# Urgency and Action; Mitigating Climate Change

A report prepared by the Environmental Working Group of *Florida Veterans for Common Sense*.

Second Edition

January 2017

Hurricane Sandy approaches the Atlantic coast in the early morning hours of October 29, 2012. This storm is an example of the extreme weather events that will become more frequent unless we take action to reverse human contributions to climate change.

(NASA photo)

Updated 5/3/2017

## About the Second Edition

We are happy and proud to release this updated version of the original article which was released in the fall of 2014. Major upgrades in the second edition include:

- A description of the causes of climate change. We offer this because we think the first step in solving a problem is to understand its causes.
- Specific and practical suggestions for reducing one's carbon footprint. We offer ideas and knowledge from a variety of sources to help the reader decide which actions will be most beneficial in his/her unique situation.

We hope you find this expanded edition to be useful as you work to mitigate climate change. Your feedback is welcomed. You can contact us at FLVCS, 100 Wallace Ave (Suite 240), Sarasota, FL 34237. 941-349-5131. Email us at flveterans@aol.com.

## Acknowledgements

The authors are grateful to FLVCS president Gene Jones, who had the vision for this project. Gene's ideas were (and are) climate change is the greatest crisis of our lifetime, and we must do all we can to fight it. Creating a booklet that tells why this fight is so important, and what we can do (in specific, concrete terms) is a good contribution to make.

We also owe a debt of gratitude to folks who have made this article possible through their support and professional advisement. Susan Darovec and Marge Keller applied their teachers' eyes and critic skills to the many drafts over the years. Without their guidance and careful editing assistance, this would make for really hard reading. Several ecological experts were kind enough to review and comment on the results of our research. We thank them for contributing to the technical and scientific credibility of what we say here: 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; and Maggie Wood, owner of the Golden Earthworm, an organic farm in Jamesport, NY.

# Urgency and Action; Mitigating Climate Change

*Florida Veterans for Common Sense*

Environmental Working Group: John Darovec and Coty Keller

## Executive Summary

The *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.

***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 heat waves, droughts and floods***,
- a large-scale ***extinction of plants and animals***, and
- of special note to us veterans, disruption of ***national security***.

There is ***reason for hope***. We have 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*** for mitigating climate change. 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 soils 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 the efficiency 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 (40-50% emissions reduction before 2025 is MAJOR), 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. 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 by 80% at mid-century, and at the same time increase the carbon we remove from the atmosphere and store in the soil***

# Contents

## List of Figures and Tables

# 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 needed goal of reducing emissions by 40-50% before the year 2025 (and the achievement of an 80% reduction by mid-century) and at the same time increasing 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 to work toward the world wide goal of reducing emissions by 40-50% before the year 2025, an 80% reduction by mid-century, and meanwhile taking more carbon out of the atmosphere and storing it in the soil.

# 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 to 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. [1]

## Threat to National Security

According to Admiral Samuel Locklear, Commander of the Pacific Theater, significant upheaval caused

[1] Matt Anderson, Director of National Audubon Society Climate Initiative speaking to Citizen's Climate Lobby monthly meeting July 9, 2016.

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 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)

We can sum up the reality of the threat by quoting John Conger, the Pentagon’s Deputy Under Secretary of Defense for Installations and Environment. “The department certainly agrees that climate change is having an impact on national security, whether by increasing global instability, by opening the Arctic or by increasing sea level and storm surge near our coastal installations..." (Davenport)

## Morality

With the release of his much-anticipated encyclical, *Laudato Si*,[2] 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 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." [3]

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.

The extent of the action we need to take is made clear in the next section.

## Running Out of Time

The United Nations Intergovernmental Panel on Climate Change (IPCC ) is made up of hundreds of the world's leading climate scientists. They have issued several reports recently. They pull no punches and make clear the stark realties:

- Global warming is caused by humans' burning of fossil fuels and other combustibles and by deforestation.
- The effects are already being felt around the world, including mounting damage to coral reefs, shrinking glaciers and more persistent droughts. There will be worse to come — rising seas, species loss and dwindling agricultural yields.
- Annual emissions of greenhouse gases have risen almost twice as fast in the first decade of this century as they did in the last decades of the 20th century. This means we are certain not to achieve the previously agreed on limit on warming to no more than 2 degrees Celsius (3.6 degrees Fahrenheit) above the pre-industrial level. We seem certain to go beyond that limit, and as a result the world will face truly alarming consequences.
- Avoiding this fate will require a ***reduction of GHG between 40-50 percent now and 70 - 80 percent in by midcentury***. And even more, to zero by the end of the century.

[2] The title of Pope Francis' encyclical, "Laudoto 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.
[3] Aisha Bhoori in Time June 17, 2015

- Timing is key: The world has only about ***a decade left in which to begin to bend the emissions curve downward.*** Otherwise, the costs of last-minute fixes will be overwhelming. ***"We cannot afford to lose another decade,"*** says Ottmar Edenhofer, a German economist and co-chairman of the committee that wrote the report. "If we lose another decade, it becomes extremely costly to achieve climate stabilization." (United Nations/IPCC, Gillis, Editorial Board, Greenfieldboyce)

The graph in Figure 1 is from the IPCC report's *Summary for Policy Makers*. It shows global temperatures (left vertical axis) and relative changes in temperature from pre-industrial level (right vertical axis) over time on the horizontal axis. You can see actual observed temperatures from 1900 until now, and then a split. The red trend line shows the projected temperatures for a high emission scenario (the path we are on); while the blue trend line is the forecast for a low-emission scenario (the path we need to be on if we want to preserve life as we know it).

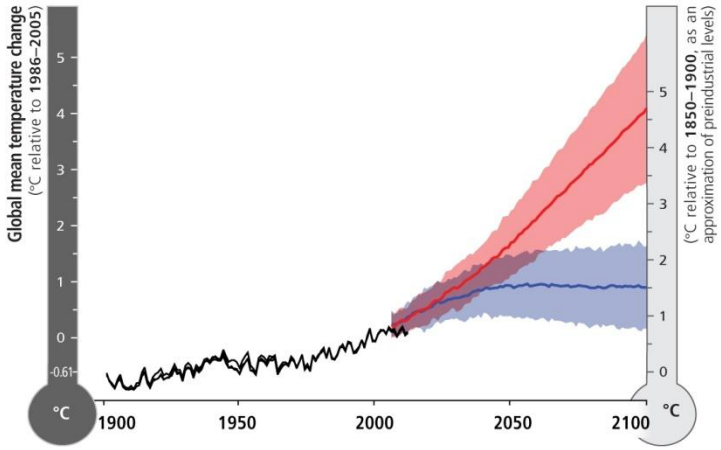



Figure 1-Fork in the Road

This graph shows two things: One is how small a temperature rise we have had in the last 100 years (about 0.8 degrees C). Two, more importantly, is the fork in the road. It predicts the temperatures in the coming decades depending on whether we take action or do nothing. If we do nothing, we will take the red path and life on earth will cease to exist as we know it.

We don't plan or decide with a thermometer. Instead we measure progress on climate change by how much carbon we emit. IPCC and the Union of Concerned Scientists (UCS) tell us that ***to take the blue path we must GHG emissions by 40-50% before 2025 and by 70-80% by mid-century.***

## Urgent Indeed

It is staggering to think of what this means to our heirs. Our children and grandchildren will almost certainly be seriously and directly affected by climate change. Imagine our offspring and their brood suffering in an environment of global chaos. We see the images of the refugees from the Syrian war situation and might imagine a similar plight for future climate refugees from American coastlines, and other parts of the world. Imagine the horror of not being able to satisfy basic physiological needs (food, water) and security needs (peace and stability).

Scientists, generals and admiral, and faith leaders tell us that unless we act now, there will be a decline in national security, more drastic and frequent weather calamities, flooded cities and communities, a shortage of food and water, and gruesome economic consequences (reduced property values, depressed world markets, and increasing poverty). Life will be difficult for our heirs, unless we take immediate and effective action. Time is of the essence. We cannot afford to lose another decade. The ***challenge is clear: to reduce GHG emissions by 40% before 2025 and by 70%-80% before 2050.*** While we do not have a specific target for stopping deforestation, we must progress toward re-forestation and the restoration of the soil's carbon content.

## 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. [4]

Thankfully 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 its 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 percent of Floridians concerned. These results are up dramatically from last year when 67% were concerned about climate change. Public opinion is a prerequisite for political will. And the political will for a stable climate is an essential ingredient for success.

What remains to be done is to convert these favorable circumstances into effective and timely action.

# What kind of action? Mitigation vs. Adaptation

Before we launch into our prescription for reducing carbon emissions, it should be recognized that there are two sets of strategies for dealing with the climate change crisis: adapting to the changes and slowing/reversing the causes. Building dikes and elevating buildings are examples of the former. We

[4] *Cooler, Smarter* p. 183

do not discount the unfortunate need to adapt to the effects of climate change. They should play a part in a comprehensive plan to deal with the problem of global warming/climate change.

There is a lot of attention paid to *adaptation*, in part because there is money to be made. *National Geographic* explains how some are profiting on the threat of rising seas. How about floating islands in the Miami area? There are no plans to reduce the emissions that cause climate change; only adaptations to buy time, and yes, make money. "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".* [5]

While adaptation may be profitable for contractors, it is costly for consumers. For example, we know from experience that elevating a $300,000 home can cost well over $100,000. Mitigation on the other hand can pay a return on investment. For example investing in a solar water heater can reduce a household's emissions from electrical energy by as much as 20-30%, thereby minimizing contributions to global warming. Meanwhile that investment can pay a handsome return.[6]

Our main concern is mitigation, those actions designed to remove or lessen the cause of the crisis by reducing carbon emissions, and re-foresting our soils, in a significant enough amount to minimize the effects of global warming.

We believe this is a noble and rational approach, because as was reported in the recent UN/IPCC Report, *climate change is already having sweeping effects on every continent and throughout the world's oceans , ...the problem is likely to grow substantially worse unless greenhouse emissions are brought under control*. (Gillis). Plus, as IPCC co-author Michael Oppenheimer says, *Everyone agrees that* ***if we don't slow the warming down, our prospects for adaptation are not good*****.** (Mufson).

Adaptation is important, and perhaps popular. But our focus is on mitigation-- attacking the causes of the problem.

## Solution Framework

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

Our program begins with citizens taking the action needed to accomplish our goal of reducing emissions by 40-70% and reversing the trend of de-forestation. 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, taking action at re-forestation, and divesting from fossil fuel providers.

[5] Laura Parker, "Treading Water," *National Geographic* February 2013 p107-125

[6] Our experience with domestic solar hot water has resulted in return on investment of 25-28%. For more insights in this area, please see the section on reducing emissions in homes and buildings.

2. Motivating those you know to take similar action.
3. Influencing government at the polling place and through lobbying.

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.

**Figure 2 - Action Framework**

### *Framework for Mitigation of Climate Change*

***Understand the causes*** of the problem of having too much heat trapping gas in the atmosphere (see "up/down" model figure 3)

- Too much emission of GHGs - Carbon Dioxide ($CO_2$), Methane ($CH_4$), Nitrous Oxide ($N_2O$), 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)***

- Conservation (use less energy)
- Shift from combustible* to non-combustible (non-GHG emitting) energy sources

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

- 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***

*if it burns, it emits GHGs - it's bad

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 an important prerequisite: Understanding the ***causes*** of global warming

## Understanding the Causes

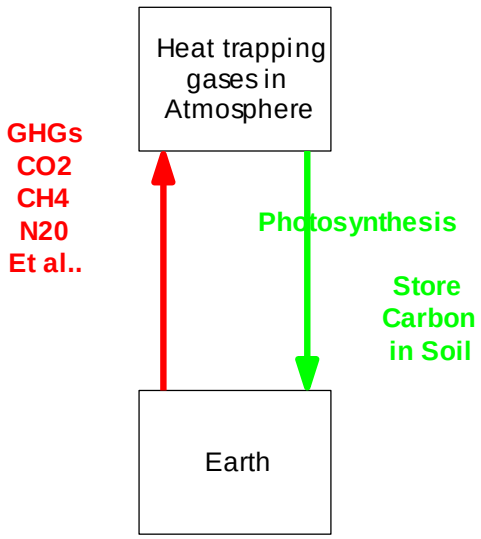
***Understanding the causes of the problem is the first step towards taking action.***

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. [7]

Figure 3 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 3 - Up/Down Model**




## $CO_2$ 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 4, from the IPCC report 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.

What gets our attention right away are the orange and red areas - the major contributions from two sources of carbon dioxide ($CO_2$) 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).

The UCS explains that the major greenhouse gas, in terms of volume, is indeed carbon dioxide ($CO_2$, about 76% of GHG). Methane ($CH_4$) and nitrous Oxide ($N_2O$) are relatively low compared to $CO_2$, but they are more potent GHGs. $CH_4$ (natural gas is methane) accounts for about 16% of GHG. $CH_4$ comes

[7] [7] UN Intergovernmental Panel on Climate Change (IPCC), 2014 and Union of Concerned Scientists

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 ($N_2O$ -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. $N_2O$ is also released naturally by the soil. ***Each pound of $N_2O$ has a global warming equivalent to roughly 300 pounds of carbon dioxide.*** Like $CO_2$, $N_2O$ stays around a long time in the atmosphere. [8]

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

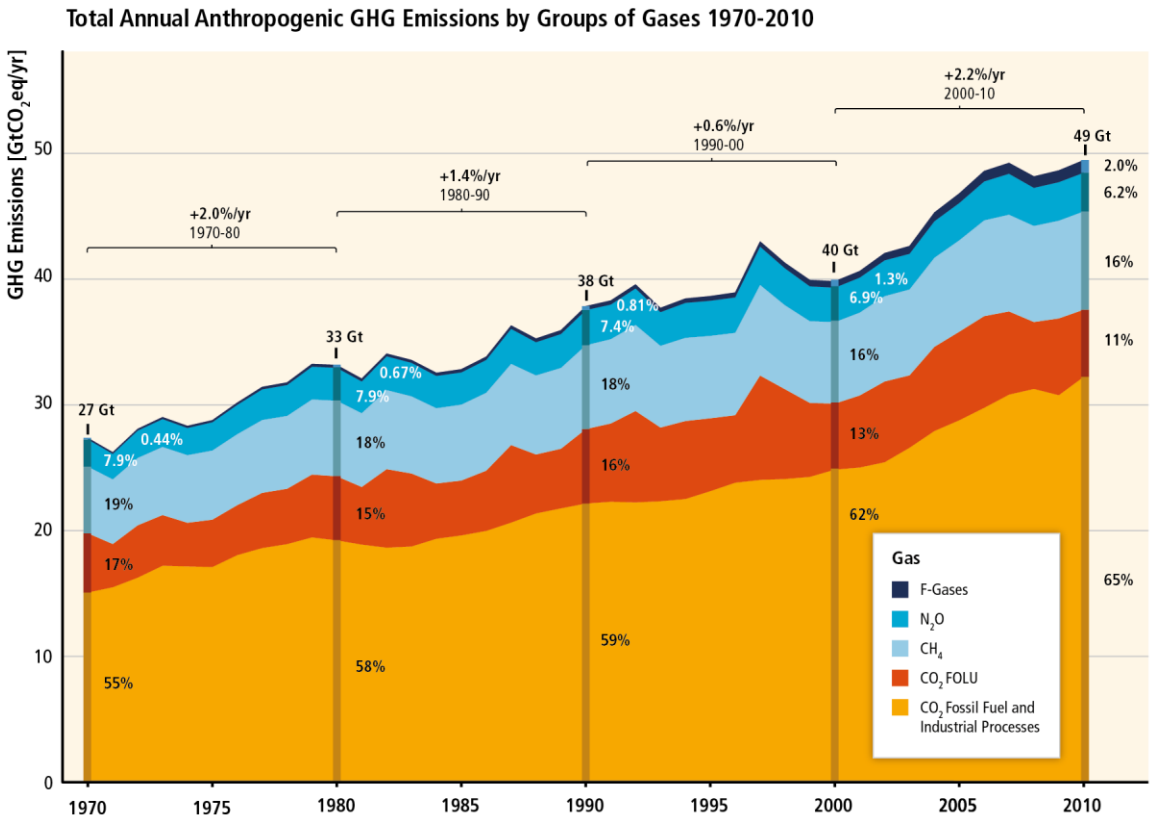



Figure 4 - Total Annual Anthropogenic GHG Emissions by Groups of Gases 1970-2010

## Electrical Power

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

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

..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.[9]

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 Earth Justice'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 attributable to imported food, or emissions driven by deforestation to make way for commodity crops like palm oil. Earth Justice 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 $CO_2$. "**Enteric fermentation**" or, more simply, cow belching is a major source of $CH_4$ (22% of $CH_4$), second only to natural gas systems (24% of $CH_4$). Bacteria in the stomachs of cattle and other ruminant animals produce $CH_4$ as they help animals digest. The $CH_4$ is released as cattle exhale and burp. $CH_4$ is also released by **animal manure** (8% of $CH_4$, the sixth largest source), especially when it's stored in giant waste lagoons, as in industrial swine production. **Rice cultivation** accounts for 2% of $CH_4$ emissions.

**Nitrous oxide** has about 300 times the global warming potential of $CO_2$. The dominant source of $N_2O$ emissions (79%) is **agricultural soil management**, including the *application of niitrogen-based synthetic fertilizers*. In the soil, nitrogen in fertilizer that isn't taken up ("assimilated") by crops is processed by bacteria back to the $N_2$ gas that is abundant in our atmosphere. However, this process also results in the production of $N_2O$. It is very important

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

to balance nitrogen in the soil with the nitrogen needed by plants to reduce the amount of $N_2O$ produced.

***$CO_2$*** 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, $CO_2$ emissions are a relatively small proportion of emissions in the food system. [10]

## 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.[11] 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. [12]

Deforestation has a three-fold impact. First, by removing trees, carbon in the soil is released into the atmosphere (adding to GHG). Second, the machinery used to destroy the forests are probably burning some sort of fuel and thereby emitting GHGs. Third, healthy trees and plants take $CO_2$ *from the atmosphere,* use it to produce valuable food for our ecosystem and store (sequester) $CO_2$ 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" - misleading terms

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.

---

[10] Peter Lehner presented this analysis to Citizen's Climate Lobby annual conference in Washington DC June 20, 2016.

[11] 2006 report by Food and Agricultural Organization of the UN (FAQ) 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 to make room for grazing cattle and grow their feed. See p. 142, *Cooler, Smarter*

[12] *Cooler, Smarte*r p. 165.

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. [13]

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. ***Non-combustion sources*** are what we need to strive for: solar, wind, nuclear, and hydro power.

"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 $CO_2$. Natural gas is mined by Fracking, which injects 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.

## Recap on the Causes

As we go about the work of creating solutions to our global warming crisis, it will serve us well to know the sources of the culprit GHG emissions, deforestation and ineffective soil management. We need to know this so we know where to attack. And we can attack on 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 is responsible for a great deal of $CO_2$. 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

[13] According to the US Energy Information Agency:

- A gallon of pure gasoline emits 19.64 pounds of $CO_2$. A gallon of E10 (gasoline with 10% ethanol content) emits 18.95 pounds of $CO_2$. About 12.73 pounds of $CO_2$ are produced when a gallon of pure ethanol is combusted.
- 22.28 pounds of $CO_2$ 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

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. 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.

## General Solutions - emit less, store more

The problem is the climate is changing because of heat trapping gases in our atmosphere. The causes are our GHG emissions and deforestation. The solutions we prescribe attack these two causes by emitting less GHG and storing more carbon.

Emitting less GHG to the atmosphere can (must) be achieved in two ways: through the conservation of energy and by shifting to non-combustion energy sources.

Meanwhile we must take more carbon out of the atmosphere. When we get to the solutions section we will investigate achieving this through re-forestation and improved soil management.

**Table 1 - General Solutions**

| Problem: Climate is Changing because of our GHG Emissions and Deforestation | |
|---|---|
| **Solution: Stop contributing to the problem- Reduce GHG emissions 70-80% by**<br>• Conservation- Using less energy<br>• Shift to non-combustion energy sources | **Solution: Get excess resident carbon out of the atmosphere**<br>• Re-Forestation<br>• Soil management |

The UN Panel on Climate Change and Union of Concerned Scientists agree on the 70-80% reduction by mid-century with a 40-50% target by 2025. How?

Researchers at Stanford University and the University of California at Berkeley, along with dozens of students and other researchers from around the world in the areas of engineering, transportation, renewable energy, atmospheric sciences, and economics, and in collaboration with The Solutions Project, have developed roadmaps for transitioning to 100% zero emission energy.

> The idea behind the roadmaps is simply to electrify everything and provide the electricity with clean, renewable energy, namely wind, water, and sunlight (WWS). By everything, we mean transportation, heating/cooling, and industry. In the end, we will use no natural gas, coal with carbon capture, Biofuels, or nuclear power. We will use no combustion and will virtually eliminate emissions of pollutant gases and particles. (Jacobson)

Keeping these ends in mind, let us now offer ideas on the means to achieve these goals.

## Action in your Own Sphere

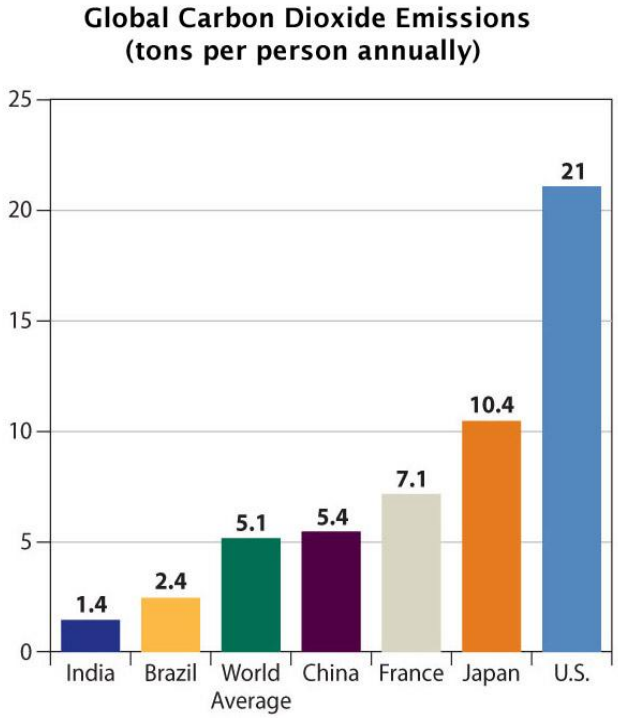
Would a dog trainer have any credibility if he/she did not own a dog? Would you follow someone advocating for reducing carbon emissions if he/she had not taken the lead by actually reducing emissions himself/herself? Leadership by example is something that most veterans can vouch for as being effective, if not essential for success in difficult ventures. This is why we believe we each should be taking ***direct action*** where we control things - in our family 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.

We cannot afford to waste another decade. We have no time to wait for government policies to change. Plus, there is nothing to lose, and everything to gain, if we act wisely.

Technology does not provide the whole answer to our problem. We 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, and monitoring our energy use to assure we are actually achieving the reductions we hoped for.

**Figure 5 - US Emissions Compared Globally**

Source of Illustration*: Cooler/Smarter* p. 8



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 emissions by at least 40% immediately and 70-80% by 2050. These goals come from the hundreds of scientists who contributed to the IPCC reports, and they coincide with the 70-80% reductions that the UCS have advocated for years.

The UCS tells us that we in the USA have a special opportunity, because on average, Americans cause 21 tons of $CO_2$ 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. [14]

## 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. [15]
2. Use a program like the one associated with the *Low Carbon Diet* (Gerson) or Lawrence Livermore Berkley National Laboratory. [16]

For a frame of reference, the "typical" American household emits about 60,000 pounds of $CO_2$ 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

[14] Cooler, Smarter p.8

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

[16] The Carbon Diet 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. The Lawrence Livermore program is more sophisticated and accounts for indirect (what you eat, what you buy) emissions as well.

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 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 $CO_2$, 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,* offer expert insights and options, beginning with an overview of where the average American's emissions come from.

**Figure 6 - Where Average American's Emissions Come From**

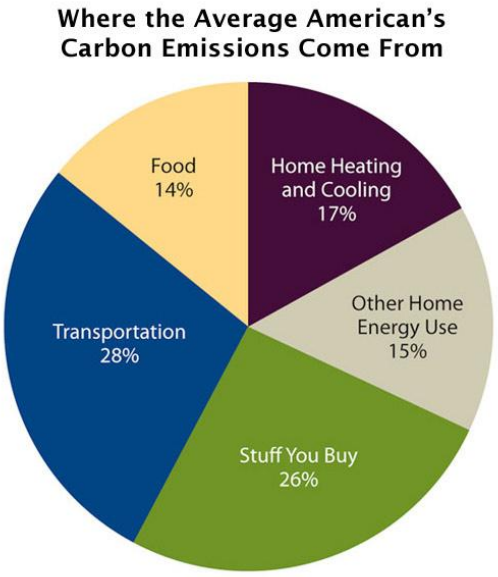



Illustration credit: *Cooler, Smarter* p. 16

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 appliance 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.

Figure 7 - Clean (free) energy made at home


- ***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 avoids 11,000 pounds of emissions annually and pays a 9% return on investment.[17]

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

Again, reducing transportation emissions can be achieve in two ways

- ***Conserve***: Don't drive -take public transit; Replace inefficient vehicles; Reduce long distance travel.

Figure 8 - CO2 Emissions per 100 Passenger Mile

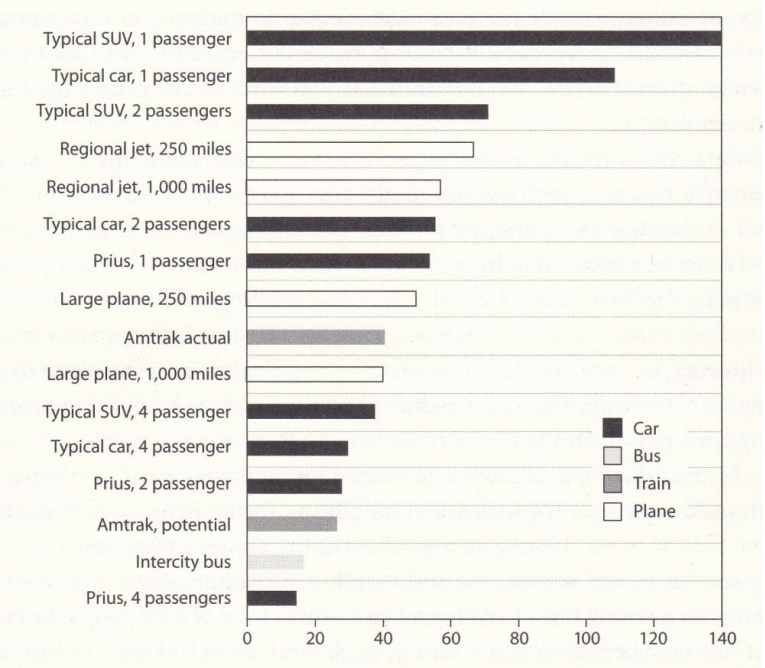



Illustration from: *Cooler, Smarter* p.76

- ***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

[17] 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*.

Vehicles (PHEVs) also reduce greenhouse gases and other emissions, even if the source of electricity is mostly coal. [18]

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.[19]

Avoid vehicles that use combustible renewables, as discussed previously.

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. [20] 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. [21] 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 Eli 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.

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. [22]

---

[18] Union of Concerned Scientists' electric vehicle life cycle analysis.

[19] 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 pound 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 Carbon Diet*.

[20] 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*.

[21] [21] *Hamerschlag,Kari 2011. Meat Eater's Guide to Climate Change and Health.* Environmental Working Group

[22] *Cooler, Smarter* pp. 141-145.

Table 2 - Meat Eater's Guide

| Excerpts from the *Meat Eater's Guide* [23] |
|---|
| • 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.<br>• 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<br>• If your four-person family skips steak once a week, it's like taking your car off the road for nearly three months.<br>• 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. |

**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 $CO_2$ 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. [24]

**Food waste.** 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 a shocking $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. [25] 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. There are three 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 $CO_2$ equivalent does not go to 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

[23] Kari Hamershlag, EWG Senior Analyst and author, *Meat Eater's Guide* pp.12
[24] *Cooler, Smarter* p143.
[25] NRDC food waste handbook. http://www.nrdc.org/food/wastefreekitchen/

change - and yes at the same time feeding us. [26] (3) ***Participate in food recovery programs***. This involves recovering perishable food that would otherwise go to waste donating it to people in need.

**Purchases -** This category includes tangible items like clothes and furniture and services like haircuts and healthcare. About half these emissions associated with these good 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.[27].

**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 $CO_2$ 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.** 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 are 300 times more potent than carbon dioxide!

**Figure 9 - Native Friendly Landscape**


[26] 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.

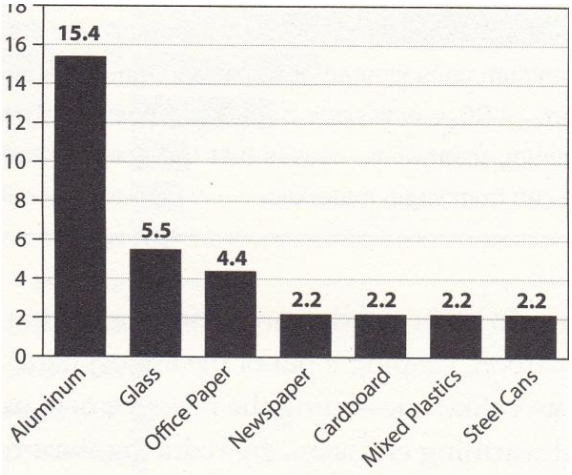
[27] Wood is a low-energy and low-emission material (compared with steel, concrete, plastic and brick) for packaging and building - but only when it is not the cause of deforestation. Buy wood products certified as sustainably grown (FSC -Forest Stewardship Council- Certified wood helps fight illegal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

**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. [28]

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. [29]

The UCS estimates that each pound of waste you recycle keeps more than twice its weight in $CO_2$ equivalent emissions out of the atmosphere. Another benefit of recycling is that it can save money, especially in places with high trash disposal costs. [30]

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




*Each pound of waste you recycle keeps more than twice its weight in $CO_2e$ 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.*

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

## Food System

As discussed earlier in the paper, the Food System accounts for 20-30% of the total GHG emissions in the US. It is imperative that this be reduced by the 70-80% needed to achieve a stable climate.

[28] Cooler, Smarter p. 168
[29] EPA finings published in the journal *Nature Climate Change*. September 21, 2015. See Cooler, Smarter pp. 167-168.
[30] *Cooler Smarter*, P. 166, 167

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 involved in the Food System 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). 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. [31]

While $CO_2$ emissions are the smallest portion of GHGs from the Food System, they need to be curtailed. Peter Lehner of Earth Justice offers these strategies for reducing $CO_2$ 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.

[31] 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.

- Improving ***energy efficiency*** and the use of ***non-emitting energy sources*** in all food system processes.

Nitrous oxide ($N_2O$) and Methane ($CH_4$) are more potent as heat trapping gasses than $CO_2$, and they are the biggest culprits associated with the Food System. We must work to reduce their emission.

Peter Lehner tell us that ***reducing $N_2O$*** 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 $N_2O$:

- ***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 nitorgen 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 $N_2O$ emissions without benefiting the farmer. By understanding this variability, farmers can apply nitrogen more efficiently.
- ***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.

Earth Justice also prescribes specific strategies for ***reducing methane ($CH_4$) 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 $CH_4$ 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 patty irrigation can help too**.** Much rice is grown in flooded fields, and the flooding results in anaerobic conditions that result in $CH_4$ generation. With correct timing of flooding and drainage over the growing season, $CH_4$ emissions can be reduced. [32], [33]

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

## 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 work 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 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.

---

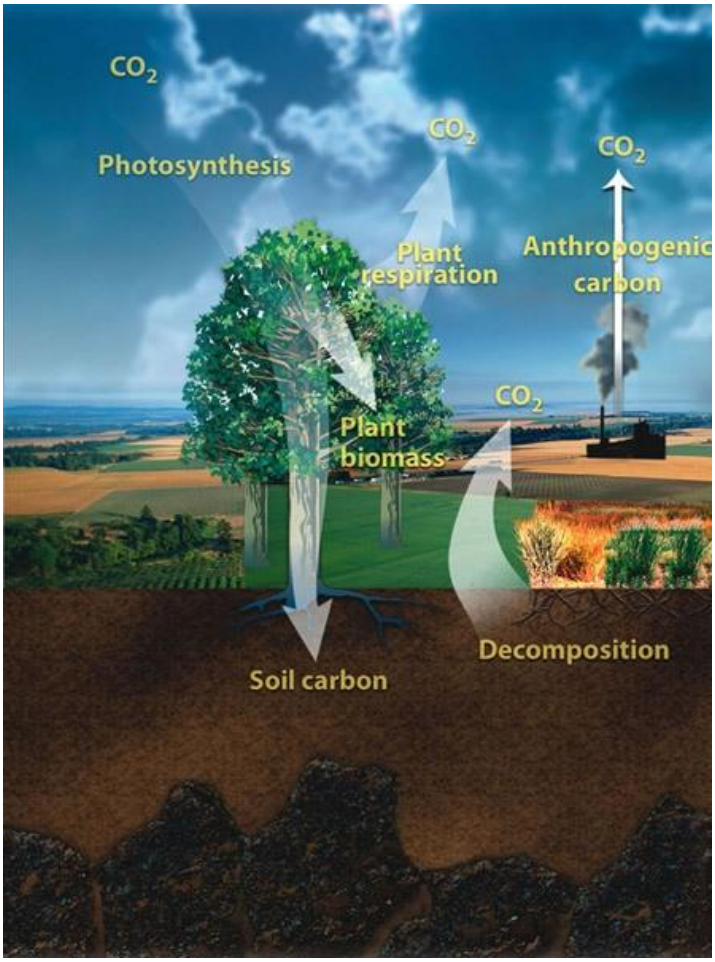
- **Pasture-based beef production.** An important caveat is that there is some evidence that, because pasture can serve as a carbon sink, net emissions from pasture-raised beef production may be lower. This requires further investigation.
- **Reduce antibiotic use:** A recent study also suggested that 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 $CH_4$ 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 $CH^4$ emissions for reuse as fuel.

[33] Peter Lehner presented this analysis to the Citizen's Climate Lobby annual conference in Washington DC June 20, 2016.

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*, 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 an artificial solution to a natural one, from feeding the plants to feeding the soil.

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 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.

**Figure 11 - The Carbon Cycle**




Source: US Department of Energy

At the Paris climate summit in late 2015, the French government launched an international initiative called 4 Pour 1000,[34] which calls on nations to increase soil carbon by 0.4 percent every year. If the entire world got on board, Pollan explains in the video, we could capture and store about three-quarters of our annual GHG emissions (Peoples). [35]

Figure 11 shows the major components of the carbon cycle. Arrows indicate the flow of carbon from one reservoir to another. The sizes of the arrows are approximately proportional to the amount of flow of carbon atoms.[36] As we initially illustrated in Figure 3, there are two sides to the problem. The "up" arrows indicate emissions of carbon into the atmosphere. The "down" arrows indicate the removal of carbon by photosynthesis, and its storage in the soil. ***Excess carbon in the atmosphere is the problem; carbon in the soil is part of the solution.***

If we can reduce our GHG emissions by the 70-80% target, and at the same time remove 75% of what we do emit - we have a great chance to stabilize our climate.

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. It's a double winner- we enrich the soil (more food, water retention, less erosion, etc.) and at the same time remove life threatening $CO_2$ 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.

We can work in our own small yards, 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 [37].

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.

---

[34] Website for4 por 100 is at http://4p1000.org/understand

[35] 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=BxiXJnZraxk

[36] University Corporation for Atmospheric Research (UCAR). http://scied.ucar.edu.

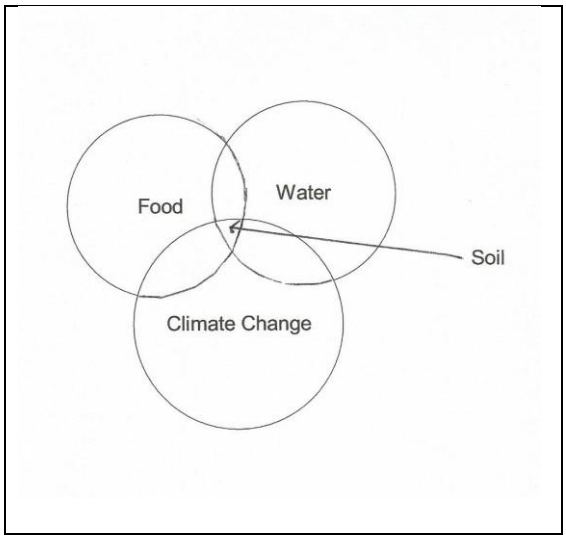
[37] Bob Streitmatter uses lasagna compost in the Luthy Botanical Garden in Peoria (See *The Soil Will Save Us* chapter 8)

## 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.

- **Water >< Food.** 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 too , their residue can run off and poison water supplies.

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




- **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.[38] 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 threaten the re-supply of aquifers and reservoirs
- **Food><Climate Change.** 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.

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

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 feeds us, but take in $CO_2$ 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 emissions electric vehicle) that meets your family's needs offers one of your biggest opportunities to cut emissions.

The ***payback*** mentality, while useful for prioritizing projects, ignores benefits gained after one's investment is recovered. 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 ***return on investment*** (ROI) to aid your decision-making.

### 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.

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.

It is perfectly fitting that periodically (annually perhaps) we would measure our GHG emissions to see if we are indeed achieving the 40% - 80% reductions we are striving for. 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.

## 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.

Figure 13 - Repentance and Redemption by Carbon Offset


In terms of our up/down model (Figure 3), we sin on the left side of the diagram 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. [39]

## 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 near term goal of 40% - 50% reductions and 70% - 80% in the long term if we calculate what we emit in GHGs and then adapt our lifestyles and behaviors to drastically reduce - if not 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.

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

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 $N_2O$ 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 doing -if you choose your investments wisely, and you follow up to assure success.

## Action to Influence Others

Looking ahead: What we do as individuals is the first step. However, until we have a universal movement with ***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."[40] 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. Here we will present some ideas for how to expand our influence to others.

### *Motivation and Interests*

Until folks are moved to take action, all our good thoughts and ideas are for naught.

Many "normal" people need to be motivated extrinsically, nudged into action by external rewards and/ or threat of punishment for not adapting a certain behavior. Some refer to this as the *Carrot and Stick* strategy for behavior modification. Someone who would trade in his/her Hummer for a Prius, after

[40] Shulman, et al. *Cooler, Smarter*. pp 184

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.

You can get the idea of what we want to do - to provide the information people can use to become intrinsically motivated or to get onboard because we help them to see it is in their own best interest to adapt to low carbon behavior.

## Resistance from Special Interests

We must Inform and influence others if we are to succeed. As one economist wrote, "All that stands in the way of saving the planet is a combination of ignorance, prejudice and vested interests."[41]

Perhaps the largest challenge will be 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 the big oil and gas companies, and utilities who have had their way for decades. How 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. Special interests 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 counter climate change action.

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 Pubic Service Commission, where there is a history of commissioners and top staffers siding with the industry and magically winding up with lucrative utility 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. 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. The documentary film *Merchants of Doubt* explains how 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. The film tells the story of how a loose-knit group of high-level scientists and scientific advisers, with deep connections in politics and industry, ran

[41] Paul Krugman writing in the June 5, 2014 *NY Times*, The Climate Domino. pp. A23. https://www.nytimes.com/2014/06/06/opinion/krugman-the-climate-domino.html.

effective campaigns to mislead the public and deny well-established scientific knowledge. 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.

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? We avoid giving credence to the denier's narrative by not offering him a debate.

## *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.

**Figure 14 - Maslow's Hierarchy of Needs**

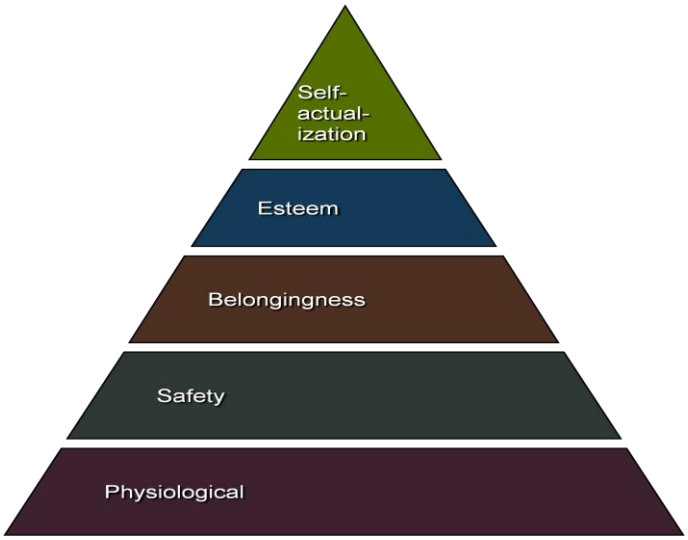



Illustration courtesy of McShane & Von Glinow,
*Organizational Behavior*

On one hand we might think that a good scare could move people to act. Indeed, behavioral theory teaches us that people are motivated most by the most basic of human needs.[42] 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.***

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 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.

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. [43]

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 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

[42] Abraham Maslow, a mid 20th century psychologist, introduced this idea which remains very popular in sociology, management, and psychology.
[43] *Cooler, Smarter* p. 183

- 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) technologies[44]

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.

## *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. [45]

### Where to start?

The UCS provides us with ideas on how to take the initiative and follow through to assure 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?

[44] This list is verbatim from Ask the Experts on page 182, Cooler, Smarter.

[45] 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)

- **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? [46]

***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 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. Bacons Furniture in Port Charlotte, Florida used an energy audit to make decisions that saved the company $40,000 annually.[47]

***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.[48] 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 learning 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. [49]

Other incentives can be put in place to reinforce green behavior. For example, give the best parking spots to the most efficient cars. 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, lets transition to the community and bring our vision to our local area.

---

[46] Thinking Thru Your Organization's Environmental Practices, *Cooler/Smarter* p. 201
[47] Reilly, Steve. "Energy Audit Pays Dividends" *Charlotte Sun* October 29, 2016
[48] More information on LEED is available from the non-profit US Green Building Council (www.usgbc.org)
[49] *Cooler/Smarter* p.204

### *Community*

About 200 towns, cities and counties around the world have reached out to learn how the villagers of Ashton Hayes, England have achieve 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." [50]

Home owner's and condo associations are groups that can promote similar actions. Consider the financial and ecological benefits of making your communities carbon neutral. 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 the Ashton Hayes.

### *Divesting.*

Many Americans are enabling the status quo by virtue of their investment portfolios. 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 probably an owner of major carbon emitters, and you are part of the problem. 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***. Why not help stabilize the climate and make a return on their investments along the way?

### *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 and re-forestation. We can do it if we enlighten those 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

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

urgent and timely action is needed (40-50% emissions reduction before 2025 is MAJOR), 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) 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.[51]

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 letter have more impact. The large

[51] Shulman, et al. *Cooler, Smarter*. pp. 215, 216

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, Face book, 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.[52]

## Local Government

The City of Saint Petersburg in Florida has voted to ***move towards 100 percent non-emitting energy.*** They plan to make the needed investment using funds received from BP's settlement of the 2010 Deepwater Horizon oil spill.

Sun Coast Sierra Club is the grassroots environment group working with the city on the project. Executive Director Michael Brune said this:

> The movement for clean energy in cities and towns across the country is now more important than ever. Saint Petersburg joins 19 other cities from San Diego, California to Greensburg, Kansas that will lead the way to support equitable and inclusive communities built on 100% clean, renewable energy for all. 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. [53]

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

---

[52] Shulman, et al. *Cooler, Smarter*. pp. 230-234

[53] 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

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 idea. 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 atmosphere. Native landscapes also require less irrigation, saving precious water supplies.

## State Government

According to the UCS it is essential that we require electric utilities to generate a **certain percentage of their power from non-emitting sources** by specific dates. To meet the goals needed for a stable climate, state goals should be:

- 50% from non- emitting sources by 2025
- 80% by 2050

It's becoming clear that such a shift in energy sources can lead to economic benefits. Writing in *The Atlantic*, Ronald Brownstein reported that several states (California, New York, Oregon, Vermont, and Hawaii) are leading the way with landmark requirements that their utilities generate fully half their power from non-emitting sources in the near term. "There is a strong trend toward strengthening portfolio standards," said Jocelyn Durkay, an energy specialist at the National Conference of State Legislatures. Policy makers are seeing the economic benefits (jobs, investment profits) provided by the growing non-emitting energy industry.

State Government should encourage **Conservation and Virtual Net Metering.** 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.

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 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 to ***Virtual*** (or group or neighborhood) ***Net Metering***. This 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 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 80% emission reductions.[54]

## 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."

*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.[55]

**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. 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 vehciles 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

[54] 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.
[55] For access to the Move To Amend Coalition, goo to https://movetoamend.org/motion.

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 $CO_2$, 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 $CO_2$ 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 i***f 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.[56]

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.

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

## 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.

## 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*, E*nvironmental 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 headline. Unfortunately, much if not all of this crap is unsubstantiated and otherwise untrue. The next time you get ridiculous a forwarded email (i.e. "Harvard report says global warming hoax was invented in the Bronx in 1988"), reply 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 Members of 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.[57]

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)[58]

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

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.

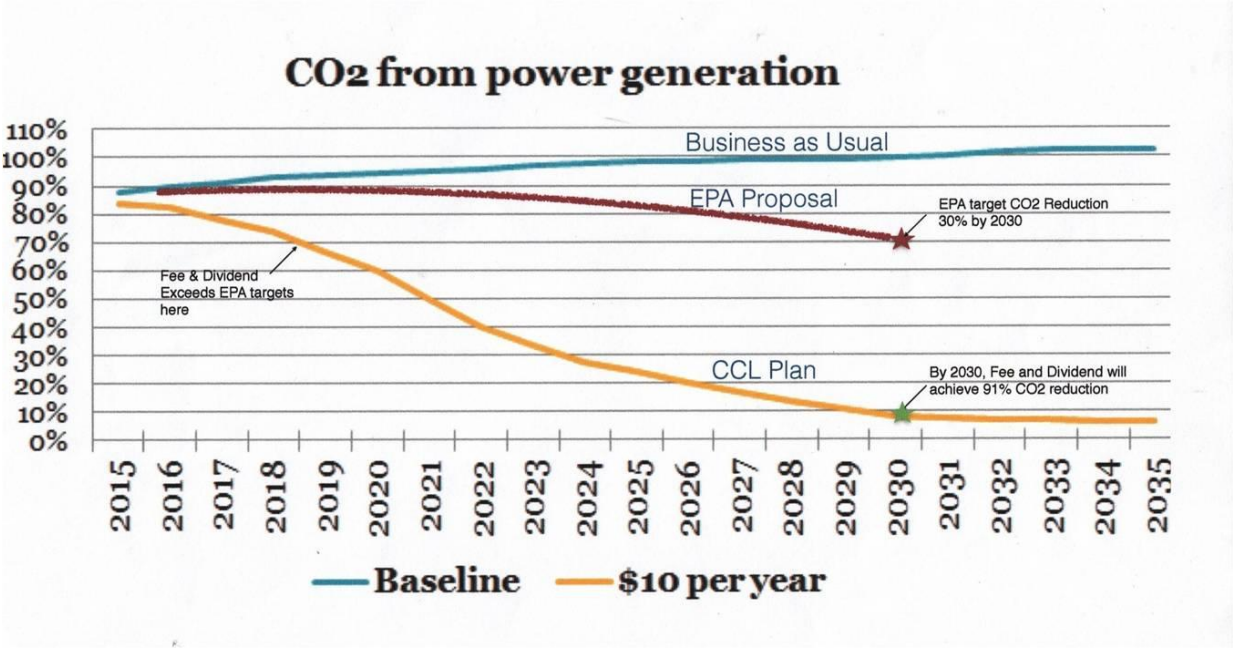
We can see that President Obama's energy policies achieve a 30% reduction by 2030. This is not enough. We need more reduction than the Paris talks agreed to.

Meanwhile, Carbon Fee and Dividend achieves a 90 percent reduction in emissions by 2030, along with the economic benefits of increased jobs and a healthier GDP. Citizens' Climate Lobby is on the right

[57] Details of Carbon Fee and Dividend can be seen at http://citizensclimatelobby.org/basics-carbon-fee-dividend/
[58] The REMI report is available at http://citizensclimatelobby.org/remi-report/

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.

**Figure 15 - Comparing Results - regulation vs. incentives**




(Source: REMI report)

## 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 state energy portfolios, 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 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

Time is running out; the situation is urgent. 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 heat waves, droughts and floods; and a large-scale extinction of plants and animals. National security will be at risk due to massive refuge movements.

There is ***reason for hope***. We have 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. It starts with understanding ***the problem.*** Armed with an understanding of the problem, owe 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 to mitigate climate change.

The Chairman of the UN IPCC uses a quote from Lao Tsu to make clear the consequences of our choices. "If you do not change direction, you will likely end up where you are headed." Let's get started, now. We cannot afford to lose any more time.

# References


Alvareza, Ramón, Stephen W. Pacalab, James J. Winebrakec, William L. Chameidesd, and Steven P. Hamburg. 2012. “Greater focus needed on methane leakage from natural gas infrastructure”. *Proceedings of the National Academy of Sciences*, vol. 109 (17). pps 6435-6440.

Biello, David. 2016. U.S. Agriculture Secretary Thinks Farmers Can Help Solve Global Warming. *Scientific American.* http://www.scientificamerican.com/climate

Brownstein, Ronald. 2016. "The Winds are Changing for Renewable Energy." *The Atlantic*. July 7. http://www.theatlantic.com/politics/archive/2016/07/are-the-winds-changing-for-renewable-energy/490250/=56

Citizens Climate Lobby, 2014. Revenue Neutral Carbon Tax. http://citizensclimatelobby.org/carbon-tax/

Cook, John 2015. *The Five Telltale Techniques of Climate Change Denial.* CNN Opinion (see Http://www.cnn.com/2015/07/22/opinions/cook-techniques-climate-change-denial/). Exertp it provided in the appendix.

CNA 2014. *National Security and the Accelerating Risks of Climate Change*. CNA Corporation. May

Davenport, Coral. 2014. "Keystone Pipeline May be Big, but This is Bigger." *New York Times*. April 22.

Davenport, Coral. 2014. "Climate Change Deemed Growing Security Threat by Military Researchers." *New York Times*. May 14.

Editorial Board, 2014. "Running Out of Time," *NY Times* April. 21.

Encyclical Letter, LAUDATO SI of the Holy Father Francis on the Care for Our Common Home, May 2015.

Energy Information Agency:

- How much carbon dioxide is produced per kilowatt-hour when generating electricity with fossil fuels? http://www.eia.gov/tools/faqs/faq.cfm?id=74&t=11
- Emissions factors for various fuels: http://www.eia.gov/oiaf/1605/coefficients.html#tbl2

EPA. 2016. U.S. Greenhouse Gas Inventory Report: 1990-2014, available at https://www3.epa.gov/climatechange/ghgemissions/usinventoryreport.html

Folger, Tim, 2013, “Rising Seas,” *National Geographic*, September

Gillis, Justin. 2014. "Scientists Sound Alarm on Climate." *New York Times* March 18.

Gillis, Justin. 2014. "As Governments Lag in Climate Change Efforts, Some Companies Step Up." *New York Times* September 24.

Gershon, David. 2006. *Low Carbon Diet: A 30 Day program to lose 5,000 pounds*. Empowerment Institute.

Gillis, Justin 2014. "Panel’s Warning on Climate Risk: Worst Is Yet to Come." *NY Times* March 31.

Greenfieldboyce, Neil. 2014. *Climate Change Adjustments Must Be Fast And Major, U.N. Panel Says*, NPR broadcast, April 13.

Hagel, Chuck. 2014. 2014 *Quadrennial Defense Review*. Secretary of Defense. March 4.

Hamerschlag, Kari 2011. *Meat Eater's Guide to Climate Change and Health.* Environmental Working Group. http://www.ewg.org/meateatersguide/a-meat-eaters-guide-to-climate-change-health-what-you-eat-matters/

Hansen, James. 2009 *Storms of My Grandchildren: The Truth About the Coming Climate Catastrophe and Our Last Chance to Save Humanity.* Bloomsbury, New York

Howarth, Robert W, Renee Santoro and Anthony Ingraffea. 2012 "Venting and leaking of methane from shale gas development. *Climatic Change*. DOI 10.1007/s10584-012-0401-0.

Hsu, Shi-Ling. 2011 *The Case for a Carbon Tax: Getting Past Our Hang-ups to Effective Climate Policy.* Island Press. Washington

Jacobson, Mark. 2016. Stanford University. Repowering 100% of all Energy in the United States and the World for 100% of the People at Low Cost With Clean and Renewable Wind, Water, and Sunlight (WWS). Available at http://web.stanford.edu/group/efmh/jacobson/Articles/I/16-10-31-SummaryRoadmaps.pdf

Keller, William (Coty) . 2013. "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.sjcny.edu/~keller/ecology/40,000%20carbon%20diet.pdf

Klein, Naomi. 2015. *This Changes Everything-Capitalism vs. The Climate.* Vintage Canada.

Kolbert, Elizabeth. 2014 *The Sixth Extinction: An Unnatural History.* Henry Holt and Company, New York.

Krugman, Paul. 2014. "Salvation Gets Cheap. " *New York Times,* April 18. pp. A23

Krugman, Paul, 2014. "The Climate Domino." *New York Times*, June 5 pp. A23

*Lawrence Berkeley National Laboratory Footprint Counter:* http://coolclimate.berkeley.edu/carboncalculator

Lehner, Peter. 2016 *Cows, Corn, and Climate: It's More Than Just Carbon.* Presentation to Citizens' Climate Lobby annual conference. June 20.

Lynas, Mark. 2007. *Six Degrees: Our Future on a Hotter Planet*. Fourth Estate, Great Britain.

Mankiw, N. Gregory. 2013. "A Carbon Tax That America Could Live With." *NY Times*. August 31.

Maslow, A. H. 1954 *Motivation and Personality*. Harper.

McKibben, Bill. 2010 *Earth: Making a Life on a Tough New Planet*. Times Books, Henry Holt and Company

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

Mullen, Admiral Michael G. 2011. National Military Strategy of the United States of America, February

Muro, Mark and Devashree Saha. 2016. Rooftop solar: Net metering is a net benefit. *Brookings Advanced Industries Series.* http://www.brookings.edu/research/papers/2016/05/23-rooftop-solar-net-metering-muro-saha.

National Audubon Society. 2015. *Audubon’s Birds and Climate Change Report: A Primer for Practitioners*. National Audubon Society, New York.

National Resources Defense Council (NRDC) food waste handbook: http://www.nrdc.org/food/wastefreekitchen/

New York Times Interactive Map. See what will become submerged if we get 5 feet (expected this century for sure no matter how quickly we cut pollution), 12’ and 25’ sea level increases. http://www.nytimes.com/interactive/2012/11/24/opinion/sunday/what-could-disappear.html?ref=sunday

Ohlson, Kristin 2014. *The Soil Will Save Us: How Scientists, Farmers, and Foodies Are Healing the Soil to Save the Planet*. Rodale Books.

Oppenheimer, Michael and Robert H. Boyle. 1990. *Dead Heat: The Race Against the Greenhouse Effect.* Basic Books, Inc., New York

Parker, Laura 2013 "Treading Water," *National Geographic* February p.107-125

Pearce, Fred. 2007. *With Speed and Violence: Why Scientists Fear Tipping Points in Climate Change*. Beacon Press. Boston

Peoples, Lynne 2014. 2015. *A Weapon Against Climate Change May Be Right Under Our Feet Healthy soil may play a huge role in mitigating global warming and helping us adapt to it. Huffington Post* ,December 12. (http://www.huffingtonpost.com/entry/soil-climate-change_us_567217e3e4b0648fe3023ad0?utm_campaign=email&utm_medium=linknews3&utm_source=newsletter)

Pollan, Michael. 2015. Video *Soil Solutions to Climate Problems.* Center for Food Safety (https://youtu.be/NxqBzrx9yIE)

Porter, Eduardo 2014. *Benefits of Easing Carbon Emissions*. *NY Times* September 24. pp. B1.

Reilly, Steve. 2016. "Energy audit pays dividends." *Charlotte Sun*. October 29.

Regional Economic Models, Inc. (REMI) and Synapse Energyonomics, Inc. (Synapse). 2014. *The Economic, Climate, Fiscal, Power, and Demographic Impact of a National Fee-and-Dividend Carbon Tax*. June 9. Washington, D.C.

Ruckelshaus, William D and William K. Reilly 2016 *Why Obama Is Right on Clean Energy*, *NY Times* September 25.

Schlossberg, Tatiana. 2016. "English Village Leads a Climate Revolution." *NY Times* August 21, A1,7

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

Siegel, A. 2013. *Admiral Calls Climate Change Top Security Issue. Daily Kos*, March 9. (http://www.dailykos.com/story/2013/03/09/1192924/-Admiral-calls-Climate-Change-top-security-issue )

Schlossberg, Tattiana 2016. "English Village Becomes Climate Leader by Quietly Cleaning Up Its Own Patch". *New York Times*. August 27.

Strauss, Benjamin and Robert Kopp, 2012. "Rising Seas, Vanishing Coastlines, " *NY Times* November 24

Sustainable World Media, 2014. *The Soil Solution to Climate Change Film* explains 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=BxiXJnZraxk.

Toensmeier, Eric, 2016. *The Carbon Farming Solution: A Global Toolkit of Perennial Crops and Regenerative Agriculture Practices for Climate Change Mitigation and Food Security.* Chelsea Green Publishing.

Toledo, Miramar. 2016. "St. Pete will be the first city in Florida to use 100 percent renewable energy." *Orlando Weekly*, Nov 23. http://www.orlandoweekly.com/Blogs/archives/2016/11/23/st-pete-will-be-the-first-city-in-florida-to-use-100-percent-renewable-energy

Union of Concerned Scientists, *Solutions for Global Warming*. http://www.ucsusa.org/global_warming/solutions/

United Nations/IPCC, 2014. *Report of the Intergovernmental Panel on Climate Change* (IPCC) http://www.ipcc-wg2.gov/AR5/

# 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.

**Contact Information:**

100 Wallace Ave
Suite 240
Sarasota, FL 34237

941-349-5131
flveterans@aol.com

http://floridaveteransforcommonsense.org/

## 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 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 in 2015 and has shifted the focus of his professional efforts to ecological matters. This includes being co-leader of a local chapter of Citizens' Climate Lobby and 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.


FLORIDA VETERANS
For Common Sense

# 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 are 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.