

Climate, Energy and Community: Vermont 2015

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This is a compilation of my 2015 Weekly Planet columns from the Sunday Rutland Herald and Barre/Montpelier Time Argus. This series started seven years ago in January 2008; and an overview paper is available¹. These columns go through the seasons, dealing with weather, climate, climate change, energy and policy issues. They blend science and opinion with a systems perspective, and encourage the reader to explore alternative and hopeful paths for themselves, their families and society. They are written so that a scientist will perceive them as accurate (although simplified); while the public can relate their tangible experience of weather and climate to the much less tangible issues of climate change, energy policy and strategies for living sustainably with the earth system.

I believe that earth scientists have a responsibility to communicate clearly and directly to the public² –as we all share responsibility for the future of the Earth. We must deepen our collective understanding, so we can make a collective decision to create a resilient future.

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¹ **Betts, A.K. and E. Gibson (2012)**, Environmental journalism revisited. *Environmental Leadership: a Reference Handbook*. Deborah R. Gallagher, Editor, SAGE publications Inc., Sept. 2012, ISBN: 9781412981507. Available at <http://alanbetts.com/research/paper/environmental-journalism-revisited/#abstract>

² **Betts, A. K. (2011)**, Communicating Climate Science. *EOS Transactions*, 92, No. 24, 14 June 2011. Available at <http://alanbetts.com/research/paper/communicating-climate-science/#abstract>

a) The transformation ahead**(January 25, 2015)**<http://rutlandherald.com/article/20150125/OPINION06/701259897>

Seven years have passed since I wrote the first Weekly Planet column — nostalgic readers can download annual collections from alanbetts.com, and read them to their families. Vermont has started the move away from fossil fuels, but for the U.S. and the planet as a whole, the transformation has been far too slow for a soft landing.

The latest research confirms that to have a fair chance of keeping global warming below 3.8 degrees Fahrenheit this century, we will have to leave a third of the oil, half the gas and more than 80 percent of the coal reserves in the ground — where they have been safe for several hundred million years. It is time to stop developing new fossil fuel reserves. This is disturbing news to an economic system that sees fossil fuels as simply wealth to be exploited now, deferring the staggering climate costs to the future.

We know why we are in this predicament. Our economic system idolizes consumerism, corporate interests and deregulation and markets cheap goods by externalizing the costs. The costs include economic injustice for the majority now, and ongoing climate change that will inflict suffering on the Earth's children and grandchildren.

Many politicians pander to historic myths and claim that because they do not understand the complexities of climate science, climate change can be ignored. Rich donors and businesses ply them with silence money. So it is we, the people, who must overcome this inertia and consciously choose to build a new economic system: one based on community solutions, regulation of our waste streams, reduced consumption and an escalating carbon tax to redirect the economy.

Meanwhile, the climate system continues to change in unexpected ways, bringing more extreme weather. This year we also learned how, as the ocean warms, the Antarctic ice sheets have become unstable and face collapse in a few centuries. Sea level rise from this ice melt seems to be doubling every 10 years. But as long as our economic models foolishly discount the future, who will care?

I take stock in January. The vegetable garden, fed by years of compost, was prolific last summer, so we have a winter supply of butternut squash, potatoes and garlic. The Brussels sprouts, kale, parsley and sage lasted into January. These greens I had to pick when temperature started to drop below 15 degrees in December and store on an insulated but unheated porch.

But the biggest delight was also eating local salads into January. Late frosts meant we had our own lettuce and arugula till Thanksgiving, and a mix of volunteer tomatoes, sprouting from the compost, set fruit very late. The last of these tomatoes ripened inside in the first week of January, and we made salads with endive and fresh spinach from the farmers market, grown under cover. Protected by glass, my own spring spinach and lettuce is up and waiting patiently for the warmth

of spring.

The early snows melted in late December, and so far our lowest January temperature in Pittsford has been minus 15 degrees: chilly but far warmer than in decades past. When the snow on south-facing slopes melted, I could carry wood uphill out of the woods and start splitting for next winter. I need the aerobic exercise.

Here in Vermont the governor calls for cleaning up Lake Champlain and accelerating the shift in our energy system away from fossil fuels. These are noble goals that require a shift in consciousness as well as in our economic models. The first goal requires new awareness from everyone living in the Lake Champlain watershed: a conscious realization that trash and waste streams from our thoughtless lives, our farms and urban land, all flow downstream into the lake. The second is even broader, for we must grasp that we humans are just one part of a rich and complex living Earth with interdependencies we have still to fathom.

So this morning, wrapped in a down jacket, I looked at the brilliant reflection of the rising sun on the frozen lake that is the floodplain of the Otter Creek, salvaged a few empty beer cans, and then returned to stoke the woodstove for another day.

b) Working with the Earth**(March 15, 2015)**

<http://rutlandherald.com/article/20150315/OPINION06/703159979>

This winter the eastern United States and Canada have had below-normal temperatures and above-normal snow cover. These go together: snow reflects sunlight and can lock in cold temperatures. In the fall the warmer Great Lakes produced many lake-effect storms, and in the past 2 months, there have been many powerful coastal snowstorms developing over the warmer Gulf-Stream. As the oceans warm, evaporation increases, storms get stronger and dump more snow.

It has been chilly here, but almost everywhere else in the northern hemisphere, from the western US to Eurasia, there were record high temperatures in January. California saw the warmest three-months on record for November to January. I heard the grizzly bears in Yellowstone were coming out of hibernation early!

On a global scale the Earth set a new global temperature record in 2014, and this continued into January. But it is stationary weather patterns that again are giving us these extremes. After two cold snowy winters in New England, we have probably forgotten the winter of 2011-2012 when we were locked into the opposite warm pattern with very little snow.

We have wasted the past 20 years. Instead of drafting binding international agreements to reduce carbon pollution, we constructed a binding but amoral global market, based on minimizing costs and maximizing profit. It was designed to make cheaper goods for us, but it has dumped staggering pollution into the atmosphere in Asia, where the primary energy source was burning coal.

We know technically what to do to slow the march of climate change: use energy more efficiently and shift to renewable sources. The latest dimmable LED lights still give me a thrill with their clear light and low energy use. Thanks to Efficiency Vermont they are cheap in the hardware store. Technically we know what to do, but ethically and morally we are lost souls.

The latest research confirms that to have a fair chance of keeping the average global warming below about 4 degrees Fahrenheit this century, we will have to leave a third of the oil, half the gas and more than 80 percent of the coal reserves in the ground. So it's clearly time to stop developing new fossil fuel reserves. This is disturbing news to an economic system that sees fossil fuels as simply wealth to be exploited now, deferring the staggering climate costs into the future. This is why we need a pollution tax on burning fossil carbon.

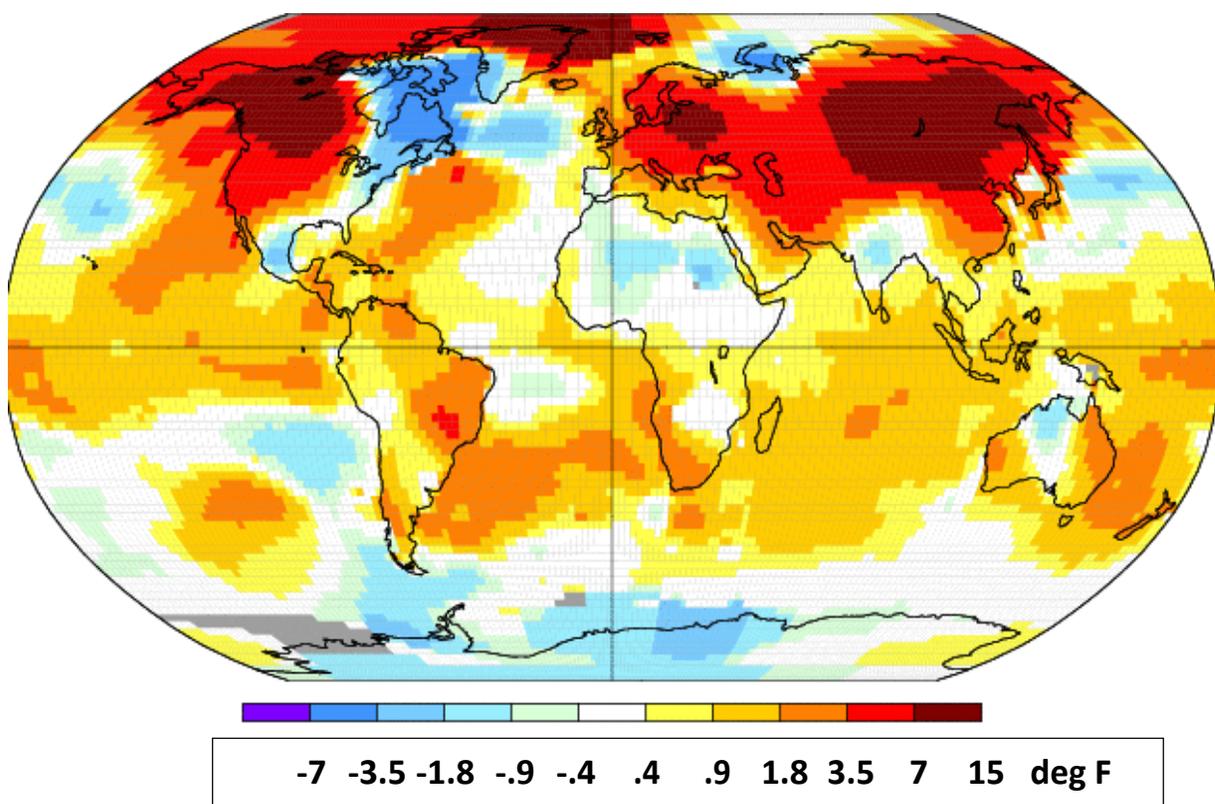
Earlier this year, Pope Francis quoted an old farmer as saying: "God always forgives, humans rarely forgive, but nature never forgives". At first I thought this was a little harsh, so I checked the source.

The farmer was referring to the exploitation of the land by monoculture until the soil has lost its vitality. Fair enough: if we don't stop burning fossil carbon, than nature, as well as human conflict, will crush our economic system with overwhelming costs. The Earth simply responds to our thoughtless exploitation with melting polar ice, rising seas, intensifying storms and extreme weather.

But what happens when we change direction and start to work with the Earth; as when a farmer diversifies into organic agriculture and the soil is rejuvenated. The Earth heals, and we are healed also; so in this sense we may be forgiven. But to change direction we must repent of our old ways.

This is the great moral challenge we face this century: understanding and reconnecting to the Earth. We tried to suppress the wisdom of the indigenous peoples who had a spiritual connection to the land. Little did we realize that a century later, this wisdom would be central to our survival as a species, and a profound source of hope.

January 2015 Temperature Anomaly (deg F) from 1951-1980 (NASA)



c) Late spring after extreme winter

(May 3, 2015)

<http://rutlandherald.com/article/20150503/OPINION06/705039969>

As I write in late April, the daffodils are finally in bloom in Pittsford. This was one full month later than in 2012, when the US had an extremely warm winter and spring; while central Europe had a cold snowy winter. The Otter Creek is in flood after snow melt, and on my morning walk I get to admire the beauty of sky, clouds and hills reflected in the still waters of the flood plain.

The spinach and lettuce that I planted in the fall survived the long winter under a sheet of glass and a foot of snow, and the spinach is ready to eat. I have been planting peas and transplanting lettuce seedlings all week.

This winter the northern hemisphere weather pattern was frozen in place throughout January, February and March. Temperatures were colder than normal across eastern Canada and the US, but there were record high temperatures in western North America and across the whole of Eurasia. This was yet another example of a remarkably stationary weather pattern giving winter extremes across the whole northern hemisphere. Yet the global mean surface temperature for the first three months of this year reached an all-time high.

The waters of the Gulf Stream and Atlantic were also warmer than usual. The large gradient of temperature between the cold continent and the warm ocean generated many strong coastal storms. In Boston, 9 feet of winter snowfall, 5 feet in February, set a new record. As lakes and oceans get warmer, the increased evaporation is likely to give us more winter snow downstream of the Great Lakes in December, and along the East Coast in winter.



Figure 1. A woman navigates high snowbanks and deep puddles in the Chinatown neighborhood of Boston in early March. Boston received a record 5 feet of snow in February, 9 feet for the winter.

But on the West Coast, California had record winter temperatures. The spring snowpack in the mountains was at a record low, so after four years of drought, the state has introduced mandatory reductions in water use for the first time.

We are lucky that Vermont has had above average rainfall in nine of the last 10 years. This spring the Vermont Legislature is expected to pass clean water legislation to manage the stormwater runoff of nutrients from urban and agricultural land. This will reduce the pollution of Lake Champlain that leads to blooms of toxic algae.

In April, I was in Quebec City to speak to the Green Churches of Canada, an ecumenical gathering of Catholic, Protestant and Orthodox religious leaders as well as First Nation representatives. They understand that our changing climate is now a great moral challenge. The exploitation of the earth for short-term economic gain impoverishes many now. The suffering for future generations and the Earth itself could become overwhelming unless we change direction soon.

This summer, Pope Francis will issue the first papal encyclical on the environment, climate change and our care of the creation. This will map out how everything is now interconnected: the exploitation of both the poor and the Earth by our economic system and how our present choices will determine the future for our children and the Earth's ecosystems on which we depend.

In December, the next climate meeting will convene in Paris to review the commitments that the nations of the world are willing to make to reduce greenhouse gas emissions over the next decade. Let us hope they are courageous commitments, as the Earth will remember for more than a century our reluctance to change direction away from an economy based on fossil fuels.

It is tragic that so many politicians would sacrifice the Earth's climate, on which so much life depends, rather than make modest changes to our economic system by introducing a carbon pollution tax to start paying for the long-term costs of increasing greenhouse gas emissions.

d) Reality and Fantasy diverge**(June 21, 2015)**

<http://rutlandherald.com/article/20150621/OPINION06/706219969>

The first three months of 2015 were the warmest on record for seven Western states and the coldest on record for New York and Vermont. Here the transition from winter to spring at the end of April was so fast that there was only a few weeks between the last ice melting and afternoon temperatures of 80 degrees.

Despite the lying snow, the first four months of the year were rather dry in Vermont. But we have had more than ten inches of rain since the 10th of May, so both vegetables and weeds are growing well in our garden.

This spring the bloom of the locust trees was the most amazing I have ever seen. At the end of May the tall trees glistened white in the sun and their scent lasted for days.

So far 2015 is the warmest year on record for the globe, and extremes of weather continue. Ahead of the monsoon rains in India, temperatures near 120 degrees melted roads, and killed more than a thousand people.

Rainfall in Texas and Oklahoma in May set new records. Indeed the very heavy rain across Texas created major flooding and brought an end to several years of drought. Texas is one of a dozen states without official plans to deal with water extremes in a changing climate, because the governor does not 'believe' in climate change. This clash between belief and reality is one of the things to watch as we move into a new election cycle.

What a delight to have a Vermont presidential candidate, Senator Bernie Sanders, who can clearly state issues that most politicians avoid discussing. A candidate who stands for the American people, not the wealthy. One who understands the costs of our global economic system for people, as well as for the Earth and its climate.

Meanwhile, Congress is upset that the U.S. weather forecasts are not the world's best. Yet Congress has starved the National Oceanic and Atmospheric Administration of funds to meet its mission for decades! In recent years, Congress has pressured NOAA to shift money from climate research to improve short term forecasts of severe weather. Congress has refused to let NOAA set up a climate service, and tried to prevent research on how climate change is increasing severe weather.

Do they think that weather and climate can be disconnected by political edict? Perhaps this election cycle they will all stand and chant "We are not climate scientists or meteorologists. Please don't blame us for the weather."

Last month, the chair of the House Science, Space, and Technology Committee, a senator from Texas, made the real priorities of Congress clear. He argued to reduce the National Science Foundation funding in the climate sciences, but continue to fund "the hard science areas of

geoscience, like deep ocean drilling and geological research to find new energy sources.” Readers will recognize the familiar argument: “We can drill our way to a prosperous future”.

This month one presidential candidate, a devout Catholic, said that Pope Francis should stick to moral issues, and leave climate science to climate scientists. This is a strange argument because his political party refuses to listen to climate scientists. And the pope, before he entered seminary, had better training in scientific methods than most politicians. The papal encyclical released this week, which casts the mistreatment of both the poor and the Earth, our common home, in moral terms, is a thorny challenge to congressional arrogance.

The refrain that comes to my mind is “when will they ever learn”. Finding and burning still more fossil fuels will push the Earth back to the high atmospheric carbon dioxide levels of the hot-house climate of the Carboniferous Era. This will in time drown the foolishness in the nation’s capital.

But it is time to go to the garden and pick some broccoli and peas for dinner.

e) Caring for our Common Home**(August 16, 2015)**<http://rutlandherald.com/article/20150816/OPINION06/708169965>

This year continues to be the warmest on record. Wild fires have been burning on the west coast after a warm dry winter and years of drought in California. Here in Vermont, my garden has dried out after a wet spring, and it was a bumper year for raspberries. I finally have the weeds under control, and I have replanted lettuce, peas, and spinach in the hope of a fall crop.

The severe storms that have caused damage and flooding across Vermont and New Hampshire blew down a couple of trees that I cut up for the winter. Tropical storm Irene severely eroded the small valley by our house and with continuing heavy rain it will not recover. The roots of many trees have been undercut and the trees are leaning, waiting to fall in storms.

All summer I have been reflecting on the recent papal encyclical on our responsibility to care for our common home, the Earth. It is a remarkable and sweeping document that addresses the deep interconnected issues that face humanity. It gracefully embraces the 21st century, accepts scientific reality, and maps out the social, economic, political, moral and spiritual challenges that need to be addressed to care for the planet and to care for the poor. It recognizes that the exploitation of the Earth and the poor by the rich nations are both driven by the amoral materialistic market system, linked to the skillful manipulation of our selfishness. It is a message no one wants to hear and discuss, and one that is heresy to Congress.

It is thorough and beautifully written, but it is too long and deep for the media to deal with. Indeed sheltered North American audiences will find a few sections hard to grasp, because they address issues that have been hidden from them. It correctly suggests that it is an anthropocentric fantasy that technology can remold our planet to serve the interests of the rich and powerful and the global market.

It starts with an appeal to humanity to protect our common home, calling for a sincere dialog about how we are shaping the future of the Earth. It recognizes that irrational confidence in progress and human abilities has led to critical environmental issues that we can no longer sweep under the carpet. It maps out from a scientific perspective the issues of pollution of air and water, climate as a common good, shrinking fresh water supplies, the loss of biodiversity, the decline in the quality of human life, the breakdown of society and global inequity. You know all these issues, but you should read this first chapter for its breadth and global clarity.

It asks why we have chosen this path, and why we, and those with economic and political power, cannot hear the cry of the Earth and the cry of the poor.

Skipping for this audience the second chapter on the gospel of creation, the third chapter addresses the human roots of the ecological crisis: the role of technology, creativity and power and its globalization. How the rise of modern anthropocentrism has led us to prize our technology so highly that we ignore the reality of the damage to the natural world and to global society.

The fourth chapter introduces integral ecology: the understanding that we are all an integral part of the ecology of the Earth. In fact environmental, economic and social ecology now determine the future of the planet. They are inseparable and must be considered as a whole. This is a sweeping step forward. The document moves from this to the ecology of daily life in our cities, to the principal of the common good and justice between generations.

The fifth chapter outlines the many dialogs needed to address the profoundly human roots of our environmental crises: international, national and local, and the need for transparency in decision making. It suggests that human fulfilment is not dependent on the efficiency-driven paradigm of technocracy, nor should we be the slaves of financial markets. It recognizes that technical solutions without moral values will not solve our global problems.

The sixth chapter asks what is needed to face the cultural, spiritual and educational challenge before us. It proposes a new covenant between humanity and the environment, and offers suggestions for an ecological spirituality. In a touching way it recognizes that the sobriety and humility needed were not favorably regarded in the last century!

I suggest you take the time to read it carefully and discuss it with friends. These issues are ours.

http://w2.vatican.va/content/francesco/en/encyclicals/documents/papa-francesco_20150524_enciclica-laudato-si.html



Pope Francis in St. Peter's Square, the Vatican, earlier this year.

f) Warm fall brings hope

(October 4, 2015)

<http://rutlandherald.com/article/20151004/OPINION06/710049963/>

The leaves are turning color rather late as it has been a remarkably warm and green September. Of course the Earth is also setting new high temperature records this year.

A strong El Nino in the equatorial Pacific has brought very warm water to the South American coast, while the North Pacific has shifted from a cold to warm phase that we call the Pacific decadal oscillation.

As greenhouse gases accumulate in the atmosphere, the cooling of the Earth to space is reduced, and the extra heat from the sun is mostly stored in the ocean. So the overturning of the North Pacific has brought this stored heat up from the depths, and this will affect North America for some years.

So people ask me: "Will this winter be like the last one?" and I reply probably not, because of this shift to a warmer ocean to the west. But the ocean patterns are never the same and the Arctic is warming also. Ocean, atmosphere, mountain waves, clouds, crops and forests are all coupled together in our weather and climate, so we cannot give detailed forecasts a season ahead.

So I add to my winter wood supply, since so little was left after last winter. I delight in the second crop of peas that are in flower and the new batch of buttercrunch lettuce, and I plant a cover crop of rye grass. The summer squash are unusually prolific for the beginning of fall, as they simply adapt to current weather. The brilliant sunshine of September brought us power as well.

Tall locust trees shade the south side of our home, so we cannot install solar panels. But this month a Clean Energy Collective community solar array in West Haven Vermont came on-line, and is now supplying our electricity. We made an up-front payment for 4.8 kW of solar panels which will provide about 5700 kWh of electricity per year. Green Mountain Power credits this to our electric bill.

For the investors among you this is a 7% tax-free return on investment at present. The price of electricity will vary of course over this long time, as the contract lasts twenty years. This is investing in our children's future. I can resell my investment, but unlike a bank CD my cash will not be returned in twenty years. But contrast this investment with the purchase of a new car: every year I pay a further 10% for fossil fuel, insurance, service and repairs, and it still rusts away in about ten years.

The visit of Pope Francis to the Americas last month showed us a vision of compassion and hope, and challenged us to face the future with an open heart. "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."

In Cuba he said: "Service is never ideological, for we do not serve ideas, we serve people." He has pointed out that serving the Earth and serving people are now closely intertwined, because we are all part of the same ecosystem. Sadly many have not grasped this vision. Hundreds of thousands of families are making the arduous 2000-mile trek by land and sea to Europe, driven from their land by spreading drought, only to be bombed in the cities by feuding ideologies, and forced to leave their countries.

This century, as ecosystems crumble and refugees flee from war and drought, it is our foresight and compassion that will bring hope.

g) Warming world challenges ideology**(November 22, 2015)**<http://rutlandherald.com/article/20151122/OPINION06/151129907>

It was a satisfying end to the gardening season with a warm fall and no killing frost until October 19 in Pittsford. Indeed the fall foliage season also came late, but the colors were vivid. I still have spinach, kale and brussel sprouts as well as butternut squash for Thanksgiving, and the lettuce I planted under glass for next spring has germinated well.

Globally 2014 was the warmest year on record, and this year global temperatures are running so much higher that 2015 will set a new warm temperature record by a large margin. The climate meeting in Paris starts in a week to consider the future of the planet – how much courage will the nations of the world have to face the truth?

Sadly in Washington politics there are many who continue to say ‘global warming has ended’ (or even that it never happened) simply because that is their political doctrine. Rather than look at the evidence, it is easier to pretend that climate scientists are heretics that are challenging the American way! They forget that November 2015 is the fiftieth anniversary of the report titled ‘Restoring the Quality of our Environment’ by the President’s Science Advisory Committee (set up by President Eisenhower), which outlined the negative impacts of rising atmospheric CO₂ on the climate and the oceans.

A couple of months ago, I was one of 20 climate scientists who signed a letter to the United States Attorney General requesting a RICO investigation of the companies who have poured millions into campaigns against climate science. This law, standing for “Racketeer Influenced and Corrupt Organizations Act” was signed by Richard Nixon in 1970, and it was used to expose the way the tobacco industry knowingly deceived the public for decades at the cost of many lives.

But when we suggested that this kind of deliberate fraud should be exposed, since this obstruction of political action for decades will lead to staggering loss of life on Earth this century, in poured the hate-mail: targeting us for challenging the gospel of money and power. Fellow scientists at public universities were attacked with demands for all their emails for the past 5 years, driven by the fantasy that we are a scientific conspiracy, threatening the noble fossil fuel industry with false climate analyses. Really! When there is over \$100 billion in annual profits at stake, it is not hard to guess where the conspiracy lies.

We now know that the Exxon team of research scientists examined the evidence that greenhouse gasses were warming the global climate back in 1978. Their assessment agreed with the 1979 National Academy of Science report that said doubling CO₂ in the atmosphere would warm the planet by 5 to 8 degrees (F). But Exxon management decided they should suppress their own scientific assessment, and instead fund groups to undermine climate science, because they could see that climate science was an obvious threat to oil industry profits. Two weeks ago, the New York attorney general began a RICO investigation of Exxon Mobil to determine whether the company lied to the public and investors about the risks of climate change.

But it is hard to deny reality for ever. Last month the Canadian government that had silenced their own government scientists on climate change to protect the tar-sands industry, was thrown out of office. I recall back in 1980, around the time Exxon decided to suppress their own science, meeting with a group of brilliant young Soviet scientists. We were part of an international science team for an Atlantic Ocean

tropical experiment. After hours, they explained that the Soviet Union was on the path to collapse because of the irreconcilable conflict between ideology and reality. They were prophetic.

For two centuries the United States government respected scientific evidence and prospered. Now it faces collapse, because the merge of web technology with the infamous principle of the “big lie” has undermined the integrity of so many politicians.

So we the people must speak up, elect leaders that stand for the truth, start to work with the Earth, and build communities that are sustainable for generations to come.



Figure 2. Last year was the Earth's warmest year on record. This warming, caused by carbon emissions, is melting polar ice and raising the level of the world's oceans.