make it seem like they are working extra (without compensation) to save the planet. So, you want to try to make life easier for those who chip in to reduce emissions.

Educate instead of torture. Let people know you recognize that their time is valuable, and you understand some folks don't have the luxury of extra time to learn about climate change. Make it easy for them by having lunchtime speakers and other (no cost) learning opportunities.

Reward results. You can urge your employer to recognize employees who develop ideas or otherwise contribute to sustainable practices. Xerox, for example, offers highly prized Earth Awards. And it pays off - in 2010 alone Xerox implemented employee suggestions that reduced carbon emissions and eliminated some 2.6 million pounds of waste, saving the company about \$10 million.⁹²

Other incentives can be put in place to reinforce green behavior. For example, give the best parking spots to the most efficient cars. Better yet, free charging for electric vehicles. Offer gift cards or small cash awards to employees who take public transit to work.

Think how cool it can be, how satisfied you can feel, and what an impact it might have on our climate if you are able to reduce emissions at your job. It can be amazing! Next, let's transition to the community and bring our vision to our local area.

Community

The Union for Concerned Scientists suggest that we share what we have learned at neighborhood and community levels. Veterans groups, hunters and anglers, local business groups, parish or congregation, schools are all opportunities to create climate action teams.⁹³

Faith based groups may have extra motivation from the belief in stewardship of God's creation and the outsized impact on the poorest people because expected droughts ruin subsistence farming and make drinking water scarce. National and global non-profits such as Interfaith Power and Light, the

⁹⁰ Reilly, Steve. "Energy Audit Pays Dividends" *Charlotte Sun* October 29, 2016

⁹¹ More information on LEED is available from the non-profit US Green Building Council (www.usgbc.org)

⁹² *Cooler/Smarter* p.204

⁹³ *ibid* p. 186-188

National Religious Partnership for the Environment, the Evangelical Environmental Network, and Green Faith can help your religious institution join the fight against global warming.

You can help by working to keep your group focused on the problem and the two-pronged solution.

Table 8- Community Level Problem and Solution Focus

Problem: Climate is Changing because of our GHG Emissions, Deforestation, Poor Soil Management	
Solution: Stop contributing to the problem- by achieving zero emissions thru <ul style="list-style-type: none"> • Conservation- Using less energy and drive down consumption • Shift to Zero Emission energy sources 	Solution: Get excess resident carbon out of the atmosphere <ul style="list-style-type: none"> • Re-Forestation • Soil management

Home owner's and condo associations are groups that can have enormous impact because of the great numbers of household they influence. Imagine having the collective ingenuity and brainpower of a community focused on assessing the carbon footprint of the neighborhood, and then evaluating where resources and innovation could have the greatest impact on emissions and re-forestation/soil management.

You can drive down energy consumption by super-insulating common walls/ceilings/basements and creating alternatives to automobile use. Facilitating the use of charging stations for electric vehicles (powered by the sun, of course) can speed the transition to zero emission energy. Your association can take credit for sucking carbon out of the atmosphere by transforming common areas to all native trees and shrubs, permaculture, and/or an organic urban farm. You can also serve as a delivery point for local community supported agriculture (CSA). These are just a few ideas. On scene insights are needed to come up with other ideas tailored to your individual circumstances.

At the association's annual meeting you can celebrate your achievements with trend diagrams showing the community's reduced energy consumption, graphs and pie charts of the emissions progress, data on your improvements in re-forestation and soil management, and tallies of the dollars saved by the residents through energy efficiencies. The goal is zero net emissions plus pulling excess carbon from the atmosphere for an overall net carbon negative score.

Consider the financial and ecological benefits of making your community net carbon negative. Property values will soar as long-term costs decrease and climate change mitigation reduces the likelihood of catastrophic events.

Assisted living facilities are another example of communities that can benefit by reducing consumption, transitioning to modern forms of energy and greening the environment.

Divesting

Do you own shares or bonds of traditional energy companies or publicly owned utilities? If your mutual funds are indexed or diversified without filters, you are likely to be an owner of major carbon emitters, and you can be viewed as part of the problem. Do you have money in Wells Fargo Bank? If so, you are supporting their underwriting projects like the Dakota Access Pipeline (McKibben 2017). Many Americans are enabling continued operations of GHG emitters by virtue of their investment portfolios.

There are alternatives that can make us money. Many large investment companies have socially responsible fund choices that allow you to divest yourself, or your company, of “dirty” holdings. For religious institutions, [Green Faith](#) has a Divest & Reinvest Campaign that offers education and organizing on fossil fuel divestment and reinvestment in a clean energy future. They offer this program to all faith communities.

If you serve on a board, whether for a business, non-profit, or religious institution, you can appeal to their social responsibility, without sacrificing financial objectives. New York city's comptroller Scott Stringer has said they intend to divest the city's five pension funds of roughly \$5 billion in fossil fuel investments out of its total of \$189 billion. "Safeguarding the retirement of our city's police officers, teachers and firefighters is our top priority, and we believe that their financial future is linked to the sustainability of the planet."

Clara Vondrich of the DivestInvest campaign says the city joins a movement that started about six years ago. She says hundreds of institutional investors managing assets of over \$5.5 trillion have taken their money out of fossil fuel investments. In November 2017, Norway's central bank urged the Norwegian government to consider divesting oil and gas company shares held in the \$1 trillion oil fund. Vondrich said other cities and entities selling off fossil fuel interests have included Berlin and Washington, D.C.; insurance companies Swiss Re, Axa and Allianz; and educational institutions such as the University of Oxford in Great Britain, Stanford University in California and Trinity College in Ireland. Philanthropies have included the Wallace Global Fund and the Rockefeller Brothers Fund, notable because the late John D. Rockefeller grew his wealth as an oil baron.⁹⁴

These nations, cities, businesses, and non-profits are not planning on suffering from the divestments. They plan to make money. The NY City comptroller says fossil fuel companies "are the past; we want to look at renewables...that's the future."⁹⁵

Why not help stabilize the climate and make a return on their investments along the way?

Talking About Climate Change – may be the most important thing we can do

The Yale Program on Climate Communications tells us that most Americans say global warming is personally important to them, but don't talk or hear about it much. About seven in ten Americans report that they “rarely” (36%) or “never” (32%) discuss global warming with family and friends, which has been trending slightly upward over the past eight years.⁹⁶ Part of the reason people don't talk about climate change is because they are afraid of having a fight. We mistakenly overestimate the likelihood of a disagreement. While in fact, research shows that about 80% of people would have a

⁹⁴ Associated Press. 2018. *NYC Sues, Divests From Oil Firms Over Climate Change*. January 10. <https://www.nytimes.com/aponline/2018/01/10/us/ap-us-fossil-fuel-divestment.html>

⁹⁵ NY City comptroller Scott Stringer interviewed by Brian Lehrer WNYC January 10, 2018

⁹⁶ Maibach, Edward, Anthony Leiserowitz, et al. 2016. Is there a Climate “Spiral of Silence” in America? Yale Program on Climate Communications. September 29. <http://climatecommunication.yale.edu/publications/climate-spiral-silence-america/>

conversation with us.⁹⁷ So, it is certainly worth the effort to talk with others about one of the most important issues facing our generation.

Knowing that the door is open to talk about climate change, what should we do to make people care? What should we try to communicate? Dr. Joanne Huxster teaches environmental studies at Eckerd College. She specializes in the public understanding and communication of environmental issues, climate change, and science. Professor Huxster tells us what doesn't work:

- Complicated scientific jargon, statistics and numbers do not make an impact on many people
- Emotional pleas can stress folks. Most of us have a finite "pool of worry," and adding to it can cause overflow - our climate concerns can spill out of the bowl and not be considered
- Talking about things far away (polar bears) and in the distant future (our neighborhood being flooded next century) are not going to gain someone's priority interest (at least at first)
- Yelling, getting angry or fighting will only entrench folks more
- Shaming, blaming or guilt-tripping turns people off. A positive, empowering message works better.

What does work? Pick someone to talk with and try Professor Huxster's advice:

1. **Set a goal**, which will be different depending on the audience. For example, you may want to just start a conversation, or to find the person's view on climate change. The goal does not have to be "to win."
2. Come to **know the person** and their biases. Learn how the person understands what makes climate change happen. How are they confirming previously held beliefs? This will lead to #3.
3. **Find the angle** that gets their attention. For example, some people are concerned about religion, health, outdoor life, or the economy. This leads to #4.
4. Try to **frame the problem** in terms of their interest. For example, try stewardship for God's creation for church goers. Health care benefits coming with lower levels of pollution may work for others. What climate change does to skiing or fishing may turn on some people. The economic benefits of modern energy sources will interest others. Focus on a discussion that resonates with the person's interests. Take care not to zoom in too close to lose the big picture.
5. Finally, work to **empower** the person to act. Psychologically, people are more likely to feel concerned and to act if they feel power or authority. Explain the consequences of personal action - for example, how reducing the use of electricity is tied to the fossil fuel sources. Many people will be amazed on the impact of reducing or eliminating red meat from the diet. Warn of the dangers of "single action bias" (i.e., recycling alone will let them off the hook).⁹⁸

Recap - influencing Family, Friends, Co-workers, Community

Moving others to join us in the effort to mitigate climate change is essential if we are to achieve our goals for reducing emissions, re-forestation and soil management. We can do it if we enlighten those

⁹⁷ *Global Warming's Six Americas*. 2016 Yale Program on Climate Communications.

<http://climatecommunication.yale.edu/about/projects/global-warmings-six-americas/>

⁹⁸ Dr. Joanne Huxster presenting *Communicating Beyond the Choir: public understanding, denial and climate change communications*, to Florida Veterans for Common Sense. January 18, 2018.

who will be intrinsically motivated and apply the carrot and the stick for those who need a nudge from external rewards/punishment.

While we do want to convey the urgency of the situation, we should avoid frightening people so much that they are frozen and incapable of action. The general message should be that, yes, the situation is urgent and timely action is needed, but there is good news:

- we possess the technology and knowledge
- solutions have economic benefits
- we will be better off all around if only we act now

The workplace offers a great opportunity to magnify efficiencies many times over. Green teams may already exist, waiting for you to join. If not, you can start in your own nook, set an example and expand company wide.

Villages, HOAs, condo associations and other community entities can be wonderful platforms from which to stabilize the climate.

We can also vote in the marketplace by divesting ourselves, and our organizations of holdings (stocks/bonds/bank deposits) in companies responsible for carbon emissions.

Action to influence Government

Please consider the thoughts of the UCS for ***making government work for us:***

You have made a number of effective climate choices in your own life. You've spread the word to friends, family members and coworkers. Now it's time to make sure your elected officials hear your voice too. From our cities and towns to states and federal government, officials are making decisions on our behalf and with our tax dollars. Put simply, these funds can be spent to improve our energy future or to impoverish it. Along the way, especially in Washington, DC, lobbyists help protect companies that benefit from continued reliance on coal, oil and gas, regardless of its long term impact on the environment or the US economy, blocking non-emitting energy and delaying energy efficiency measures and other efforts to limit carbon emissions.

Listening to the rhetoric of oil, coal and gas company executives, one might think they were champions of limited government and the free market. But in truth, fossil fuels companies are heavily subsidized...getting twice the direct subsidies and tax breaks that non-emitting energy receives. Their enormous profits would shrink considerably without federal support...If we hope to reduce carbon emissions, we need to reverse these priorities and devote our resources to developing non-emitting energy instead of subsidizing emissions as usual.

With a problem of the magnitude of global warming, it makes sense for government to take a hands-on role in implementing solutions, along with citizens and businesses. Action at the state and national level is a crucial component of any successful effort to drive down

emissions. As engaged citizens, we each have a vital role to play in spurring this government action along.⁹⁹

How/what you can do. Many activist groups, and the UCS suggest that the best option is to have one-on-one contact with elected leaders. Email is easy but calls and letters have more impact. The large number of constituent calls a legislator gets on an issue sometimes persuades him/her to change a vote.

More advice for speaking to the office of an elected official: ask to speak to the aide who handles energy and climate issues. Try to plan the call, know facts, tell the listener about your expertise and be brief. Be timely - call when a vote is imminent. Also let them know what you think after the vote too.

It has never been easier to spread the word - websites, email, blogs, Facebook, Google, Twitter, Texting, YouTube, podcasts and more. Try to engage others and organize events. Don't forget traditional media - Letters to the Editor can reach large numbers of folks.¹⁰⁰

Local Communities and Governments

Local governments are on the front lines of human behavior. Let's consider the impact they can have on drawing down on the amounts of carbon in our atmosphere.

Refrigerant Management

Refrigerants are potent heat trappers. Because 90 percent of refrigerant emissions happen at end of life, effective disposal of those currently in circulation is essential. After being carefully removed and stored, refrigerants can be purified for reuse or transformed into other chemicals that do not cause warming. Since local governments are normally responsible for waste management, officials closest to home should be held accountable for what *Drawdown* reveals is the number one solution (out of 100) to global warming. Refrigeration management can result in 89.74 Gigatons reduced CO₂ through 2050.

Table 9 - Refrigeration Management Drawdown #1

Every refrigerator and air conditioner contains chemical refrigerants that absorb and release heat to enable chilling. Refrigerants, specifically CFCs and HCFCs, were once culprits in depleting the ozone layer. Thanks to the 1987 Montreal Protocol, they have been phased out. HFCs, the primary replacement, spare the ozone layer, but have 1,000 to 9,000 times greater capacity to warm the atmosphere than carbon dioxide.

In October 2016, officials from more than 170 countries met in Kigali, Rwanda, to negotiate a deal to address this problem. Through an amendment to the Montreal Protocol, the world will phase out HFCs—starting with high-income countries in 2019, then some low-income countries in 2024 and others in 2028. Substitutes are already on the market, including natural refrigerants such as propane and ammonium.

Scientists estimate the Kigali accord will reduce global warming by nearly one degree Fahrenheit. Still, the bank of HFCs will grow substantially before all countries halt their use. Because 90 percent of refrigerant emissions happen at end of life, effective disposal of those currently in circulation is essential. After being carefully removed and stored, refrigerants can be purified for reuse or transformed into other chemicals that do not cause warming.¹⁰¹

⁹⁹ Shulman, et al. *Cooler, Smarter*. pp. 215, 216

¹⁰⁰ Shulman, et al. *Cooler, Smarter*. pp. 230-234

¹⁰¹ Hawken, Paul (editor), 2017. *Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming*. Penguin Books, p. 164-5. <http://www.drawdown.org/solutions/materials/refrigerant-management>

About 200 towns, cities and counties around the world have reached out to learn how the villagers of Ashton Hayes, England have achieved carbon neutrality.

This village of 1,000 people cut emissions by things as simple as using clotheslines instead of driers, taking fewer flights, installing solar panels and glazing windows to better insulate their homes. Ashton Hayes did this without leadership from politicians or government. The community cut its carbon footprint most dramatically by installing solar panels on the local school and other buildings.

Similar methods have been adopted by Eden Mills, a small community in Ontario, Canada. They cut emissions about 14% in 8 years, and they are planting trees in the village forest to help absorb the carbon dioxide the town emits. Eden Mills resident Charles Simon traveled to Ashton Hayes in 2007 to learn how to translate their approach to Eden Mills, adopting the apolitical, voluntary, fun method. "Some of the changes are so easy," Mr. Simon said. "Just put on a sweater instead of turning on the heat."¹⁰²

Across the U.S., more than 30 cities have adopted the goal of achieving 100% non-emitting energy with target dates of 2030 for municipal operations and 2045 for the entire community. In Florida, this includes the cities of Saint Petersburg, Orlando and Sarasota. Sun Coast Sierra Club's executive director Michael Brune said this:

The movement for clean energy in cities and towns across the country is now more important than ever.... Whether you're from a red state or blue state, clean energy works for everyone and local leaders will continue to move forward to create more jobs, stronger communities, and cleaner air and water.¹⁰³

Building Codes, Landscape Rules

The UCS tells the "tale of two houses" built in Lakeland, Florida, side by side, by the same contractor, using the same floor plan and basic amenities. One was built with energy efficient materials and design, including more wall insulation, a white roof, high efficiency heating and cooling, and solar systems for water heating and electrical power. The initial investment for the efficient home was substantially higher, but its consumption from the electrical grid was found to be 92% lower than the conventional house next door. The savings on the future electric bills alone pays a healthy return on the extra investment. We need to alter our home building processes so people are able to realize these savings, and we can avoid the extra electricity needed to feed old fashioned, inefficient buildings.

A first step is to **adjust local building codes to require homes to comply with the latest conservation standards**. We want to implement the strictest and most up-to-date codes so that new and remodeled buildings will be as energy efficient as possible. Developers and builders play an important role here. They can help make clear the benefits for prospective buyers by showing how their up-front investment in conservation will pay returns in the long run in terms of monthly energy savings and home value. LEED (Leadership in Energy and Environmental Design) and Energy Star

¹⁰² Tatiana Schlossberg reporting in the *NY Times* ("English Village Leads a Climate Revolution") August 21, 2016. pp 1,7

¹⁰³ Miramar Toledo writing in the *Orlando Weekly* November 23, 2016.

<http://www.orlandoweekly.com/Blogs/archives/2016/11/23/st-pete-will-be-the-first-city-in-florida-to-use-100-percent-renewable-energy>

standards can be put to use in our homes and buildings with dramatic financial pay backs. Meanwhile every KWH of power consumption we avoid is less GHG emitted.

Local **rules for landscaping and development** can have a great impact. Once people realize that what looks like a well-groomed landscape is actually not that great for our climate or clean water, they will support natural ideas. We should be aiming for re-forestation with imaginative landscape codes for homes, condos, businesses and community spaces. Native landscapes avoid fertilizer use, which leads to less emissions in their production and application. Meanwhile, more photosynthesis from healthy native plants and trees removes more carbon from the atmosphere. Native landscapes also require less irrigation, saving precious water supplies.

Divestment - an increasingly important force in local politics

Just as individuals' withdrawal from investment in fossil fuel has had an impact, cities have begun to pull billions from "banks like Wells Fargo that underwrite projects like the Dakota Access Pipeline."¹⁰⁴

We can/should call on our local governments to divest from fossil fuels and stop enabling the profit making from companies whose activities emit GHGs.

State Government

A report from the Center for Biological Diversity (Ryan 2018) makes clear the critical nature of the states' role. Think about this as you ponder how you can take action to influence your state policy makers:

As the Trump administration turns back the dial on climate progress at the federal level, states play an increasingly critical role in creating and stimulating clean-energy progress in the United States. In particular, state-level policies have an enormous influence on distributed solar, such as those on existing rooftops, parking lots and along roadways. ***If fully developed, distributed solar could provide most of the United States' electricity with minimal negative social and environmental impacts***, paving the way for important reductions on fossil fuels that are driving the climate crisis.¹⁰⁵

Unfortunately, the vast majority of states are lacking the fundamental policies that would encourage solar market development; even worse, many are actively preventing it through policy barriers and restrictions. While the ten states graded F in the Center for Biological Diversity report account for more than a third of the total rooftop-solar potential in the contiguous United States, they account for just 7.5 percent of net generation. Texas and Florida stand out as two of the states with the most potential but the worst distributed-solar policies.

Some of the most important state energy policies are ***Electricity Portfolio Standards, Conservation, Community Solar (Virtual Net Metering)*** and ***Third-Party Ownership***.

¹⁰⁴ McKibben, Bill. 2017 Divesting from Fossil Fuels, NY Times Dec 18.

¹⁰⁵ Greer Ryan 2018. *Throwing Shade: 10 Sunny States' Policies Blocking Distributed Solar Development*. Center for Biological Development. Executive Summary https://www.biologicaldiversity.org/programs/population_and_sustainability/energy/pdfs/ThrowingShade2018.pdf

Electricity Portfolio Standards

According to the Union of Concerned Scientists, the most powerful arrow in the state government's quiver is the electricity portfolio standard. The standards require electric utilities to generate a certain percentage of their power from non-emitting sources by specific dates. As pointed out earlier in the solutions section, **Zero Emissions** are what we must achieve. This means transitioning to 100% solar, wind, nuclear, hydro and geothermal energy.

By requiring a clear and firm target date, the laws offer certainty to investors and developers of non-emitting energy while helping utilities get away from carbon-based source of energy.¹⁰⁶ The Center for Biological Diversity report tells us that of the 10 states graded F in energy policy, eight are lacking mandatory portfolio standards, policies that are key to creating a safe market for investing in rooftop solar.

It is important to recognize that the presence of a portfolio standard does not mean that it will drive distributed-solar growth specifically. This is because, unless the standard has a "carveout" for distributed solar, the percentage of zero-emission energy may be met totally by utility-scale solar. A carveout specifies that a certain portion of the portfolio goal be met through specific sources and ideally would include a generous distributed PV carveout.¹⁰⁷

To achieve a stable climate, that is to keep global temperature below 1.5 degrees C, electric portfolio goals should be 50% of our energy from non-emitting sources by 2025 and 100% by 2050.¹⁰⁸ And there should be a specific carveout for rooftop, parking lot, roadway (distributed) solar. Utility-grade solar combined with lots of distributed solar power will enable us to provide solar power with minimal negative social and environmental impacts.

The importance of electricity portfolio standards cannot be over-estimated. According to the Union for Concerned Scientists, if the electricity sector (which accounts for about 1/3 of GHG emissions) is to successfully transition to zero emission energy, **we must have two government policies** installed:

1. Electricity Portfolio Standards at the state level
2. Increasing the price on carbon at the federal level.¹⁰⁹ See the federal government section for an explanation of the why/how of putting a price on carbon.

State Governments should encourage Conservation

We pointed out earlier (Figure 1 Bending the Curves), that reducing energy consumption is essential to success. Conservation is the means to reduce energy consumption, and state governments can take the lead.

¹⁰⁶ Union of Concerned Scientists, Cooler, Smarter pp. 222,223;234-235

¹⁰⁷ Greer Ryan *Throwing Shade* p. 8

¹⁰⁸ Requirements to stay below 1.5 degree C from the United Nations/IPCC, 2018. *Special Report on Global Warming of 1.5°*. Intergovernmental Panel on Climate Change (IPCC). <https://www.ipcc.ch/sr15/> and the Forth National Climate Assessment (outside scientists and officials from 13 federal agencies wrote this 2018 report) <https://nca2018.globalchange.gov/chapter/front-matter-about/>

¹⁰⁹ Clemmer, Steve, Jeremy Richardson, Sandra Sattler & Dave Lochbaum 2018 *The Nuclear power dilemma- Declining Profits, Plant Closures, and the Threat of Rising Carbon Emissions*. Union of Concerned Scientists. <https://www.ucsusa.org/nuclear-power/cost-nuclear-power/retirements>

Electric utilities play a big role in conservation. Helping our citizens reduce their electrical consumption by conservation and efficiency measures leads to a direct reduction in emissions because it avoids the use of electrical power. Programs such as **energy audits** enable us to find out how to use energy more efficiently, how to conserve it, and yes, how to save lots of money. Audits can be provided by utility companies, who also can offer discounts for more **energy-efficient air-conditioning units and other energy-reduction programs**. But not all states regulate utilities to assure such programs. For example, in Florida utilities must submit 10-year energy-efficient goals every five years to the Public Service Commission. Critics say that the commission's methodology in reviewing the goals is out-of-date, resulting in signing off on smaller and smaller conservation goals. According to the Southern Alliance's 2018 Energy Efficiency in the Southeast scorecard, Florida had the second-worst performance in energy efficiency delivered to consumers in the Southeast region, above only Alabama.¹¹⁰

It is essential that utilities **upgrade their business models** so they will be generating less power even with inevitable population growth. This can be achieved, in part, by expanding distributed power (rooftop solar in particular) and helping customers conserve power by making their homes and businesses more efficient. Shifting to zero emission power sources also helps as modern sources of energy are more efficient than old fashioned fossil fuels.

Above all, the key is to **break the link between a utility's profits and the amount of electricity it sells**. This is a turn from the old model of making more money by selling more electricity. As explained by NRDC's Sheryl Carter, "electric utilities should not be viewed or regulated as if it were a commodity business dependent on growth in electricity sales to keep its owners financially whole. This outdated model creates a disincentive for investment in energy efficiency, clean distributed generation, and many other important customer choices that can reduce their consumption and bills. Instead, utilities should be focused on meeting customers' service needs and our energy and greenhouse gas reduction goals."¹¹¹

State **regulators** are the key to success. They hold the power to make utilities conserve power thru audits, other energy efficiency programs and by breaking the link between profits and electricity sales. Let the utilities make money by providing service instead of selling more power.

Community Solar/Virtual Net Metering

Net Metering allows the use of wind or solar generation without having to invest in a storage system. Utility companies agree to take our excess power and use it on the grid. And when we need power (for example, at night when the sun is not shining), they provide us with electricity. Our meter runs forward when we take power from the grid and backwards when we send them power. We agree to compensate each other according to the "net" reading. Net metering serves the interests of the customer and the utility. We don't have to invest in batteries to store our excess power (and carry us

¹¹⁰ Pounds, Marcia Heroux. 2019. "FPL seeks state approval to slash energy-efficiency goals." South Florida Sun Sentinel. August 12. <https://www.sun-sentinel.com/business/fl-bz-fpl-energy-goals-hearing-20190812-km2a3zuhk5fbndb2y3d7okkmie-story.html>

¹¹¹ Carter, Sheryl 2016. A Vision for the Future of the Electric Industry. National Resources Defense Council. December. Feb. <https://www.nrdc.org/resources/vision-future-electric-industry>

thru the nights) and the utility makes money on our excess power, offsetting their cost of maintaining the grid.

What we need to do is expand beyond net metering to **Community Solar** or **Virtual** (also called “group” or “neighborhood”) **Net Metering**. As explained by Ryan Greer,

Community or shared-solar programs allow multiple utility customers to connect to one shared solar installation, benefiting from the power provided and financial savings. Customers who otherwise wouldn't be able to install solar panels on their homes, either because they're renters, they can't afford panels on their own or due to structural or shading issues, are able to access solar energy through these programs. Community solar projects can share similarities with utility-scale solar projects (e.g., large capacity size and often found as ground-mounted systems), but they are generally considered distributed solar due to their benefiting communities directly, and as they can be built near to where electricity is used. States can encourage community solar installations through a variety of policies, including virtual net metering and specific community solar acts. Virtual net metering is a type of aggregate net metering, where credits from one PV solar system are used to offset multiple customers' electricity bills.¹¹²

Virtual Net Metering allows utility customers to share the electricity output from a single solar power generator, typically in proportion to their ownership of the shared system. This allow folks in an apartment house or Condo complex (for example) to share the benefits from a common, larger photovoltaic system. Researchers from Brookings Institute conclude net metering is a net benefit to the grid and all ratepayers. That's good news because increasing the numbers of small (including neighborhood) solar and wind generators is necessary to achieve our goals of net zero emissions.¹¹³

Third-party owners

“TPOs” are private companies that provide either solar electricity or equipment to generate electricity to building owners or tenants, typically with little or no upfront costs.

Third-party ownership is an important driver of distributed-solar markets. Of the 1.3 GW of residential solar installed in 2014, 72 percent was third-party owned. In New Jersey, a leading distributed-solar state, more than 90 percent of residential solar systems are third party owned.¹¹⁴

With almost three quarters of US rooftop solar provided by TPO, we can see that this sort of financing is a great benefit to the distributed-solar industry. TPO generally occurs through two models: leases and power purchase agreements (PPAs). A customer can sign a traditional lease and pay for the use of a solar system or sign a power purchase agreement (PPA) to pay a specific rate for the electricity that is generated each month. TPO makes solar power feasible for many folks who otherwise would not have the means.

One of the more obvious attacks on the distributed-solar market is that of third-party ownership bans. By barring these types of agreements, states restrict rooftop-solar

¹¹² Greer Ryan *Throwing Shade* p.11

¹¹³ Mark Muro and Devashree Saha authored the 2016 *Brookings Advanced Industry Series* report in 2016. <http://www.brookings.edu/research/papers/2016/05/23-rooftop-solar-net-metering-muro-saha>.

¹¹⁴ Greer Ryan, *Throwing Shade* 13

development. Of the 10 states graded F in in this report, Alabama and Oklahoma explicitly disallow both leases and PPAs, Florida and Louisiana allow leases but not PPAs, and legality is unknown or unclear in Indiana, Tennessee and Wisconsin.¹¹⁵

We need all states to allow full third-party ownership, so as not to deny solar power to most Americans.

Victims of Regulatory Capture – take action

Futurist Tony Seba uses the term “regulatory capture” to describe situations like what we have in Florida. The public is being regulated by a government serving the interests of industry, working against the people.¹¹⁶ To quote Greer Ryan, “The ‘Sunshine State’ needs to start living up to its name and its technical potential by allowing for its residents to ‘go solar,’” and move on to zero emissions in time to achieve a stable climate.

We in Florida need to work to influence our government to work for us - to achieve the most vital state level policies:

- Electricity portfolio standards, with a distributed solar carveout, for 50% of our energy from non- emitting sources by 2025 and 100% by 2050. As per the UCS, this may be the most powerful arrow in our quiver at the state level.
- Conservation measures to reduce the amount of energy we use, as discussed earlier– every kwh we don’t have to produce, is one less kwh to transition from fossil fuel to solar energy.
- Virtual net metering, so we can expand distributed solar power as groups or neighborhoods
- Full third-party solar ownership including power purchase agreements, to provide solar to those who are unable to buy it outright.

Federal Government

Big problem- who runs the government

On January 21, 2010, with its ruling in *Citizens United v. Federal Election Commission*, the Supreme Court ruled that corporations are persons, entitled by the U.S. Constitution to buy elections and run our government. This is a huge problem that makes it difficult, if not impossible, to resolve any issue including climate.

Human beings are people; corporations are legal fictions. A grassroots movement, [Move to Amend](#), has rightly concluded, "We, the People of the United States of America, reject the U.S. Supreme Court's ruling in *Citizens United* and other related cases, and we should amend our Constitution to firmly establish that **money is not speech**, and that **human beings, not corporations, are persons entitled to constitutional rights**. The Supreme Court is misguided in principle, and wrong on the law. In a democracy, the people rule."

¹¹⁵ Greer Ryan, *Throwing Shade* p. 13

¹¹⁶ Youth Climate Report <https://vimeo.com/149044470>.– Tony Seba on the clean disruption of energy and transportation. This ½ hour video offers another explanation of how the rise in technology and drop in cost of capital for clean energy will lead to lots of stranded assets for centralized power and fossil fuels companies.

Table 10 - We the People Amendment

Section 1. [Artificial Entities Such as Corporations Do Not Have Constitutional Rights]

The rights protected by the Constitution of the United States are the rights of [natural persons](#) only.

[Artificial entities](#) established by the laws of any State, the United States, or any foreign state shall have [no rights](#) under this Constitution and are subject to [regulation](#) by the People, through Federal, State, or local law.

The [privileges](#) of artificial entities shall be determined by the People, through Federal, State, or local law, and shall not be construed to be [inherent or inalienable](#).

Section 2. [Money is Not Free Speech]

Federal, State, and local government [shall](#) regulate, limit, or prohibit contributions and expenditures, including [a candidate's own contributions and expenditures](#), to ensure that all citizens, regardless of their economic status, have access to the political process, and that no person gains, as a result of their money, substantially more access or ability to influence in any way the election of any candidate for public office or any [ballot measure](#).

Federal, State, and local government [shall require](#) that any permissible contributions and expenditures be [publicly disclosed](#).

The judiciary [shall not](#) construe the spending of money to influence elections to be [speech under the First Amendment](#).

Source: <https://movetoamend.org/wethepeopleamendment>

Citizens United provided the impetus for Move to Amend to launch their campaign for the 28th Amendment and their *Motion to Amend* petition. Since then they have acquired hundreds of thousands of supporters, leading to a consistently growing network of affiliate organizations and hundreds of coalition members.

The [Motion to Amend](#) petition is the well from which they draw success. As such, getting more signatures is among the most important things any Move to Amend supporter can do to help them triumph. Please **Ask your neighbors to sign the petition to declare their support for this movement -- if you use Social Media, [join the Thunderclap campaign to spread the word](#)**. If you don't use Social Media, please share ask your friends to sign the [Motion to Amend](#) petition.¹¹⁷

Finally, and of vital importance, is to get sponsors in Congress for House Joint Resolution 48, which was introduced in January 2017.

- Send a message to your U.S. House Representative urging them to co-sponsor the "We the People Amendment" - [CLICK HERE](#)

¹¹⁷ For access to the Move To Amend Coalition, go to <https://movetoamend.org/motion>.

- Send a message to your U.S. Senator urging them to introduce the "We the People Amendment" - [CLICK HERE](#)

Increasing the price of carbon is perhaps the most logical, practical and effective way to alter people's behavior in a way that can have significant effects on emissions. As the Union of Concerned Scientists say, pricing carbon at the federal level and state electricity portfolio standards are the two most potent arrows in the government's quiver for action on climate change.

With a consistent and predictable increase in the price of combustible energy sources, the market will favor radical shifts towards the use of non-carbon emitting energy sources. Not only will people, businesses and agencies be more motivated to conserve energy, they will invest in wind, water and solar for their own use. Habits will shift away from the traditional use of internal combustion vehicles and planes to alternative means of transportation such as electric vehicles and public transportation including rail. Similarly, with homes, office buildings and factories, new paradigms will emerge for energy conservation and energy sources. Why? The new ways will be less costly and more sustainable than the status quo. As a good friend of the FLVCS says, "People don't care until it hits them in the pocketbook."

Eduardo Porter, reporting for the *NY Times*, explains how carbon pricing can work to reduce emissions and improve the economy.

At first blush, the proposition that replacing fossil fuel with more expensive energy could produce a net economic gain seems implausible. Until now, even many supporters of tough action accepted the idea that there would be a necessary price to pay initially to achieve the long-term goal of avoiding catastrophic climate change.

But the new thinking turns that on its head by taking more careful account of the hidden benefits of mitigating climate change.

"The cost of action is well known," said Helen Mountford, director of economics at the World Resources Institute, which worked on the "New Climate Economy" report. "The co-benefits, like reduced health costs, are less known."

The findings are not isolated. Research published this month by Ian Parry and Chandara Veung of the International Monetary Fund and Dirk Heine of the University of Bologna concluded that almost every one of the top 20 carbon emitters would reap economic gains by imposing a hefty carbon tax, if they deployed the revenue to reduce taxes on income.

A tax of \$63 per ton of CO₂, for instance, would not only cut China's emissions by some 17 percent, it would also cut the number of Chinese sickened or killed by pollution from coal. If Beijing used the money to cut other taxes, it would increase economic efficiency, adding up to a net economic gain — on top of any climate impact — of more than 1 percent of China's gross domestic product.

This finding does not depend on any technological breakthroughs. It happens whether solar energy is cheap or expensive.

While this is all theory, some empirical research also supports the finding. In 2008, for instance, the Canadian province of British Columbia unilaterally imposed a carbon tax that rose from 10 Canadian dollars per ton of CO₂ in 2010 to 30 dollars in 2012, using the money to reduce personal and corporate income taxes.

An assessment of the experience published last year by economists at the Organization for Economic Cooperation and Development found that fuel use declined, but economic growth remained on the same trajectory as the rest of Canada's. Notably, British Columbia ended up with the lowest income tax in the country.

An important finding is that the carbon pricing only works to improve the economy ***if the money is given back to the people***. If carbon revenue is not refunded to people, for example by reducing income taxes, the net gain from a carbon tax evaporates and becomes a net cost.¹¹⁸

There is one drawback to refunds via the tax system: it is bad for poor people. This is because low income people don't pay much, if anything, towards income taxes. They would be paying more for energy, but not receiving any offsetting moneys. A way to remedy this is to have a carbon pricing system that refunds money in the form of direct dividend payment.

Pricing carbon is seen by many as the most important policy tool for fighting climate change. In a wrap up of the Bonn 2017 climate conference, James Hansen said that pricing carbon is a must if we are to have a chance to decrease GHG emissions by the 3% annually that is needed to keep us from going over the 1.5 degree C threshold.¹¹⁹ Paul Hawken, editor of Drawdown, says that a price on carbon would accelerate all of the 100 solutions cited in Drawdown.¹²⁰

No Subsidies, No Rebates.

We often hear complaints, especially in Florida, about unreliable or non-existent subsidies for clean energy or rebates for wind/solar generators. It provides a handy excuse for not investing in solar or wind. Our position is that we do not want government to subsidize any form of energy.

First, the existence of a subsidy or rebate implies that the product needs an unfair playing field to survive, that it is not worthy on its own merits. We have already shown that this is not true. Non-combustible energy sources and alternative means of transportation can be effective and good investments as well.

Second, once the price of combustible sources of energy are adjusted to include their social costs (i.e., taxed in proportion to the carbon they emit), the non-emitting energy sources will become relatively less expensive. In the end, clean energy will gain market advantage.

Also, emitting fuels are now receiving various subsidies. The argument for removing them is easier to make if no energy sources get subsidies.

¹¹⁸ Eduardo Porter, *NY Times* September 24, 2014. "Benefits of Easing Carbon Emissions." Business page 1.

¹¹⁹ Hansen, James, Pam Pearson and Philip Duffy with Scott Steward. 2017. *Scientific Reticence: A Threat to Humanity and Nature* press conference at COP-23 in Bonn, Germany on 10 November.

¹²⁰ Paul Hawken speaking at the August meeting of Citizens' Climate Lobby. Paul Hawken is an environmentalist, entrepreneur, author and activist who has dedicated his life to environmental sustainability and changing the relationship between business and the environment.

Specific Actions

Let's shift from abstract ideas to reality. How can you put these ideas to work in a practical sense?

- ***Get informed, stay informed, and spread the word.*** Signing up for the e-mailing lists of responsible non-profits like the *Union of Concerned Scientists*, *Environmental Working Group (EWG)*, *Food and Water Watch*, *Natural Resources Defense Council (NRDC)* and *350.org* can help you stay abreast of current energy events. They send alerts when Congress and the Executive branch are about to do something anti-environmental (i.e., giving another pass to big oil and gas), and they provide insights and tips in the form of letters and petitions for how we can influence government officials.

You can also help stop the flow of fake news and misleading information. Many of us have friends and relatives, armed with web-browsers and email who are more than happy to send links and forward mail with eye catching headlines. Unfortunately, much if not all of this crap is unsubstantiated and otherwise untrue. The next time you get forwarded a ridiculous email (i.e., "Harvard report says global warming hoax was invented in the Bronx in 1988"), reply, by asking for the source of the information - tell them you think an important issue like this should be backed up with accountability. You might help the sender think twice before spreading such nonsense in the future. Better yet, you might help him/her evaluate news sources for their credibility.

- ***Join and get active in Citizens' Climate Lobby (CCL).*** CCL is an international grassroots non-partisan group that trains and supports volunteers to build relationships with their legislators in the US Congress in order to influence climate policy. The CCL's purposes are to 1) create the political will for a stable climate and 2) empower individuals to have breakthroughs in exercising their personal and political power.

CCL proposes a [carbon fee and dividend](#) that returns all revenues, net of administrative costs, to households. As we explained earlier, putting a steeply rising price on carbon is a key to influence people to shift from carbon emitting fuels to those that do not.¹²¹

The CCL proposal has been evaluated by Regional Economic Models, Inc. In their study the CCL plan will:

- lower carbon emissions 33% in 10 years and 55% after 20 years
- save 13,000 people from early deaths annually due to inhaling toxins
- create 2.2 million jobs! [\(REMI\)](#)¹²²

What's not to like? Is this too good to be true? As Lynn Meyer of the New York chapter of CCL explains, there are costs. And we should be aware that there is no such thing as a free lunch.

Well, yes, people will pay more for gas. After distribution of the revenue about two thirds of the public would come out ahead considering how high the dividend checks would go, beginning at about \$50 per month and ending

¹²¹ Details of Carbon Fee and Dividend can be seen at <http://citizensclimatelobby.org/basics-carbon-fee-dividend/>

¹²² The REMI report is available at <http://citizensclimatelobby.org/remi-report/>

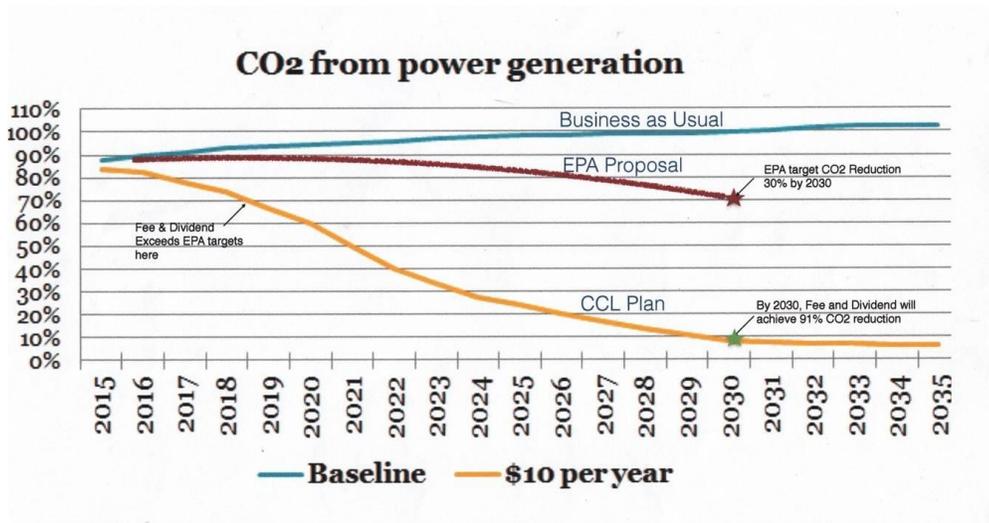
up in the hundreds, perhaps \$300 per month. That's if they don't alter their way of life at all. People with an extravagant lifestyle, of course, would lose out.

Some people in the fossil fuel industry would lose their jobs. But there would be a net increase in jobs for two reasons: 1- Wind and solar are labor-intensive compared to fossil fuels, and that labor cannot be outsourced. 2- When you put money in the pockets of middle-class people, they tend to go out and spend it. Therefore, the main street economy – restaurants, doctors, movie theaters, etc.- would all pick up business.

A few states would definitely suffer, for example, Wyoming and West Virginia. There could be a provision in the final bill for aid to these states and to individuals who have lost their jobs and/or might need to relocate.

Overall, the benefits of implementing CCL’s carbon fee proposal far outweigh the costs. Another way to demonstrate the powerful impact this legislation could have is by comparing it to President Obama's Clean Power Plan, which is the basis of the US participation in the Climate Accords. Please look at figure 16. This illustration is important because it helps us see the benefit of incentives (fee and dividend) over command and control mechanisms - regulation via the Clean Power Plan.

Figure 15 - Comparing Results - regulation vs. incentives



Meanwhile, Carbon Fee and Dividend achieves a 90 percent reduction in emissions by 2030, along with the economic benefits of more jobs and a healthier GDP. Citizens' Climate Lobby is on the right track, with a worthy cause and a strategy to break through the logjam in Washington and enact meaningful climate change legislation. Your active participation and support adds weight to CCL's chance of success.

We can see that President Obama’s energy policies could achieve a 30% reduction by 2030. This is not enough. We need more reduction than the Paris talks agreed to.

The vertical axis is relative to 2005 emissions. We can compare the goals for the EPA Clean Power Plan (the red trend line) with the baseline case (blue line - doing nothing). The orange line projects what happens with the CCL policy. ¹²³

Recap - Influencing Government

While special interests can try to buy votes, they cannot cast votes. A properly informed and motivated citizenry can create the political will for a stable climate by telling our elected officials what we want: energy saving local building codes, natural (chemical free) landscape rules that re-forest our communities, state energy portfolios and virtual net metering. Most important, we must make clear to our people in congress that we want a steadily rising price on carbon, with all the revenues going back to the people.

We can also elect officials who promise to legislate the kinds of changes we need to have in order to preserve life as we know it. If our legislators learn that we will not vote for them if they don’t forego special interests in favor of the public welfare, we may get them to cast votes that help save the planet, instead of enriching the conventional energy industry.

You can let candidates, as well as those in office, know that to earn your vote they must support legislation and policies that aim to reduce carbon emissions. You can tell them they need to get behind a carbon tax that returns revenues to the taxpayers, and they need to support an amendment to the Constitution that states corporations are not people, and money is not free speech. You can take action by voting for those who promise to legislate the kinds of changes needed to reduce emissions (especially increasing the price on carbon, state electricity portfolio standards, energy saving local building codes, virtual net metering, and natural landscape rules that re-forest our communities).

By joining and/or supporting [Citizens' Climate Lobby](#) and the [Move to Amend Coalition](#) you can nudge our federal government towards a stable climate and a restoration of our democracy.

Follow Up

Feeling good about “being green” and actually having an impact on climate change can be two different experiences. We know people with solar panels on their house who did not notice the system was not working for weeks until the flashing “please reset” indicator was noticed by a visitor. And there is the family happily driving their hybrid SUV, feeling cool while they were only getting the same 23 MPG one of us used to get in a old VW van. They really had no handle on what they were emitting, nor did they consider the alternatives. They were feeling good and not doing good.

Problems are only truly solved when decisions are implemented and verified. This means that we must check to assure our carbon reduction strategies are having the intended effect. A sure way to do this is to follow up, measure the emissions and how much carbon we are storing, and compare the actual results with the planned outcome. To assure you are meeting the strategic objectives you need to answer the question: **have you achieved that 40% to 80% reduction** within your realm? What’s up

¹²³ Source: [REMI report](#)

with your re-forestation plan? If you are on track, celebrate and keep on track. If you have fallen short, it's time to adjust the plan and make it more effective.

And are you being influential?

- Have your friends, family, workplace achieved similar reductions?
- Do you see governments enacting what we need to stabilize the climate?
- Have you lobbied sufficiently to implement a revenue neutral price on carbon?
- Have you lobbied for an amendment to establish that corporations are not people and that money is not free speech?
- Have you divested yourself (and your business) of carbon burning energy stocks?

According to the US Energy Information Administration, we emitted almost 33 billion metric tons in 2011. If we do our job as citizens, businesses and governments, we will be at or below 20 billion metric tons in 2021.

Conclusion

Global warming is real, it's bad, we are the cause. It's already too late to reverse of the damage. But there are solutions to avert the worst ***if we act now.***

Unless we (as individuals, businesses and governments) take immediate action to reduce carbon emissions, our children will almost certainly be impacted by the gruesome consequences of climate change: severe food shortages as warming makes it harder to grow crops; an accelerating rise of the sea that would inundate coastlines too rapidly for humanity to adjust; extreme weather events, heat waves, droughts and floods; and a large-scale extinction of plants and animals. It's also going to get very hot, with months of 105°F days in many parts of the nation. National security will be at risk due to massive refuge movements and other increases in conflict. We must, by 2030 have moved well beyond our use of fossil fuels and unsustainable lifestyles or the future of life as we know it is lost.

Forget all the talk of 2050. We need to have made the transition by 2030.

There is ***reason for hope.*** We have most of the technology and know-how today to meet the challenge. The economic benefits of making the transition to a carbon free society make it financially worthwhile. Most of all the tide of public opinion has shifted towards the people wanting action on climate change, which means the political will for a stable climate is within our grasp. What remains to be done is to convert these favorable circumstances into effective and timely action.

This report presents a ***practical and concrete action plan*** for mitigating climate change. See Table 10 on the next page. It starts with understanding ***the problem.*** Armed with an understanding of the problem, we can take stock of the ***carbon footprint in our own realm,*** that is, in our family's activities, and at our businesses. Once we estimate our carbon footprint, we can assess our impact from buildings, transportation, diet and by what we buy. This guide will help us take the food system into account and help us see that while excess carbon in the atmosphere is the problem, storing carbon in the soil is a solution. This leads us towards native landscapes and natural farming.

This report also offers advice on how to influence others, and what we need government to do in terms of mitigating climate change. Let's get started. Now. We cannot afford to lose any more time.

Table 11- Action Framework

Framework for Mitigation of Climate Change

Understand the causes of the problem of having too much heat trapping gas in the atmosphere

- Too much emission of GHGs - Carbon Dioxide (CO₂), Methane (CH₄), Nitrous Oxide (N₂O), and F gases
- Insufficient photosynthesis (taking carbon from the atmosphere and storing it in the soil) as a result of deforestation and ineffective soil management

Solutions

1. Put ***less GHGs into the atmosphere (Stop contributing to the problem)*** by a combination of

- Conservation (using less energy) including electricity, transportation, what we eat, what we buy (and don't buy) and wasting less.
- Shifting to 100% Zero Emission energy sources (solar, wind, nuclear, hydro power and geothermal energy)

2. ***Get resident excess carbon out of the atmosphere.*** Store it in the soil by letting photosynthesis do its thing thru

- Reforestation
- Effective soil management

Areas for action

1. In your ***own realm***
2. ***influencing other people*** - family, friends, neighbors, co-workers and colleagues
3. ***Influencing government***

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About Florida Veterans for Common Sense

Statement of Principles

Veterans have a duty to help forge the future of our country. To that end, Florida Veterans for Common Sense will work to shape local and national policies. As veterans, we support the founding principles of the United States of America. We hold these to be liberty, equality, human rights and democracy. We support these values without regard to partisan politics. As veterans, we call upon our government to provide returning veterans the best medical and psychological treatment. We call for dedicated funding and fundamental reform of the Veterans Administration to provide such treatment for all veterans. As veterans, we support a strong military designed to protect citizens against 21st century threats both foreign and domestic. As veterans, we support the ethical and humane treatment of prisoners and we oppose all torture.

Since the Constitution of the United States of America, which we veterans swore to uphold, seeks to provide those benefits to ourselves and our posterity, we also wish to provide our descendants a peaceful planet with a stable climate.

History

Florida Veterans for Common Sense began in Sarasota, Florida, during the run-up to the Iraq War in 2002. As the drumbeat for war intensified, three Vietnam-era Veterans questioned our government's positions that the war would be short and easy, and that the Iraqi people would greet American troops as liberators. As in the case of the Vietnam War, they also noticed the “intelligence” used to justify the war appeared to be propaganda rather than reliable information. As they talked about the impending invasion with others, the three veterans learned they were not alone in their opinions.

The three sought local veterans groups in an effort to speak out against the invasion, but what they found was disappointing. Not only were the local groups not warning against the folly of an invasion of Iraq, they were promoting it. As a result, the three and other like-minded veterans formed their own organization to express their concerns.

That organization decided its goal was to inform the community about national defense and veterans' issues. They had little media experience, but the members encouraged each other to speak out against the Iraq war and tried to educate candidates for government office using facts and analysis opposing the war. After the Iraq invasion, the group noted that, as in the Vietnam case, returning soldiers were not appreciated by the public. Worse, our government failed to provide the returning soldiers needed medical and psychological care. Once again American soldiers were fighting and dying on the other side of the world without a clearly defined mission. Nothing had been learned from the Vietnam War. Members believed that continuing the Iraq occupation was not in the best interest of the United States nor did it somehow make us safer. They debated the conduct of the war and discussed a timetable for withdrawing troops from Iraq.

In time a consensus emerged that the United States should withdraw completely from Iraq by the end of 2007. At about that time the group was operating as a voluntary chapter of Veterans for Common Sense, a national veterans advocacy group. It found, however, that it was limited in its ability to grow and educate effectively. In August, 2007, therefore, the group incorporated as a 501 (c) 4 tax-exempt corporation, Florida Veterans for Common Sense, Inc.

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About the Authors

John Darovec is a retired marine biologist, Air Force Captain, and physician assistant. As a marine biologist he did research in fish ecology and evolution at The Florida Marine Research Institute of the Florida Department of Natural Resources. In the military he served in various units of the New York and Florida Army National Guards before transferring to the Air Force to serve full time as a Physician Assistant at MacDill Air Force Base. As a civilian physician assistant he also worked in neurosurgery, neurology, family practice, and urgent care.

His college degrees are from Marietta College (B.S. in Science), Queens College of the City University of New York (M.A.), and The University of Oklahoma (B.S. as a Physician Associate).

John is a member of several activist groups concerned with climate destabilization including: The Sierra Club, 350.org, Florida Veterans for Common Sense, Physicians for Social Responsibility, and the Union of Concerned Scientists.

He and his wife Susan live in Bradenton where they lead the local Citizens' Climate Lobby group (Florida District 16) in its effort to build political support for a carbon fee and dividend bill that will fight global warming while it improves the economy and world health.

William "Coty" Keller lives in Port Charlotte with his wife Marge. He is in his fourth career. Coty is a Vietnam combat veteran who served for over 20 years in the US Navy. He commanded two warships and taught management & national security affairs at the Naval War College. Coty's second career was in industry, in both service (insurance) and manufacturing (yacht production). His third career spanned two decades in college teaching, almost all of it with graduate level professionals. Coty was an associate professor of management at St. Joseph's College in New York and adjunct professor of National Security Affairs at the Naval War College. In 2015, Coty "retired" from teaching college and has shifted the focus of his professional efforts to ecological matters. This includes work with the local chapter of Citizens' Climate Lobby and as a volunteer in the field for the Florida Park Service, eradicating Brazilian Peppers from the Mangrove Forests.

Coty has a bachelor's degree in Psychology from Colgate University, a master's in Financial Management from the Naval Postgraduate School and a PhD in Decision Science from Walden University. He is certified as a Florida Master Naturalist by the University of Florida.



Appendix: Inoculation against Climate Denial

Excerpts from Cook, John 2015. *The Five Telltale Techniques of Climate Change Denial*.

Climate deniers rely on a common set of five techniques to dispute the science, and knowing deniers' tactics can help inoculate people from a misleading view of reality.

1. Fake experts

Ninety-seven percent of climate scientists agree that humans are causing global warming. This has been found independently in a number of studies, including [surveys](#) of Earth scientists, [analysis](#) of public statements about climate change and [analysis of peer-reviewed scientific papers](#). How might one cast doubt on the overwhelming scientific consensus? One technique is the use of fake experts.

We see this in online petitions such as the *Global Warming Petition Project*, which features more than 31,000 scientists claiming humans aren't disrupting our climate. How can there be 97% consensus when 31,000 scientists disagree? It turns out 99.9% of the petition's signatories aren't climate scientists. They include computer scientists, mechanical engineers and medical scientists but few climate scientists. The Global Warming Petition Project is fake experts in bulk.

2. Logical fallacies

The reason why there's a 97% consensus is because of the many lines of evidence that humans are causing global warming. Human fingerprints are being observed in heat escaping out to space, in the structure of the atmosphere and even in the changing seasons. Another denialist technique used to counter the weight of evidence is the logical fallacy.

The most common fallacious argument is that current climate change must be natural because climate has changed naturally in the past. This myth commits the logical fallacy of jumping to conclusions. It's like finding a dead body with a knife sticking out of its back, and arguing that the person must have died of natural causes because humans have died of natural causes in the past. The premise does not lead to the conclusion.

3. Impossible expectations

While many lines of evidence inform our understanding of climate change, another source of understanding is found in climate models. These are computer simulations built from the fundamental laws of physics, and they have made many accurate predictions since the 1970s. Climate models have successfully predicted the loss of Arctic sea ice, sea level rise and the geographic pattern of global warming. However, one technique used to cast doubt on climate models is the tactic of impossible expectations.

Some people argue that climate models are unreliable if they don't make perfect short-term predictions. However, a number of unpredictable influences such as ocean and solar cycles have short-term influences on climate. Over the long term, these effects average out, which is why climate models do so well at long-term predictions.

4. Cherry-picking

Signs of global warming have been observed all over our planet. Ice sheets in Greenland and Antarctica are losing hundreds of billions of tons of ice every year. Global sea level is rising. Thousands of species are migrating toward cooler regions in response to warming. The ocean is building up four atomic bombs worth of heat [every second](#). One way to avoid this overwhelming body of evidence is through the technique of cherry-picking.

For example, a persistent myth is that global warming stopped in recent decades. This is done by focusing on one slice of our climate system -- the surface temperature record. Further, it relies on cherry-picking short time periods. This ignores the long-term trend and more importantly, ignores the many warming indicators telling us that our planet continues to build up heat.

5. Conspiracy theory

The global surface temperature record is constructed by teams across the world, each compiling their own independent record. These different efforts, each using their own methods, paint a consistent picture of global warming. Climate science deniers reject this coherent evidence with conspiracy theories.

The thousands of scientists across the world who develop these temperature records are regularly accused of faking their data to inflate the global warming trend. Of course, critics produce no evidence for a global conspiracy. In fact, a number of [investigations](#) into the scientists' methodology has concluded that they conducted their research with robust integrity. How do the conspiracy theorists respond to each exoneration? By expanding their conspiracy theory to include the investigators!

The [link between conspiratorial thinking and science denial](#) has serious and practical consequences. Conspiracy theorists are immune to scientific evidence, as any evidence conflicting with their beliefs is considered part of a conspiracy. The implication is that the most effective approach is not changing the mind of the unchangeable. Rather a more fruitful approach is communicating the realities of climate change to the large, undecided majority who are open to scientific evidence. A crucial part of the puzzle is explaining the techniques of science denial. This has the powerful effect of [inoculating people](#) against the misinformation of climate science deniers.