



NASA satellite photo, Hurricane Sandy

A Climate Chronology

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A Climate Chronology: International Policy, U.S. Policy, and Science

The most challenging of all endeavors in human history will likely be that of understanding the impact of our industrial and technological enterprises on the planet's climate and ecosystems, and responding effectively to the threats posed by that impact. I began writing this chronology while developing a climate policy course at the University of Maine. It has grown substantially during the ensuing six years, and continues to grow. By juxtaposing developments in climate science, U.S. policy, and international policy over the previous century, I hope to give the reader new insights into where we have been, where we are now, and where we may be headed in this formidable endeavor. I welcome comments, and suggested additions to this evolving work. It will be updated every January.

I owe thanks to George Criner, for asking me to develop the climate policy course; to my University of Maine students, game to explore these turbulent waters and mindful of their import for their lives; to my daughter Annya Tisher, who joined me at the Boston Women's March with the sign, "Climate Change Matters;" and most recently to Patty McCredie, an editor, and Jennifer Linton, a graphic designer, both fellow Climate Leaders in Al Gore's Climate Reality Leadership Corps, who have generously offered to help take this to the next phase. An interactive web design is a work in progress, and Patty contributed her editorial skills to this edition.

19th Century overview

Humans begin to replace wood and other biomass fuels with a readily available fossil fuel: coal; coal fuels the Industrial Revolution.

Humans in parts of Europe and the United States replace the biomass fuels such as wood and peat that had served Homo sapiens for hundreds of thousands of years with coal, a highly energy-intensive fossil fuel. Machine technology and the corporate form of business organization—punctuated by passage of the British Limited Liability Act of 1855—facilitate both the extraction of coal and the deployment of energy to reshape civilization's infrastructure and way of life. U.S. consumption of fossil fuels surpasses that of wood in the early 1880's. During the second half of the 19th century, the average U.S. per capita supply of all energy increases by 25%; utilization of coal increases by a factor of ten.*

* Vaclav Smil, *Energy at the Crossroads: Global Perspectives and Uncertainties* (Cambridge: MIT Press, 2005), 1.

20th Century overview

Oil and gas join the arsenal of high-energy fossil fuels, spurring rapid global land, sea, and air transport; total energy consumption worldwide experiences unprecedented growth, most dramatically in the United States

Oil and gas make new modes of rapid global land, sea, and air transportation possible. Coal is the predominant fuel in the production of electricity. Total energy consumption worldwide experiences unprecedented growth. Between 1900 and 2000, consumption of fossil fuels rises almost fifteenfold. As scientist and policy analyst Vaclav Smil notes, “[I]n spite of the near quadrupling of global population—from 1.6 billion in 1900 to 6.1 billion in 2000—average annual per capita supply of commercial energy more than quadrupled from just 14 GJ [gigajoules] to roughly 60 GJ...” United States residents are far and away the largest consumers of energy. Between 1900 and 2000, annual per capita energy supply in the United States more than triples to about 340 GJ per capita, or more than five times the global average.*

* Vaclav Smil, *Energy at the Crossroads: Global Perspectives and Uncertainties* (Cambridge: MIT Press, 2005), 2.

1824

French mathematician and physicist Jean Baptiste Joseph Fourier first hypothesizes that the atmosphere plays a significant role in mediating temperature on Earth

Fourier, in the article “General Remarks on the Temperature of the Earth and Outer Space,” likens the effect of the Earth’s atmosphere in regulating global temperature to a glass covered box: “The temperature [of the Earth] can be augmented by the interposition of the atmosphere, because heat in the state of light finds less resistance in penetrating the air, than in re-passing into the air when converted into non-luminous heat.” This analogy would ultimately inspire the term “greenhouse effect.”*

*Joseph Fourier, "Remarques Générales sur les Températures Du Globe Terrestre et des Espaces Planétaires." *Annales de Chemie et de Physique* 27: 136-67 (1824), translation by Ebenezer Burgess, "General Remarks on the Temperature of the Earth and Outer Space," *American Journal of Science* 32: 1-20 (1837). Cited in: Spencer Weart, *The Discovery of Global Warming: A hypertext history of how scientists came to (partly) understand what people are doing to cause climate change,* January, 2017, http://history.aip.org/climate/simple.htm#L_M085 ; Dr. Weart’s website is a valuable resource for those who would like to delve deeper into climate science. He also offers a rich collection of photographs of key players, graphs, and other illustrations at <http://history.aip.org/climate/illus.htm>.

1861

Irish physicist John Tyndall demonstrates experimentally that water vapor and other gases warm the atmosphere

John Tyndall, in the article “On the Absorption and Radiation of Heat by Gases and Vapours, and on the Physical Connexion of Radiation, Absorption, and Conduction,” reports on an experimental apparatus to demonstrate and measure the heat trapping impact of atmospheric gases. His later comment underscores his surprise at this discovery: “Those who, like myself, have been taught to regard transparent gases as almost perfectly diathermanous (transparent to heat), will probably share the astonishment with which I witnessed the foregoing effects....I

was indeed slow to believe it possible that a body so constituted, and so transparent to light as olefiant gas, could be so densely opake to any kind of calorific (infrared) rays; and to secure myself against error, I made several hundred experiments with this single substance."* In 1862, Tyndall provides the following analogy: "As a dam built across a river causes a local deepening of the stream, so our atmosphere, thrown as a barrier across the terrestrial rays, produces a local heightening of the temperature at the Earth's surface."** In his 1863 book *Heat Considered as a Mode of Motion*, Tyndall notes the importance of this finding for conditions amenable to life on earth: "Aqueous vapour [water vapor] is a blanket, more necessary to the vegetable life of England than clothing is to man. Remove for a single summer night the aqueous vapour from the air which overspreads this country, and you would assuredly destroy every plant capable of being destroyed by a freezing temperature. The warmth of our fields and gardens would pour itself unrequited into space, and the sun would rise upon an island held fast in the iron grip of frost."***

* Richard Black, "Tyndall's climate message, 150 years on," *BBC News*, September 28, 2011, <http://www.bbc.com/news/science-environment-15093234>

** John Tyndall, "On Radiation through the Earth's Atmosphere." *Philosophical Magazine* ser. 4, 25 (1863), 200-206; Cited in: Spencer Weart, *The Discovery of Global Warming* (Feb. 2016), http://history.aip.org/climate/simple.htm#L_M085

***John Tyndall, *Heat Considered as a Mode of Motion* (1863); Cited in: NASA Data, "Measuring the Earth's Water Blanket," https://mynasadata.larc.nasa.gov/science_projects/measuring-the-earths-water-vapor-blanket/

1904

Swedish scientist Svante Arrhenius concludes that the Earth's temperature might increase by 5 to 6 degrees Celsius with a doubling of atmospheric CO₂

Nobel Laureate Svante Arrhenius follows early 19th century scientists Jean-Baptiste Fourier and John Tyndall to investigate the role of greenhouse gases in warming Earth's surface. Tens of thousands of hand calculations lead Arrhenius to the conclusion that the Earth's temperature might increase by 5 to 6 degrees Celsius with a doubling of atmospheric CO₂. He suggests that this increase could make the Earth's climate "more equable," stimulating plant growth and food production. He also errs in his timescale, believing it would take humans 3,000 years to double atmospheric CO₂.* A 1912 issue of Popular Mechanics brought the work of Arrhenius to the attention of the general public: "a theory has been elaborated, primarily by the great Swedish scientist Arrhenius, that the earth has had a warm climate when the carbon dioxide in the atmosphere was abundant, and a cold climate when it was scarce. It is believed that if the atmosphere contained two to three times its present amount, the climate would be considerably warmer." Under a photo of massive plumes of smoke coming from factory smokestacks, the article elaborates, "The furnaces of the world are now burning about 2,000,000,000 tons of coal a year. When this is burned, uniting with oxygen, it adds about 7,000,000,000 tons of carbon dioxide to the atmosphere yearly. This tends to make the atmosphere a more effective blanket for the earth and to raise its temperature. The effect may be considerable in a few centuries."**

*Svante Arrhenius, "On the influence of carbonic acid in the air upon the temperature of the ground," *Philosophical Magazine Series 5*, Vol. 41, Issue 251, 1896, <http://www.tandfonline.com/doi/abs/10.1080/14786449608620846>; Richard Wolfson, *Energy, Environment, and Climate* (New York: W.W. Norton, 2012), 336.

**Page of 1912 issue of Popular Mechanics, circulated in a Tweet by climate scientist Peter Gleick, June 9, 2017. Writes Gleick, a member of the National Academy of Sciences and a MacArthur Fellow, "Climate science isn't rocket science. It's much harder. But we've been working at it for more than a century. And we're damn good at it."

1938

English engineer and amateur meteorologist Guy Callendar concludes that humans have added about 150,000 million tonnes of CO₂ to the air over the previous 50 years

“The artificial production of carbon dioxide and its influence on temperature,” a paper by Guy Callendar appearing in the *Quarterly Journal of the Royal Meteorological Society*, concludes that “by fuel combustion man has added about 150,000 million tons [tonnes] of carbon dioxide to the air over the past 50 years,” and estimates that approximately three quarters of that has remained in the atmosphere. Callendar concludes that this increase in carbon dioxide has caused to an increase in mean global temperatures during the previous half century: “From this the increase in mean temperature, due to the artificial production of carbon dioxide, is estimated to be at the rate of 0.003°C. per year at the present time.”* As physicist and historian of science Spencer Weart notes: “As for the future, Callendar estimated, on flimsy grounds, that a doubling of CO₂ could gradually bring a 2°C rise in future centuries. Aware that industrial emissions were already far greater than in Arrhenius’s day, Callendar saw this warming as a matter of present interest....Callendar’s publications attracted some attention, and climatology textbooks of the 1940’s and 1950’s routinely included a brief reference to his studies. But most meteorologists gave Callendar’s idea scant credence.”**

* G.S. Callendar, “The artificial production of carbon dioxide and its influence on temperature,” *Quarterly Journal of the Royal Meteorological Society*, Vol. 64, Issue 275, April, 1938, <http://onlinelibrary.wiley.com/doi/10.1002/qj.49706427503/abstract>

**Spencer Weart, The Discovery of Global Warming (Feb. 2016), http://history.aip.org/climate/simple.htm#L_M085

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1951

American marine biologist and writer Rachel Carson publishes the New York Times bestseller *The Sea Around Us*, including observations about pronounced warming in the Arctic regions of the Earth

In a chapter in *The Sea Around Us* entitled “The Global Thermostat,” Rachel Carson observes, “Now in our lifetime we are witnessing a startling alteration of climate... It is now established beyond question that a definite change in the arctic climate set in about 1900, that it became astonishingly marked about 1930, and that it is now spreading into sub-arctic and temperate regions. The frigid top of the world is very clearly warming up.”* Carson discusses several theories for this, but none related to human industrial activity. *The Sea Around Us* remains on the New York Times bestseller list for 86 weeks, and sells a quarter of a million copies by the end of 1952. The chapter “The Global Thermostat” is republished in *Vogue* magazine.**

* Rachel Carson, *The Sea Around Us*. (New York: Oxford, 1951) , 183.

**Arlene Rodd Quarantiello, *Rachel Carson: A Biography* (Greenwood Publishing Group, 2004), 54-55.

1956

Canadian physicist Gilbert Plass publishes a lucid explanation of “carbon dioxide theory” to account for “the general warming of the climate that has taken place in the last sixty years”

Physicist Gilbert Plass of Johns Hopkins and colleagues publish “The Carbon Dioxide Theory of Climatic Change,” to account for “the general warming of the climate that has taken place in the last sixty years” in the journal *American Scientist*. The article questions: “What is the reason for the recent temperature rise that is found throughout the world? Will this trend toward warmer climates continue for some time? The carbon dioxide theory may provide the answer.” After citing various other theories for warming, Plass notes: “Although the carbon dioxide theory of climatic change was one of the most widely held fifty years ago, in recent years it has had relatively few adherents. However, recent research work suggests that the usual reasons for rejecting this theory are not valid.” Evidence demonstrates that “[t]he infrared absorption properties of carbon dioxide, water vapor, and ozone determine our climate to a large extent. Their action has often been compared to that of a greenhouse... [A]s the amount of carbon dioxide increases... the outgoing radiation is trapped more effectively near the earth’s surface and the temperature rises. The latest calculations show that if the carbon dioxide content of the atmosphere should double, the surface temperature would rise 3.6 Celsius...” The article goes on to discuss the impact of fossil fuel combustion: “Recently... man has added an important new factor to the carbon dioxide balance... [C]ombustion of fossil fuels is adding 6.0×10^9 tons [tonnes] per year of carbon dioxide to the atmosphere at the present time and the rate is increasing every year. Today this factor is larger than any contribution from the inorganic world. Thus today man by his own activities is increasing the carbon dioxide in the atmosphere at the rate of 30 per cent a century.... Even if there may be some question as to whether or not the general amelioration of the climate in the last fifty years has really been caused by increased industrial activity, there can be no doubt that this will become an increasingly serious problem as the level of industrial activity increases. In a few centuries the amount of carbon dioxide released into the atmosphere will have become so large that it will have a profound influence on our climate.”*

*Gilbert N. Plass, James Rodger Fleming, Gavin Schmidt, “Carbon Dioxide and the Climate,” *American Scientist* Vol. 44, No. 3 (July 1956):302-316; reprinted in *American Scientist*, January-February 2010, <http://www.americanscientist.org/issues/pub/2010/1/carbon-dioxide-and-the-climate/4>

1956

The New York Times publishes a summary of the Gilbert Plass paper headlined “Warmer climate on the earth may be due to more carbon dioxide in the air”

The New York Times summary of the Gilbert Plass paper concludes: “Even if our coal and oil reserves will be used up in 1,000 years, seventeen times the present amount of carbon dioxide in the atmosphere must be reckoned with. The introduction of nuclear energy will not make much difference. Coal and oil are still plentiful and cheap in many parts of the world, and there’s every reason to believe that both will be consumed by industry as long as it pays to do so.”*

* Waldemar Kaempffert, "Warmer climate on the earth may be due to more carbon dioxide in the air," *New York Times*, October 28, 1956, <http://query.nytimes.com/mem/archive-free/pdf?res=9800E2DC133EE63ABC4051DFB667838D649EDE>

1957

American oceanographers Roger Revelle and Hans Suess demonstrate that CO₂ levels in the air have increased as a result of the use of fossil fuels

Roger Revelle and Hans Suess of the Scripps Institution of Oceanography publish "Carbon Dioxide Exchange Between Atmosphere and Ocean and the Question of an Increase of Atmospheric CO₂ during the Past Decades." From measuring carbon content in wood and marine material, the authors conclude that "most of the CO₂ released by artificial fuel combustion since the beginning of the industrial revolution must have been absorbed by the oceans. The increase in atmospheric CO₂ from this cause is at present small but may become significant during future decades if industrial fuel combustion continues to rise exponentially." The authors observe that previous estimates about the amount of warming that would be attributable to increased CO₂ releases have not taken into account feedback mechanisms that can enhance warming: "amplifying or feed-back processes may exist such that a slight change in the character of the back radiation might have a more pronounced effect. Possible examples are a decrease in the albedo [reflection of solar energy] of the earth due to melting of ice caps..." * The authors note that this emerging human impact on the planet is unprecedented: "Thus human beings are now carrying out a large scale geophysical experiment of a kind that could not have happened in the past... Within a few centuries we are returning to the atmosphere and oceans the concentrated organic carbon stored in sedimentary rocks over hundreds of millions of years. This experiment... may yield a far-reaching insight into the process determining weather and climate."*

* Revelle, Roger, and Hans E. Suess. "Carbon Dioxide Exchange Between Atmosphere and Oceans and the Question of an Increase of Atmospheric CO₂ during the Past Decades," *Tellus* 9 (1957): 19-20.

<http://www.uscentrist.org/platform/positions/environment/context-environment/docs/Revelle-Suess1957.pdf>

1965

Roger Revelle contributes to the first mention of global warming in a government report, drawing an analogy between human-produced gases entering the global atmosphere and the effect of glass in a greenhouse

Serving on the President's Science Advisory Committee Panel on Environmental Pollution, oceanographer Roger Revelle contributes to an appendix to the government report *Restoring the Quality of our Environment*, entitled "Carbon Dioxide from Fossil Fuels: the Invisible Pollutant." Citing measurements by the U.S. Weather Bureau on Mauna Loa Mountain in Hawaii, the report notes that "the data show, clearly and conclusively, that from 1958 through 1962 the carbon dioxide content of the atmosphere increased by 1.36 percent. The increase from year to year was quite regular, close to the average annual value of 0.23%. By comparing the measured increase with the known quantity of carbon dioxide produced by fossil fuel

combustion...we see that almost exactly half of the fossil fuel CO₂ apparently remained in the atmosphere.” The report concludes that “Within a few short centuries, we are contributing to the air a significant portion of the carbon that was slowly extracted by plants and buried in the sediments during half a billion years....[A]n increase in atmospheric carbon could act, much like the glass in a greenhouse, to raise the temperature of the lower air.”*

*Environmental Pollution Panel of the President’s Scientific Advisory Committee, *Restoring the Quality of Our Environment*, 1965 (Washington, DC: GPO, 1965), App. Y4, 116,
<http://dge.stanford.edu/labs/caldeiralab/Caldeira%20downloads/PSAC,%201965,%20Restoring%20the%20Quality%20of%20Our%20Environment.pdf>

1965

President Lyndon Johnson states in a Special Message to Congress, “This generation has altered the composition of the atmosphere on a global scale through... a steady increase in carbon dioxide from the burning of fossil fuels”

President Johnson’s “Special Message on Conservation and Restoration of Natural Beauty” begins with the observation that “modern technology, which has added much to our lives can also have a darker side. Its uncontrolled waste products are menacing the world we live in, our enjoyment and our health. The air we breathe, our water, our soil and wildlife, are being blighted by the poisons and chemicals which are the by-products of technology and industry. The skeletons of discarded cars litter the countryside. The same society which receives the rewards of technology, must, as a cooperating whole, take responsibility for control. To deal with these new problems will require a new conservation. We must not only protect the countryside and save it from destruction, we must restore what has been destroyed and salvage the beauty and charm of our cities. Our conservation must be not just the classic conservation of protection and development, but a creative conservation of restoration and innovation. Its concern is not with nature alone, but with the total relation between man and the world around him. Its object is not just man's welfare but the dignity of man's spirit.”*

* Lyndon B. Johnson, Special Message to the Congress on Conservation and Restoration of Natural Beauty, February 8, 1965, <http://www.presidency.ucsb.edu/ws/?pid=27285>

1967

Syukuro Manabe and Richard T. Wetherald are the first to use a computer model to explore the impact of increasing atmospheric carbon dioxide on the Earth’s climate

Syukuro Manabe and Richard T. Wetherald publish “Thermal Equilibrium of the Atmosphere with a Given Distribution of Relative Humidity” in the *Journal of the Atmospheric Sciences*. They conclude that “a doubling of the CO₂ content in the atmosphere has the effect of raising the temperature of the atmosphere (whose relative humidity is fixed) by about 2C.”* The analysis is “the first to represent the fundamental elements of the Earth’s climate in a computer model, and to explore what doubling carbon dioxide (CO₂) would do to global temperature.” A 2015 *CarbonBrief* poll of leading scientists from the Intergovernmental Panel on Climate

Change (IPCC) will find this paper most often chosen as the “most influential climate change paper of all time.”**

* Syukuro Manabe and Richard Wetherald, “Thermal Equilibrium of the Atmosphere with a Given Distribution of Relative Humidity,” *Journal of the Atmospheric Sciences*, Vol. 24, No. 3, May, 1967, <http://journals.ametsoc.org/doi/abs/10.1175/1520-0469%281967%29024%3C0241%3ATEOTAW%3E2.0.CO%3B2>

** Roz Pidcock, “The Most Influential Climate Change Papers of All Time,” *CarbonBrief*, June 7, 2015, <http://www.carbonbrief.org/the-most-influential-climate-change-papers-of-all-time>; My acknowledgment to the *CarbonBrief* survey report for identifying a number of other research articles included in this chronology.

1970

President Richard Nixon establishes the U.S. Environmental Protection Agency, and the National Environmental Policy Act of 1969 takes effect.

President Richard Nixon’s Special Message to Congress in establishing the U.S. Environmental Protection Agency (EPA) opens by noting that “[a]s concern with the condition of our physical environment has intensified, it has become increasingly clear that we need to know more about the total environment--land, water, and air. It also has become increasingly clear that only by reorganizing our Federal efforts can we develop that knowledge, and effectively ensure the protection, development and enhancement of the total environment itself.” The President proposed a “far more effective approach to pollution control [which] would: Identify pollutants. Trace them through the entire ecological chain, observing and recording changes in form as they occur. Determine the total exposure of man and his environment. Examine interactions among forms of pollution. Identify where in the ecological chain interdiction would be most appropriate.” “In organizational terms,” the President concludes, “this requires pulling together into one agency a variety of research, monitoring, standard-setting and enforcement activities now scattered through several departments and agencies. It also requires that the new agency include sufficient support elements--in research and in aids to State and local anti-pollution programs, for example--to give it the needed strength and potential for carrying out its mission.”* Coincident with the establishment of the EPA, the National Environmental Policy Act of 1969 mandates, for the first time, that federal agencies “include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on... the environmental impact of the proposed action...”**

*President Richard Nixon, Reorganization Plan No. 3 of 1970, July 9, 1970, <https://archive.epa.gov/epa/aboutepa/reorganization-plan-no-3-1970.html>

** National Environmental Policy Act of 1969, Sec. 102, 42 USC 4332, <https://www.fws.gov/r9esnepa/RelatedLegislativeAuthorities/nepa1969.PDF>

1970

Congress enacts the Clean Air Act, in a near-unanimous endorsement of strong environmental protections

In a remarkable show of bipartisanship, the Senate vote for the Clean Air Act is unanimous, the House vote 374 to 1. The *New York Times* describes the legislation as “far broader in its reach, far tougher in its deadlines and penalties, than any of its three predecessors.”* The principal architect of this law is Maine’s Senator Edmund Muskie, a Democrat, chair of the Senate Subcommittee on the Environment; he partners with Tennessee Senator James Baker, a Republican, to develop and promote the legislation. The law gives broad powers to the new Environmental Protection Agency (EPA) to set national “ambient air quality standards,” for specific pollutants, and charges the states with writing “implementation plans” to achieve those standards. It provides for regulation of both “mobile sources” – cars, trucks, aircraft – and “stationary sources” – factories, refineries, power plants. Greenhouse gases carbon dioxide and methane are not among the “criteria pollutants” listed in the law for immediate regulatory attention, but the law provides for periodic reassessment of and additions to the list of regulated pollutants. If the EPA determines that new pollutants “cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare,” it must regulate them. The law’s definition of effects on “welfare” “includes, but is not limited to, effects on soils, water, crops, vegetation, manmade materials, animals, wildlife, weather, visibility, and climate.”** During the signing ceremony in the Roosevelt Room, President Richard Nixon observes, " I would only hope that as we go now from the year of the beginning, the year of proposing, the year 1970, to the year of action, 1971, that all of us, Democrats, Republicans, the House, the Senate, the executive branch, that all of us can look back upon this year as that time when we began to make a movement toward a goal that we all want, a goal that Theodore Roosevelt deeply believed in and a goal that he lived in his whole life. He loved the environment. He loved the clean air and the open spaces, and he loved the western part of the United States particularly, which will be greatly affected by this kind of action."*** The *American Chemical Society Journal* comments: “The new year 1971, the second in the seventies – the environmental decade – came in with a new air pollution control law. Without question, the new law is tough. It is also complicated...With more deadlines per square inch than any other piece of legislation, [it] is the best blueprint for clean air the nation has ever had.”****

*E.W. Kenworthy, “Tough New Clean-Air Bill Passed by Senate, 73-0,” *The New York Times*, September 23, 1970, <http://query.nytimes.com/mem/archive/pdf?res=9802E0D71038EE34BC4B51DFBF66838B669EDE>

**Clean Air Act of 1970, Pub. L. 91-604, 84 Stat 1676, December 31, 1970, 42 U.S.C.7401 et seq., 7409, 7521(a)(1), 7602(h), <https://www.gpo.gov/fdsys/pkg/STATUTE-84/pdf/STATUTE-84-Pg1676.pdf>

***President Richard Nixon, Remarks on Signing the Clean Air Amendments of 1970. December 31, 1970, <http://www.presidency.ucsb.edu/ws/?pid=2874>

****American Chemical Society Journal, *Environmental Science & Technology*, 5, (2), 106 (1971)

1971

Development of supersonic transport raises concerns about impacts on climate, and the Climate Impact Assessment Program is created under the Department of Transportation

Described as the “the first major project in integrated assessment of an environmental issue,” the mission statement of the Climate Impact Assessment Program (CIAP) states that “in order to determine regulatory constraints on flight in the stratosphere such that no adverse environmental effects result, CIAP will assess ... the impact on man, plants, and animals of

climatic changes which may occur from the operation of a worldwide stratospheric fleet as projected to 1990." The project has a \$20 million budget and a three year deadline, and involves hundreds of researchers. The impact on climate is part of their charge, but concerns focused on the effect of supersonic transport on depletion of the ozone layer. The final report of the project clearly endorses international regulation of supersonic transport, but refrains from specific recommendations on the form of regulation.*

*NASA Socioeconomic Data and Applications Center, "Thematic Guide to Integrated Assessment Modeling," <http://sedac.ciesin.columbia.edu/mva/iamcc.tg/TGsec2-1.html>; Karen Fisher-Vanden, "International Policy Instrument Prominence in the Climate Change Debate: A Case Study of the United States." ENRP Discussion Paper E-97-06, Kennedy School of Government, Harvard University, August 1997, 2, <http://www.hks.harvard.edu/gea/pubs/e-97-06.pdf>

1972

The United Nations Conference on the Human Environment, meeting in Stockholm and attended by 113 nations, is the first global meeting of nations to consider environmental concerns.

The Conference Declaration opens with the finding that "The protection and improvement of the human environment is a major issue which affects the well-being of peoples and economic development throughout the world; it is the urgent desire of the peoples of the whole world and the duty of all Governments....In our time, man's capability to transform his surroundings, if used wisely, can bring to all peoples the benefits of development and the opportunity to enhance the quality of life. Wrongly or heedlessly applied, the same power can do incalculable harm to human beings and the human environment. We see around us growing evidence of man-made harm in many regions of the earth: dangerous levels of pollution in water, air, earth and living beings; major and undesirable disturbances to the ecological balance of the biosphere; destruction and depletion of irreplaceable resources; and gross deficiencies, harmful to the physical, mental and social health of man, in the man-made environment, particularly in the living and working environment." Participant nations agree to 26 general principles, including Principle 6: "The discharge of toxic substances or of other substances and the release of heat, in such quantities or concentrations as to exceed the capacity of the environment to render them harmless, must be halted in order to ensure that serious or irreversible damage is not inflicted upon ecosystems," and Principle 12: "Resources should be made available to preserve and improve the environment, taking into account the circumstances and particular requirements of developing countries and any costs which may emanate from their incorporating environmental safeguards into their development planning and the need for making available to them, upon their request, additional international technical and financial assistance for this purpose." The very first recommendation under the Conference's "Action Plan," under "Identification and Control of Pollutants of Broad International Significance," is Recommendation 70, targeting climate change: "It is recommended that Governments be mindful of activities in which there is an appreciable risk of effects on climate, and to this end: (a) Carefully evaluate the likelihood and magnitude of climatic effects and disseminate their findings to the maximum extent feasible before embarking on such activities; (b) Consult fully other interested States when activities carrying a risk of such effects are being contemplated or implemented."*

*Report of the United Nations Conference on the Human Environment, Stockholm, 5-16 June, 1972, <http://www.un-documents.net/aconf48-14r1.pdf>

1972

The Club of Rome publishes *Limits to Growth*, a report that predicts that if current growth trends continue unchanged, the limits to growth on the planet will be reached within the next 100 years

The report *Limits to Growth*, making unprecedented use of computer modeling, summarizes its findings as follows: “1. If the present growth trends in world population, industrialization, pollution, food production, and resource depletion continue unchanged, the limits to growth on this planet will be reached sometime within the next one hundred years. The most probable result will be a rather sudden and uncontrollable decline in both population and industrial capacity. 2. It is possible to alter these growth trends and to establish a condition of ecological and economic stability that is sustainable far into the future. The state of global equilibrium could be designed so that the basic material needs of each person on earth are satisfied and each person has an equal opportunity to realize his individual human potential. 3. If the world’s people decide to strive for this second outcome rather than the first, the sooner they begin working to attain it, the greater will be there chances of success.”* The study is translated into thirty languages and sells 30 million copies, more than any other environmental book.**

*Donella Meadows and others, *Limits to Growth* (New York: Signet, 1972),
http://collections.dartmouth.edu/teitexts/meadows/diplomatic/meadows_ltg-diplomatic.html#pg-17

**Bill McKibben, *Eaarth* (New York: Henry Holt, 2011) at 90-92.

1975

In the first peer-reviewed reference to “global warming,” Wallace Broecker publishes the paper “Climatic Change: Are we on the brink of a pronounced global warming?”

Columbia University professor of Geological Sciences Wallace Broecker’s paper concludes: “If man-made dust is unimportant as a major cause of climatic change, then a strong case can be made that the present cooling trend will, within a decade or so, give way to a pronounced warming induced by carbon dioxide. By analogy with similar events in the past, the natural climatic cooling which, since 1940, has more than compensated for the carbon dioxide effect, will soon bottom out. Once this happens, the exponential rise in the atmospheric carbon dioxide content will tend to become a significant factor and by early in the next century will have driven the mean planetary temperature beyond the limits experienced during the last 1000 years.”*

*Wallace Broecker, “Climatic Change: Are we on the brink of a pronounced global warming?”, *Science*, Vol. 189, No. 4201 (August 8, 1975), p. 460-463, <http://www.jstor.org/stable/1740491>

1976

Charles D. Keeling creates the “Keeling Curve,” a simple visualization of the longest continuous record of CO₂ concentration in the world

A paper published by Charles D. Keeling of the Scripps Institution of Oceanography and coauthors in the journal *Tellus*, “Atmospheric carbon dioxide variations at Mauna Loa Observatory, Hawaii,” tracks increases in atmospheric carbon dioxide measured at the Mauna Loa Observatory, finding that “the annual average CO₂ concentration rose 3.4% between 1959 and 1971...Similar changes in rate have been observed at the South Pole and are evidently a global phenomenon.” The Keeling Curve shows measurements dating back to 1958 at Mauna Loa and as it later develops incorporates ice core records to show CO₂ measurements dating back to 1700.* As *CarbonBrief* comments: “With the Mauna Loa measurements continuing today, the so-called ‘Keeling curve’ is the longest continuous record of carbon dioxide concentration in the world. Its historical significance and striking simplicity has made it one of the most iconic visualizations of climate change.”**

*Charles D. Keeling and others, “Atmospheric carbon dioxide variations at Moana Loa Observatory, Hawaii,” *Tellus*, Vol. 28, Issue 6, December, 1976, <http://onlinelibrary.wiley.com/doi/10.1111/j.2153-3490.1976.tb00701.x/abstract> ; Rob Monroe, “How are ice-core data and Mauna Loa atmospheric data made comparable?” Scripps Institution of Oceanography, March 20, 2014, <https://scripps.ucsd.edu/programs/keelingcurve/2014/03/20/how-are-ice-core-data-and-mauna-loa-atmospheric-data-made-comparable>

** Roz Pidcock, “The Most Influential Climate Change Papers of All Time,” *CarbonBrief*, June 7, 2015, <http://www.carbonbrief.org/the-most-influential-climate-change-papers-of-all-time>

1977

The U.S. National Academy of Sciences releases a report that identifies a global warming trend caused by increased use of fossil fuels, and predicts that global temperatures could rise by 6 degrees Celsius by 2150 due to fossil fuel emissions

The National Academy of Sciences (NAS) report, “Energy and Climate: Studies in Geophysics,” observes, “Examination of the possible long-term effects of energy use is particularly timely. With the end of the oil age in sight, we must make long-term decisions as to future energy policies. One lesson we have been learning is that the time required for transition from one major source to another is several decades.” The findings, the NAS notes, “should lead neither to panic nor to complacency.”*

* National Academy of Sciences, *Energy and Climate: Studies in Geophysics*, 1977. (Washington, DC: GPO, 1977), vii-viii, http://www.nap.edu/openbook.php?record_id=12024&page=1

1977

President Jimmy Carter sends Congress a comprehensive National Energy Plan with 113 legislative proposals, including new taxes on automobiles, on utilities that burn oil or natural gas instead of coal, and a gasoline tax intended to create a floor on gasoline prices

President Carter's National Energy Plan has been described as "as ambitious and complex as any legislative proposal a president has ever sent to Congress." Plan architect James Schlesinger describes the Carter Administration's goals: to transition away from "cheap and abundant energy used wastefully without regard to national and international imperatives to an era of more expansive energy with concomitant regard for efficiency, conservation, international and environmental concerns." The proposal includes dramatically expanding federal regulatory power over energy producers, suppliers, and consumers. President Carter describes his energy initiative as "the moral equivalent of war." The American people, however, continue to regard cheap gasoline, inexpensive electricity, and low heating prices as an entitlement. The legislation finally enacted included virtually none of President Carter's proposed taxes to stimulate conservation and the production of alternative fuels. Schlesinger: "The basic constituency for this problem is in the future." President Carter: "We can manage the short-term shortages more effectively and we will, but there are no short-term solutions to our long-range problems. There is simply no way to avoid sacrifice."^{*}

* Michael J. Graetz, *The End of Energy: The Unmaking of America's Environment, Security, and Independence* (Cambridge: MIT Press, 2011) at 106, 110, 141.

1977

Senior Exxon Corporation scientist James F. Black advises Exxon's Management Committee that CO₂ from the world's use of fossil fuels would warm the planet and could eventually endanger humanity

At a meeting at Exxon Corporation's headquarters, senior Exxon scientist James F. Black advises Exxon's Management Committee that "...there is general scientific agreement that the most likely manner in which mankind is influencing the global climate is through carbon dioxide release from the burning of fossil fuels." In an updated report to a broader range of Exxon executives and scientists in 1978, Black states that "Present thinking holds that man has a time window of five to ten years before the need for hard decisions regarding changes in energy strategies might become critical."^{*}

* Neela Banerjee, Lisa Song and David Hasemyer, *Exxon: The Road Not Taken*, Sept. 15, 2015, Inside Climate News, <http://insideclimatenews.org/news/15092015/Exxons-own-research-confirmed-fossil-fuels-role-in-global-warming>

1978

The National Climate Program Act increases federal funding for climate research, under the National Climate Program Office of the National Oceanic and Atmospheric Administration

The law includes a Congressional finds that: "(1) Weather and climate change affect food production, energy use, land use, water resources and other factors vital to national security and human welfare. (2) An ability to anticipate natural and man-induced changes in climate would

contribute to the soundness of policy decisions in the public and private sectors. (3) Significant improvements in the ability to forecast climate on an intermediate and long-term basis are possible. (4) Information regarding climate is not being fully disseminated or used, and Federal efforts have given insufficient attention to assessing and applying this information.” It directs the President to develop a five-year plan for, among other actions, “basic and applied research to improve the understanding of climate processes, natural and man induced, and the social, economic, and political implications of climate change;” “global data collection, and monitoring and analysis activities to provide reliable, useful and readily available information on a continuing basis;” and “measures for increasing international cooperation in climate research, monitoring, analysis and data dissemination.” *

* National Climate Program Act of 1978, Pub. L. 95-367, <https://www.gpo.gov/fdsys/pkg/STATUTE-92/pdf/STATUTE-92-Pg601.pdf>

1979

The first World Climate Conference is organized by the United Nations and the World Health Organization.

The conference held in Geneva includes 350 specialists from 53 countries and 24 international organizations and from a wide range of disciplines including agriculture, water resources, fisheries, energy, environment, ecology, biology, medicine, sociology and economics. After two weeks of deliberations, the organizers issue a World Climate Conference Declaration: “Having regard to the all-pervading influence of climate on human society and on many fields of human activities and endeavour, the Conference finds that it is now urgently necessary for the nations of the world: (a) To take full advantage of man’s present knowledge of climate; (b) To take steps to improve significantly that knowledge; (c) To foresee and prevent potential man-made changes in climate that might be adverse to the well-being of humanity.”*

*John W. Zillman, “A History of Climate Activities,” *World Meteorological Association Bulletin* Vol 58(3)2009, <https://public.wmo.int/en/bulletin/history-climate-activities>

1979

President Jimmy Carter climbs to the roof of the White House to mark the installation of 32 solar panels to heat water for the White House

At the dedication ceremony for the White House solar panels on June 20, 1979, President Carter announces a “new solar strategy,” to reach a goal to obtain 20% of the nation’s energy from renewables by 2000. He observes, “In the year 2000 this solar water heater behind me, which is being dedicated today, will still be here supplying cheap, efficient energy.... A generation from now, this solar heater can either be a curiosity, a museum piece, an example of a road not taken or it can be just a small part of one of the greatest and most exciting adventures ever undertaken by the American people.”* [see 1986]

* Michael J. Graetz, *The End of Energy: The Unmaking of America's Environment, Security, and Independence* (Cambridge: MIT Press, 2011) at 118; David Biello, "Where Did Carter's White House's Solar Panels Go?" *Scientific American*, August 6, 2010, <https://www.scientificamerican.com/article/carter-white-house-solar-panel-array/>

1979

A report of an Ad Hoc Study Group on carbon dioxide and climate for the National Research Council chaired by MIT meteorologist Jule Charney estimates "the most probable global warming for a doubling of CO₂ to be near 3°C with a probable error of ± 1.5°C."

The forward to the 22 page "Charney Report" by Verner Suomi, Chairman of the Climate Research Board of the National Research Council, notes that "For more than a century, we have been aware that changes in the composition of the atmosphere could affect its ability to trap the sun's energy for our benefit. We now have incontrovertible evidence that the atmosphere is indeed changing and that we ourselves contribute to that change. Atmospheric concentrations of carbon dioxide are steadily increasing, and these changes are linked with man's use of fossil fuels and exploitation of the land. Since carbon dioxide plays a significant role in the heat budget of the atmosphere, it is reasonable to suppose that continued increases would affect climate." Suomi directs a cautionary warning to policymakers: "The conclusions of this brief but intense investigation may be comforting to scientists but disturbing to policymakers. If carbon dioxide continues to increase, the study group finds no reason to doubt that climate changes will result and no reason to believe that these changes will be negligible. The conclusions of prior studies have been generally reaffirmed. However, the study group points out that the ocean, the great and ponderous flywheel of the global climate system, may be expected to slow the course of observable climatic change. A wait-and-see policy may mean waiting until it is too late." In addition to characterizing the impact of the oceans in delaying observable atmospheric warming, the study explores the impact of both positive and negative feedback mechanisms: "A strong positive feedback mechanism is the accompanying increase of moisture, which is an even more powerful absorber of terrestrial radiation. We have examined with care all known negative feedback mechanisms, such as increase in low or middle cloud amount, and have concluded that the oversimplifications and inaccuracies in the models are not likely to have vitiated the principal conclusion that there will be appreciable warming. The known negative feedback mechanisms can reduce the warming, but they do not appear to be so strong as the positive moisture feedback."*

*Jule G. Charney and others, *Carbon Dioxide and Climate: A Scientific Assessment* (National Academy of Sciences 1979), http://www.ecd.bnl.gov/steve/charney_report1979.pdf

1980

Three years after its first climate report, a second National Academy of Sciences report on anthropogenic warming, chaired by economist Thomas Schelling, stresses uncertainty about the extent and timing of climate changes

In response to the Charney Report in 1979, the White House Office of Science and Technology asks the National Academy of Sciences to opine on the likely *timing* of increases in global temperature. According to the National Academy of Sciences (NAS) report (a letter, not a full assessment), “In view of the uncertainties, controversies, and complex linkages surrounding the carbon dioxide issue, and the possibility that some of the greatest uncertainties will be reduced within the decade, it seems to most of us that *the near-term emphasis should be on research, with as low a political profile as possible* [emphasis in original document].... We do not know enough to address most of these questions right now. We believe that we can learn faster than the problem can develop.”* John Perry, a meteorologist and chief staff officer for the Academy’s Climate Research Board, criticized this assessment in a guest editorial in the Journal *Climatic Change* entitled “Energy and Climate: Today’s Problem, not Tomorrow’s” by arguing, “If we have good reason to believe that a 100 percent increase in carbon dioxide will produce significant impacts on climate, then we must have equally good reason to suspect that even the small increase we have already produced may have subtly altered our climate.... Climate change is not a matter for the next century; we are most probably doing it right now.”**

* Naomi Oreskes and Erik M. Conway, *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (New York: Bloomsbury Press, 2010), 175-6.

**John Perry, “Energy and Climate: Today’s Problem, not Tomorrow’s,” *Climatic Change*, September 1981, Volume 3, Issue 3, 223-225, <https://link.springer.com/article/10.1007/BF02423215>

1980's

The Reagan Administration cuts energy R&D funding by more than half; numerous battles erupt in Congress over the Department of Energy’s attempts to reduce its climate research budget and the content of climate research programs; the Reagan Administrative is supportive, however, of two major developments related to climate policy: the international treaty to protect the Ozone layer, and the creation of the Intergovernmental Panel on Climate Change.

As Karen Fischer-Vanden comments, public dissatisfaction with some of the Carter Administration’s R&D funding decisions “fed an already existing national trend toward more conservative views—including the desire for less government and industry deregulation where preferred actions of private businesses are induced through market mechanisms.”* “Carter had earlier asked us to lower our thermostats and wear sweaters.” wrote Richard Cohen in *The Washington Post*, “He wore one himself. Reagan, who succeeded Carter in the White House, wore only a smile. For him, there was no energy crisis. Whereas Carter had insisted that only the government could manage the energy crisis, Reagan, in his first inaugural, demanded that government get out of the way. Speaking of general economic conditions at the time, he said, ‘Government is not the solution to our problem.’ He went on to call for America to return to greatness, to ‘reawaken this industrial giant,’ and all sorts of swell things would happen.”** The Reagan administration is instrumental, however, in supporting the Vienna Convention for the Protection of the Ozone Layer [see 1985] and the creation of an international organization to assess scientific and socio-economic information related to global climate change [see 1988].

* Karen Fisher-Vanden, "International Policy Instrument Prominence in the Climate Change Debate: A Case Study of the United States." ENRP Discussion Paper E-97-06, Kennedy School of Government, Harvard University, August 1997, 3. <http://www.hks.harvard.edu/gea/pubs/e-97-06.pdf>

**Richard Cohen, "Wish Upon A Pump," *The Washington Post*, <http://www.washingtonpost.com/wp-dyn/content/article/2008/07/07/AR2008070702215.html>

1981

A prescient study by NASA scientist James Hansen states that potential effects of anthropogenic carbon dioxide warming in the 21st century include "the creation of drought-prone regions in North America and central Asia as part of a shifting of climatic zones, erosion of the West Antarctic ice sheet with a consequent worldwide rise in sea level, and opening of the fabled Northwest Passage"

The study by James Hansen and others, entitled "Climate impact of increasing atmospheric carbon dioxide," is published in *Science*. As the abstract states, "The global temperature rose 0.2°C between the middle 1960s and 1980, yielding a warming of 0.4°C in the past century. This temperature increase is consistent with the calculated effect due to measured increases of atmospheric carbon dioxide. Variations of volcanic aerosols and possibly solar luminosity appear to be primary causes of observed fluctuations about the mean trend of increasing temperature. It is shown that the anthropogenic carbon dioxide warming should emerge from the noise level of natural climate variability by the end of the century, and there is a high probability of warming in the 1980s. Potential effects on climate in the 21st century include the creation of drought-prone regions in North America and central Asia as part of a shifting of climatic zones, erosion of the West Antarctic ice sheet with a consequent worldwide rise in sea level, and opening of the fabled Northwest Passage."*

*James Hansen and coauthors, "Climate impact of increasing atmospheric carbon dioxide," *Science*, 213, 957-966, 1981, <https://pubs.giss.nasa.gov/abs/ha04600x.html>

1982

Tennessee Congressman Al Gore cosponsors the first Congressional hearing on the implications of global warming and the development of technologies to combat it

Al Gore was introduced to climate science as a student of Roger Revelle's at Harvard. He acknowledges during the course of this hearing a need for greater scientific certainty to spur a policy response: "It does seem to me that if we can elevate the degree of certainty, we will have a better chance of summoning up the political will to address this problem."* One of those testifying is NASA scientist James Hansen, who later recollected his testimony as follows: "In that testimony I summarized three papers published with colleagues in 1981, the principal paper being one in *Science* ... in which we showed that, when Southern Hemisphere data were included, the Earth had warmed by about 0.4°C (0.7°F) over the previous century. The second paper showed that non-CO₂ gases caused a climate forcing almost as large as that of CO₂. The third paper showed that sea level had increased about 12 cm in the preceding 100 years and

suggested for the first time, I believe, that thermal expansion of ocean water accounted for a significant fraction of sea level rise.”**

* Karen Fisher-Vanden, “International Policy Instrument Prominence in the Climate Change Debate: A Case Study of the United States.” ENRP Discussion Paper E-97-06, Kennedy School of Government, Harvard University, August 1997, 3. <http://www.hks.harvard.edu/gea/pubs/e-97-06.pdf>

** James E. Hansen, “Political Interference with Government Climate Science,” Testimony before the Committee on Oversight and Government Review, U.S. House of Representatives, March 19, 2017, http://www.columbia.edu/~jeh1/2007/Testimony_20070319.pdf

1981-2

The Reagan Administration urges the National Academy of Sciences to restrain its concern on the climate issue

In meetings leading up to a 1983 National Academy of Science (NAS) report, Department of Energy officials advise NAS that they “[do] not approve of ... speculative, alarmist, ‘wolf-crying’ scenarios....” A White House Office of Science and Technology official advises NAS staff that there is no need for alarm, because “technology will ultimately be the answer to the problems of providing energy and protecting the environment.”*

* Naomi Oreskes and Erik M. Conway, *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (New York: Bloomsbury Press, 2010), 182.

1982

Reagan appointee Frederick Koomanoff speaks in support of “serious, sustained and systematic investigation” of the CO₂ issue

At a Reagan Administration-sponsored conference entitled *Carbon Dioxide, Science, and Consensus*, the Reagan appointee to the Carbon Dioxide Research Division, Frederick Koomanoff, opens the proceedings with the observation that “[the] Executive Branch and the Congress clearly regard the CO₂ issue as one deserving serious, sustained and systematic investigation. The credit for this lies in the good science and solid research that has and is being performed.” James C. Greene, science consultant to the House Committee on Science and Technology, warns, “A veil hangs ominously over the earth, from pole to pole, over all the continents, and over the oceans... To a significant degree, man has put it there. It is called simply enough, carbon dioxide pollution. If today’s worst case scenario becomes tomorrow’s reality, it will be too late to reverse the atmospheric buildup or to ameliorate the severe adverse human and environmental impacts of this pollutant.”*

*John Perlin, “You Won’t Believe What I Found in the Ronald Reagan Presidential Library Regarding Climate Change,” Dec. 8, 2015, *CleanTechnica*, <http://cleantechnica.com/2015/12/08/you-wont-believe-what-i-found-in-the-ronald-reagan-presidential-library-regarding-climate-change-i-sure-was-surprised-cleantechnica-exclusive/>

1982

Exxon Corporation management receives “wide circulation” of a primer on CO₂ and climate change marked “not to be distributed externally,” but ultimately decides to publish its findings regarding the threats of climate change

As reported in 2015 in the investigative report, “Exxon: The Road Not Taken,” by *Inside Climate News*, the primer given to Exxon management is based on extensive research performed by the company since 1977. The primer states that heading off global warming “would require major reductions in fossil fuel combustion.” Unless that happens, “there are some potentially catastrophic events that must be considered. ...Once the effects are measurable, they might not be reversible.” In a September, 1982 report summarizing Exxon’s own climate research, Roger Cohen, head of theoretical sciences at Exxon Corporate Research Laboratories, states that "Over the past several years a clear scientific consensus has emerged," which concludes that a doubling of the carbon dioxide in the atmosphere would produce average global warming of 3 degrees Celsius, plus or minus 1.5 degrees C. “There is unanimous agreement in the scientific community that a temperature increase of this magnitude would bring about significant changes in the earth's climate, including rainfall distribution and alterations in the biosphere.” Cohen urges publication of these findings because it is our "ethical responsibility is to permit the publication of our research in the scientific literature," while he acknowledges the "connection between Exxon's major business and the role of fossil fuel combustion in contributing to the increase of atmospheric CO₂." Exxon will follow his advice: “Between 1983 and 1984, its researchers published their results in at least three peer-reviewed papers in *Journal of the Atmospheric Sciences* and an American Geophysical Union monograph.”*

* Neela Banerjee, Lisa Song and David Hasemeyer, *Exxon: The Road Not Taken*, Sept. 15, 2015, Inside Climate News, <http://insideclimatenews.org/news/15092015/Exxons-own-research-confirmed-fossil-fuels-role-in-global-warming>

1983

The views of climate scientists and economists diverge markedly in a new National Academy of Sciences report on climate change

The National Academy of Sciences (NAS) report, “Changing Climate: Report of the Carbon Dioxide Assessment Committee,” includes five chapters detailing the likelihood of climate change written by climate scientists, including Roger Revelle, and two chapters by economists, including Thomas Schelling. The views diverge markedly. Schelling argues that it is a mistake to assume a “preference for... dealing with causes rather than symptoms... It would be wrong to commit ourselves to the principle that if fossil fuels and carbon dioxide are where the problem arises, that must also be where the solution lies.” The economist William Nierenberg, who chairs the Committee, stresses human migration and adaptation as the likely most economical approach to the problem. Physicist Alvin Weinberg writes a scathing critique of the report, as “so seriously flawed in its underlying analysis and in its conclusions... Does the Committee really believe that the United States or Western Europe or Canada would accept the huge influx of refugees from poor countries that have suffered a drastic shift in rainfall pattern?”*

* Naomi Oreskes and Erik M. Conway, *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (New York: Bloomsbury Press, 2010), 177 - 181.

1985

The Vienna Convention for the Protection of the Ozone Layer becomes the first global treaty with enforceable provisions addressing atmospheric pollution

U.S. leadership plays a pivotal role in attaining the Vienna Convention for the Protection of the Ozone Layer, an international agreement on a clear timetable for reducing the production of chlorofluorocarbons and halons that degrade the atmospheric ozone layer.* The Environmental Protection Agency and the State Department meet with considerable opposition to the treaty in the Reagan cabinet, but President Reagan ultimately supports the treaty provisions.** As Cass Sunstein later observes in *The New York Times*, “There is a real irony here. Republicans and conservatives had ridiculed scientists who expressed concern about the destruction of the ozone layer. How did Ronald Reagan, of all people, come to favor aggressive regulatory steps and lead the world toward a strong and historic international agreement? A large part of the answer lies in a tool disliked by many progressives but embraced by Reagan (and Mr. Obama): cost-benefit analysis. Reagan’s economists found that the costs of phasing out ozone-depleting chemicals were a lot lower than the costs of not doing so — largely measured in terms of avoiding cancers that would otherwise occur. Presented with that analysis, Reagan decided that the issue was pretty clear.”***

* United Nations Environment Program, *Vienna Convention for the Protection of the Ozone Layer*, <http://ozone.unep.org/en/treaties-and-decisions/vienna-convention-protection-ozone-layer>

** Robert A. Wampler, “US Climate Change Policy in the 1980’s,” George Washington University National Security Archive, Dec. 2, 2015, <http://nsarchive.gwu.edu/NSAEBB/NSAEBB536-Reagan-Bush-Recognized-Need-for-US-Leadership-on-Climate-Change-in-1980s/>

***Cass Sunstein, “Climate Change: Lessons from Ronald Reagan,” *The New York Times*, November 10, 2012, <http://www.nytimes.com/2012/11/11/opinion/sunday/climate-change-lessons-from-ronald-reagan.html>

1986

President Ronald Reagan removes the 32 solar panels that President Jimmy Carter installed on the White House roof in 1979; they find their way to the roof of the cafeteria at Unity College, Maine, and then to museums around the world.

As David Biello reports in a 2010 article in *Scientific American*: “‘Hey! That system is working. Why don’t you keep it?’ recalls mechanical engineer Fred Morse, now of Abengoa Solar, who helped install the original solar panels as director of the solar energy program during the Carter years and then watched as they were dismantled during his tenure in the same job under Reagan. ‘Hey! This whole [renewable] R&D program is working, why don’t you keep it?’” The development director of Unity College, Peter Marbach, asks for the panels, and former President Jimmy Carter and Maine Senator William Cohen support the effort to move them to Maine. For a fee of \$500 to the General Services Administration, Unity College takes possession of 16 of the panels, and drives them to Maine in a battered blue school bus to Maine, for installation on the Unity College cafeteria. “The rest went back into storage, too big to fit in an area that is much smaller than the White House roof.

Once Marbach arrived back at the college, donations flooded in to help refurbish and install them, including a gift of \$150,000 worth of pre-Mobil merger Exxon stock, money from actress Glenn Close and a mention by Al Gore during a campaign stop in Maine that year.” Some of the remaining panels are now in the Smithsonian’s National Museum of American History, the Carter Library, and the Solar Science and Technology Museum in Dezhou, China. Observes Biello: “China now produce[s] some 80 percent of the solar water heaters used in the world today.”*

*David Biello, “Where Did Carter’s White House’s Solar Panels Go?” *Scientific American*, August 6, 2010, <https://www.scientificamerican.com/article/carter-white-house-solar-panel-array/>

1987

The Global Climate Protection Act mandates the development of a coordinated national policy on global climate change, and articulates a substantially higher level of Congressional concern about climate change than did the 1978 National Climate Protection Act which it amends

Congressional findings in this law are that “(1) There exists evidence that manmade pollution—the release of carbon dioxide, chlorofluorocarbons, methane, and other trace gases into the atmosphere—may be producing a long-term and substantial increase in the average temperature on Earth, a phenomenon known as global warming through the greenhouse effect. (2) By early in the next century, an increase in Earth temperature could (A) so alter global weather patterns as to have an effect on existing agricultural production and on the habitability of large portions of the Earth; and (B) cause thermal expansion of the oceans and partial melting of the polar ice caps and glaciers, resulting in rising sea levels... (4) While the consequences of the greenhouse effect may not be fully manifest until the next century, ongoing pollution and deforestation may be contributing now to an irreversible process. Necessary actions must be identified and implemented in time to protect the climate. (5) The global nature of this problem will require vigorous efforts to achieve international cooperation aimed at minimizing and responding to adverse climate change; such international cooperation will be greatly enhanced by United States leadership.” Congress accordingly mandates the following goals for national climate action: “United States policy should seek to— (1) increase worldwide understanding of the greenhouse effect and its environmental and health consequences; (2) foster cooperation among nations to develop more extensive and coordinated scientific research efforts with respect to the greenhouse effect; (3) identify technologies and activities to limit mankind's adverse effect on the global climate by— (A) slowing the rate of increase of concentrations of greenhouse gases in the atmosphere in the near term; and (B) stabilizing or reducing atmospheric concentrations of greenhouse gases over the long term.” *

*Global Climate Protection Act of 1987, Pub. L. 100-204, title XI, Dec. 22, 1987, 101 Stat. 1407, <https://www.gpo.gov/fdsys/pkg/USCODE-2011-title15/html/USCODE-2011-title15-chap56.htm>

1988

NASA scientist James Hansen testifies in Congress on the reality of global warming, and its impact on current experiences of extreme weather

During an unusually hot summer, NASA scientist James Hansen testifies in Congress on the reality of global warming: “Number one, the earth is warmer in 1988 than at any time in the history of instrumental measurements. Number two, the global warming is now large enough that we can ascribe with a high degree of confidence a cause and effect relationship to the greenhouse effect. And number three, our computer climate simulations indicate that the greenhouse effect is already large enough to begin to affect the probability of extreme events such as summer heat waves.”* Also testifying in this hearing are Syukuro Manabe of NASA’s Geophysical Fluid Dynamics Laboratory, Dr. George Woodwell, director of the Woods Hole Research Center, and Dr. Michael Oppenheimer, an atmospheric physicist with the Environmental Defense Fund. As *The New York Times* reports, “Until now, scientists have been cautious about attributing rising global temperatures of recent years to the predicted global warming caused by pollutants in the atmosphere, known as the ‘greenhouse effect.’ But today Dr. James E. Hansen of the National Aeronautics and Space Administration told a Congressional committee that it was 99 percent certain that the warming trend was not a natural variation but was caused by a buildup of carbon dioxide and other artificial gases in the atmosphere.”**

*<http://image.guardian.co.uk/sys-files/Environment/documents/2008/06/23/ClimateChangeHearing1988.pdf>

**Philip Shabecoff, “Global Warming Has Begun, Experts tell Senate,” *The New York Times*, June 24, 1988, <http://www.nytimes.com/1988/06/24/us/global-warming-has-begun-expert-tells-senate.html?pagewanted=all>

1988

The Intergovernmental Panel on Climate Change (IPCC) is created by the World Meteorological Organization and the United Nations Environment Program, with instrumental support from the U.S. Reagan Administration.

The idea of an international organization under the United Nations focused on climate science and policy was originally proposed by UN officials in 1985, but rejected by the Reagan Administration, the Soviet Union and others, which preferred that this work be directed by domestic institutions and agencies. In 1987, according to an analysis by Tana Johnson, “Suddenly, the situation changed. By 1987, the Ronald Reagan administration in the United States hammered out a proposal for a new institution called the Intergovernmental Panel on Climate Change (IPCC). Other states were excluded from the deliberations but swiftly rubber-stamped the plan. Thus, in a brief period, the institutions addressing climate change shifted markedly. From being under the sole purview of domestic agencies, the issue was taken up by a new international body.”* The IPCC’s stated mission is “to provide the world with a clear scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts.” The IPCC “reviews and assesses the most recent scientific, technical and socio-economic information produced worldwide relevant to the understanding of climate change. It does not conduct any research nor does it monitor climate related data or parameters.” All members of the United Nations are entitled to membership in the IPCC. As stated on the IPCC’s web page: “Because of its scientific and intergovernmental nature, the IPCC embodies a unique opportunity to provide rigorous and balanced scientific

information to decision makers. By endorsing the IPCC reports, governments acknowledge the authority of their scientific content. The work of the organization is therefore policy-relevant and yet policy-neutral, never policy-prescriptive.”**

*Tana Johnson, *Organizational Progeny: Why Governments are Losing Control over the Proliferating Structures of Global Governance* (Oxford University Press, 2014), 1,
https://static1.squarespace.com/static/535bc5d5e4b0264746466c9f/t/54333741e4b075883baa9ad1/1412642625536/Chapter1_Organizational_Progeny_Tana_Johnson.pdf

** United Nations, Intergovernmental Panel on Climate Change, <https://www.ipcc.ch/organization/organization.shtml>

1988

The United Nations General Assembly, declaring that “climate change is a common concern of mankind,” convenes an international committee to negotiate a climate change treaty at the 1992 Rio Conference on Environment and Development

The General Assembly resolution, a first formal step toward development of a treaty, “[r]equests the Secretary-General of the World Meteorological Organization and the Executive Director of the United Nations Environment Programme, through the Intergovernmental Panel on Climate Change, immediately to initiate action leading, as soon as possible, to a comprehensive review and recommendations with respect to:... (c) Possible response strategies to delay, limit or mitigate the impact of adverse climate change; (d) The identification and possible strengthening of relevant existing international legal instruments having a bearing on climate; (e) Elements for inclusion in a possible future international convention on climate.”*

* Resolution of the United Nations General Assembly, December 6, 1988, <http://www.un.org/documents/ga/res/43/a43r053.htm>

1988

Presidential candidate George H.W. Bush promises in a campaign speech to act against climate change

In Michigan on August 31, Bush states, "Those who think we are powerless to do anything about the greenhouse effect forget about the 'White House effect'; as President, I intend to do something about it," He promises to convene an international conference on the environment" "We will talk about global warming," he said, "and we will act." Eight months later *The New York Times* notes that "Mr. Bush has not acted. He hasn't called for an international conference or even arranged a conference of his own policy makers to resolve their differences. Hence he is hearing no clear advice."*

*Editorial Board, "The White House and the Greenhouse," *The New York Times*, May 9, 1989, <http://www.nytimes.com/1989/05/09/opinion/the-white-house-and-the-greenhouse.html>

1989

A Department of State briefing memorandum urges the G.H.W. Bush Administration to engage proactively on the issue of climate change, which it calls “the most far reaching environmental issue of our time”

According to the February 15, 1989 Department of State briefing memorandum (declassified March 2015), “There is no way that the U.S. can develop a credible international strategy on climate change unless it addresses U.S. emissions of CO₂ from fossil fuel combustion. Once we have developed a domestic strategy for stabilizing and then reducing our use of fossil fuels over time, we can then develop an international strategy which is consistent with our domestic strategy.” Another briefing memorandum dated February 9, 1989 and declassified in March 2015 from Frederick Bernthal, Assistant Secretary of State for Oceans and International Environment and Scientific Affairs, observes, “While it is clear that we need to know more about climate change, prudence dictates that we also begin to weigh impacts and possible responses. We simply cannot wait—the costs of inaction will be too high.”*

* Department of State briefing memorandum, February 9, 1989, reprinted in Robert A. Wampler, “U.S. Climate Change Policy in the 1980’s,” George Washington University National Security Archive, December 2, 2015,

<http://nsarchive.gwu.edu/NSAEBB/NSAEBB536-Reagan-Bush-Recognized-Need-for-US-Leadership-on-Climate-Change-in-1980s/>

1989

The conservative George C. Marshall Institute issues its first report attacking climate science

The conservative George C. Marshall Institute, with economist William Nierenberg on its Board, issues its first report attacking climate science. As described by historians of science Naomi Oreskes and Erik Conway, “Their initial strategy wasn’t to deny the fact of global warming but to blame it on the Sun. They circulated an unpublished ‘white paper’ ...published as a small book the following year, entitled, ‘Global Warming: What Does the Science Tell Us?’ Echoing the tobacco industry strategy, they claimed the report would set the record straight on global warming. The Institute’s Washington office staff contacted the White House to request an opportunity to present it. Nierenberg gave the briefing himself, to members of the Office of Cabinet Affairs, the Office of Policy Development, the Council of Economic Advisors, and the Office of Management and Budget.” Presentations of the report to the G.H.W. Bush Administration “had a big impact, stopping the positive momentum that had been building” on climate change policy.*

*Naomi Oreskes and Erik M. Conway, *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (New York: Bloomsbury Press, 2010), 186-7.

1989

The G.H.W. Bush Administration takes unprecedented steps to censor a government scientist’s Congressional testimony on climate change.

In testimony delivered to the House Committee on Oversight and Government Review on March 19, 2007, NASA scientist James Hansen stated that “[d]uring the past 25 years I have

noticed an increase in the degree of political interference with scientific testimony to Congress.” He in particular describes a difference between his various testimonies to Congress during the Reagan Administration, where there was only one case where he and White House reviewers could not agree on acceptable language, and in that case he was given permission to testify “as an individual,” and negotiations with the G.H.W.Bush White House on testimony in 1989: “In 1989, after climate change had become of greater public and political concern, the constraints on communication via congressional testimony became stricter, at least in my experience. When I submitted written testimony to NASA Headquarters in 1989 for presentation to a Senate Committee chaired by Senator Gore, my secretary was instructed by NASA Headquarters to send the original typescript to NASA Headquarters so that they could insert several changes that were required by the White House OMB [Office of Management and Budget]. When I was informed of this I was angered, intercepted the typescript, and insisted that any changes had to be made in my office. Several acceptable rewordings were negotiated (NASA Headquarters being the intermediary between OMB and me), but three changes that OMB required were unacceptable to me. Unlike the case earlier in the 1980s, I was told by NASA Headquarters that I needed to accept the changes or not testify. I agreed to accept the changes, but I then sent a fax to Senator Gore requesting that he ask me during the hearing about those specific statements, because I wanted to make clear that they were the opinion of the White House OMB, not my opinion.” The changes demanded by the White House, detailed by Hansen in his 2007 testimony served either to exaggerate uncertainties about climate science, or discourage policy responses.*

*James E. Hansen, “Political Interference with Government Climate Science,” Testimony before the Committee on Oversight and Government Review, U.S. House of Representatives, March 19, 2007,
http://www.columbia.edu/~jeh1/2007/Testimony_20070319.pdf

1989

United Kingdom Prime Minister Margaret Thatcher warns the United Nations General Assembly about the threat of climate change

Prime Minister Thatcher, who holds a degree in chemistry from Oxford and has worked as a research chemist, states that “Of all the challenges faced by the world community in [the previous] four years, one has grown clearer than any other in both urgency and importance—I refer to the threat to our global environment. I shall take the opportunity of addressing the general assembly to speak on that subject alone.” Thatcher notes that, “We are seeing a vast increase in the amount of carbon dioxide reaching the atmosphere. The annual increase is three billion tonnes: and half the carbon emitted since the Industrial Revolution still remains in the atmosphere... Put in its bluntest form: the main threat to our environment is more and more people, and their activities: The land they cultivate ever more intensively; The forests they cut down and burn; The mountain sides they lay bare; The fossil fuels they burn; The rivers and the seas they pollute. The result is that change in future is likely to be more fundamental and more widespread than anything we have known hitherto. Change to the sea around us, change to the atmosphere above, leading in turn to change in the world's climate, which could alter the way we live in the most fundamental way of all. That prospect is a new factor in human affairs. It is

comparable in its implications to the discovery of how to split the atom. Indeed, its results could be even more far-reaching.”*

*Margaret Thatcher, Speech to the United Nations General Assembly (Global Environment), November 8, 1989, <http://www.margaretthatcher.org/document/107817>

1990

The Intergovernmental Panel on Climate Change produces its first assessment report, observing that unrestricted fossil fuel use would produce a “rate of increase of global mean temperature during the next century of about .3 degrees Celsius per decade; this is greater than seen over the past 10,000 years”

The first assessment report of the Intergovernmental Panel on Climate Change (IPCC) is the result of the work of several hundred scientists from 25 countries, and describes itself as “the most authoritative and strongly supported statement on climate change that has ever been made by the international scientific community.” The Executive Summary begins with the statement: “We are certain that:.... emissions resulting from human activities are substantially increasing the atmospheric concentrations of the greenhouse gases carbon dioxide, methane, chlorofluorocarbons (CFCs) and nitrous oxide These increases will enhance the greenhouse effect, resulting on average in an additional warming of the Earth's surface The main greenhouse gas, water vapour, will increase in response to global warming and further enhance it.” The IPCC predicts based on current models that under “Business-as-Usual” emissions of greenhouse gases the planet will experience “a likely increase in global mean temperature of about 1°C above the present value by 2025 and 3°C before the end of the next century.” With respect to mitigation efforts, the report cautions that “the long-lived gases [carbon dioxide, nitrous oxides, and chlorofluorocarbons] would require immediate reductions in emissions from human activities of over 60% to stabilise their concentrations at today's levels.” The report addresses and rejects the Marshall Institute argument for blaming the sun: “On a decadal time-scale solar variability and changes in greenhouse gas concentration could give changes of similar magnitudes. However ...over longer time-scales the increases in greenhouse gases are likely to be more important...The changes predicted to occur by about the middle of the next century due to increases in greenhouse gas concentrations from the Business-as-Usual emissions will make global mean temperatures higher than they have been in the last 150,000 years.”*

*Intergovernmental Panel on Climate Change, *Climate Change: The IPCC Scientific Assessment* (Cambridge, Cambridge University Press, 1990), https://www.ipcc.ch/ipccreports/far/wg_I/ipcc_far_wg_I_full_report.pdf

Early 1990’s

Paul Mayewski discovers evidence in ice core samples of abrupt historical climate change occurring over a period as short as one or two years

Paul Mayewski, who will later join the University of Maine Climate Change Institute, discovers a historical record of “abrupt climate change” through study of global ice core samples. Rapid changes in precipitation, temperature, wind speeds and currents, and storm frequencies have occurred in the distant past and could occur again within as short a time as one to two years, could be sustained for decades or centuries, and “can lead to collapse of civilizations.” These occur in both natural and human-impacted climates, and can result from temperature changes of as little as 1 or ½ degrees Celsius. Writes Mayewski: “Today we know that even “milder” versions of abrupt climate change are significant enough to radically alter the course of civilizations and ecosystems … and that these events are taken seriously enough to be the subject of numerous governmental scientific and security reports.”*

*Paul Mayewski, “Climate Change and the Role of Humans,” March 31, 2011 lecture, University of Maine; Paul Mayewski, “Abrupt Climate Change: The Next Major Challenge,” <http://www.iii.org/sites/default/files/docs/pdf/Mayewski1.pdf>

1990

At the Second World Climate Conference in Geneva, the United States refuses to agree with other nations to a binding target to stabilize CO₂ emissions at 1990 levels by 2000

The Second World Climate Conference in Geneva includes six days of scientific presentations and discussions involving 747 participants from 116 countries; and two days of policy sessions attended by 908 participants from 137 countries. The original purpose of the conference is to review a decade of work on applying climate information to “the challenges of food, water, energy and urban and building design.” A later emerging focus is to review the first assessment of the IPCC, in preparation for the negotiations for a UN Framework Convention on Climate Change, scheduled to begin in Washington DC in February 1991 and to conclude in time for signature at the Rio Earth Summit in June 1992.* On this latter agenda item there is significant disagreement. European nations, Canada, Australia, New Zealand, and Japan each are prepared to commit to stabilize CO₂ emissions at 1990 levels by 2000; only the United States, under G.H.W. Bush, does not agree to a binding target. The conference concludes with a weak declaration that industrialized countries should establish targets and/or national programs to control emissions.**

* John W. Zillman, “A History of Climate Activities,” World Meteorological Association Bulletin Vol 58(3)2009, <https://public.wmo.int/en/bulletin/history-climate-activities>

** Karen Fisher-Vanden, “International Policy Instrument Prominence in the Climate Change Debate: A Case Study of the United States.” ENRP Discussion Paper E-97-06, Kennedy School of Government, Harvard University, August 1997, 14. <http://www.hks.harvard.edu/gea/pubs/e-97-06.pdf>.

1990

Secretary of State James Baker’s presentation to the Intergovernmental Panel on Climate Change proposes a modest, “no-regrets” strategy, taking only those actions which are justified for other reasons, such as increasing fuel efficiency

This approach is in conflict with the approach advocated by other countries of the Intergovernmental Panel on Climate Change (IPCC), which favor targets and timetables.* The political rationale for Secretary of State James Baker's approach is outlined in a Feb., 1989 Department of State briefing paper declassified in 2015, under the caption "Opportunities and Problems:" "The most important cause of global warming is CO₂ emissions caused by the combustion of fossil fuels. The costs to society of a major cutback in the use of such fuels could be immense (e.g., as much as half a trillion dollars to replace U.S. coal-based electricity generation alone). Major uncertainties about the offsetting effect of an anticipated increase in cloud cover, the dynamics of the ocean/atmosphere interface and other key variables make it difficult to justify those costs politically. But a number of prudent measures could be taken that we would never regret, whether or not global warming ever occurs e.g., increased efficiency in energy use, global reforestation, and phasing out CFC [chlorofluorocarbon] production and use."**

*Karen Fisher-Vanden, "International Policy Instrument Prominence in the Climate Change Debate: A Case Study of the United States." ENRP Discussion Paper E-97-06, Kennedy School of Government, Harvard University, August 1997, 14, <http://www.hks.harvard.edu/gea/pubs/e-97-06.pdf>.

**Frederick M. Bernthal, Memorandum to the Secretary, Department of State, "Review of Key Policy Issues: The Environment," February 27, 1989, <http://nsarchive.gwu.edu/NSAEBB/NSAEBB536-Reagan-Bush-Recognized-Need-for-US-Leadership-on-Climate-Change-in-1980s/documents/Document%2010.pdf>

1991

Economist William Nierenberg and the Marshall Institute attack the conclusions of the Intergovernmental Panel on Climate Change and argue that global temperatures will increase at most by 1 degree Celsius by the end of the 21st century

In a presentation to the World Petroleum Congress, economist William Nierenberg and the Marshall Institute attack the conclusions of the Intergovernmental Panel on Climate Change (IPCC), arguing that global temperatures will increase at most by 1 degree Celsius by the end of the 21st century. In a letter to the American Petroleum Institute, Marshall Institute physicist Robert Jastrow states that "It is generally considered in the scientific community that the Marshall report was responsible for the Administration's opposition to carbon taxes and restrictions on fossil fuel consumption," and claims that the Marshall Institute "is still the controlling influence in the White House." *

*Naomi Oreskes and Erik M. Conway, *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (New York: Bloomsbury Press, 2010), 189-190.

1991

Yale economist William Nordhaus makes a "highly tentative" estimate that the economic damage from a 3-degree Celsius rise in global mean temperature could be "1/4% output for today's United States economy"

Yale economist William Nordhaus publishes an assessment of the costs of global warming, "To Slow or Not to Slow: The Economics of the Greenhouse Effect," in *The Economic Journal*. He provides a "highly tentative" estimate that the damage from a 3-degree Celsius rise in global

mean temperature could be “1/4% output for today’s United States economy,” but notes that “There are clearly unmeasured and unmeasurable impacts which might raise this impact to 1%, or at most 2% of total global output.” He describes the latter estimate as a “hunch.” Nordhaus’s estimate excludes non-marketed resources such as biodiversity and species loss, damage to human health, non-commercial recreation, and ecosystem damage. He estimates the global costs of greenhouse gas emissions reductions at \$2 billion a year for a 10% reduction, \$31 billion for a 25% reduction, and \$191 billion for a 50% reduction.* This work is influential in supporting the U.S. position against mandatory emissions reduction in international negotiations, and encounters significant criticism by other economists.**

*William Nordhaus, “To Slow or Not to Slow: The Economics of the Greenhouse Effect,” *The Economic Journal*, Vol. 101, No. 407 (July 1991), https://www.jstor.org/stable/2233864?seq=1#page_scan_tab_contents

**Clive L. Splash, *Greenhouse Economics: Value and Ethics* (Taylor & Francis, 2002, 113), 161-170.

1991

In preparation for the 1992 United Nations Conference on Environment and Development (“Rio Conference”), the G.H.W. Bush Administration presents “A Comprehensive Approach to Addressing Potential Climate Change” to the United Nations Intergovernmental Negotiating Committee

The Report states that, “The best design for a climate change convention, and for any policy responses that might ensue, would be a ‘comprehensive approach’ that addresses all relevant trace gases, their sources and sinks....in order to deal with the many scientific, environmental, and economic aspects of the climate system, which involves multiple trace gases resulting from activities in every sector of human society.”* A memorandum of the Department of Justice had recommended emissions trading as a strategy for reduction of greenhouse gases; the subsequent Bush Administration report mentions the concept of emissions trading but does not specifically advocate for it.**

*Horace M. Karling, *Global Climate Change* (Nova Publishers, 2001), 50.

** Karen Fisher-Vanden, “International Policy Instrument Prominence in the Climate Change Debate: A Case Study of the United States.” ENRP Discussion Paper E-97-06, Kennedy School of Government, Harvard University, August 1997, 15, <http://www.hks.harvard.edu/gea/pubs/e-97-06.pdf>.

1991

In anticipation of the Rio Conference, the Edison Electric Institute, the Western Fuels Association, and the National Coal Association form the Information Council on the Environment (“ICE”) with a goal to “reposition global warming as a theory (not fact)”

ICE initiates a \$500,000 public relations campaign that tested target audiences in Fargo, North Dakota, Flagstaff, Arizona, and Bowling Green, Kentucky for radio and newspaper advertisements. The test markets, *The Guardian* notes, “all... happened to be the homes of members of the energy and commerce or ways and means committees of the US House of Representatives.” * Leaked internal documents describe their targets as “older, less educated males from larger households, who are not typically active information seekers, and are not likely to be ‘green’ consumers. Members of this group are skeptical about global warming,

predisposed to favor the ICE agenda, and likely to be even more supportive of that agenda following exposure to new information. They are not, however, accustomed to taking political action. They are good targets for radio advertisements.” The memo goes on: “Another possible target segment is younger, lower-income women. These women are more receptive than other audience segments to factual information concerning the evidence for global warming. They are likely to be “green” consumers, to believe the earth is warming, and to think the problem is serious. However, they are also likely to soften their support for federal legislation after hearing new information on global warming. These women are good targets for magazine advertisements.” An ICE ad says, “Who told you the earth was warming: Chicken Little? Chicken Little’s hysteria about the sky falling was based on a fact that got blown out of proportion. It’s the same with global warming. There’s no hard evidence it is occurring. In fact, the evidence the Earth is warming is weak. Proof that carbon dioxide has been the primary cause is non-existent...If you care about the environment, but don’t want your imagination to run away with you, be sure you get the facts.”**

*George Monbiot, “The denial industry case notes,” *The Guardian*, December 7, 2009,

<https://www.theguardian.com/environment/georgemonbiot/2009/dec/07/george-monbiot-blog-climate-denial-industry>

**Union of Concerned Scientists, Climate Deception Dossier, http://www.ucsusa.org/sites/default/files/attach/2015/07/Climate-Deception-Dossier-5_ICE.pdf

1992

The United Nations Conference on Environment and Development (Rio Conference) draws 178 countries and 140 heads of state, and results in a signed commitment of 154 nations to work toward preventing “dangerous anthropogenic interference with the climate system”

In his opening remarks, Canadian businessman and diplomat Maurice Strong, Secretary General of the Rio Conference, describes the moral imperative for the work of the conference as follows: “Central to the issues we are going to have to deal with are: patterns of production and consumption in the industrial world that are undermining the Earth’s life-support systems; the explosive increase in population, largely in the developing world, that is adding a quarter of a million people daily; deepening disparities between rich and poor that leave 75 per cent of humanity struggling to live; and an economic system that takes no account of ecological costs or damage - one which views unfettered growth as progress. We have been the most successful species ever; we are now a species out of control. Our very success is leading us to a dangerous future.”* The Rio Conference reaches international agreements on several principles of action, including the Rio Declaration on Environment and Development, which includes Principle 15: “In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.” The UN Framework Convention on Climate Change (UNFCCC), signed by 154 nations, enters into force in 1994 and describes as its “ultimate objective” the “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.” In article 4(2) of the UNFCCC, the developed countries enter into a voluntary, unenforceable

commitment to reduce their emissions to 1990 levels by the year 2000. Other agreements reached at the Conference include a Non-legally Binding Authoritative Statement on Forests; a Convention on Biological Diversity, and Agenda 21, a guide to implementation on Climate Change and Biodiversity Conventions.^{**} President George H.W. Bush attends the Rio Conference and signs the Framework Convention on Climate Change, and the Senate ratifies.^{***} In his statement on signing the ratification document of the treaty, President Bush notes that “The Climate Convention is the first step in crucial long-term international efforts to address climate change. The international community moved with unprecedented speed in negotiating this convention and thereby beginning the response to climate change. As proposed by the United States, the convention is comprehensive in scope and action-oriented. All parties must inventory all sources and sinks of greenhouse gases and establish national climate change programs. Industrialized countries must go further, outlining in detail the programs and measures they will undertake to limit greenhouse emissions and adapt to climate change and quantifying expected results. Parties will meet on a regular basis to review and update those plans in the light of evolving scientific and economic information.”^{****} Subsequent UNFCCC proceedings will develop a “protocol” for enforceable emissions limitations under the Rio treaty.

*Maurice F. Strong, “Opening Statement to the Rio Summit” (June 3, 1992), <http://www.mauricestrong.net/index.php/opening-statement6>

** United Nations, Framework Convention on Climate Change, 1992, <https://unfccc.int/resource/docs/convkp/conveng.pdf>, United Nations Conference on Environment and Development, <http://www.un.org/geninfo/bp/enviro.html>.

***<https://www.congress.gov/treaty-document/102nd-congress/38>

****George H.W. Bush: "Statement on Signing the Instrument of Ratification for the United Nations Framework Convention on Climate Change," October 13, 1992. Online by Gerhard Peters and John T. Woolley, *The American Presidency Project*, <http://www.presidency.ucsb.edu/ws/?pid=21611>

1993

The Clinton Administration submits its Climate Change Action Plan for stabilizing emissions at 1990 levels by 2000, pursuant to the Framework Convention on Climate Change from the Rio Conference

The Clinton Administration Climate Change Action Plan, coauthored by Vice President Al Gore, commits \$1.9 billion in “new and redirected” federal funding for 1994 to 2000, and promises to leverage “over \$60 billion in private investment” over the same period for environmental technologies. Its plan for stabilizing emissions at 1990 levels by 2000 consists mainly of extensions to existing programs and voluntary measures undertaken by U.S. businesses.* It is nevertheless decried by The Heritage Foundation on the grounds that “It would not, in fact, be voluntary as the Administration claims. Most qualified scientists believe catastrophic global warming is improbable. There are better ways to address any threat which may exist.”**

* William J. Clinton and Albert Gore, The Climate Change Action Plan (1993), <http://catalog.hathitrust.org/Record/002802159>

** John Shanahan, “Clinton’s ‘Voluntary’ Global Warming Plan: Expensive, Ineffective, and Unnecessary,” *The Heritage Foundation* (1994), <http://www.heritage.org/research/reports/1994/08/bg995nbsp-clintons-voluntary-global>

1993

President Clinton proposes a “BTU tax”; it is opposed by Republicans in Congress, who pass a much more modest tax on gasoline and diesel

As the *New York Times* summarizes the proposal: “President Clinton wants to add some new letters to the Government's tax-code alphabet soup: B.T.U. His proposed broad-based energy tax would apply to the energy content of nearly all fuels, as measured by the British thermal unit, or B.T.U. -- the quantity of heat needed to raise the temperature of a pound of water by 1 degree Fahrenheit. When the tax is fully in force, the Treasury estimated, it would increase the \$2,242 energy bill for a family of four earning \$25,000 by \$105. The new tax would raise the price of gasoline by 2.5 cents a gallon next year; in 1996 the tax would be 7.5 cents a gallon higher than it is now. With the average household using about 1,000 gallons of gasoline a year, that means an increase cost of about \$25 the first year and \$75 the third year.”* The House passes the “BTU tax” provision, but with zero Republican support. The tax proposal is rejected in the Senate, which enacts a much more modest tax increase of 4.3 cents per gallon, just on gasoline and diesel fuels. “The next year Republicans won a majority in the House for the first time in a generation, and many House Democrats who voted for the BTU tax were not reelected,” observes Columbia University law professor Michael Graetz.**

*Steven Greenhouse, “Clinton’s Economic Plan: The Energy Plan; Fuels Tax: Spreading the Burden,” *The New York Times*, February 18, 1993, <http://www.nytimes.com/1993/02/18/us/clinton-s-economic-plan-the-energy-plan-fuels-tax-spreading-the-burden.html>

** Michael J. Graetz, *The End of Energy: The Unmaking of America’s Environment, Security, and Independence* (Cambridge: MIT Press 2011), 183-184.

1993

Researchers measure world carbon emissions from 1950 to 1986 and find that the United States, with 5% of world population, is responsible for 30 percent of cumulative emissions; India, with 17 percent of world population, is responsible for less than 2% of emissions

An introductory note to the report commissioned by the United Nations underscores the need for substantial financial support for developing nations: “After the United Nations Conference on Environment and Development in Rio de Janeiro in 1992, a central issue in the Climate Change Convention relates to the amounts and sources of the greenhouse gases emitted from the various countries and regions, both industrialized and developing, and their relation to international governance. To date, the lack of agreed principles has stalled agreement as to what concrete and practical steps should be taken to meet the needs for stabilizing climate change. The present book ... is aimed at presenting the state of the art in greenhouse indices, and related international policy making and governance, clarifying key technical issues relating to greenhouse gas emissions, and outlining the economic responsibilities of various countries based on the emissions. It makes an argument for the necessary North-South resource transfers.”*

* Peter Hayes and Kirk Smith, eds., *The Global Greenhouse Regime: Who Pays?* (United Nations University Press 1993), <http://archive.unu.edu/unupress/unupbooks/80836e/80836E00.htm#Contents>

1995

The Intergovernmental Panel on Climate Change produces its Second Assessment Report concluding that despite various uncertainties, “the balance of evidence suggests that there is a discernible human influence on global climate”

The Summary for Policymakers, Second Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), Working Group I: “Our ability to quantify the human influence on global climate is currently limited because the expected signal is still emerging from the noise of natural variability, and because there are uncertainties in key factors. These include the magnitude and patterns of long term natural variability and the time-evolving pattern of forcing by, and response to, changes in concentrations of greenhouse gases and aerosols, and land surface changes. Nevertheless, the balance of evidence suggests that there is a discernible human influence on global climate.” Climate forecasts include: “A general warming is expected to lead to an increase in the occurrence of extremely hot days and a decrease in the occurrence of extremely cold days. Warmer temperatures will lead to a more vigorous hydrological cycle; this translates into prospects for more severe droughts and/or floods in some places and less severe droughts and/or floods in other places. Several models indicate an increase in precipitation intensity, suggesting a possibility for more extreme rainfall events. Knowledge is currently insufficient to say whether there will be any changes in the occurrence or geographical distribution of severe storms, e.g., tropical cyclones.”*

* Intergovernmental Panel on Climate Change, *Second Assessment Report* (1995), 22, <https://www.ipcc.ch/pdf/climate-changes-1995/ipcc-2nd-assessment/2nd-assessment-en.pdf>

1997

Marshall Institute Board Chair Fred Seitz writes a letter to the Wall Street Journal complaining of changes made to the Intergovernmental Panel on Climate Change Report of Working Group I as a “corruption of the peer-review process”

Seitz contends that the final report “remov[ed] hints of the skepticism with which many scientists regard claims that human activities are having a major impact on climate...” The American Meteorological Society responds in a letter in the Bulletin of the American Meteorological Society: “[There] appear[es] to be a concerted and systematic effort by some individuals to undermine and discredit the scientific process that has led many scientists working on understanding climate to conclude that there is a very real possibility that humans are modifying Earth’s climate on a global scale. Rather than carrying out a legitimate scientific debate through the peer-reviewed literature, they are waging in the public media a vocal campaign against scientific results with which they disagree.”*

* Naomi Oreskes and Erik M. Conway, *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (New York: Bloomsbury Press, 2010), 208-210.

1997

In an about-face from Exxon's acknowledgment of climate change and engagement in climate research in the 1970's and 1980's, Exxon Chief Executive Officer Lee Raymond raises doubt about the climate models Exxon researchers had helped build, and claims that "the earth is cooler today than it was twenty years ago"

Regarding the climate models Exxon researchers had helped build, Exxon Chief Executive Officer Lee Raymond claims that "1990s models were predicting temperature increases of two to five degrees Celsius by the year 2100. Last year's models say one to three degrees. Where to next year?" In a speech before the World Petroleum Congress, he dismisses any sense of urgency: "We need to understand the issue better, and fortunately, we have time... It is highly unlikely that the temperature in the middle of the next century will be significantly affected whether policies are enacted now or 20 years from now."*

* Neela Banerjee, Lisa Song and David Hasemyer, *Exxon: The Road Not Taken*, Sept. 15, 2015, Inside Climate News, <http://insideclimatenews.org/news/15092015/Exxons-own-research-confirmed-fossil-fuels-role-in-global-warming>

1997

At the Kyoto Conference on Climate Change in Tokyo, more than 150 countries meet to establish the Kyoto Protocol as an extension of the United Nations Framework Convention on Climate Change, which will assign mandatory targets for signatory industrialized nations to reduce greenhouse gas emissions

The United States enters Kyoto negotiations with a goal to reduce emissions to 1990 levels by 2012, a substantially more modest goal than those urged by other participants. Vice President Al Gore plays a major role in negotiations and President Clinton signs the treaty, after participants agree to U.S. language authorizing emissions trading to meet goals. The Natural Resources Defense Council describes Kyoto as "by far the strongest environmental treaty ever drafted"; Senate Republican Majority Leader Trent Lott says it would "empower international bureaucrats to impose financial obligations on the United States"; and Democratic Representative Henry Waxman predicts that an attempt at ratification will provoke "the mother of all environmental legislative battles." A contemporary commentator invokes a previous observation by Al Gore: "The minimum that is scientifically necessary far exceeds the maximum that is politically feasible."* The U.S. Senate then passes a unanimous resolution expressing its sense that the United States should not enter the Kyoto Protocol unless targets apply to nations such as China and India, and unless it would not "result in serious harm to the US economy."** President Clinton does not submit the protocol to the Senate for ratification.

* Bud Ward, "Kyoto: The Mother of E-Law Battles," *The Environmental Forum*, Jan/Feb 1998.

**Senate Resolution 98, 105th Congress, <https://www.congress.gov/bill/105th-congress/senate-resolution/98>

1999

Nineteen private organizations petition the Environmental Protection Agency to regulate greenhouse gases from new motor vehicles under the Clean Air Act

The petition, filed October 20, 1999, recites the fact that “90% of U.S. greenhouse gas emissions from anthropogenic sources occurs because of the combustion of fossil fuel. U.S. mobile sources are responsible for a significant amount of greenhouse gas emissions. In fact, in the United States, the fossil fuel CO₂ emissions from cars and light trucks are higher than the total nationwide CO₂ emissions from all but three other countries (China, Russia, and Japan).” The petitioners argue that greenhouse gases meet the definition of “pollutant” under the Clean Air Act, and must be regulated if the EPA determines that they “cause[s] or contribute[s] to air pollution which may reasonably be anticipated to endanger public health *or* welfare.” Since “the EPA and other federal agencies have already made numerous findings that greenhouse gas emissions from new motor vehicles are air pollutants reasonably anticipated to endanger public health and welfare... the Administrator has the statutory obligation to regulate the emissions of air pollutants from new motor vehicles under Sec. 202(a)(1) in order to prevent future harm.”* The private petitioners are later joined by various state and local governments, including Maine.[see 2007 (April)]

*International Center for Technology Assessment et al., Petition for Rulemaking and Collateral Relief Seeking the Regulation of Greenhouse Gas Emissions from New Motor Vehicles Under Sec. 202 of the Clean Air Act, Oct. 20, 1999, http://www.ciel.org/Publications/greenhouse_petition_EPA.pdf

2000

Al Gore runs against George W. Bush for President; candidate Bush promises to propose legislation to force utilities to reduce carbon dioxide

On September 29, 2000, presidential candidate George W. Bush unveils an environmental plan that would require power plants to reduce emissions of four main pollutants. Bush says he will propose legislation requiring “electric utilities to reduce emissions and significantly improve air quality.” Specifically, he promises to “work with Congress, the Environmental Protection Agency, the Department of Energy, consumer and environmental groups, and industry to develop legislation that will establish mandatory reduction targets for emissions of four main pollutants: sulfur dioxide, nitrogen oxide, mercury, and carbon dioxide.”* Twelve days later, in the second presidential debate on October 11, 2000, he seems more ambivalent. Bush is asked about his views on global warming. He replies: “I think it’s an issue that we need to take very seriously. But I don’t think we know the solution to global warming yet. And I don’t think we’ve got all the facts before we make decisions. I tell you one thing I’m not going to do is I’m not going to let the United States carry the burden for cleaning up the world’s air. Like Kyoto Treaty would have done. China and India were exempted from that treaty. I think we need to be more even-handed, as evidently 99 senators...supported that position [referring to the Senate resolution against Kyoto].” Candidate Gore responds: “I disagree that we don’t know the cause of global warming. I think that we do. It’s pollution, carbon dioxide, and other chemicals that are even more potent, but in smaller quantities, that cause this. Look, the world’s temperature is going up, weather patterns are changing, storms are getting more violent and unpredictable. What are we going to tell our children? I’m a grandfather now. I want to be able to tell my grandson when I’m in my later years that I didn’t turn away from the evidence that showed we

were doing some serious harm.”*** Third party candidate Ralph Nader meanwhile attacks Gore as a “broker of environmental voters for corporate cash.” On election day in Florida, Nader receives 97,421 votes, and Bush defeats Gore by 537. On the U.S. Supreme Court’s 5/4 refusal to authorize a recount in *Bush v. Gore*, Gore concedes the election.***

*History Commons, Context of 'September 29, 2000: Presidential Candidate Bush Promises to Clean-Up Power Plants and Reduce CO2 Emissions'; <http://www.historycommons.org/context.jsp?item=BushPromiseMandatoryEmissionCuts>

**2000 Second Presidential Debate, transcribed at Climate Silence.org; <http://climatesilence.org/data/debates/#2000>

*** Eric Pooley, *The Climate War: True Believers, Power Brokers, and the Fight to Save the Earth* (New York: Harper Collins 2010), 106.

2000

The Heartland Institute, a conservative think tank, begins a major initiative on combating climate change science and policy

The Heartland Institute was founded in 1984, and in the 1990's worked with the tobacco industry to challenge the connections between smoking and health, and oppose smoking regulations. As described in Naomi Oreskes' and Erik Conway's *Merchants of Doubt*, the Heartland Institute is known “for its persistent questioning of climate science, for its promotion of ‘experts’ who have done little, if any, peer-reviewed climate research, and for its sponsorship of a conference in New York City in 2008 alleging that the scientific community’s work on global warming is fake.”* [see 2012 (May)]

*Naomi Oreskes and Erik M. Conway, *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (Bloomsbury, 2010), 233.

2000 (November)

Kyoto treaty talks break down at a United Nations Conference of the Parties meeting at The Hague, Netherlands, even after an all-night negotiation

The lame duck U.S. Clinton Administration argues that countries should be able to satisfy up to 80% of their reductions by emissions trading and by establishing carbon sinks, rather than by actually reducing carbon emissions. The European Union opposes this position. As Andrew Revkin writes in *The New York Times*: “From the outset the talks were riven by conflicting agendas as they aimed to fill in the fine print of a 1997 treaty, called the Kyoto Protocol, drafted by more than 170 countries. Poor countries sought billions of dollars to help them adapt to climate change, while rich nations aimed to blunt the economic impact of the treaty by finding the least costly ways to cut their emissions of warming gases. But today the failure came down to persistent disagreement between industrial powers on opposite sides of the Atlantic over the role of trees and properly managed farmland in acting as “sinks” to absorb carbon dioxide, the dominant greenhouse gas.”* A post-mortem on the meeting’s failure by the Italian research institute Fondazione Eni Enrico Mattei observes that “The American population still does not think that climate change poses a heavy threat on its future nor that changes in its life-style are required. Hence public pressure for climate policy is almost non-existent in the U.S.; the environmental movement increasingly co-operates with industries.” Still, the analysis notes that many representatives of major businesses were present at The Hague and urging climate

action: “Many representatives were sent to The Hague to show the importance of the climate talks to the business sector and to lobby for a market-friendly realisation of the Kyoto Protocol. Since the business sector addressed climate issues much more progressively than ever before, the Umbrella Group, and in particular the U.S., had no more excuses for delaying actions to combat climate change. Notwithstanding the initial satisfaction that the The Hague-failure caused for America’s smokestack industries, even they admitted that it would be much easier if the conference would have agreed to a common strategy to reduce the GHG emissions. General Motors corporation spokesman Dave Barthmuss expressed the industry’s position in the following way: ‘If we were given mandates, and targets to hit, there are a lot of technologies we have to meet them.’”**

* Andrew Revkin, “Treaty Talks Fail to Find Consensus in Global Warming,” *New York Times*, Nov. 26, 2000,

<http://www.nytimes.com/2000/11/26/world/treaty-talks-fail-to-find-consensus-in-global-warming.html>

**Barbara Buchner, “What Really Happened in The Hague?” Fondazione Eni Enrico Mattei, March 28, 2001,

<http://www.feem.it/userfiles/attach/publication/ndl2001/ndl2001-038.pdf>

2000

Ten years after the EPA prepared its first Emissions Inventory of Greenhouse Emissions and Sinks pursuant to obligations under the UNFCCC, total greenhouse gas emissions (CO₂ equivalent) in 2000 are 7259 million metric tons [tonnes], 13.5% higher than in 1990*

*U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2014* (published 2016), Table 2-1, Recent Trends in U.S. Greenhouse Gas Emissions and Sinks (MMT CO₂ Eq.), <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2014>

2001(January)

The Third Assessment Report from the Intergovernmental Panel on Climate Change asserts “new and stronger evidence that most of the observed warming over the last 50 years is attributable to human activities”

The Intergovernmental Panel on Climate Change (IPCC) releases its Third Assessment Report, with a far stronger position on human causation than in its 1995 assessment. The report attributes “most of the observed warming” to human activities and observes that “the globally averaged surface temperature is projected to increase by 1.4 to 5.8 degrees Celsius over the period 1990 to 2100... the projected rate of warming is very likely to be without precedent during at least the last 10,000 years, based on paleoclimate data. Temperature increases are projected to be greater than those in the Second Assessment Report (SAR), which were about 1.0 to 3.5°C.” The report warns that “Greenhouse gas forcing in the 21st century could set in motion largescale, high-impact, non-linear, and potentially abrupt changes in physical and biological systems over the coming decades to millennia, with a wide range of associated likelihoods. Some of the projected abrupt/non-linear changes in physical systems and in the natural sources and sinks of greenhouse gases could be irreversible, but there is an incomplete understanding of some of the underlying processes.”* Media response is pronounced. *The Washington Post* reports: “approved unanimously at a U.N. conference in Shanghai and

described as the most comprehensive study on the subject to date, [the report] says that Earth's average temperature could rise by as much as 10.4 degrees over the next 100 years – the most rapid change in 10 millennia and more than 60 percent higher than the same group predicted less than six years ago.” The *Post* quotes Klaus Topfer, head of the U.N. Environment Program, as saying, “The scientific consensus presented in this comprehensive report about human-induced climate change should sound the alarm bells in every national capital and in every local community...We should start preparing ourselves.”**

*Intergovernmental Panel on Climate Change, *Climate Change 2001: Summary for Policymakers*, 5, 8, 14, <https://www.ipcc.ch/ipccreports/tar/vol4/english/pdf/spm.pdf>

** “Scientists Issue Dire Prediction on Warming: Faster Climate Shift Portends Global Calamity This Century,” *The Washington Post*, January 23, 2001, reprinted at <http://www.heatisonline.org/contentserver/objecthandlers/index.cfm?id=3591&method=full>

2001 (March)

President George W. Bush announces that the United States will not ratify the Kyoto Protocol, while simultaneously announcing what *The Economist* calls “a U-turn on a crucial aspect of his domestic policy on climate change: a campaign pledge to regulate CO₂ through domestic environmental laws.”

The Economist notes that President Bush’s about-face on regulating CO₂ is an “embarrassment [to] Christie Whitman, head of the Environmental Protection Agency, and other top officials,” and argues that “The alleged uncertainties of climate science are not a justification for Mr. Bush’s actions. It is notable that even such heavyweight companies as Ford, BP and Royal Dutch/Shell, all of which opposed Kyoto, have since shifted their positions towards supporting its general aims, if not its specific targets. This is because they recognise that the overwhelming consensus among the climate scientists is that global warming is real, that its effects will eventually be damaging or even catastrophic, and that the evidence of man’s role in it is strong enough to warrant some action now.”*

*“Oh, No, Kyoto,” *The Economist*, April 5, 2001, <http://www.economist.com/node/561509>

2001(May)

The George W. Bush White House asks the National Academy of Sciences (NAS) for “assistance in identifying the areas in the science of climate change where there are the greatest certainties and uncertainties,” and “views on whether there are any substantive differences between the IPCC [Intergovernmental Panel on Climate Change] Reports and the IPCC summaries;” the subsequent NAS report is a strong endorsement of the IPCC

In the forward to the NAS Report, entitled, *Climate Change Science: An Analysis of Some Key Questions*, Bruce Alberts, President of the National Academy, notes that “the White House asked for a response ‘as soon as possible,’ but no later than early June—less than one month after submitting its formal request. The National Academy has a mandate arising from its 1863 charter to respond to government requests when asked. In view of the critical nature of this

issue, we agreed to undertake this study and to use our own funds to support it.” In response to the White House’s question “Are greenhouse gases causing climate change,” the NAS responds: “The IPCC’s conclusion that most of the observed warming of the last 50 years is likely to have been due to the increase in greenhouse gas concentrations accurately reflects the current thinking of the scientific community on this issue. The stated degree of confidence in the IPCC assessment is higher today than it was 10, or even 5 years ago, but uncertainty remains because of (1)the level of natural variability inherent in the climate system on time scales of decades to centuries, (2)the questionable ability of models to accurately simulate natural variability on those long time scales, and (3)the degree of confidence that can be placed on reconstructions of global mean temperature over the past millennium based on proxy evidence. Despite the uncertainties, there is general agreement that the observed warming is real and particularly strong within the past 20 years.” In response to the President’s inference that there were inconsistencies between the summary reports, in particular the *Summary for Policymakers*, and the underlying reports, the NAS responds: “The committee finds that the full IPCC Working Group I (WGI) report is an admirable summary of research activities in climate science, and the full report is adequately summarized in the *Technical Summary*...The *Summary for Policymakers* reflects less emphasis on communicating the basis for uncertainty and a stronger emphasis on areas of major concern associated with human-induced climate change. This change in emphasis appears to be the result of a summary process in which scientists work with policy makers on the document. Written responses from U.S. coordinating and lead scientific authors to the committee indicate, however, that (a) no changes were made without the consent of the convening lead authors...and (b) most changes that did occur lacked significant impact.”*

*National Academies of Sciences, *Climate Change Science: An Analysis of Some Key Questions*, May, 2001, <https://www.nap.edu/read/10139/chapter/2>

2001 (November)

165 nations reach final agreement in a meeting in Marrakech, Morocco on the Kyoto Protocol: participant nations to cut total emissions by 2012 to 5% below 1990 levels

As Andrew Revkin writes in *The New York Times*, ‘Negotiations were far tougher than those producing every other past international environmental treaty, officials of many governments said, because cuts in these emissions will come mainly from restricting the burning of coal, oil and other fossil fuels, the underpinning of industrial economies. ...As happens to most international agreements, the treaty lost some of its initial vision over years of negotiation between blocs of countries that would be affected differently by its terms. For example, Russia, Canada and Japan sought and gained substantial credit toward their gas targets for the ability of their forests to absorb carbon dioxide... In telephone interviews yesterday, American officials at the meeting gave no sign that the Bush administration would reconsider joining the effort. ‘Other countries have chosen their path, and our answer is still no,’ said a senior member of the American delegation.’*

*Andrew C. Revkin, "Global Warming Impasse Is Broken," *The New York Times*, November 11, 2001,
<http://www.nytimes.com/2001/11/11/world/global-warming-impasse-is-broken.html>

2002 (June)

Brian O'Neill and Michael Oppenheimer suggest that “taking a precautionary approach because of the very large uncertainties, a limit of 2 degrees above 1990 global average temperature is justified to protect the [West Antarctic Ice Sheet]

In an article entitled "Dangerous Climate Impacts and the Kyoto Protocol," Brian O'Neill, of Brown University, and Michael Oppenheimer, of Princeton University, suggest ways to define the level of temperature rise that would constitute "dangerous anthropogenic interference" with the climate system, under the terms of the UN Framework Convention on Climate Change. They note that "both proponents and detractors of the Kyoto Protocol... have begun to demand a definition of long-term objectives. For example, on 11 June 2001, U.S. President George W. Bush stated that the emissions targets embodied in the Kyoto Protocol 'were arbitrary and not based upon science' and 'no one can say with any certainty what constitutes a dangerous level of warming, and therefore what level must be avoided.'" They suggest that markers for policymakers for dangerous levels of warming could include "large-scale eradication of coral reef systems," "disintegration of the West Antarctic Ice Sheet," or "weakening or shutdown of the density-driven, large-scale [thermohaline] circulation of the oceans." Temperature rises that would trigger these three markers vary: "A long-term target of 1°C above 1990 global temperatures would prevent severe damage to some reef systems. Taking a precautionary approach because of the very large uncertainties, a limit of 2°C above 1990 global average temperature is justified to protect [West Antarctic Ice Sheet]. To avert shutdown of the [thermohaline circulation], we define a limit at 3°C warming over 100 years..."*

* Brian C. O'Neill and Michael Oppenheimer, "Dangerous Climate Impacts and the Kyoto Protocol," *Science* 14 Jun 2002: Vol. 296, Issue 5575, pp. 1971-1972, <http://science.sciencemag.org/content/296/5575/1971/tab-e-letters>

2002

Republican political consultant Frank Luntz advises Republicans to use the term “climate change” instead of “global warming,” because it sounds less “frightening”

In a confidential memo obtained by the Environmental Working Group, Frank Luntz argues that "The scientific debate is closing [against us] but not yet closed. There is still a window of opportunity to challenge the science...Voters believe that there is no consensus about global warming within the scientific community. Should the public come to believe that the scientific issues are settled, their views about global warming will change accordingly. Therefore, you need to continue to make the lack of scientific certainty a primary issue in the debate." The party should describe its policies as "conservationist" instead of "environmentalist", because "most people" think environmentalists are "extremists" who indulge in "some pretty bizarre behaviour... that turns off many voters." The environment, Luntz cautioned, "is probably the single issue on which Republicans in general - and President Bush in particular - are most vulnerable."* A Republican source, speaking to *The Guardian* on

condition of anonymity, said party strategists agreed with Luntz's conclusion that "many Americans believe Republicans do not care about the environment". *The Guardian* observes that "[t]he phrase "global warming" appeared frequently in President Bush's speeches in 2001, but decreased to almost nothing during 2002, when the memo was produced."**

*The Luntz Research Group, "The Environment: A Cleaner, Safer, Healthier America,"

https://niggraths.files.wordpress.com/2013/03/luntzresearch_environment.pdf

** Oliver Burkeman, "Memo exposes Bush's new green strategy," *The Guardian*, March 3, 2003,

<https://www.theguardian.com/environment/2003/mar/04/usnews.climatechange>

2003(July)

Oklahoma Senator James Inhofe calls global warming "the greatest hoax ever perpetrated on the American people"

Inhofe is Chair of the Senate Committee on the Environment and Public Works. In one of many speeches over the years on the floor of the Senate against the notion of climate change he states: "Wake up, America. With all the hysteria, all the fear, all the phony science, could it be that manmade global warming is the greatest hoax ever perpetrated on the American people? I believe it is." Inhofe has a bachelor's degree in Economics from the University of Tulsa.* He will later make DeSmog's list of America's "Top Ten Climate Deniers." He is reported to have received over \$2 million in political contributions from the fossil fuel industry. He once compares the Environmental Protection Agency to the Gestapo, and in 2014 brings a snowball into Senate floor to refute global warming. In 2012, he will write a book, *The Greatest Hoax: How the Global Warming Conspiracy Threatens Your Future*.**

*DeSmog: Clearing the PR Pollution that Clouds Climate Science, <https://www.desmogblog.com/james-inhofe>

**Brendan Demille, "Top 10 Climate Deniers," <https://www.beforetheflood.com/explore/the-deniers/top-10-climate-deniers/>

2002 (October)

The United States, once the foremost advocate of requiring developing countries to control greenhouse gas emissions, joins with the Organization of the Petroleum Exporting Countries (OPEC), India, and China to block the European Union from establishing a more inclusive regime after Kyoto expires in 2012

At the 8th United Nations Framework Convention on Climate Change Conference of the Parties meeting in Delhi, the United States, having declined to join Kyoto, encourages developing nations to also reject binding emissions targets.* India's Prime Minister Atal Bihari Vajpayee delivers a speech arguing that "poorer countries could not be expected to invest money in tackling the causes of global warming. They bear little responsibility... producing fewer greenhouse gases than industrialized countries, and yet have been hit harder by the natural calamities, from drought to floods, caused by climate changes." As Amy Waldman writes in *The New York Times*, "If Russia has been hesitant about ratifying the Kyoto pact because of the withdrawal of the United States, India may have been emboldened by America's rejection of formal commitments to reduce emissions of warming gases. 'We do not see targets and timetables as realistic for developing countries,' the head of the American delegation, Paula Dobriansky, the under secretary of state for global affairs, said in an interview today. Instead,

the American delegation here repeatedly sounded two themes: that adapting to climate change is as essential as preventing it, and that economic growth is the key to environmental progress.”**

* Gardiner and others, *Climate Ethics: Essential Readings* (New York: Oxford 2010), 265.

**Amy Waldman, “At Climate Meeting, Unlikely Ally for Have-Nots,” *New York Times*, November 1, 2002, <http://www.nytimes.com/2002/11/01/international/asia/01DELH.html>

2003 (January)

Scientist Robert Gagosian speaks to the World Economic Forum, raising concern about the possibility of “abrupt climate change,” which could produce winters “twice as cold as the worst winters on record in the eastern United States in the past century”

Scientist Robert Gagosian, president of the Woods Hole Oceanographic Institute, speaks to the World Economic Forum about the impact of climate change on the Ocean Conveyor, the deep circulation system that drives the world’s ocean currents and affects weather. Gagosian opens his report entitled, “Abrupt Climate Change: Should We Be Worried?” with the observation that “Most of the studies and debates on potential climate change, along with its ecological and economic impacts, have focused on the ongoing buildup of industrial greenhouse gases in the atmosphere and a *gradual* increase in global temperatures. This line of thinking, however, fails to consider another potentially disruptive climate scenario. It ignores recent and rapidly advancing evidence that Earth’s climate repeatedly has shifted *abruptly* and *dramatically* in the past, and is capable of doing so in the future.” Models predict, Gagosian reports, that with disruption of the Ocean Conveyor, the North Atlantic region would cool 3 to 5 degrees Celsius, producing winters “twice as cold as the worst winters on record in the eastern United States in the past century.” “It is important to clarify that we are *not* contemplating a situation of *either* abrupt cooling *or* global warming. Rather, abrupt regional cooling and gradual global warming can unfold simultaneously. Indeed, greenhouse warming is a destabilizing factor that makes abrupt climate change more probable.”*

*Robert Gagosian, “Abrupt Climate Change: Should We Be Worried?” Woods Hole Oceanographic Institute, January 27, 2003, <http://www.whoi.edu/institutes/occi/images/WEFwhitepaper.pdf>

2003 (January)

Camille Parmesan and Gary Yohe publish “A globally coherent fingerprint of climate change impacts across natural systems” in the journal *Nature*, the first formal assessment of climate change impacts on plant and animal species; they find, after analyzing more than 1,700 species, that “recent biological trends match climate change predictions”

Camille Parmesan of the University of Texas, and Gary Yohe of Wesleyan University, find that “[g]lobal meta-analyses documented significant [species] range shifts averaging 6.1 km per decade towards the poles (or metres per decade upward), and significant mean advancement of spring events by 2.3 days per decade.... This suite of analyses generates ‘very high confidence’ (as laid down by the IPCC) that climate change is already affecting living systems.”*

*Camille Parmesan and Gary Yohe, “A globally coherent fingerprint of climate change impacts across natural systems,” *Nature* 421, 37-42, January 2, 2003, <http://www.nature.com/nature/journal/v421/n6918/abs/nature01286.html>

2003(July, August)

Philip Cooney, chief of staff at the White House Council on Environmental Quality (CEQ), and a former lobbyist for the American Petroleum Institute, makes close to 300 edits to the administration's *Strategic Plan of the Climate Change Science Program*, to "exaggerate or emphasize the scientific uncertainties or to deemphasize or diminish the importance of the human role in global warming," according to a House committee investigation

As Eric Pooley relates in his book, *The Climate War*, "At CEQ, according to whistleblowers and congressional investigators, Cooney and others began a systematic effort to mislead the public and minimize the significance of climate change by editing scientific reports produced by the federal bureaucracy. This was not a rogue operative single-handedly trying to undermine the integrity of American science; it was a concerted action by the administration that has been thoroughly documented by journalists as well as by the House Oversight Committee. [Myron] Ebell was in the thick of it. Cooney's campaign came to an end in June 2005, when *New York Times* reporter Andrew Revkin wrote about what was going on. Two days after the scandal broke, Cooney resigned from the White House. A week later, he went to work for ExxonMobil."*[re Myron Ebell, see 2017 (November)]

*Eric Pooley, *The Climate War: True Believers, Power Brokers, and the Fight to Save the Earth* (New York: Harper Collins 2010), 47.

2003 (September)

The Environmental Protection Agency (EPA) denies the petition to regulate greenhouse gases (GHG) in new motor vehicles, saying that contrary to the opinions of two former general counsels, the Clean Air Act does not authorize the EPA to issue regulations to address climate change, and that even if it had the authority, it would be unwise to set GHG standards at this time

The EPA's response acknowledges that it received almost 50,000 comments on the petition, "most of which were relatively brief expressions of support for the petition." In concluding that now is not the time to regulate greenhouse gases, the EPA stated, "We agree with the President that 'we must address the issue of global climate change' ... We do not believe, however, that it would be either effective or appropriate for EPA to establish GHG standards for motor vehicles at this time. As described in detail below, the President has laid out a comprehensive approach to climate change that calls for near-term voluntary actions and incentives along with programs aimed at reducing scientific uncertainties and encouraging technological development so that the government may effectively and efficiently address the climate change issue over the long term." The petitioners appeal the denial to the federal courts.* [see 2007 (April)]

*U.S. Environmental Protection Agency, "Control of Emissions from New Highway Vehicles and Engines," 68 Fed.Reg.52922 (September 8, 2003), <https://www.gpo.gov/fdsys/pkg/FR-2003-09-08/pdf/03-22764.pdf>

2004 (August)

Steven Pacala and Robert Socolow, Princeton professors of Ecology and Engineering, respectively, publish an influential study analyzing policy alternatives for CO₂ reduction as “stabilization wedges”

According to “Stabilization wedges: Solving the climate problem for the next 50 years with current technologies,” published in the journal *Science*, under “business as usual” (1.5% annual carbon growth, 2% growth in primary energy consumption, and 3% growth in gross world product), carbon emissions would more than double over the next 50 years. In order to stabilize CO₂ concentration at 500 ± 50 parts per million (ppm), fossil fuel emissions must be limited to 7 gigatonnes carbon (GtC)/year over the next 50 years, then must decline by about two-thirds in the following 50 years. The authors state, “To develop the revolutionary technologies required for such large emissions reductions in the second half of the century, enhanced research and development would have to begin immediately.”*

*Steven Pacala and Robert Socolow, “Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies,” *Science* 13 Aug 2004: Vol. 305, Issue 5686, pp. 968-972, <http://science.sciencemag.org/content/305/5686/968>

2004 (August)

The Annual Report of the US Climate Change Science Program submitted to Congress reflects what the *New York Times* calls a “striking shift in the way the Bush administration has portrayed the science of climate change.”

The report states that emissions of carbon dioxide and other heat-trapping gases are the “only likely explanation” for global warming over the last three decades. As Andrew Revkin writes in the *New York Times*, “In delivering the report to Congress yesterday, an administration official, Dr. James R Mahoney, said it reflected “the best possible scientific information” on climate change. Previously, President Bush and other officials had emphasized uncertainties in understanding the causes and consequences of warming as a reason for rejecting binding restrictions on heat-trapping gases...Still, the report was disputed by some groups, aligned with industry, that oppose restrictions on carbon dioxide emissions and have attacked science pointing to dangerous human-caused warming as flawed. Myron Ebell of the libertarian Competitive Enterprise Institute said the report was ‘another indication that the administration continues to be incoherent in its global warming policies.’”*

*Andrew Revkin, “U.S. Report, in Shift, Turns Focus to Greenhouse Gases,” *The New York Times*, August 26, 2004, <http://www.nytimes.com/2004/08/26/us/us-report-in-shift-turns-focus-to-greenhouse-gases.html>

2004 (September)

Prime Minister Tony Blair of Britain urges international action on climate change, stating that “[i]t is now that timely action can avert disaster.”

Tony Blair describes global warming as “unsustainable in the long-term. And by long-term I do not mean centuries ahead. I mean within the lifetime of my children certainly; and possibly within my own. And by unsustainable, I do not mean a phenomenon causing problems of adjustment. I mean a challenge so far-reaching in its impact and irreversible

in its destructive power, that it alters radically human existence.” Blair acknowledges, however, that “the challenge is complicated politically by two factors. First, its likely effect will not be felt to its full extent until after the time for the political decisions that need to be taken, has passed. In other words, there is a mismatch in timing between the environmental and electoral impact. Secondly, no one nation alone can resolve it. It has no definable boundaries. Short of international action commonly agreed and commonly followed through, it is hard even for a large country to make a difference on its own.”*

*Tony Blair, “Speech given by the prime minister on the environment and the ‘urgent issue’ of climate change,” September 14, 2004, <https://www.theguardian.com/politics/2004/sep/15/greenpolitics.uk>

2004 (December)

University of California History of Science Professor Naomi Oreskes performs a review of articles in peer-reviewed scientific journals over a ten-year period, to determine whether there is a consensus on human-caused global warming; she concludes, “[p]oliticians, economists, journalists, and others may have the impression of confusion, disagreement, or discord among climate scientists, but that impression is incorrect.”

As reported in an essay entitled, “The Scientific Consensus on Climate Change,” published in *Science*, Oreskes analyzes 928 abstracts, published in refereed scientific journals between 1993 and 2003, and listed in the ISI database with the keywords “global climate change.” Her conclusions: “The 928 papers were divided into six categories: explicit endorsement of the consensus position, evaluation of impacts, mitigation proposals, methods, paleoclimate analysis, and rejection of the consensus position. Of all the papers, 75% fell into the first three categories, either explicitly or implicitly accepting the consensus view; 25% dealt with methods or paleoclimate, taking no position on current anthropogenic climate change. Remarkably, none of the papers disagreed with the consensus position. Admittedly, authors evaluating impacts, developing methods, or studying paleoclimatic change might believe that current climate change is natural. However, none of these papers argued that point.”** In 2016, authors of seven different “consensus studies” including Oreskes will collaborate on an analysis finding that: “Depending on exactly how you measure the expert consensus, it’s somewhere between 90% and 100% that agree humans are responsible for climate change, with most of our studies finding 97% consensus among publishing climate scientists.”***

*Naomi Oreskes, “The Scientific Consensus on Climate Change,” *Science*, December 3, 2004, <http://science.sciencemag.org/content/306/5702/1686.full>

** John Cook and coauthors, “Consensus on Consensus: A synthesis of consensus estimates on human-caused global warming,” *Environmental Research Letters*, April 13, 2016, <http://iopscience.iop.org/article/10.1088/1748-9326/11/4/048002>; see also *Skeptical Science*, “The 97% consensus on global warming,” <https://www.skepticalscience.com/global-warming-scientific-consensus-intermediate.htm>

2004 (December)

The Maine Department of Environmental Protection and State Planning Office complete a Maine Climate Action Plan to reduce Maine’s greenhouse gas emissions to 1990 levels by

2010, 10% below those levels by 2020, and “by a sufficient amount to avert the threat of global warming over the longer term, which could be as much as 75%”

The Plan notes that “[m]ost of the recommended actions are expected to produce significant cobenefits *in addition to saving carbon*. Of particular significance are those will have a positive impact on human health, are likely to reward efficiency, and/or can be expected to promote economic growth and development. Many of these occur in the realm of air quality affecting human health, since lessening the emission of CO₂ from combustion of fossil fuels for electricity or transportation will also lead to reductions in other air pollutants. These include smog-producing sulfur and nitrogen oxide, and those fine particulates implicated in asthma and other respiratory diseases. Other co-benefits are expected to arise from the development of new technologies, particularly in the forestry sector, which in turn will produce additional economic benefits. Many of the electricity demand management options, such as energy efficiency measures, will save Maine people and businesses significant dollars, while contributing to Maine’s energy security.”* [see 2016 (January)]

*Maine Department of Environmental Protection, *A Climate Action Plan for Maine 2004*.

<http://www.eesi.org/files/MaineClimateActionPlan2004Volume%201.pdf>

2004 (December)

The 10th United Nations Framework Convention on Climate Change Conference of the Parties (COP) meeting in Buenos Aires seeks, over the United States’ objections, to begin discussion of the next international steps after expiration of the Kyoto Protocol in 2012

The United States seeks to block even informal discussion of post-2012 emissions regulation.* As the Climate Action Network (CAN) International newsletter reports during the proceedings, “The Bush Administration has made its position on post-2012 commitments crystal clear: it will not engage in any negotiations or discussions about mandatory emissions limits. This irresponsible stance leaves the rest of the world with three options. First, ignore the statements of the US and try to engage them in negotiations anyway. This would be like beating one’s head against a brick wall – painful and not very productive. Second, wait for the next US administration in four years. Given the increasingly evident impacts of climate change, the world cannot afford such a delay. Third, start negotiations next year, as called for in the Kyoto Protocol, without any expectation of meaningful participation by the US. While far from ideal, this is the only option that holds out any prospect of progress.”** CAN International holds a side event presenting a scorecard comparing performance of the nation participants in the conference. The scores are based on leadership role in climate negotiations; emission trends and target fulfillment; national policies; contributions to funding; and long term targets to reduce emissions: “The EU earned the highest score with six out of 10, mostly due to leadership, while the US, having distinguished itself as the most destructive in negotiations and careless of emissions, was awarded a negative score.”***

* Gardiner and others, *Climate Ethics: Essential Readings* (New York: Oxford 2010), 265.

**Climate Action Network, “Ministers Urged to Move Forward Without the US,” *ECO NGO Newsletter*, December 15, 2004, <http://www.climate-network.org/sites/default/files/ECOCOP1009.pdf>

*** Climate Action Network, “CAN Releases Scorecard Results,” *ECO NGO Newsletter*, December 10, 2004, <http://www.climate-network.org/sites/default/files/ECOCOP1005.pdf>

2005 (February)

The Kyoto Protocol becomes binding, without the participation of the United States; with 55 nations ratifying, representing at least 55% of worldwide CO₂ emissions, it sets binding emissions targets for 37 industrialized countries, with a goal of reducing emissions to 5% below 1990 levels by 2012

The reductions are to be achieved through national regulation and international market mechanisms, including emissions trading, clean development mechanisms, and joint implementation.* Some commentators conclude, however, that as a result of modifications of the Protocol in earlier meetings, the agreement could countenance as much as a 9 % increase in emissions from developed countries between 2000 and 2010. Mustifa Babiker in *Environmental Science and Policy* observes: “Only after the US has taken some domestic actions will progress come in knitting together a more universally suitable, and sustainable, approach to the issue. But should this happen, there may well be an opportunity to reconsider the international architecture of climate policy and revise those features of the Protocol that make it politically unsustainable as originally conceived.”**

*United Nations FCCC, Kyoto Protocol, http://unfccc.int/kyoto_protocol/items/2830.php

** Mustifa Babiker and others, “The Evolution of a Climate Regime: Kyoto to Marrakech.” *Environmental Science and Policy* 2 /3: 195-206 (2002). <http://www.sciencedirect.com/science/journal/14629011/5/3>

2005 (November)

Prime Minister Tony Blair of Britain speaks to the G8 about “division” over the Kyoto Protocol, noting that “The blunt truth about the politics of climate change is that no country will want to sacrifice its economy in order to meet this challenge”

Blair states that this is a particular concern in the developing world: “Now it has been extremely important to have the Kyoto Treaty and to have it come into force, and in particular some of the mechanisms associated with it are absolutely essential, but in the end this will never be dealt with properly unless we manage to find the answer to this problem - how do we combine the need, not just for developed economies to grow, but in particular for the developing world to grow and the need for people, through economic growth, to lift themselves out of poverty, to improve their living standards, with a proper responsible attitude to the environment?” Blair is “actually optimistic that it can be done,” but states that it is “essential” that conversations continue within the framework of the United Nations.*

*Tony Blair, “Speech to the London G8 Climate Change Conference,” November 1, 2005, <http://webarchive.nationalarchives.gov.uk/20060715135117/http://number10.gov.uk/page8439>

2005 (December)

Seven northeastern states, including Maine, agree to create the Regional Greenhouse Gas Initiative (RGGI), the first mandatory, market based CO₂ trading program; they aim to

cap and then reduce CO₂ emissions from the power sector by 10% below starting levels by 2018.

The founding states are Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York, and Vermont. Rhode Island and Maryland will later join, and New Jersey will withdraw. The program is implemented in 2009. In 2014 the *New York Times* will report that “Since 2009, the nine states have cut their emissions by 18 percent, while their economies grew by 9.2 percent. By comparison, emissions in the other 41 states fell by 4 percent, while their economies grew by 8.8 percent.” The states achieve emissions reductions by retiring coal-burning plants, expanding use of natural gas, and deploying wind and solar production facilities. The *New York Times* comments that “Some critics of the Environmental Protection Agency’s new requirements for power plants argue that forcing emissions reduction will curtail economic growth. But the recent experience of states that already cap carbon emissions reveals that emissions and economic growth are no longer tightly tied together.”**

* Regional Greenhouse Gas Initiative Memorandum of Understanding, December 20, 2005;

http://www.rggi.org/docs/mou_final_12_20_05.pdf

** Hannah Fairfield, “Best of Both Worlds? Northeast Cut Emissions and Enjoyed Growth,” *The New York Times*, June 6, 2014, <https://www.nytimes.com/2014/06/06/upshot/best-of-both-worlds-northeast-cut-emissions-and-enjoyed-growth.html>

2006

China surpasses the United States in annual CO₂ emissions

According to figures released in 2007 by the Netherlands Environmental Assessment Agency, China produced 6200 million metric tons of CO₂ (6.2 gigatonnes (Gt)) in 2006, versus 5800 million metric tons (5.8 Gt) from the United States. China’s emissions surged by 8.7% in 2006, while those of the United States decreased by 1.4%. Global fossil fuel-related CO₂ emissions have increased by 35% since 1990, according to the Agency’s 2007 analysis of industry and government data. China’s emissions per capita, however, are only about one-fifth of those of the United States.*

*Netherlands Environmental Assessment Agency, “China now no. 1 in CO₂ emissions; USA in Second Position,” (2007); <http://www.pbl.nl/en/dossiers/Climatechange/Chinanowno1inCO2emissionsUSAinsecondposition>

2006 (March)

Meteorologists Isaac Held and Brian Soden publish a paper in the *Journal of Climate* which analyzes the connection between precipitation events and global warming, and advances the “wet-get-wetter, dry-get-drier” paradigm

Isaac Held of the National Oceanic and Atmospheric Administration and Brian Soden of the University of Miami publish “Robust Responses of the Hydrological Cycle to Global Warming” in the *Journal of Climate*. The authors conclude that “assuming that the lower-tropospheric relative humidity is unchanged and that the flow is unchanged, the poleward vapor transport and the pattern of evaporation minus precipitation … increases proportionally to the lower-tropospheric vapor, and in this sense wet regions get wetter and dry regions drier. Since the changes in precipitation have considerably more structure than the changes in evaporation, this

simple picture helps us understand the zonally averaged pattern of precipitation change.”** As Professor Steve Sherwood reported to *Carbon Brief*, “[This paper] advanced what is known as the “wet-get-wetter, dry-get-drier” paradigm for precipitation in global warming. This mantra has been widely misunderstood and misapplied, but was the first and perhaps still the only systematic conclusion about regional precipitation and global warming based on robust physical understanding of the atmosphere.”**

* Isaac Held and Brian Soden, “Robust Responses of the Hydrological Cycle to Global Warming,” *Journal of Climate*, Vol. 19, 5686 (March, 2006), <http://journals.ametsoc.org/doi/abs/10.1175/JCLI3990.1>

** Roz Pidcock, “The Most Influential Climate Change Papers of All Time,” *CarbonBrief*, June 7, 2015, <http://www.carbonbrief.org/the-most-influential-climate-change-papers-of-all-time>

2006 (May)

The Al Gore film *An Inconvenient Truth* is released, grossing \$50 million and selling more than 1.5 million DVDs

The film is produced by Lawrence Bender, a 1979 graduate of the University of Maine in Civil Engineering, and directed by Davis Guggenheim. It documents the efforts of former Vice President Al Gore to educate the public about climate change with a slide show which he had, as of the time of the film, shown about 1000 times. The film wins two Oscars, including for Best Documentary Feature.* Critic David Remnick in *The New Yorker* lauds the film: “as a means of education, ‘An Inconvenient Truth’ is a brilliantly lucid, often riveting attempt to warn Americans off our hellbent path to global suicide. ‘An Inconvenient Truth’ is not the most entertaining film of the year. But it might be the most important.” Remnick laments, however, that the film is not likely to have an effect on the man determining U.S. climate change policy: “The catch, of course, is that the audience-of-one that most urgently needs to see the film and take it to heart—namely, the man who beat Gore in the courts six years ago—does not much believe in science or, for that matter, in any information that disturbs his prejudices, his fantasies, or his sleep. Inconvenient truths are precisely what this White House is structured to avoid and deny.”** Al Gore moves on to train thousands of people around the world to present his slide show through his nonprofit organization, The Climate Reality Project.***

* Wikipedia, The Free Encyclopedia, s.v. “An Inconvenient Truth,” (accessed June 8, 2017),
https://en.wikipedia.org/wiki/An_Inconvenient_Truth

**David Remnick, “Ozone Man,” *The New Yorker*, April 24, 2006, <http://www.newyorker.com/magazine/2006/04/24/ozone-man>

***The Climate Reality Project, <https://www.climaterealityproject.org/>

2006 (July)

Nobel laureate for Chemistry Paul Crutzen publishes the editorial essay “Albedo Enhancement by Stratospheric Sulphur Injections” in the journal *Climate Change*, sparking debate about whether geoengineering solutions would be a viable response to climate change

Paul Crutzen, of the Scripps Institution of Oceanography, notes that sulfate particles from fossil fuel combustion reflect solar radiation and cool the planet, partially counteracting the warming greenhouse effect. However, “this fortunate coincidence is ‘bought’ at a substantial price” in terms of the health consequences of sulfate pollution. “This creates a dilemma for environmental policy makers, because the required emission reductions of SO₂, and also anthropogenic organics (except black carbon), as dictated by health and ecological considerations, add to global warming and associated negative consequences, such as sea level rise, caused by the greenhouse gases.” Given “grossly unsuccessful” international efforts to reduce greenhouse gas emissions, Crutzen suggests that “although by far not the best solution, the usefulness of artificially enhancing earth’s albedo and thereby cooling climate by adding sunlight reflecting aerosol in the stratosphere … might again be explored and debated as a way to defuse the Catch-22 situation just presented and additionally counteract the climate forcing of growing CO₂ emissions.”*

*Paul Crutzen, “Albedo Enhancement by Stratospheric Sulphur Injections”, *Climatic Change* 77:211-219. 2006,
<http://link.springer.com/article/10.1007%2Fs10584-006-9101-y>

2006 (September)

California passes the Global Warming Solutions Act, intended to begin in 2012 to reduce emissions to 1990 levels by 2020, a 15% reduction over emissions expected under a “business-as-usual” scenario, and authorizing, but not requiring, a cap-and-trade approach

The law includes a legislative finding that “Global warming poses a serious threat to the economic well-being, public health, natural resources, and the environment of California. The potential adverse impacts of global warming include the exacerbation of air quality problems, a reduction in the quality and supply of water to the state from the Sierra snowpack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to marine ecosystems and the natural environment, and an increase in the incidences of infectious diseases, asthma, and other human health-related problems.” A fee system is implemented in 2010 to fund the program. The “fee is collected annually from large sources of GHGs, including oil refineries, electricity power plants (including imported electricity), cement plants and other industrial sources. There are approximately 250 fee payers that emit 330 million metric tons of GHG emissions per year.” A statewide cap-and-trade system is initiated in 2012.*

* California Environmental Protection Agency, Assembly Bill 32 Overview, <https://www.arb.ca.gov/cc/ab32/ab32.htm>

2006 (October)

Sir Nicholas Stern, Head of the British Government Economic Service, and a London School of Economics professor, releases a 700 page report, the “Stern Review: The Economics of Climate Change,” the most in depth such study to date.

The report’s Executive Summary states, “Climate change will affect the basic elements of life for people around the world – access to water, food production, health, and the environment.

Hundreds of millions of people could suffer hunger, water shortages and coastal flooding as the world warms. Using the results from formal economic models, the Review estimates that if we don't act, the overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP each year, now and forever. If a wider range of risks and impacts is taken into account, the estimates of damage could rise to 20% of GDP or more. In contrast, the costs of action – reducing greenhouse gas emissions to avoid the worst impacts of climate change – can be limited to around 1% of global GDP each year. The investment that takes place in the next 10-20 years will have a profound effect on the climate in the second half of this century and in the next. Our actions now and over the coming decades could create risks of major disruption to economic and social activity, on a scale similar to those associated with the great wars and the economic depression of the first half of the 20th century. And it will be difficult or impossible to reverse these changes.”*

*Sir Nicholas Stern, *Stern Review: The Economics of Climate Change* (HM Treasury 2006),
http://webarchive.nationalarchives.gov.uk/20130129110402/http://www.hm-treasury.gov.uk/d/CLOSED_SHORT_executive_summary.pdf

2007 (January)

The U.S. Climate Action Partnership comes out in favor of a cap on carbon emissions, departing from business's long-standing opposition to any climate legislation

The U.S. Climate Action Partnership, a coalition of four environmental organizations and ten Fortune 500 corporations, including Duke Energy (the 3rd largest emitter of greenhouse gases (GHG) in the United States), DuPont, Alcoa, and Caterpillar, and organized by James Rogers, Duke CEO and Chair of the Edison Electric Institute, and Fred Krupp, Environmental Defense Fund, comes out in favor of a cap on carbon emissions, departing from business's long-standing opposition to any climate legislation. The coalition would become divided in future years on specifics of U.S. legislative proposals.*

* Eric Pooley, *The Climate War: True Believers, Power Brokers, and the Fight to Save the Earth* (New York: Harper Collins 2010) 6, 160, 161.

2007 (February)

The Intergovernmental Panel on Climate Change (IPCC) releases its Fourth Assessment of climate change science, finding that “[w]arming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level”

The report reflects the input of more than 1,200 authors and 2,500 scientific expert reviewers from more than 130 countries. The report strengthens its characterization of the human role in global warming, finding that it is “very likely” that emissions of heat-trapping gases from human activities have caused “most of the observed increase in globally averaged temperatures since the mid-20th century.” Atmospheric concentration of carbon dioxide and methane “exceeds by far the natural range over the last 650,000 years.” Concentrations of these greenhouse gases since the beginning of the era of industrialization have increased at a rate that is “very likely to have been unprecedented in more than 10,000 years.” Eleven of the last

twelve years (1995–2006) “rank among the 12 warmest years in the instrumental record of global surface temperature (since 1850).”* The Intergovernmental Panel on Climate Change (IPCC) Chair Rajendra Pachauri observes, “If there’s no action before 2012, that’s too late. What we do in the next two to three years will determine our future. This is the defining moment.”**

* Intergovernmental Panel on Climate Change, Summary for Policymakers. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working*

Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (2007),
<https://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf>; see also,

Union of Concerned Scientists, ‘Findings of the IPCC Fourth Assessment: Climate Change Science,’
http://www.ucsusa.org/global_warming/science_and_impacts/science/findings-of-the-ipcc-fourth-2.html#.WTF_kOvyvIU

** Elizabeth Rosenthal, “U.N. Report Describes Risk of Inaction on Climate Change,” *New York Times*, November 17, 2007,
<http://www.nytimes.com/2007/11/17/science/earth/17cnd-climate.html>

2007(February)

Vice President Dick Cheney comments in a television interview, “Where there does not appear to be a consensus....is the extent to which that’s part of a normal cycle versus the extent to which it’s caused by man, greenhouse gases, et cetera”

Following release of the IPCC Fourth Assessment, Vice President Dick Cheney is asked about climate change, “a subject Mr. Cheney has rarely addressed in the past,” in an ABC television interview. He states that he has not seen Al Gore’s movie *An Inconvenient Truth* (“He didn’t invite me to the showing...Not that I had planned to go anyway.”) He states that, “I think there’s an emerging consensus that we do have global warming. You can look at the data on that, and I think clearly we’re in a period of warming. Where there does not appear to be a consensus, where it begins to break down, is the extent to which that’s part of a normal cycle versus the extent to which it’s caused by man, greenhouse gases, et cetera.” When the interviewer Jonathan Karl asks him, “So you think the jury is still out about whether or not this warming we’re seeing has been caused by human activity?”, Cheney replies, “Some of it has, I think. But exactly where you draw the line? I don’t know. I’m not a scientist. I talk with people who supposedly know something about it. You get conflicting viewpoints. But I do think it is an important subject, and it will be addressed in the Congress. I think there will be a big debate on it in the next couple of years.”*

*ABC News, “Exclusive: Cheney on Global Warming,” February 23, 2007,
<http://abcnews.go.com/Technology/story?id=2898539&page=1>

2007 (March)

NASA scientist James Hansen testifies before the House Committee on Oversight and Government Review, on the subject of political interference with government climate science.

As Hanson testified, “[i]nterference with communication of science to the public has been greater during the current [G.W.Bush] Administration than at any time in my career. As I was quoted on the 2006 calendar of the Freedom Forum ‘In my more than three decades in

government, I have never seen anything approaching the degree to which information flow from scientists to the public has been screened and controlled as it has now.' The effect of the filtering of climate change science during the current Administration has been to make the reality of climate change less certain than the facts indicate and to reduce concern about the relation of climate change to human-made greenhouse gas emissions.”*

*James E. Hansen, “Political Interference with Government Climate Science,” Testimony before the Committee on Oversight and Government Review, U.S. House of Representatives, March 19, 2007,
http://www.columbia.edu/~jeh1/2007/Testimony_20070319.pdf

2007 (April)

The U.S. Supreme Court rules in Massachusetts v. Environmental Protection Agency in favor of plaintiff petitioner states, municipalities, and organizations who claim the Environmental Protection Agency's refusal to regulate greenhouse gas emissions from motor vehicles under the Clean Air Act is illegal

The U.S. Supreme Court rules 5/4, in a decision by Justice John Paul Stevens, in favor of plaintiff petitioner states, municipalities, and organizations, and asserts that petitioners have standing to sue even if the harm is widely shared and the Environmental Protection Agency (EPA) can do little to alleviate much of it (“...the rise in sea levels associated with global warming has already harmed and will continue to harm Massachusetts. The risk of catastrophic harm, though remote, is nevertheless real. That risk would be reduced to some extent if petitioners received the relief they seek”); that the Clean Air Act (CAA) gives the EPA authority to regulate greenhouse gas (GHG) emissions (“EPA never identifies any action remotely suggesting that Congress meant to curtail its power to treat greenhouse gases as air pollutants”); and that the EPA is required to regulate unless it determines that GHG emissions do not contribute to climate change or it provides a reasonable explanation for declining to regulate (“...the use of the word ‘judgment’ is not a roving license to ignore the statutory text. It is but a direction to exercise discretion within defined statutory limits. If EPA makes a finding of endangerment, the Clean Air Act requires the agency to regulate emissions of the deleterious pollutant from new motor vehicles.”). *

*Massachusetts v. EPA 549 US 497 (2007), <http://www.supremecourt.gov/opinions/06pdf/05-1120.pdf>

2007(June)

China releases its first national plan on climate change, pledging to reduce energy intensity (CO₂ per unit of gross national product) to 20% below 2005 levels by 2010, and increase renewables by 10% by 2010

As Margret J. Kim and Robert E. Jones characterize the plan, in the American Bar Association, *Natural Resources and Environment Journal*, “In reality, the Plan simply rehashed China’s official stance: China is very aware of the global warming conundrum but has no intention of sacrificing her economic growth to mitigate global warming. Moreover, in China’s view, as most of the GHG emissions were released by the developed nations, those nations should bear

the brunt of mitigation responsibility, not China. Even the modest “carbon intensity goal” of reducing intensity (CO₂ per unit of gross national product) by 40 percent from 2000 levels by 2020, as suggested in an early draft report, was absent in the final Plan. Despite China’s ranking highest in annual CO₂ emissions, the Plan defends China’s low per capita emissions and states that its climate change policy will be guided by the principle of “common but differentiated responsibilities.” Under this doctrine, developed countries, such as the United States, should take the lead in reducing GHG emissions, rather than developing countries, such as China, that are not responsible for the present climate predicament.”*

*Margret J. Kim and Robert E. Jones, “China: Climate Change Superpower and the Clean Technology Revolution,” *ABA Natural Resources & Environment* 9 (Winter 2008), http://www.americanbar.org/content/dam/aba/publications/natural_resources_environment/2008_winter/nre_win08_kim_jones.authch_eckdam.pdf

2007 (October)

Al Gore and the Intergovernmental Panel for Climate Change win the Nobel Peace Prize for illuminating “the processes and decisions that appear to be necessary to protect the world’s future climate, and thereby reduce the future threat to the security of mankind.”

Gore states in his acceptance speech, delivered December 10, 2007: “The distinguished scientists with whom it is the greatest honor of my life to share this award have laid before us a choice between two different futures – a choice that to my ears echoes the words of an ancient prophet: ‘Life or death, blessings or curses. Therefore, choose life, that both thou and thy seed may live’... However, despite a growing number of honorable exceptions, too many of the world’s leaders are still best described in the words Winston Churchill applied to those who ignored Adolf Hitler’s threat: ‘They go on in strange paradox, decided only to be undecided, resolved to be irresolute, adamant for drift, solid for fluidity, all powerful to be impotent.’... In the years since this prize was first awarded, the entire relationship between humankind and the earth has been radically transformed. And still, we have remained largely oblivious to the impact of our cumulative actions. Indeed, without realizing it, we have begun to wage war on the earth itself. Now, we and the earth’s climate are locked in a relationship familiar to war planners: ‘Mutually assured destruction.’” To avoid this consequence, Gore urges, “We must quickly mobilize our civilization with the urgency and resolve that has previously been seen only when nations mobilized for war.”*

*Al Gore, Nobel Lecture, December 10, 2007, https://www.nobelprize.org/nobel_prizes/peace/laureates/2007/gore-lecture_en.html

2007 (October)

The Office of Vice President Dick Cheney orders six pages deleted from testimony by the director of the Centers for Disease Control and Prevention, which would have stated that “CDC considers climate change a serious public health concern.”

According to a report in the Washington Post, former EPA deputy associate administrator Jason K. Burnett, in a letter to California Senator Barbara Boxer in July, 2008, said an official from Cheney’s office ordered that six pages be edited out of the testimony of Julie L.

Gerberding, director of the Centers for Disease Control and Prevention, including the statement that "CDC considers climate change a serious public health concern." The official's concern about the testimony was that it could be used to justify a finding that climate change "endangered public health or welfare" under the Clean Air Act, which would have required, under the recent Supreme Court decision, regulation of greenhouse gases under the Clean Air Act. "The Council on Environmental Quality (CEQ) and the Office of the Vice President (OVP) were seeking deletions to the CDC testimony," Burnett wrote in response to an inquiry from the Senate Environment and Public Works Committee, which Senator Boxer chairs. "CEQ requested that I work with CDC to remove from the testimony any discussion of the human health consequences of climate change."*

*Juliet Eilperin, "Cheney's Staff Cut Testimony on Warming," *The Washington Post*, July 9, 2008, <http://www.washingtonpost.com/wp-dyn/content/article/2008/07/08/AR2008070801442.html>

2007 (December)

The Bali Action Plan is created under the United Nations Framework Convention on Climate Change; general agreement is reached on a framework for achieving greenhouse gas reduction goals, following expiration of the Kyoto Protocol in 2012, over objections of the United States

The Bali Action Plan calls for "measurable, reportable and verifiable nationally appropriate mitigation commitments or actions, including quantified emission limitation and reduction objectives, by all developed country parties," as well as "[n]ationally appropriate mitigation actions by developing country parties in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner.* The accomplishments of the Conference of the Parties prevail over significant obstacles posed by the United States. A headline in *ECO*, the conference newsletter of the Climate Action Network, reads: "Late Breaking News! US Fails to Wreck Bali." The newsletter reports: "The US made a last ditch attempt this morning to block progress on the Bali roadmap by submitting a proposal to ditch the Kyoto Protocol and replace it with a non-binding bottom up, voluntary framework. This outrageous behaviour was met with stunned silence by the delegates."** Former Vice President Al Gore, delivering a speech at Bali, states that "I am not an official of the United States and I am not bound by the diplomatic niceties, so I am going to speak an inconvenient truth. My own country, the United States, is principally responsible for obstructing progress here in Bali. We all know that." Gore's proposed response to that obstruction: "You can decide to move forward and do all of the difficult work that needs to be done, and save a large, open blank space in your document, and put a footnote by it. And when you look at the footnote, write... 'this document is incomplete, but we are going to move forward anyway on the hope that the blank will be filled in.'" As Eric Pooler describes in his report on Bali negotiations in *Climate War*, "The blank space was there to fill when the U.S. was ready. For this was Gore's larger message: Another American would soon be seizing the reins of power...Gore's words in Bali were a promise to the world, at a time when it was badly needed, that there were two Americas."***

* Bali Action Plan, <http://unfccc.int/resource/docs/2007/cop13/eng/06a01.pdf>

** Climate Action Network, "US Fails to Wreck Bali," *ECO NGO Newsletter*, December 14, 2007, <http://www.climate-network.org/sites/default/files/ECCop13n11.pdf>

*** Eric Pooley, *The Climate War: True Believers, Power Brokers, and the Fight to Save the Earth* (New York: Harper Collins 2010), 14.

2007 (December)

The Energy Independence and Security Act of 2007 requires new vehicles sold in the United States to average 35 mpg by 2020, and enacts other energy efficiency measures

The law institutes the first new Corporate Average Fuel Economy (CAFE) standards for automobiles since 1975, and the first such standards for medium duty and heavy duty commercial vehicles. The stated aims of the act also include increasing the production of clean renewable fuels; increasing the efficiency of products, buildings, and vehicles; promoting research on and deploying greenhouse gas capture and storage options. The law imposes a variety of new standards for lighting and for residential and commercial appliances.* Early versions of the legislation in the House would have repealed about \$22 billion of oil and gas subsidies that were designed to offset the cost of supporting a variety of energy efficiency and renewable energy tax incentives, but those were opposed in the Senate were not part of the final law.**

*Energy Independence and Security Act of 2007, Public Law 110-140(2007), 42 U.S.C. sec. 17001 et seq., <http://www.epa.gov/laws-regulations/summary-energy-independence-and-security-act>

**Congressional Review Service Report for Congress, "The Energy Independence and Security Act of 2007, December 21, 2007, https://www1.eere.energy.gov/manufacturing/tech_assistance/pdfs/crs_report_energy_act_2007.pdf

2007 (December)

The Environmental Protection Agency administrator rejects California's petition to impose greenhouse gas standards for motor vehicles, overruling the unanimous recommendation of his technical and legal staff

Since the 1970's, the Environmental Protection Agency (EPA) had approved all previous California requests to adopt air pollution standards more stringent than federal ones. California decides to sue the EPA. As reported in *The Washington Post*, "The decision set in motion a legal battle that EPA's lawyers expect to lose and demonstrated the Bush administration's determination to oppose any mandatory measures specifically targeted at curbing global warming pollution. A total of 18 states, representing 45 percent of the nation's auto market, have either adopted or pledged to implement California's proposed tailpipe emissions rules, which seek to cut vehicles' greenhouse gas emissions by 30 percent between 2009 and 2016." EPA Administrator Stephen Johnson cites the just enacted Energy Independence and Security Act's national CAFE standards (which did not regulate greenhouse gases) as preferable to "a confusing patchwork of state rules."* California Governor Arnold Schwarzenegger responds that "California is ready to implement the nation's cleanest standards for vehicle emissions, but we cannot do that until the federal government grants a waiver allowing us to enforce those standards...Our air quality, our health and our environment are too important to delay any

longer, and it is not just the people of California who are waiting. Those states that want to follow our lead cannot do so until federal permission is granted. In fact, fourteen other states are expected to join our lawsuit later today.”** Maine is one of those states which join the lawsuit. [see 2009 (June)]

*Juliet Eilperin, “EPA Chief Denies Calif. Limits on Auto Emissions,” *Washington Post*, Dec. 20, 2007, <http://www.washingtonpost.com/wp-dyn/content/article/2007/12/19/AR2007121902012.html>

**California Office of the Governor, “Governor Schwarzenegger Announces Lawsuit Against U.S. EPA for Failing to Act on California’s Tailpipe Emissions Request,” December 19, 2007, <https://www.gov.ca.gov/news.php?id=8047>

2007 (December)

In response to the Supreme Court decision in Massachusetts v. EPA, EPA staff submits a finding that greenhouse gases do indeed “endanger the public health and welfare” to the White House; the White House refuses to read the finding

A finding that pollutants “endanger the public health and welfare” is a prerequisite to regulating them under the Clean Air Act, as confirmed in *Massachusetts v. EPA*. As a result of the court decision, EPA staff were directed to determine whether such a finding was warranted. As reported in a Union of Concerned Scientist Scientific Integrity Program case study, EPA official Jason Burnett emailed a draft endangerment finding to the White House Office of Management and Budget on December 5, 2007. Within minutes the White House asked the EPA to retract the email and say it had been sent in error. EPA Administrator Stephen Johnson refused to do this, saying it had not been sent in error. As the Union of Concerned Scientist study found, “The White House then requested that EPA send an email asking the White House not to review the document because provisions in the Energy Bill, then under consideration in Congress, might make the finding moot; Johnson again refused. The White House then decided it would not open the EPA's email, because doing so would require them to move ahead with the formal regulatory process and make the documents public.” The endangerment finding was ultimately worked into a May, 2008 draft Advanced Notice of Proposed Rulemaking, which was leaked to the press.*

*“The EPA’s Elusive Climate Change Endangerment Report,” Union of Concerned Scientists, <http://www.ucsusa.org/our-work/center-science-and-democracy/promoting-scientific-integrity/climate-change-endangerment-report.html#.VuRiWfkrlIU>

2008 (April)

NASA scientist James Hansen suggests that the Intergovernmental Panel on Climate Change (IPCC) estimates of the danger from increasing temperatures are inadequate; he argues for a lower target for maximum CO₂ concentration, 300 to 350 ppm

Based on IPCC analyses, the European Union adopted a goal of keeping global temperatures below 2 degrees Celsius above preindustrial times, which implies a maximum CO₂ concentration of 450 ppm. National Aeronautics and Space Administration (NASA) scientist James Hansen and his coauthors in “Target atmospheric CO₂: Where should humanity aim?,”

argue that “humanity must aim for an even lower level of greenhouse gases (GHG).” This is based on feedback processes not included in most climate models, such as ice sheet disintegration, vegetation migration, and GHG release from tundra or ocean sediments. Hansen recommends a 300 to 350 ppm CO₂ target to avoid irreversible changes to Arctic sea ice, sea levels, and coral reef health. “The present global mean CO₂, 385 ppm, is already in the dangerous zone.” “If humanity wishes to preserve a planet similar to that on which civilization developed and to which life on Earth is adapted, paleoclimate evidence and ongoing climate change suggest that CO₂ will need to be reduced from its current 385 ppm to at most 350 ppm. The largest uncertainty in the target arises from possible changes of non- CO₂ forcings. An initial 350 ppm CO₂ target may be achievable by phasing out coal use except where CO₂ is captured and adopting agricultural and forestry practices that sequester carbon. If the present overshoot of this target CO₂ is not brief, there is a possibility of seeing irreversible catastrophic effects.”* According to Bill McKibben, founder of 350.org, this paper is “probably the most important scientific paper published in this millennium to date.”**

*James Hansen and coauthors, “Target atmospheric CO₂: Where should humanity aim?” Open Atmos. Sci. J. (2008), vol. 2, pp. 217-231, <http://arxiv.org/abs/0804.1126>

**Bill McKibben, speech at the University of Maine, Oct. 7, 2014

2008 (June)

Physicist and climate expert Joseph Romm, writing for the journal *Nature*, delivers a critique and reanalysis of the Pacala/Socolow “stabilization wedges”, in view of recent emissions data and understanding of feedback mechanisms

Joseph Romm publishes the paper “Cleaning up on carbon,” in *Nature Reports Climate Change*: “[C]arbon emissions from the global consumption of fossil fuels are currently above 8 GtC [gigatonnes carbon] per year and rising faster than the most pessimistic economic model considered by the Intergovernmental Panel on Climate Change (IPCC). Yet even if the high price of energy from fossil fuels and power plants combines with regional climate initiatives to slow the current rate of growth somewhat, we will probably hit 11 gigatonnes of carbon emissions per year by 2020.” Romm concludes: “The United States simply cannot wait another decade to find out whether domestic cap-and-trade legislation will drive carbon dioxide to a high enough price to curb emissions growth sharply.”* [see 2004 (August)]

* Joseph Romm, “Cleaning up on carbon,” *Nature Reports Climate Change*, published online: 19 June 2008 | doi:10.1038/climate.2008.59, <http://www.nature.com/climate/2008/0807/full/climate.2008.59.html>

2008

Author Bill McKibben and a group of students at Middlebury College found activist organization 350.org, calling for cutting carbon emissions by 80% by 2050, and bringing CO₂ concentration down to 350 ppm

From the 350.org website: “When we started organizing in 2008, we saw climate change as the most important issue facing humanity — but climate action was mired in politics and all but stalled. We didn’t know how to fix things, but we knew that one missing ingredient was a climate movement that reflected the scale of the crisis. So we started organizing coordinated days of action that linked activists and organizations around the world, including the International Day of Climate Action in 2009, the Global Work Party in 2010, Moving Planet in 2011, and Climate Impacts Day in 2012. We held the ‘world’s biggest art installation’ and ‘the most widespread day of political action in the planet’s history.’ We figured that if we were going to be a movement, then we had to start acting like one.”*

*350.org, Our History, <http://350.org/our-history/>

2008 (July)

The EPA issues an Advance Notice of Proposed Rulemaking (ANPR) soliciting public input on effects of climate change, the applicability of the Clean Air Act (CAA) to greenhouse gases, and “how to respond to the U.S. Supreme Court’s decision in *Massachusetts v. EPA.*” clearly taking the view that the CAA is “ill-suited for the task of regulating global greenhouse gases”

EPA Administrator Stephen Johnson prefaces the ANPR by stating his concern that “One point is clear: The potential regulation of greenhouse gases under any portion of the Clean Air Act could result in an unprecedented expansion of EPA authority that would have a profound effect on virtually every sector of the economy and touch every household in the land.” The Clean Air Act, Johnson argues, is “an outdated law originally enacted to control regional pollutants that cause direct health effects, is ill-suited for the task of regulating global greenhouse gases. Based on the analysis to date, pursuing this course of action would inevitably result in a very complicated, time consuming and, likely, convoluted set of regulations. These rules … would be relatively ineffective at reducing greenhouse gas concentrations given the potentially damaging effect on jobs and the U.S. economy.”* [see 2009 (December)]

*U.S. Environmental Protection Agency, “Regulating Greenhouse Gases under the Clean Air Act, Proposed Rule,” 73 Fed. Reg. 44,354 (July 30, 2008), <https://www.gpo.gov/fdsys/pkg/FR-2008-07-30/pdf/E8-16432.pdf>

2008 (November)

Barack Obama runs against John McCain for President; climate change receives scant attention in televised debates and interviews

The League of Conservation Voters researches how often presidential candidates are asked about environmental issues in televised debates and interviews. Of 3,231 questions asked of the candidates by top political reporters at five networks, only eight had to do with climate change.* In the first McCain-Obama debate, McCain touts his long term support for nuclear power; Obama responds that McCain has “voted 23 times against alternative energy, like solar, and wind, and biodiesel.” In the second debate, when asked about climate change, McCain states that “when we have an issue that we may hand our children and our grandchildren a damaged planet, I have disagreed strongly with the Bush administration on this issue. I traveled

all over the world looking at the effects of greenhouse gas emissions, Joe Lieberman and I. And I introduced the first legislation, and we forced votes on it. That's the good news, my friends. The bad news is we lost. But we kept the debate going, and we kept this issue to—to posing to Americans the danger that climate change opposes." McCain adds that the "best way of fixing" climate change is nuclear power. Obama, in response to the same question, says, "This is one of the biggest challenges of our times. And it is absolutely critical that we understand this is not just a challenge, it's an opportunity, because if we create a new energy economy, we can create five million new jobs, easily, here in the United States. It can be an engine that drives us into the future the same way the computer was the engine for economic growth over the last couple of decades...And that's why we've got to make some investments and I've called for investments in solar, wind, geothermal."** Obama wins the election, declaring support for cap and trade to address climate change, but will defer largely to Congress to work out the details. He focuses his own efforts on healthcare reform as a major Administration initiative. Obama will incorporate billions for green energy in the stimulus package.

* Eric Pooley, *The Climate War: True Believers, Power Brokers, and the Fight to Save the Earth* (New York: Harper Collins 2010) 127, 297

**2008 First and Second Presidential Debates, transcribed at Climate Silence.org, <http://climatesilence.org/data/debates/#2000>

2009 (January)

A study from the National Oceanic and Atmospheric Administration by Senior Scientist Susan Solomon and coauthors concludes that changes in surface temperature, rainfall, and sea level will be largely irreversible for more than a thousand years after CO₂ emissions are completely stopped

As the authors summarize: "The severity of damaging human-induced climate change depends not only on the magnitude of the change but also on the potential for irreversibility. This paper shows that the climate change that takes place due to increases in carbon dioxide concentration is largely irreversible for 1,000 years after emissions stop. Following cessation of emissions, removal of atmospheric carbon dioxide decreases radiative forcing, but is largely compensated by slower loss of heat to the ocean, so that atmospheric temperatures do not drop significantly for at least 1,000 years. Among illustrative irreversible impacts that should be expected if atmospheric carbon dioxide concentrations increase from current levels near 385 parts per million by volume (ppmv) to a peak of 450–600 ppmv over the coming century are irreversible dry-season rainfall reductions in several regions comparable to those of the "dust bowl" era and inexorable sea level rise."* In an analysis of the implications of Solomon's paper, John Sternman, an analyst of risk perception and management at the Sloan School, M.I.T., writes, "it's important that people not react to Solomon's work with despair. Yes, a certain amount of climate change, due to past emissions, is inevitable, and will not be reversible. But it would be tragic if people concluded that therefore there is nothing we can do, that it is futile to reduce emissions, and that therefore all efforts should shift to adaptation. To the contrary: if nothing is done to cut emissions, and soon, the climate our children and grandchildren will face will almost certainly be far less hospitable, and there will be no turning back. By the time we know for certain how bad it will be it will be too late to take any corrective action. The Solomon

paper should finally bury the idea that we can wait and see. It further strengthens the case for immediate, strong mitigation. The good news is that it's getting cheaper every day to cut carbon emissions. Through learning, scale economies, R&D, and other forms of innovation, new technologies for carbon-neutral renewable energy are becoming more available and less expensive.”**

* Susan Solomon and coauthors, “Irreversible climate change due to carbon dioxide emissions,” Proc.Natl.Acad.Sci. USA 106(6)1704-1709. <http://www.pnas.org/content/early/2009/01/28/0812721106.abstract>

**Andrew Revkin, “The Greenhouse Effect and the Bathtub Effect,” *The New York Times*, January 28, 2009, <https://dotearth.blogs.nytimes.com/2009/01/28/the-greenhouse-effect-and-the-bathtub-effect/>

2009 (January)

The U.S. Climate Action Partnership (USCAP) releases A Blueprint for Legislative Action, calling for a cap and trade program that will reduce CO₂ emissions to 58 percent of 2005 levels by 2030 and 20 percent of 2005 levels by 2050

Among the 26 corporate members of USCAP signing on to the “*Blueprint*” are Ford, General Motors, BP America, Shell, Chrysler, Dow, Dupont, and Alcoa. The introduction to the report is titled, “Climate Change Legislation Can Benefit Our Economy and Energy Future.” The report argues: “New and emerging technologies can put us on the right path, and the potential for other continued technology improvement is high. But to assure success, we need well-aligned national energy and climate policies that set out a new direction for the country. These policies must establish an orderly and predictable schedule of GHG reductions that will move the private sector to develop and deploy the new and advanced energy technologies of tomorrow. Thoughtful and comprehensive national energy and climate policy will help secure our economic prosperity and provide American businesses and the nation’s workforce with the opportunity to innovate and succeed.”* The Partnership argues that rather than auctioning emissions allowances as President Obama has proposed, the government should give the allowances to industry for free. Henry Waxman, Chair of the Energy and Commerce Committee, praises the *Blueprint*, and incorporates much of the proposal into the Waxman/Markey bill, H.R. 2454.**

*United States Climate Action Partnership, *A Blueprint for Legislative Action*, January, 2009, <https://www.c2es.org/docUploads/USCAP-legislative-blueprint.pdf>

** Michael J. Graetz, *The End of Energy: The Unmaking of America's Environment, Security, and Independence* (Cambridge: MIT Press 2011), 234-5.

2009

About six lobbyists per member of Congress—2,340 lobbyists—are registered to work on climate change on Capitol Hill, 85 percent of them aimed at slowing down government action

The surge in lobbyists in Washington is spurred by concern about new agendas for Congressional and administrative action with the Obama administration.* OpenSecrets.org reports: “In all, federal lobbyists’ clients spent more than \$3.47 billion [in 2009], often driven to Washington, D.C.’s power centers and halls of influence by political issues central to the age: health care reform, financial reform, energy policy. That figure represents a more than 5 percent increase over \$3.3 billion worth of federal lobbying recorded in 2008, the previous all-time annual high for lobbying expenditures. And it comes in a year when a recession persisted, the dollar’s value against major foreign currencies declined and joblessness rates increased.”**

* Bill McKibben, *Eaarth* (New York: St. Martin’s 2011), 56.

**OpenSecrets.org, Center for Responsive Politics, “Federal Lobbying Climbs in 2009 as Lawmakers Execute Aggressive Congressional Agenda,” February 12, 2010, <https://www.opensecrets.org/news/2010/02/federal-lobbying-soars-in-2009/>

2009 (February)

The University of Maine Climate Change Institute publishes *Maine’s Climate Future*, representing a collaboration of more than 70 scientists across disciplines

Some of the conclusions of the report: “For the 21st century, models show a strong trend in Maine toward warmer conditions with more precipitation in all four seasons.... increased intensity of precipitation...A warming ocean could increase the frequency and intensity of hurricanes.” “It is difficult to predict the effect on specific species, but we may have fewer spruce, loons, chickadees, lynx, halibut and moose; and more oaks, bobcats, summer flounder and deer.” “[P]otential increases in commercially important fish or tree species could be tempered by similar increases in toxic red tides, invasive species, pests or diseases.”*

* G.L.Jacobson and others. 2009. *Maine’s Climate Future: An Initial Assessment*. Orono, Me: University of Maine. http://climatechange.umaine.edu/files/Maines_Climate_Future.pdf

2009 (April)

Writing for the journal *Nature*, Malte and Nicolai Meinshausen and coauthors estimate the relative assurance of keeping global temperatures under 2 degrees Celsius above preindustrial times under various cumulative emission scenarios

109 of the 192 signing countries of the United Nations Framework Convention on Climate Change are calling for warming to be limited to two degrees Celsius or lower relative to pre-industrial levels. Malte and Nicolai Meinshausen, of the Potsdam Institute for Climate Impact Research and Oxford University’s Statistics Department respectively, publish “Greenhouse-gas emissions targets for limiting global warming to 2 degrees C” in *Nature*. They assert that if cumulative emissions from 2000 to 2050 are limited to 1,000 gigatonnes (Gt) CO₂ equivalent (one trillion tonnes), there is a 75% chance that the globe will not warm more than 2 degrees Celsius. Between 2000 and 2006, 234 Gt CO₂ were emitted, leaving 766 Gt to go. That is, a

quarter of the “bathtub” had been filled in 1/10 of the time allotted. As the press release regarding the study states, “The new results have direct relevance to the international negotiations now underway...(quoting coauthor Retto Knutti) ‘With every year of delay, we consume a larger part of our emissions budget, losing room to manoeuvre and increasing the probabilities of dangerous consequences.’”*

*Malte Meinshausen and others, “Greenhouse-gas emissions targets for limiting global warming to 2 degrees C,” *Nature* 458, 1158-1162 (30 April 2009) <https://www.pik-potsdam.de/news/press-releases/archive/2009/on-the-way-to-phasing-out-emissions-more-than-50-reductions-needed-by-2050-to-respect-2b0c-climate-target>

2009 (April)

House GOP leader (later Speaker of the House) John Boehner on ABC: “The idea that carbon dioxide is a carcinogen that is harmful to our environment is almost comical. Every time we exhale, we exhale carbon dioxide. Every cow in the world, you know, when they do what they do, you’ve got more carbon dioxide”

Comments Joe Romm, at ThinkProgress: “Almost comical? How about completely tragic? One of the GOP’s senior leaders thinks this debate is about whether carbon dioxide is a carcinogen? And thinks carcinogens harm the environment, rather than people? And thinks that cows are of concern because they produce carbon dioxide, rather than methane? It bears repeating: Anti-science conservatives are now the cement shoes on the American people, pulling us down into the ocean hot, acidic dead zone.”*

*Joe Romm, “House GOP Leader Boehner on ABC,” Think Progress, April 20, 2009, <https://thinkprogress.org/house-gop-leader-boehner-on-abc-the-idea-that-carbon-dioxide-is-a-carcinogen-that-is-harmful-to-our-d013d4fa47b5>

2009 (June)

The Obama Administration Environmental Protection Agency settles the California motor vehicle emissions suit and approves California waiver, allowing it and 13 other states to regulate greenhouse gas motor vehicle emissions

The decision reverses the Bush Administration denial of the waiver,* restoring a 40-year interpretation the Clean Air Act. EPA Administrator Lisa Jackson says in an interview that granting the waiver "preserves California's role as a leader on clean air policy," particularly on motor vehicles. "It feels good to know that we are able to move past -- address -- this issue, responding to the president's call." California Gov. Arnold Schwarzenegger calls the decision a "huge step for our emerging green economy that will create thousands of new jobs and bring Californians the cars they want while reducing greenhouse gas emissions."** A study by the Environmental Defense fund comparing the current federal Corporate Average Fuel Efficiency standards with the California standards approved by this action, for its impact on costs in the 13 states which have adopted the California standards, including Maine, finds that

"[c]ombined, the 13 states will avoid consuming 16 billion gallons of fuel in 2030, saving drivers \$40 billion in fuel costs based on an average gas price of \$2.50."*** [see 2007 (December)]

*U.S. Environmental Protection Agency, California Greenhouse Gas Waiver Request, <https://www.epa.gov/regulations-emissions-vehicles-and-engines/california-greenhouse-gas-waiver-request>

74 Fed. Reg. Vol. 74, No. 209, 32744, <https://www.gpo.gov/fdsys/pkg/FR-2009-07-08/pdf/E9-15943.pdf>

**Jim Tankersley, "EPA Gives California Emissions Waiver," *Los Angeles Times*, June 30, 2009, <http://articles.latimes.com/2009/jun/30/nation/na-california-waiver30>

***Environmental Defense Fund, "13 States Adopting California Clean Car Standards Would Reap Significant Economic and Environmental Benefits," June 30, 2009, <https://www.edf.org/news/13-states-adopting-california-clean-car-standards-would-reap-significant-economic-and-environmental-benefits>

2009 (June)

The House approves the Waxman/Markey bill, H.R. 2454, the American Clean Energy and Security Act, with a cap-and-trade system for regulating greenhouse gases, but it fails in the Senate

The American Clean Energy and Security Act, approved by a vote of 219 to 212 in the House of Representatives, would authorize a national cap and trade system to regulate greenhouse gases (GHG), but prohibit regional programs such as the Regional Greenhouse Gas Initiative (RGGI). Negotiations for comparable legislation in the Senate fail. A detailed analysis of the Senate negotiations by Ryan Lizza in *The New Yorker* reveals significant failures of leadership, and the impact of a voracious right-wing press. The report also suggests that industries closely engaged in the negotiations preferred a simpler, more predictable carbon fee approach to cap-and-trade. * Greenpeace, Friends of the Earth, the Climate Justice Leadership Forum, and some other environmental groups oppose the Waxman/Markey bill. Greenpeace states that "giveaways and preferences in the [legislation] will actually spur a new generation of nuclear and coal-fired power plants to the detriment of real energy solutions." ** NASA scientist James Hansen writes an opinion piece in *InsideClimateNews* which is strenuously opposed to the cap-and-trade approach to regulating greenhouse gases: "governments are retreating to feckless "cap-and-trade", a minor tweak to business-as-usual. Oil companies are so relieved to realize that they do not need to learn to be energy companies that they are decreasing their already trivial investments in renewable energy. Cap-and-trade is the temple of doom. It would lock in disasters for our children and grandchildren. Its fecklessness was proven by the Kyoto Protocol. It took a decade to implement the treaty, as countries extracted concessions that weakened even mild goals. Most countries that claim to have met their obligations actually increased their emissions. Others found that even modest reductions of emissions were inconvenient, and thus they simply ignored their goals." Instead, Hansen proposes a substantial carbon fee, ratcheted up over time.*** Meanwhile Maine Senator Susan Collins and Washington Senator Maria Cantwell propose a "cap-and-dividend" bill which would auction allowances, return 75 percent of the proceeds to U.S. citizens per capita, and use the remaining 25 percent for clean-energy R&D. The "CLEAR Act", or "Carbon Limits and Energy for America's Renewal Act," provides no trading of the allowances, and contains no provisions for offsets. Writes Michael Graetz: "This bill resembles a carbon tax and rebate system, but the dreaded word *tax* appears nowhere. The senators emphasize that their legislation takes only 39 pages of statutory language, saying, "Instead of a behemoth bill designed to conceal backroom deals and giveaways, our framework is a straight path that all Americans can follow."** This prescient proposal gets very little traction in the Senate.

*Ryan Lizza, "As the World Burns," *The New Yorker*, October 11, 2010, <http://www.newyorker.com/magazine/2010/10/11/as-the-world-burns>

** Michael J. Graetz, *The End of Energy: The Unmaking of America's Environment, Security, and Independence* (Cambridge: MIT Press 2011), 237, 242.

***James Hansen, "Cap-and-Trade is the Temple of Doom," *InsideClimateNews*, May 6, 2009, <https://insideclimatenews.org/news/20090506/cap-and-trade-temple-doom>

2009 (October)

A Pew Research Center survey finds a sharp decline over the past year (from 71% to 57%) in the percentage of Americans who say there is solid evidence that global temperatures are rising

The Pew Research Center national survey of 1,500 adults on cellular and landlines also finds that fewer Americans see global warming as a very serious problem—35% say that it is serious in October, 2009, down from 44% in April 2008. The percentage of those believing human activity causes global warming also has significantly declined: 36% say in October 2009 that global warming is a result of human activity, versus 47% in April 2008. "The decline in the belief in solid evidence of global warming has come across the political spectrum, but has been particularly pronounced among independents. Just 53% of independents now see solid evidence of global warming, compared with 75% who did so in April 2008." Despite growing skepticism, a majority of Americans favor regulatory action to curb emissions: "the survey finds more support than opposition for a policy to set limits on carbon emissions. Half of Americans favor setting limits on carbon emissions and making companies pay for their emissions, even if this may lead to higher energy prices; 39% oppose imposing limits on carbon emissions under these circumstances." *

* Pew Research Center, "Fewer Americans See Solid Evidence of Global Warming," Oct. 22, 2009, <http://peoplepress.org/2009/10/22/fewer-americans-see-solid-evidence-of-global-warming/>

2009 (November)

Hundreds of private e-mail messages and documents hacked from a computer server at the University of East Anglia, United Kingdom, fuel public and media arguments from global warming skeptics that scientists conspired to overstate the case for human influence on climate change

Andrew Revkin describes the hacked emails in the *New York Times*: "The e-mail messages, attributed to prominent American and British climate researchers, include discussions of scientific data and whether it should be released, exchanges about how best to combat the arguments of skeptics, and casual comments — in some cases derisive — about specific people known for their skeptical views. Drafts of scientific papers and a photo collage that portrays climate skeptics on an ice floe were also among the hacked data, some of which dates back 13 years." After an analysis of the documents and discussions with various scientist whose emails were disclosed, Revkin concludes, "The evidence pointing to a growing human contribution to global warming is so widely accepted that the hacked material is unlikely to erode the overall argument. However, the documents will undoubtedly raise questions about the quality of

research on some specific questions and the actions of some scientists.”* The hacked documents were leaked shortly before the Copenhagen Conference of the Parties of the United Nations Framework Convention on Climate Change, and “was extensively referred to there,” according to an official inquiry into the hacked documents and their implication at the University of East Anglia. The key findings of the latter report are: “Climate science is a matter of such global importance, that the highest standards of honesty, rigour and openness are needed in its conduct. On the specific allegations made against the behaviour of CRU [Climate Research Unit] scientists, we find that their rigour and honesty as scientists are not in doubt. In addition, we do not find that their behaviour has prejudiced the balance of advice given to policy makers. In particular, we did not find any evidence of behaviour that might undermine the conclusions of the IPCC assessments. But we do find that there has been a consistent pattern of failing to display the proper degree of openness, both on the part of the CRU scientists and on the part of the [University of East Anglia], who failed to recognise not only the significance of statutory requirements but also the risk to the reputation of the University and, indeed, to the credibility of UK climate science.”**

* Andrew C. Revkin, “Hacked E-Mail Is New Fodder for Climate Dispute,” *The New York Times*, November 20, 2009, <http://www.nytimes.com/2009/11/21/science/earth/21climate.html>

**University of East Anglia, “The Independent Climate Change E-mails Review,” July, 2010, <http://www.cce-review.org/pdf/FINAL%20REPORT.pdf>

2009 (December)

In compliance with the ruling in Massachusetts v. Environmental Protection Agency, the Obama EPA issues a final “endangerment finding” that six greenhouse gases (GHG) “may reasonably be anticipated to endanger public health and welfare”; it proposes mandatory reporting of GHG emissions from large sources and announces that it is considering whether to regulate GHG emissions from coal-fired power plants

The introduction to the finding states: “The Administrator has determined that the body of scientific evidence compellingly supports this finding. The major assessments by the U.S. Global Climate Research Program (USGCRP), the Intergovernmental Panel on Climate Change (IPCC), and the National Research Council (NRC) serve as the primary scientific basis supporting the Administrator’s endangerment finding. The Administrator reached her determination by considering both observed and projected effects of greenhouse gases in the atmosphere, their effect on climate, and the public health and welfare risks and impacts associated with such climate change. The Administrator’s assessment focused on public health and the public welfare impacts within the United States. She also examined the evidence with respect to impacts in other world regions, and she concluded that these impacts strengthen the case for endangerment to public health and welfare because impacts in other world regions can in turn adversely affect the United States.”*

*Environmental Protection Agency, Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66495, December 15, 2009, <https://www.federalregister.gov/documents/2009/12/15/E9-29537/endangerment-and-cause-or-contribute-findings-for-greenhouse-gases-under-section-202a-of-the-clean>

2009 (December)

The United Nations Framework Convention on Climate Change Conference of the Parties meeting in Copenhagen ends with a three-page “accord” that is neither legally binding, nor formally accepted

The “accord” contains no specific emissions-reduction goals, but sets an objective that world temperatures should not rise by more than 2 degrees Celsius above preindustrial levels by 2050.* Joss Garman in London’s *Independent*: “It is no exaggeration to describe the outcome of Copenhagen as a historic failure that will live in infamy,” where “[t]he most progressive US president in a generation comes to the most important international meeting since the Second World War and delivers a speech so devoid of substance that he might as well have made it on speaker-phone from a beach in Hawaii. His aides argue in private that he had no choice, such is the opposition on Capitol Hill to any action that could challenge the dominance of fossil fuels in American life. And so the nation that put a man on the Moon can’t summon the collective will to protect men and women back here on Earth from the consequences of an economic model and lifestyle choice that has taken on the mantle of a religion.”**

*Michael J. Graetz, *The End of Energy: The Unmaking of America's Environment, Security, and Independence* (Cambridge: MIT Press 2011), 175.

**Josh Garman, “Copenhagen – Historic Failure That Will Live In Infamy,” *The Independent*, December 20, 2009; <http://www.countercurrents.org/garman191209.htm>

2010 (February)

For the first time, the U.S. Department of Defense’s primary planning document, the Quadrennial Defense Review, assesses the impact of climate change on global stability and defense operations

This assessment was required by a 2008 statutory amendment sponsored by Senators Hillary Clinton (D-NY) and John Warner (R-VA).* The report observes that “Climate change and energy are two key issues that will play a significant role in shaping the future security environment. Although they produce distinct types of challenges, climate change, energy security, and economic stability are inextricably linked. The actions that the Department takes now can prepare us to respond effectively to these challenges in the near term and in the future.

.. Assessments conducted by the intelligence community indicate that climate change could have significant geopolitical impacts around the world, contributing to poverty, environmental degradation, and the further weakening of fragile governments. Climate change will contribute to food and water scarcity, will increase the spread of disease, and may spur or exacerbate mass migration. While climate change alone does not cause conflict, it may act as an accelerant of instability or conflict, placing a burden to respond on civilian institutions and militaries around the world. In addition, extreme weather events may lead to increased demands for defense support to civil authorities for humanitarian assistance or disaster response both within the United States and overseas. In some nations, the military is the only institution with the capacity to respond to a large-scale natural disaster. Proactive engagement with these countries can help build their capability to respond to such events.”**

* Brad Johnson, "Pentagon: 'Climate Change, Energy Security, and Economic Stability are Inextricably Linked,'" *ThinkProgress.org*, February 1, 2010, <http://thinkprogress.org/climate/2010/02/01/174552/qdr-climate-threat/>

** US Department of Defense, Quadrennial Defense Review Report, February, 2010,
http://www.defense.gov/Portals/1/features/defenseReviews/QDR/QDR_as_of_29JAN10_1600.pdf

2010 (February)

In response to the hacked e-mails from University of East Anglia, United Kingdom, Senator James Inhofe, ranking Republican on the Environment and Public Works Committee, releases a report calling for criminal prosecution of 17 climate scientists

An editorial in the journal *Nature* calls Senator Inhofe's proposal "nonsense that was hardly a surprise considering the source," but observes that "[c]limate scientists are on the defensive, knocked off balance by a re-energized community of global-warming deniers who, by dominating the media agenda, are sowing doubts about the fundamental science. Most researchers find themselves completely out of their league in this kind of battle because it's only superficially about the science. The real goal is to stoke the angry fires of talk radio, cable news, the blogosphere and the like, all of which feed off of contrarian story lines and seldom make the time to assess facts and weigh evidence. Civility, honesty, fact and perspective are irrelevant."* [see 2009 (November)]

* Editorial, "Climate of fear," *Nature* 464, 141 (March 11, 2010),
<http://www.nature.com/nature/journal/v464/n7286/full/464141a.html>

2010 (May)

The Environmental Protection Agency takes the first U.S. regulatory action to control greenhouse gases; jointly with the National Highway Traffic Safety Administration, it issues a final rule for Corporate Average Fuel Economy (CAFÉ) standards and greenhouse gas standards for passenger cars, light-duty trucks, and medium-duty passenger vehicles [see 1999]

The EPA finally takes the action that a group of environmental organizations and states asked it to do eleven years ago, in the 1999 petition. The rule will apply to model years 2012 through 2016. The EPA notes that "Mobile sources emitted 31 percent of all U.S. GHGs in 2007...and have been the fastest-growing source of U.S. GHGs since 1990," and the vehicles regulated by this rule "are responsible for almost 60 percent of all U.S. transportation-related GHG emissions." The EPA explains the relationship between fuel economy and GHG pollution: "The National Program is both needed and possible because the relationship between improving fuel economy and reducing CO₂ tailpipe emissions is a very direct and close one. The amount of those CO₂ emissions is essentially constant per gallon combusted of a given type of fuel. Thus, the more fuel efficient a vehicle is, the less fuel it burns to travel a given distance. The less fuel it burns, the less CO₂ it emits in traveling that distance. While there are emission control technologies that reduce the pollutants (e.g. carbon monoxide) produced by imperfect combustion of fuel by capturing or converting them to other compounds, there is no such technology for CO₂. Further, while some of those pollutants can also be reduced by achieving a more complete combustion of fuel, doing so only increases the tailpipe emissions of CO₂." The National Program "is estimated to result in approximately 960 million metric tons of total

carbon dioxide equivalent emissions reductions and approximately 1.8 billion barrels of oil savings over the lifetime of vehicles sold in model years ... 2012 through 2016.”*

*U.S. Environmental Protection Agency, “Light-duty Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards; Final Rule, 75 Fed. Reg. 25323, May 7, 2010, <https://www.federalregister.gov/documents/2010/05/07/2010-8159/light-duty-vehicle-greenhouse-gas-emission-standards-and-corporate-average-fuel-economy-standards>

2010 (June)

The Environmental Protection Agency issues a final “tailoring” rule under the Clean Air Act for applying greenhouse gas (GHG) emission standards to stationary sources (factories, power plants) permit proceedings; the rule limits applicability of GHG regulation to larger facilities, which account for 70% of all GHG emissions from stationary sources

The EPA details the legal justification under court decisions for regulating only the largest sources of greenhouse gases in Prevention of Significant Deterioration and Title V operating permit proceedings, thus “relieving overwhelming permitting burdens that would, in the absence of this rule, fall on permitting authorities and sources.” The Obama EPA’s approach avoids the scenario the G.W. Bush administration hypothesized as a basis for rejecting greenhouse gas regulation under the Clean Air Act, that the EPA “would be required to regulate a very large number of new and existing stationary sources, including smaller sources ...indeed, a large single family residence could exceed this threshold if all appliances consumed natural gas.”**[see 2008 (July)]

*U.S. Environmental Protection Agency, “Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule,” 75 Fed. Reg. 32513, (June 3, 2010) <https://www.federalregister.gov/documents/2010/06/03/2010-11974/prevention-of-significant-deterioration-and-title-v-greenhouse-gas-tailoring-rule>

** U.S. Environmental Protection Agency, “Regulating Greenhouse Gases under the Clean Air Act, Proposed Rule,” 73 Fed. Reg. 44354 (July 30, 2008), <https://www.gpo.gov/fdsys/pkg/FR-2008-07-30/pdf/E8-16432.pdf>

2010

Record breaking heat waves cause devastation across the globe

2010 ties with 2005 as the warmest year on record, with 19 countries setting new high-temperature records. Pakistan registers the hottest temperature ever recorded on the Asian continent (128.3 degrees F). Summer heat in western Russia cause wildfires and destroy one-third of Russia’s wheat crop; 56,000 deaths in Russia are attributed to the combination of extreme heat, smog, and smoke. China’s Yunan province experiences extreme heat and the worst drought in 100 years, causing massive crop failures. In the United States on the east coast temperatures reaches 106 degrees F as far north as Maryland.*

*Center for Climate and Energy Solutions, “Extreme Weather and Climate Change,” <https://www.c2es.org/publications/extreme-weather-and-climate-change>

2010 (September)

Members of Americans for Prosperity (AFP) begin protesting at Regional Greenhouse Gas Initiative (RGGI) offices and attacking the program as a “stealth tax”

Conservative activist Clint Woods of the Koch-funded American Legislative Exchange Council (ALEC) states that the Regional Greenhouse Gas Initiative (RGGI) and other regional cap-and-trade regimes had become the “new battlefield” since federal climate legislation was defeated. “ALEC, which has created template legislation for state lawmakers to use as a way to back out of regional climate accords, received \$125,000 from the Koch brothers’ Claude R. Lambe Charitable Foundation in 2009 and has received donations totaling \$533,000 from the Koch foundations since 1997.” The 2014 Showtime series *Years of Living Dangerously* will explore the Koch brothers’ role opposing RGGI in New Jersey. * AFP sponsors a bill in the New Jersey legislator for repeal of New Jersey’s greenhouse gas reduction statute, and withdrawal of the state from RGGI. Writes Kevin Mooney in *The American Spectator*: “An anti-regulatory earthquake is stirring in New Jersey that could potentially free other states and regions from economically unsound energy restrictions and renewable mandates that have further burdened America’s already beleaguered consumers with higher costs.”** Governor Christie will withdraw from RGGI in the next year; as *The New York Times* reports, “[o]pponents were quick to ascribe political motives to the governor’s decision, given that Mr. Christie is seen as a possible Republican candidate in the 2012 presidential race and conservatives have vilified cap-and-trade programs, which set limits on emissions, as an unjust tax on business.”*** In 2011, a similar effort supported by AFP in New Hampshire will be successful in passing legislation to mandate withdrawal from RGGI, but the legislation will be vetoed by Democratic governor John Lynch.****Greenpeace quotes AFP New Hampshire state director Corey Lewandowski as claiming that RGGI money “was taken by regulators from consumers in the form of higher electricity bills and then redistributed to environmental special interests friendly to the politicians in power.” *

*Greenpeace, “Koch Front Groups Attack RGGI,” <http://www.greenpeace.org/usa/en/campaigns/global-warming-and-energy/polluterwatch/koch-industries/CASE-STUDY-Koch-Front-Groups-Attack-RGGI--the-Northeast-Regional-Greenhouse-Gas-Initiative/>

**Kevin Mooney, “A Capper for Christie,” *The American Spectator*, September 28, 2010, https://spectator.org/38855_capper-christie/

***Mireya Navarro, Christie Pull New Jersey from 10-State Climate Initiative,” *New York Times*, May 26, 2011, <http://www.nytimes.com/2011/05/27/nyregion/christie-pulls-nj-from-greenhouse-gas-coalition.html>

****”New Hampshire Governor Vetoes RGGI Withdrawal Bill,” *POWERNews*, July 13, 2011, <http://www.powermag.com/new-hampshire-governor-vetoes-raggi-withdrawal-bill/?printmode=1>

2010 (November)

The Hadley Centre for Climate Prediction and Research in the United Kingdom (Richard Betts, et al.) releases an analysis concluding that based on the Intergovernmental Panel on Climate Change scenarios and “the uncertainties in climate-carbon cycle feedbacks... our best estimate is that the [fossil fuel intensive] emissions scenario would lead to a warming of 4 degrees Celsius relative to preindustrial during the 2070’s”

Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report examined six possible scenarios for future greenhouse gas emissions where there were no regulatory efforts to

reduce emissions. As the study notes, “The scenarios represent the emissions that would be consistent with a range of plausible future trajectories of population, economic growth and technology change, without policies to specifically reduce emissions in order to address climate change. Even though the possibility of reducing emissions through climate policy was not included in these scenarios, they still project a very wide range of emissions …All six scenarios were considered by the IPCC to be equally sound; no scenario was considered to be more or less likely than any others.” The IPCC found the likely range of global warming relative to pre-industrial temperatures under these scenarios to be between 1.6°C and 6.9°C. This study took a closer look at the scenario with the greatest estimate of cumulative future emissions, applying some complex modeling regarding ocean-atmosphere general circulation models, and carbon-cycle feedbacks, which, for practical and cost considerations, had not been employed in the IPCC assessment. Their goal was to determine the approximate time that temperatures could reach 4% Celsius in the absence of carbon reduction policies. Their conclusions were “that the [fossil fuel intensive] emissions scenario would lead to a rise in global mean temperature of between approximately 3°C and 7°C by the 2090s relative to pre-industrial, with best estimates being around 5°C. Our best estimate is that a temperature rise of 4°C would be reached in the 2070s, and if carbon-cycle feedbacks are strong, then 4°C could be reached in the early 2060s.”*

* Richard Betts and coauthors, “When Could Global Warming Reach 4 degrees Centigrade?” The Royal Society, November 29, 2010, <http://rsta.royalsocietypublishing.org/content/369/1934/67>

2010

Twenty years after the EPA prepared its first Emissions Inventory of Greenhouse Emissions and Sinks pursuant to obligations under the UNFCCC, total greenhouse gas emissions (CO₂ equivalent) in 2000 are 6985 million metric tons [tonnes], 9.2% higher than in 1990, but 3.8% lower than ten years ago, in 2000.*

*U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2014* (published 2016), Table 2-1. Recent Trends in U.S. Greenhouse Gas Emissions and Sinks (MMT CO₂ Eq.), <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2014>

2011(March)

Paul Mayewski, director of the University of Maine Climate Change Institute, gives a public lecture discussing the potential for “abrupt climate change” as a result of changes in global temperatures because greenhouse gases have risen 100 times faster in the last century than in the past

Mayewski notes that the average estimate for temperature increases as a result of current greenhouse gas (GHG) concentrations and trends is 2 to 3 degrees Celsius, far higher than changes that dramatically altered civilizations in the past. He describes the “toxic climate cocktail” that humans have put into the atmosphere, which will cause “much less stable climate conditions” in North America in the next few decades and beyond.*

* Paul Mayewski, "Climate Change and the Role of Humans," March 31, 2011 lecture, University of Maine.

2011 (April)

A study reported in Proceedings of the National Academy of Sciences examines growth in emissions transfers from international trade from 1990 to 2008, finding a doubling of emissions in developing countries

The study entitled "Growth in emission transfers via international trade from 1990 to 2008," by Glen Peters of the Center for International Climate and Environmental Research, Oslo, and coauthors finds that while emissions in developed signatories to the Kyoto Protocol have stabilized, emissions in developing countries have doubled. Stabilization in developed countries was partly because international trade had allowed them to move their production to places like China. The rise in emissions from goods produced in developing countries but consumed in developed countries was significantly greater than the emissions savings of developed countries. "To quantify the growth in emission transfers via international trade, we developed a trade-linked global database for CO₂ emissions covering 113 countries and 57 economic sectors from 1990 to 2008. We find that the emissions from the production of traded goods and services have increased from 4.3 Gt CO₂ in 1990 (20% of global emissions) to 7.8 Gt CO₂ in 2008 (26%). Most developed countries have increased their consumption-based emissions faster than their territorial emissions, and non-energy-intensive manufacturing had a key role in the emission transfers. The net emission transfers via international trade from developing to developed countries increased from 0.4 Gt CO₂ in 1990 to 1.6 Gt CO₂ in 2008, which exceeds the Kyoto Protocol emission reductions. Our results indicate that international trade is a significant factor in explaining the change in emissions in many countries, from both a production and consumption perspective. We suggest that countries monitor emission transfers via international trade, in addition to territorial emissions, to ensure progress toward stabilization of global greenhouse gas emissions."*

* Glen P. Peters and others, "Growth in Emissions Transfers via International Trade from 1990 to 2008," PNAS, vol. 108, No. 21, April 19, 2011, <http://www.pnas.org/content/early/2011/04/19/1006388108>

2011 (June)

In State of Connecticut v. American Electric Power Company, the U.S. Supreme Court overrules a decision of the U.S. Court of Appeals for the Second Circuit, which had recognized a claim under federal common law of nuisance by eight states against six power plants for emissions of greenhouse gases (GHGs) contributing to global warming

The Supreme Court holds that the statutory right of the Environmental Protection Agency to regulate greenhouse gases (GHGs) under the Clean Air Act displaces any federal common law right the plaintiffs might have had to remedy harms caused by the emission of greenhouse gases. "It is altogether fitting that Congress designated an expert agency, here, EPA, as best suited to serve as primary regulator of greenhouse gas emissions. The expert agency is surely better equipped to do the job than individual district judges issuing ad hoc, case-by-case injunctions. Federal judges lack the scientific, economic, and technological resources an agency

can utilize in coping with issues of this order.” The Court leaves open the question of whether there are state-based nuisance claims that might be asserted.*

*Connecticut v. American Electric Power Company, 131 S. Ct. 2527 (2011), <https://www.law.cornell.edu/supct/html/10-174.ZS.html>

2011 (June)

Sixty scientific experts meet in Peru to begin exploration of geo-engineering options for inclusion in next report of the Intergovernmental Panel on Climate Change in 2014

The Guardian reports that documents leaked in advance of the meeting reveal that “around 60 scientists will propose or try to assess a range of radical measures, including: blasting sulphate aerosols into the stratosphere to reflect sunlight into space; depositing massive quantities of iron filings into the oceans; bio-engineering crops to be a lighter colour to reflect sunlight; and suppressing cirrus clouds.”* “We are getting into very risky territory,” states Christiana Figueres, director of the United Nations Framework Convention on Climate Change (UNFCCC). One hundred twenty-five environmental organizations write a letter to the head of the Intergovernmental Panel on Climate Change (IPCC): “The IPCC...must take great care not to squander its credibility on geo-engineering, a topic that is gathering steam precisely when there is no real progress on mitigation and adaptation.”**

*John Vidal, “IPCC asks scientists to assess geo-engineering climate solutions,” *The Guardian*, June 15, 2011, <https://www.theguardian.com/environment/2011/jun/15/ipcc-geo-engineering-climate>

** Gwynne Dyer, “The time to research climate fixes is here,” *Bangor Daily News* June 21, 2011.

2011 (July)

A study assesses the prospects for global coral reef survival in the face of combined assaults of sea surface temperature rise and ocean acidification

Writing in the Journal *Science*, John Pandolfi, of the Australian Research Council Centre of Excellence for Coral Reef Studies, and coauthors examine climatic conditions at the time of ancient coral reef die-offs and current observations to attempt to assess the prospects for coral reef survival. They note that “Many physiological responses in present-day coral reefs to climate change are interpreted as consistent with the imminent disappearance of modern reefs globally because of annual mass bleaching events, carbonate dissolution, and insufficient time for substantial evolutionary responses.” The study takes into consideration some evidence of coral reef adaptation (“thermal tolerance”) to gradually increasing temperatures: “The most pessimistic projection is for global-scale losses of coral reefs resulting from annual mass bleaching events. More recent mathematical modeling that incorporates adaptation of thermal tolerance under varying emissions scenarios suggests that a wide range of outcomes is possible, from a complete collapse of coral cover by the middle of this century to maintenance of comparable levels of cover to 2100 and beyond. The outcome will depend on the extent of thermal adaptation and aggressive [greenhouse gas] emissions reduction: Both appear necessary to avoid extended declines in coral cover to very low levels.”*

*John Pandolfi and coauthors, “Projecting Coral Reef Futures Under Global Warming and Ocean Acidification,” *Science*, Vol. 333, Issue 6041, pp. 418-422, July 22, 2011, <http://science.sciencemag.org/content/333/6041/418.full>

2011 (October)

Prominent physicist and global warming skeptic Richard Muller completes a two-year \$600,000 study, paid in part by the Koch brothers, on whether or not global temperatures are really rising; Muller confirms that it is: “[N]ow we have confidence that the temperature rise that had previously been reported had been done without bias”

Although the study does not address the causes of global warming, Muller agrees that “Greenhouse gases could have a disastrous impact on the world.”* A year later Muller, in an op-ed in *The New York Times*, will report his conclusion that the warming is indeed caused by humans, and that it is even larger than estimates by the IPCC: “Call me a converted skeptic. Three years ago I identified problems in previous climate studies that, in my mind, threw doubt on the very existence of global warming. Last year, following an intensive research effort involving a dozen scientists, I concluded that global warming was real and that the prior estimates of the rate of warming were correct. I’m now going a step further: Humans are almost entirely the cause. My total turnaround, in such a short time, is the result of careful and objective analysis by the Berkeley Earth Surface Temperature project, which I founded with my daughter Elizabeth. Our results show that the average temperature of the earth’s land has risen by two and a half degrees Fahrenheit over the past 250 years, including an increase of one and a half degrees over the most recent 50 years. Moreover, it appears likely that essentially all of this increase results from the human emission of greenhouse gases. These findings are stronger than those of the Intergovernmental Panel on Climate Change, the United Nations group that defines the scientific and diplomatic consensus on global warming.”**

*“Global warming skeptic changes mind after two-year study,” *Bangor Daily News*, Oct. 31, 2011.

**Richard A. Muller, “The Conversion of a Climate Change Skeptic,” *The New York Times*, July 28, 2012, http://www.nytimes.com/2012/07/30/opinion/the-conversion-of-a-climate-change-skeptic.html?_r=1&pagewanted=all

2011 (November)

The U.S. Department of Energy Carbon Dioxide Information Analysis Center reports that estimates of global 2010 carbon emissions show a record 6% increase of carbon emissions, an increase of over 9 billion tonnes of carbon, with more than half the increase attributed to China (up 10% to 2.247 teragrams carbon (Tg-C) (million tonnes)), and the United States (up 4% to 1.498 Tg-C)

Calculations based on population estimates are that per capita U.S. emissions are now 2.8 times China’s per capita emissions. The 2010 global figures, totaling 9,139 teragrams (Tg)(or 9.139 gigatonnes (Gt)) are higher than the worst-case scenario outlined four years ago by the Intergovernmental Panel on Climate Change (IPCC). This is the highest annual increase in carbon emissions since measurements began 25 years ago. However, developed countries that ratified the Kyoto Protocol have reduced their emissions overall since 1997 and have achieved their goals of cutting emissions to about 8% below 1990 levels.* [But see 2011(April)]

* Carbon Dioxide Information Analysis Center, <http://cdiac.ornl.gov>; see also Richard Pantaleo, “2010 Global Carbon Dioxide Levels Hit Record High,” *Voice of America*, November 11, 2011, <http://blogs.voanews.com/science-world/2011/11/11/2010-global-carbon-dioxide-levels-hit-record-high/>

2011 (December)

International climate talks in Durban, South Africa conclude with a distinctly “modest” agreement to work toward a future “protocol, legal instrument or an agreed outcome with legal force” that includes developing countries like China, India, and Brazil

The deadline for finalizing an agreement is 2015, with terms not enforceable until 2020. Michael A. Levi, a climate change and energy fellow at the Council on Foreign Relations in New York admits that “[t]he reality is that there is no more agreement on the future of the climate talks than there was when negotiators first convened two weeks ago...Europe will continue to insist on a full-blown legally binding agreement; China and India will continue to oppose one; and the United States, while leaving the door open to an agreement that is binding for all, will continue to be unenthusiastic as well. These positions are largely rooted in incompatible views of the future, and there is no reason to believe that more talking will change them.”* Lou Leonard of the World Wildlife Fund comments, “The phrase ‘agreed outcome with legal force’ is new. They just made it up. We don’t know what it means.”** Columnist Gwynne Dyer remarks, “It is not the first time that short term self-interest has trumped over the long-term common interest, but it may be the worst time.”***

*John M. Broder, “Climate Talks in Durban Yield Limited Agreement,” *New York Times*, December 11, 2011, <http://www.nytimes.com/2011/12/12/science/earth/countries-at-un-conference-agree-to-draft-new-emissions-treaty.html>

** “Climate deal sets stage for international conflict,” *Bangor Daily News*, Dec. 16, 2011.

*** Gwynn Dyer, “2011: A Quite Important Year,” *Bangor Daily News*, Jan. 3, 2012.

2011 (December)

Canada withdraws from the Kyoto Protocol

The only country to formally repudiate the Kyoto Protocol after signing on to it, Canada will avoid \$14 billion in fines for failure to meet emissions targets. Its ministers complain that the two largest greenhouse gas emitters, China and the United States, are not a part of the agreement. As *The Guardian* observes: “Canada’s Conservative government is reluctant to hurt Canada’s booming oil sands sector, the country’s fastest growing source of greenhouse gases. Canada has the world’s third-largest oil reserves, more than 170bn barrels. Daily production of 1.5m barrels from the oil sands is expected to increase to 3.7mn in 2025. Only Saudi Arabia and Venezuela have more reserves. But the enormous amount of energy and water needed in the extraction process increases greenhouse gas emissions.”*

**The Guardian*, “Canada pull out of Kyoto Protocol,” December 13, 2011, <https://www.theguardian.com/environment/2011/dec/13/canada-pulls-out-kyoto-protocol>

2012 (January)

Sixteen scientists publish an op-ed in the *Wall Street Journal*, “No Need to Panic about Global Warming,” arguing that “there is no compelling scientific argument for dramatic action to ‘decarbonize’ the world’s economy”

“Even if one accepts the inflated climate forecasts of the Intergovernmental Panel on Climate Change (IPCC), aggressive greenhouse gas control policies are not justified economically,” say the authors.* A week later, forty scientists sign on to a response in the *Wall Street Journal*, saying the “No Need to Panic” piece was “the climate science equivalent of dentists practicing cardiology.” “While accomplished in their own fields, most of these authors have no expertise in climate science. The few authors who have such expertise are known to have extreme views that are out of step with nearly every other climate expert.” The letter goes on to note that 97% of researchers who actively publish on climate science agree that climate change is real and caused by humans. It concludes: “It would be an act of recklessness for any political leader to disregard the weight of evidence and ignore the enormous risks that climate change clearly poses.” In writing on the *Wall Street Journal* op-ed and the letter response, *The Guardian* reports that “at least two [of the sixteen scientists signing the op-ed] used to work for Exxon and six others have worked for think tanks funded by industry groups including Exxon.” It also reports that the *Wall Street Journal* “had earlier refused to publish a similar letter from 255 scientists from the National Academy of Sciences that supported the mainstream view on climate change.”** That letter was subsequently published in the journal *Science*. *** The first author of the letter from 255 National Academy of Sciences members, Peter Gleick, President of The Pacific Institute and a MacArthur Fellow, writes in *Forbes*: “The National Academy of Sciences is the nation’s pre-eminent independent scientific organization. Its members are among the most respected in the world in their fields. Yet the [*Wall Street*] *Journal* wouldn’t publish this letter, from more than 15 times as many top scientists. Instead they chose to publish an error-filled and misleading piece on climate because some so-called experts aligned with their bias signed it. This may be good politics for them, but it is bad science and it is bad for the nation. *Science* magazine – perhaps the nation’s most important journal on scientific issues – published the letter from the NAS members after the Journal turned it down. Do you have an open mind? Read both, side by side. And understand that every national academy of sciences on the planet agrees with the reality and seriousness of human caused climate change.”**** Meanwhile Yale economist William Nordhaus, whose work is cited for support in the *Wall Street Journal* op-ed, weighs in with a primer on everything wrong about the op-ed: “My response is primarily designed to correct their misleading description of my own research; but it also is directed more broadly at their attempt to discredit scientists and scientific research on climate change. I have identified six key issues that are raised in the article, and I provide commentary about their substance and accuracy... [O]n each of these questions, the sixteen scientists provide incorrect or misleading answers. At a time when we need to clarify public confusions about the science and economics of climate change, they have muddied the waters. I will describe their mistakes and explain the findings of current climate science and economics.”*****

*Commentary, “No Need to Panic About Global Warming,” *Wall Street Journal*, January 27, 2012, <http://online.wsj.com/article/SB10001424052970204301404577171531838421366.html#printMode>

**Suzanne Goldenberg, “*Wall Street Journal rapped over climate change stance*,” *The Guardian*, February 1, 2012, <https://www.theguardian.com/environment/2012/feb/01/wall-street-journal-climate-change>

***Peter Gleick and 254 others, "Climate Change and the Integrity of Science," *Science*, May 7, 2010, <http://science.sciencemag.org/content/sci/328/5979/689.full.pdf>

****Peter Gleick, "Remarkable Editorial Bias on Climate Science at the Wall Street Journal," *Forbes*, January 27, 2012, <https://www.forbes.com/sites/petergleick/2012/01/27/remarkable-editorial-bias-on-climate-science-at-the-wall-street-journal/#7b812c1c664f>

***** William Nordhaus, "Why the Global Warming Skeptics Are Wrong," *The New York Review of Books*, March 22, 2012, <http://www.nybooks.com/articles/archives/2012/mar/22/why-global-warming-skeptics-are-wrong/>

2012 (March)

The Environmental Protection Agency proposes the first federal limits on greenhouse gas emissions from new power plants

The Environmental Protection Agency (EPA) proposes a limit of 1,000 pounds of CO₂ per megawatt-hour of electricity produced.* This is easily met by gas-fired power plants, but a spokesman for Peabody Energy, the largest coal mining company in the United States, says that for coal plants this standard would "require something that doesn't exist as a commercial technology." The EPA says it will allow new plants to begin operating with higher levels of emissions as long as the average annual emissions over a period of 30 years meet the standard. Senator Joe Manchin, a West Virginia Democrat and former governor, expresses strong opposition: "This E.P.A. is fully engaging in a war on coal, even though this country will continue to rely on coal as an affordable, stable and abundant energy source for decades to come....This approach relies totally on cheap natural gas, and we've seen that bubble burst before."**

*U.S. Environmental Protection Agency, "Standards of Performance for Greenhouse Gas Emissions for New Stationary Sources: Electric Utility Generating Units, Proposed Rule," 77 Fed. Reg. 22391, May 13, 2012, <https://www.federalregister.gov/documents/2012/04/13/2012-7820/standards-of-performance-for-greenhouse-gas-emissions-for-new-stationary-sources-electric-utility>

** Felicity Barringer, "For New Generation of Power Plants, a New Emissions Rule from EPA," March 27, 2012, <http://www.nytimes.com/2012/03/28/science/earth/epa-sets-greenhouse-emission-limits-on-new-power-plants.html>

2012 (April)

Bill McKibben speaks at the University of Maine; he argues against the Keystone Pipeline, in favor of a carbon tax, and for repeal of the \$20 billion/year fossil fuel subsidies: "It's not enough that they're destroying the planet, we're paying them a performance bonus along the way"

McKibben is highly critical of progress on climate policy to date: "We've essentially had a 20 year bipartisan policy of accomplishing nothing in Washington." Quoting Martin Luther King, McKibben says, "The arc of the moral universe is long, but it bends toward justice. ...[But] the arc of the physical universe is short, and it bends toward heat." Citing inaction and disengagement in Congress, McKibben acknowledged, "You might bet against us winning, but it's a bet you're not allowed to make."*

* Bill McKibben, remarks at the Hope Festival, University of Maine, Orono, Maine, April 21, 2012.

2012(May)

The Heartland Institute initiates a controversial and short-lived “Unabomber” billboard campaign.

The billboard, put up in the Chicago area, features a photo of Unabomber Ted Kaczinsky, with a “quote,” “I still believe in global warming. Do you?” The campaign planned to include similar billboards with Charles Manson, Fidel Castro, and Osama Bin Laden. The Institute says that the campaign seeks to convey the message that “the most prominent advocates of global warming aren’t scientists. They are murderers, tyrants, and madmen.” Shortly before *The Washington Post*’s Jason Samenow ran a post about the campaign, the President of the Institute issues a statement: “We will stop running [the billboard] at 4:00 p.m. CST today. (It’s a digital billboard, so a simple phone call is all it takes.) The Heartland Institute knew this was a risk when deciding to test it, but decided it was a necessary price to make an emotional appeal to people who otherwise aren’t following the climate change debate.”* *The Guardian* calls the campaign “quite possibly one of the most ill-judged poster campaigns in the history of ill-judged poster campaigns.”**

*Jason Samenow, “Heartland Institute launches campaign linking terrorism, murder, and global warming belief,” *The Washington Post*, May 4, 2012, https://www.washingtonpost.com/blogs/capital-weather-gang/post/heartland-institute-launches-campaign-linking-terrorism-murder-and-global-warming-belief/2012/05/04/gIQAJJ3Q1T_blog.html?utm_term=.5d4014b4f1ff

**Leo Hickman, “Heartland Institute compares belief in global warming to mass murder,” May 4, 2012, <https://www.theguardian.com/environment/blog/2012/may/04/heartland-institute-global-warming-murder>

2012 (June)

Dutch scientist Michiel Schaeffer and coauthors publish a letter in the journal *Nature Climate Change*, concluding that no matter how quickly we cut emissions, sea levels are likely to rise 5 feet in 100 to 300 years

The authors summarize their findings by noting that even under the ambitious scenario that temperatures are kept below 2 °C, “By 2300 a 1.5 °C scenario could peak sea level at a median estimate of 1.5 m above 2000. The 50% probability scenario for 2 °C warming would see sea level reaching 2.7 m above 2000 and still rising at about double the present-day rate. Halting [sea level rise] within a few centuries is likely to be achieved only with the large-scale deployment of CO₂ removal efforts, for example, combining large-scale bioenergy systems with carbon capture and storage.”* The implications of this become more clear to Benjamin Strauss and Robert Kopp, writing in *The New York Times* five months later, following Hurricane Sandy: “More than six million Americans live on land less than five feet above the local high tide. ... Worse, rising seas raise the launching pad for storm surge, the thick wall of water that the wind can drive ahead of a storm. In a world with oceans that are five feet higher, our calculations show that New York City would average one flood as high as Hurricane Sandy’s about every 15 years, even without accounting for the stronger storms and bigger surges that are likely to result from warming.”**

*Michiel Schaeffer and coauthors, “Long-term sea level rise implied by 1.5 C and 2 C warming levels,” *Nature Climate Change* 2, 867-870 (2012) <http://www.nature.com/nclimate/journal/v2/n12/abs/nclimate1584.html>

** Benjamin Strauss and Robert Kopp, “Rising Seas, Vanishing Coastlines,” *New York Times*, November 25, 2012, <http://www.nytimes.com/2012/11/25/opinion/sunday/rising-seas-vanishing-coastlines.html>

2012 (July)

The first five months of 2012 are the hottest on record in the contiguous United States; in June 2012, 164 high-temperature records are tied or broken around the country

More than 40,000 daily heat records have been broken around the country so far during the year of 2012, according to the National Oceanic and Atmospheric Administration (NOAA). By comparison, in 2011—the ninth warmest year on record—only 25,000 daily records had been set by that date.*

*Douglas Main, “Why has 2012 been the hottest year on record in the United States?” *Christian Science Monitor*, July 3, 2012, <http://www.csmonitor.com/Science/2012/0703/Why-has-2012-been-the-hottest-year-on-record-in-the-US>

2012 (August)

The Obama Administration announces strict new vehicle fuel efficiency standards, requiring that the U.S. auto fleet average 54.5 miles per gallon by 2025, according to the Washington Post, “an uncontroversial move that, unlike other administration energy policies, was endorsed by industry and environmentalists alike”

The Obama Administration press release states that “[w]hen combined with previous standards set by this Administration, this move will nearly double the fuel efficiency of those vehicles compared to new vehicles currently on our roads.”*

*Juliet Eilperin, “Autos must average 54.5 mpg by 2025, new EPA standards say,” *The Washington Post*, August 28, 2012, http://www.washingtonpost.com/national/health-science/autos-must-average-545-mpg-by-2025-new-epa-standards-are-expected-to-say/2012/08/28/2c47924a-f117-11e1-892d-bc92fee603a7_story.html; The White House, Press Release, August 28, 2012, <https://www.whitehouse.gov/the-press-office/2012/08/28/obama-administration-finalizes-historic-545-mpg-fuel-efficiency-standard>

2012 (September)

NASA scientist James Hansen and coauthors introduce the concept that “climate dice,” or the chance of unusually warm or cool seasons, have become more and more “loaded” in the past 30 years, coincident with rapid global warming

Publishing in the *Proceedings of the National Academy of Sciences*, Hansen and coauthors observe: “The distribution of seasonal mean temperature anomalies has shifted toward higher temperatures and the range of anomalies has increased. An important change is the emergence of a category of summertime extremely hot outliers, more than three standard deviations (3σ) warmer than the climatology of the 1951–1980 base period. This hot extreme, which covered much less than 1% of Earth’s surface during the base period, now typically covers about 10% of the land area. It follows that we can state, with a high degree of confidence, that extreme anomalies such as those in Texas and Oklahoma in 2011 and Moscow in 2010 were a consequence of global warming because their likelihood in the absence of global warming was exceedingly small.” They elaborate in their discussion: “The climate dice are now loaded to a degree that a perceptive person old enough to remember the climate of 1951–1980 should recognize the existence of climate change, especially in summer. Summers with mean temperature in the category defined as cold in 1951–1980 climatology (mean temperature below

-0.43σ), which occurred about one-third of the time in 1951–1980, now occur about 10% of the time, while those in the hot category have increased from about 33% to about 75%.”

In response to the claims that the extreme anomalies are the result of localized meteorological conditions, the authors state: “It is not uncommon for meteorologists to reject global warming as a cause of these extreme events, offering instead a meteorological explanation. For example, it is said that the Moscow heat wave was caused by an extreme atmospheric “blocking” situation, or the Texas heat wave was caused by La Niña ocean temperature patterns. Certainly the locations of extreme anomalies in any given case depend on specific weather patterns. However, blocking patterns and La Niñas have always been common, yet the large areas of extreme warming have come into existence only with large global warming. Today’s extreme anomalies occur as a result of simultaneous contributions of specific weather patterns and global warming.”*

* James Hansen, Makiko Sato, and Rito Reudy, “Perception of climate change,” *Proceedings of the National Academy of Sciences*, Vol. 19, No. 37, September 11, 2012, <http://www.pnas.org/content/109/37/E2415.short>

2012

Mitt Romney runs against Barack Obama for the Presidency; Romney backtracks on human causation of global warming and President Obama touts both oil and gas exploration and action on climate change

Republican presidential nominee Mitt Romney evokes laughter from his audience at the Republican National Convention when he announces, “President Obama promised to begin to slow the rise of the oceans and to heal the planet. My promise is to help you and your family.” Climate scientist Michael Mann responds, “Romney’s cynical denial of climate change is the real threat to our families, to our children and grandchildren’s future.” Romney, who in the past indicated a clear appreciation of the fact of climate change and its consequences, more recently states that humans contribute to our warming world, but the extent is unclear and “there remains a lack of scientific consensus.”* During the Republican primary season, every Republican candidate but one, Jon Huntsman, questions or denies the science of climate change and rejects policies to deal with global warming.** Climatesilence.org comments that “Although Barack Obama sprinkles his speeches with mentions of energy and climate, throughout his re-election campaign he remained stubbornly silent on the immediate and profound task of phasing out a carbon-based economy.” In his January, 2012 State of the Union address, the president abandons the possibility of congressional action on climate: “The differences in this chamber may be too deep right now to pass a comprehensive plan to fight climate change.”*** President Obama’s speech at the Democratic National Convention touts his development of oil and natural gas, as well as renewables: “We’ve opened millions of new acres for oil and gas exploration in the last three years, and we’ll open more. But unlike my opponent, I will not let oil companies write this country’s energy plan or endanger our coastlines or collect another \$4 billion in corporate welfare from our taxpayers. We’re offering a better path. We’re offering a better path where we — a future where we keep investing in wind and solar and clean coal, where farmers and scientists harness new biofuels to power our cars and trucks, where construction workers build homes and factories that waste less energy, where — where we develop a hundred-year supply of natural gas that’s right beneath our feet. If you choose this

path, we can cut our oil imports in half by 2020 and support more than 600,000 new jobs in natural gas alone,” while promising action on climate change: “my plan *will* continue to reduce the carbon pollution that is heating our planet because climate change is not a hoax. More droughts and floods and wildfires are not a joke. They’re a threat to our children’s future. And in this election, you can do something about it.”**** A New York Times analysis finds that spending on television ads promoting coal and more oil and gas drilling and criticizing clean energy has exceeded \$153 million this year, nearly 4 times the \$41 million spent to defend the president’s energy record or raise concerns about global warming. By contrast, in 2008 spending on green energy ads greatly exceeded those for fossil fuels, \$152 million to \$109 million.*****

* The Huffington Post, “Obama’s ‘Climate Change is Not a Hoax’ Declaration at DNC Challenges Romney,” September 7, 2012, http://www.huffingtonpost.com/2012/09/07/obamas-climate-change-dnc-romney_n_1864747.html

** Coral Davenport, “Large Companies Prepared to Pay a Price on Carbon,” *New York Times*, December 5, 2013, <http://nyti.ms/1kcXJsy>

***Climatesilence.org, “Obama Ends His Climate Silence,” http://climatesilence.org/graph/#.WT5_WevvvIU

****National Public Radio, “Transcript: President Obama’s Convention Speech, September 6, 2012, <http://www.npr.org/2012/09/06/160713941/transcript-president-obamas-convention-speech>

***** Eric Lipton and Clifford Krauss, “Fossil Fuel Industry Ads Dominate TV Campaign,” *New York Times*, September 14, 2012, <http://www.nytimes.com/2012/09/14/us/politics/fossil-fuel-industry-opens-wallet-to-defeat-obama.html?pagewanted=all>

2012 (September)

Satellite images show that the Arctic summer melt has reduced the area of frozen sea to the smallest extent ever recorded.

The Arctic sea ice is less than 3.5 million square kilometers, less than half the area of four decades ago.* As *The Guardian* notes, “Arctic sea ice cover has been shrinking since the 1970s when it averaged around 8m sq km a year, but such a dramatic collapse in ice cover in one year is highly unusual.” An analysis in *Science* predicts that an “ice-free Arctic Sea may be years, not decades, away.” “The now-clearly-accelerating decline of summer ice—punctuated by exceptional losses in 2007 and now in 2012—has persuaded everyone that summer Arctic sea ice will be a goner far sooner than the end of the century, as current models predict. So the full knock-on effects of an ice-free Arctic Ocean—from the loss of polar bear habitat to possible increases of weather extremes at mid-latitudes—could be here in many people's lifetimes. How far wrong the models might be, however, is still very much in dispute.”** In August, the first Chinese ship (an icebreaker) crosses the Arctic ocean along the north coast of Russia, finding much less ice than expected during this summer period. The Chinese expedition leader said that Beijing was interested in the “monumental change” in the polar environment caused by global warming.***

*John Vidal and Adam Vaughn, “Arctic sea ice shrinks to smallest extent ever recorded,” *The Guardian* , September 14, 2012, <http://www.guardian.co.uk/environment/2012/sep/14/arctic-sea-ice-smallest-extent>

** Richard Kerr, “Ice-free Arctic Sea May Be Years, Not Decades, Away,” *Science*, Vol. 337, Issue 6102, 28 Sept. 2012, 1591, <http://science.sciencemag.org/content/337/6102/1591>

*** Jon Viglundson and Alister Doyle, "First Chinese ship crosses Arctic Ocean amid record melt," *Reuters*, August 17, 2012, <http://www.reuters.com/article/2012/08/17/us-china-environment-idUSBRE87G0P820120817>

2012 (October)

Hurricane Sandy is the largest tropical storm system in the recorded history of the Atlantic Basin

Hurricane Sandy cuts a swath of damage 1000 miles wide over 10 states, causing more than 100 deaths and damages in excess of \$71 billion, second only to Hurricane Katrina in U.S. history.* Damage to the New York City subway system is the worst ever sustained in its 108-year history. ** The "superstorm" creates the lowest barometric pressure ever recorded this far north. The death toll is at least 149. *** New York Governor Andrew Cuomo comments to President Obama that "we're having a 100-year flood every two years now," referring to 2011's Hurricane Irene and 2012's Hurricane Sandy.**** The November 2, 2012 cover of Bloomberg Businessweek proclaims, "It's Global Warming, Stupid."***** New York City Mayor Michael Bloomberg (an independent, ex-Republican, ex-Democrat), declares that he will be voting for Obama: the storm "has brought the stakes of Tuesday's Presidential election into sharp relief"....One party "sees climate change as an urgent problem that threatens our planet. One does not." New Jersey governor Chris Christie praises President Obama's response to the disaster: "Obama's extraordinary leadership," Christie said, was "outstanding," "excellent," "wonderful."***** A National Atmospheric and Oceanographic Administration (NOAA) study the following year concludes that climate-related increases in sea level have nearly doubled the probability of a Sandy-level flood recurrence [see 2013 (Sept.)].

* NOAA, Frequently Asked Questions, <http://www.aoml.noaa.gov/hrd/tcfaq/costliesttable.html>

** William Vantuono, "Hurricane Sandy devastates NY/NJ-area passenger rail systems," RailwayAge, October 31, 2012, <http://www.railwayage.com/index.php/passenger/commuter-regional/hurricane-sandy-devastates-ny-nj-area-passenger-rail-systems.html>

*** Tim Sharp, "Superstorm Sandy: Facts about the Frankenstorm," LiveScience, November 27, 2012, <http://www.livescience.com/24380-hurricane-sandy-status-data.html>

**** CNN Transcript, November 1, 2012, <http://www.cnn.com/TRANSCRIPTS/1211/01/cnr.03.html>

***** Paul M. Barrett, "It's Global Warming, Stupid," Bloomberg Businessweek, November 2, 2012, <http://www.bloomberg.com/news/articles/2012-11-01/its-global-warming-stupid>

***** Hendrik Herzberg, "Into the Storm," *The New Yorker*, November 12, 2012, 27, <http://www.newyorker.com/magazine/2012/11/12/into-the-storm>

2012 (November)

President Obama is reelected; a Newsweek article entitled "The Morning After" proposes tackling climate change, including consideration of a carbon tax, as the number two priority (after the "fiscal cliff") of Obama's second term

Michael Tomasky writes, "[h]ere are four issues Obama must or should focus on before the drowsy lame-duckery that inevitably begins to overtake a two-term president's final two years starts to set in--and before a restive House GOP gins up some shaky grounds for an impeachment proceeding, which is always a possibility with today's Republican Party, and which could occupy Obama's final two years as it did Bill Clinton's."*

*Michael Tomasky, "The Morning After," *Newsweek*, November 19, 2012,<https://www.highbeam.com/doc/1G1-316794137.html>

2012 (November)

Bill McKibben, speaking in Portland, Maine together with Unity College President Stephen Mulkey, calls for America's colleges and universities to divest their investments in fossil fuel companies; Unity College is the first in the country to sign on to the "divestiture movement"

As the *Bangor Daily News* reports, Unity College President Stephen Mulkey "has persuaded the college's board of trustees to unanimously vote to divest the school's endowment funds 'from every industry that is polluting this planet,' according to an announcement from the college. The college's endowment — the funds institutions set aside for investment income — is \$13.5 million, according to Debbie Cronin, the college's vice-president of finance and administration. 'The trustees have looked at the college's finances in the context of our ethical obligations to our students, and they have chosen to make a stand,' Mulkey wrote in an opinion column." * By 2016, the funds divested from fossil fuels across the globe will reach \$5 trillion. [see 2016 (December)]

*Tom Groening, "Unity College takes stand against fossil fuels, aims at 'sustainability science'", *Bangor Daily News*, November 9, 2012, <http://bangordailynews.com/2012/11/09/news/midcoast/unity-college-takes-stand-against-fossil-fuels-aims-at-sustainability-science/>

2012 (December)

Global annual CO₂ emissions are estimated to be 35.6 billion tonnes, rising an estimated 2.6% in 2012, according to a study by the Global Carbon Project

In 2011, CO₂ emissions grew 3.1%, to an estimated total of 38.2 billion tonnes, placing the world on a near-certain path towards dangerous climate change, such as more heat waves, droughts, and storms. Current emissions growth is placing the world on a path to warm between 4 degrees and 6 degrees Celsius, with global annual emissions jumping 58% between 1990 and 2012. (The Kyoto Treaty's goal was to bring emissions of the developed countries down to 5% below 1990 levels by 2012.) China's carbon emissions grew 9.9% in 2011 after rising 10.4% in 2010 and now contribute 28% of all CO₂ pollution compared with 16% contributed by the United States.*

*Global Carbon Project, "The Global Carbon Budget, 1959-2011," 2012
<http://www.globalcarbonproject.org/carbonbudget/archive.htm#CB2012>

2012 (December)

Between 1751 and 2012, according to data from the U.S. Department of Energy's Carbon Dioxide Information Analysis Center, more than 365 billion tons [tonnes] of carbon has been added to the atmosphere as a result of fossil fuel combustion and cement manufacturing

As Naomi Oreskes and Erik Conway will note in their 2014 monograph *The Collapse of Western Civilization: A View from the Future*, "Remarkably, more than half of these emissions

occurred after the mid-1970's—that is, after scientists had built computer models demonstrating that greenhouse gases would cause warming. Emissions continued to accelerate even after the UNFCCC was established: between 1992 and 2012, total CO₂ emissions increased by 38 percent. Some of this increase was understandable, as energy use grew in poor nations seeking to raise their standard of living. Less explicable is why, at the very moment when disruptive climate change was becoming apparent, wealthy nations dramatically increased their production of fossil fuels. The countries most involved in this enigma were two of the world's richest: the United States and Canada.”*

*Naomi Oreskes and Erik M. Conway, *The Collapse of Western Civilization: A View from the Future* (Columbia University Press 2014), 18-19; Tom A. Boden, Gregg Marland, and Robert J. Andres, “Global, Regional, and National Fossil-Fuel CO₂ Emissions,” Carbon Dioxide Information Analysis Center (Oak Ridge, Tenn.: Oak Ridge National Laboratory, 2017); http://cdiac.ornl.gov/trends/emis/tre_glob_2014.html

2013 (January)

President Obama makes climate a top priority in his Second Inaugural address: “We will respond to the threat of climate change, knowing that the failure to do so would betray our children and future generations”

President Obama argues that disastrous consequences of climate change speak louder than climate denial: “Some may still deny the overwhelming judgment of science, but none can avoid the devastating impact of raging fires, and crippling drought, and more powerful storms. The path towards sustainable energy sources will be long and sometimes difficult. But America cannot resist this transition—we must lead it. We cannot cede to other nations the technology that will power new jobs and new industries—we must claim its promise. That’s how we will maintain our economic vitality and our national treasure—our forests and waterways, our crop lands and snow-capped peaks. That is how we will preserve our planet, commanded to our care by God.”* The Sierra Club and the Natural Resources Defense Council urge him to focus on executive orders and regulations, rather than Congress. “Congress is a place where good ideas go to die,” remarked Melinda Pierce, legislative director of the Sierra Club.**

* President Barack Obama, Second Inaugural Address, January 21, 2013, <https://www.whitehouse.gov/the-press-office/2013/01/21/inaugural-address-president-barack-obama>

**Dan Merica, “Environmentalists want Obama to steer clear of Congress on climate change,” CNN, January 23, 2013, <http://www.cnn.com/2013/01/23/politics/obama-climate-change/index.html>

2013 (January)

The team of scientists originally funded by the Koch Brothers, to demonstrate that man-made global warming was not real, publishes their research, finding quite the opposite

Writing in the journal *Geoinformatics & Geostatistics*, Richard Muller and coauthors [see 2011 (October)] conclude that for the past 250 years, warming of the planet can be entirely explained by increasing human greenhouse gas emissions, with upward and downward variations the result of cooling created by volcanic eruptions. From the abstract: “solar forcing does not

appear to contribute to the observed global warming of the past 250 years; the entire change can be modeled by a sum of volcanism and a single anthropogenic proxy.” From the conclusion: “Our analysis does not rule out long-term trends due to natural causes; however, since all of the long-term (century scale) trend in temperature can be explained by a simple response to greenhouse gas changes, there is no need to assume other sources of long-term variation are present.”*

*Robert Rohde, Richard Muller, and coauthors, “A New Estimate of the Average Earth Surface Land Temperature Spanning 1753 to 2011,” *Geoinformatics & Geostatistics: an Overview* 2013, 1:1, <https://www.scitechnol.com/2327-4581/2327-4581-1-101.pdf>

2013 (February)

In his State of the Union address, President Obama affirms his commitment to tackle the issue of climate change: “[F]or the sake of our children and our future, we must do more to combat climate change”

President Obama signals his readiness to take executive action if Congress does not act: “Now, it’s true that no single event makes a trend. But the fact is the 12 hottest years on record have all come in the last 15. Heat waves, droughts, wildfires, floods—all are now more frequent and more intense. We can choose to believe that Superstorm Sandy, and the most severe drought in decades, and the worst wildfires some states have ever seen were all just a freak coincidence. Or we can choose to believe in the overwhelming judgment of science—and act before it’s too late. ...If Congress won’t act soon to protect future generations, I will. I will direct my Cabinet to come up with executive actions we can take, now and in the future, to reduce pollution, prepare our communities for the consequences of climate change, and speed the transition to more sustainable sources of energy.”*

*President Barack Obama, 2013 State of the Union Address, February 12, 2013, <https://www.whitehouse.gov/the-press-office/2013/02/12/remarks-president-state-union-address>

2013 (March)

Researchers at Oregon State University and Harvard University publish a study in the journal *Science* comparing the relative rate of climate change over the last 11,300 years

The study, “A Reconstruction of Regional and Global Temperature for the Past 11,300 Years,” found that temperature over the last 100 years has warmed 1.3 degrees Fahrenheit [.72 degrees Celsius], whereas during the last 5000 years, the Earth cooled about 1.3 degrees Fahrenheit. Temperature on Earth is, in effect, changing 50 times faster than it did during the period when agriculture and modern civilization were developed by humankind.*

* Shaun A. Marcotte and others, “A Reconstruction of Regional and Global Temperature for the Past 11,300 Years,” *Science*, Vol.339, Issue 6124 (May 8, 2013): 1198-1201, <http://www.sciencemag.org/content/339/6124/1198.abstract>

2013 (April)

According to a report released by George Mason and Yale universities, 62% of self-identified Republicans and GOP-leaning Independents say in a national survey that the United States should or probably should take action to address climate change despite uncertainties

While only 52% of those surveyed say climate change is happening, more than three-quarters say the nation should use more renewable energy—with 69% saying more renewables should be used immediately. By a 2-1 margin, respondents say the nation should reduce its reliance on fossil fuels when considering the benefits. Only 35% of the 938 respondents agree with the Republican Party’s position on climate change.*

*Edward Maibach and others, *A National Survey of Republicans and Republican-Leaning Independents on Energy and Climate Change*, George Mason University/Yale University, April 2, 2013,
http://environment.yale.edu/climate-communication-OFF/files/Republican_VIEWS_on_Climate_Change.pdf

2013 (April)

The National Oceanic and Atmospheric Administration reports that the annual average sea temperature for the Northeast Shelf Ecosystem in 2012 has reached 14 degrees Celsius (57.2 degrees Fahrenheit), the highest average ever calculated since measurements were first collected in 1854

The Northeast Shelf extends from the Gulf of Maine to Cape Hatteras, North Carolina. The sea temperature changes suggest notable ecosystem impacts: “The Northeast Shelf’s warm water thermal habitat was also at a record high level during 2012, while cold water habitat was at a record low level. Early winter mixing of the water column went to extreme depths, which will impact the spring 2013 plankton bloom. Mixing redistributes nutrients and affects stratification of the water column as the bloom develops. Temperature is also affecting distributions of fish and shellfish on the Northeast Shelf. The advisory provides data on changes in distribution, or shifts in the center of the population, of seven key fishery species over time. The four southern species - black sea bass, summer flounder, longfin squid and butterfish - all showed a northeastward or upshelf shift. American lobster has shifted upshelf over time but at a slower rate than the southern species. Atlantic cod and haddock have shifted downshelf.”*

*Shelley Dawicki, “Sea Surface Temperatures Reach Highest Levels in 150 Years on Northeast Continental Shelf,” NOAA Northeast Fisheries Science Center, April 25, 2013,
http://www.nefsc.noaa.gov/press_release/2013/SciSpot/SS1304/

2013 (May)

Senior U.S. government officials are briefed at the White House on the dangers of an ice-free Arctic, possibly within two years

Participants at the White House briefing include marine scientist Professor Carlos Duarte, director of the Oceans Institute at the University of Western Australia. In early April, Duarte had warned that the Arctic summer sea ice was melting at a rate faster than predicted by conventional climate models, and could be ice free as early as 2015—rather than toward the end

of the century, as the U.N. Intergovernmental Panel on Climate Change (IPCC) projected in 2007. He now says: “The Arctic situation is snowballing: dangerous changes in the Arctic derived from accumulated anthropogenic greenhouse gases lead to more activities conducive to further greenhouse gas emissions. This situation has the momentum of a runaway train.” The loss of arctic sea ice may be contributing to the recent experience of extreme weather across the globe. Rutgers University climate scientist Jennifer Francis points to the phenomenon of “Arctic amplification”, where: “The loss of Arctic summer sea ice and the rapid warming of the Far North are altering the jet stream over North America, Europe, and Russia. Scientists are now just beginning to understand how these profound shifts may be increasing the likelihood of more persistent and extreme weather.”*

* Nafeez Ahmed, “White House warned on imminent Arctic ice death spiral,” *The Guardian*, May 2, 2013, <http://m.guardian.co.uk/environment/earth-insight/2013/may/02/white-house-arctic-ice-death-spiral>

2013 (May)

The National Oceanic and Atmospheric Administration announces the first occurrence of CO₂ levels at 400 ppm for a 24-hour average at the atmospheric baseline station at Mauna Loa Observatory, Hawaii; then the levels are revised down to 399.89 parts per million

A second monitoring program operated by the Scripps Institution of Oceanography still registers a level of 400.08 parts per million for the same period.* “It symbolizes that so far we have failed miserably in tackling this problem,” said Pieter P. Tans, who runs the monitoring program at the National Oceanic and Atmospheric Administration (NOAA) that reports the new reading.** Studies suggest that CO₂ has not been at this level for at least 800,000 years—long before humans appeared on the Earth—and perhaps for as long as 10 to 15 million years ago.*** NASA climatologist Gavin Smith observes, “We are a society that has inadvertently chosen the double-black diamond run without having learned to ski first. It will be a bumpy ride.”****

* Justin Gillis, “Crucial Carbon Dioxide Reading Revised Downward,” *New York Times*, May 13, 2013,

http://www.nytimes.com/2013/05/14/science/earth/crucial-carbon-dioxide-reading-revised-downward.html?_r=0

**Justin Gillis, “Heat Trapping Gas Passes Milestone, Raising Fear,” *New York Times*, May 10, 2013,

<http://www.nytimes.com/2013/05/11/science/earth/carbon-dioxide-level-passes-long-feared-milestone.html?pagewanted=all>

***Andrew Friedman, “The Last Time CO₂ Was This High, Humans Didn’t Exist,” *Climate Central*, May 3, 2013,

<http://www.climatecentral.org/news/the-last-time-co2-was-this-high-humans-didnt-exist-15938>

**** NASA, “NASA Scientists React to 400 PPM Milestone,” <http://climate.nasa.gov/400ppmquotes/>

2013 (May)

The Obama Administration Office of Management and Budget increases the social cost of carbon used in calculating costs and benefits of environmental policies and legislative proposals by 60%; this is in part due to increased estimates of rising sea levels and consequent property damage

As the Technical Support Document explains, “agencies are required ‘to assess both the costs and benefits of the intended regulation and...adopt a regulation only upon a reasoned determination that the benefits ...justify its costs.’ The purpose of the ‘social cost of

carbon’(SCC) estimates presented here is to allow agencies to incorporate the social benefits of reducing carbon dioxide (CO₂) emissions into the cost-benefit analyses of regulatory actions that have small, or ‘marginal,’ impacts on cumulative global emissions. The estimates are presented with an acknowledgement of the many uncertainties involved and with a clear understanding that they should be updated over time to reflect increasing knowledge of the science and economics of climate impacts.”* As David Roberts, of *Grist*, writes, the Social Cost of Carbon “is, as economist Frank Ackerman put it a few years ago, ‘the most important number you’ve never heard of.’ Why does it matter? Because the U.S. government uses it to assess the costs and benefits of regulatory action. The higher the social cost of carbon, the more action can be economically justified.” The 2013 change “will, all things being equal, increase by 60 percent the amount of carbon mitigation that can be economically justified. That’s a big deal, especially in light of the fact that EPA regulations are going to make (or break) Obama’s second-term climate legacy.”**

*Interagency Working Group on Social Cost of Carbon, “Technical Support Document: - Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis - Under Executive Order 12866”, May, 2013, <http://www.ourenergypolicy.org/technical-support-document-technical-update-of-the-social-cost-of-carbon-for-regulatory-impact-analysis-under-executive-order-12866/>

** David Roberts, “The Obama climate move that nobody noticed,” *Grist*, June 3, 2013. http://grist.org/climate-energy/the-obama-climate-move-that-nobody-noticed/?utm_source=twitter&utm_medium=tweet&utm_campaign=socialflow

2013 (May)

Thomas Friedman, writing in *The New York Times*, tracks the connection between climate change and civil war in Syria

In an article entitled “Without Water, Revolution,” Friedman writes, “This Syrian disaster is like a superstorm. It’s what happens when an extreme weather event, the worst drought in Syria’s modern history, combines with a fast-growing population and a repressive and corrupt regime and unleashes extreme sectarian and religious passions.” “[B]etween 2006 and 2011, some 60 percent of Syria’s land mass was ravaged by the drought and, with the water table already too low and river irrigation shrunken, it wiped out the livelihoods of 800,000 Syrian farmers and herders, the United Nations reported. ‘Half the population in Syria between the Tigris and Euphrates Rivers left the land’ for urban areas during the last decade, said [Syrian economist Samir] Aita. And with Assad doing nothing to help the drought refugees, a lot of very simple farmers and their kids got politicized... Young people and farmers starved for jobs — and land starved for water — were a prescription for revolution.” “In an age of climate change,” comments Friedman, “we’re likely to see many more such conflicts.”*

*Thomas Friedman, “Without Water, Revolution,” *The New York Times*, May 19, 2013, <http://www.nytimes.com/2013/05/19/opinion/sunday/friedman-without-water-revolution.html>

2013 (June)

Global emissions of CO₂ from energy use rose 1.4 percent to 31.6 billion tonnes in 2012, setting a record and suggesting future temperature increases well above international climate goals, the International Energy Agency reports

Continuing this pace could mean a temperature increase over pre-industrial times of as much as 5.3 degrees Celsius (9 degrees Fahrenheit), which International Energy Agency (IEA) chief economist Fatih Birol warns “would be a disaster for all countries.” U.S. emissions declined by 3.8%, half of which was attributed to switching from coal to natural gas. China emissions rose by 3.8%, the smallest increase in decades, and half the increase of 2011. China now produces a quarter of all global emissions from energy use.*

*Steven Mufson, “Carbon dioxide emissions rose 1.4% in 2012, IEA report says,” *The Washington Post*, June 10, 2013, http://www.washingtonpost.com/business/economy/carbon-dioxide-emissions-rose-14-percent-in-2012-iea-report-says/2013/06/09/35d32bac-d123-11e2-8cbe-1bcbee06f8f8_story.html

2013 (June)

President Obama and Chinese President Xi Jinping, meeting in California, agree to work together to eliminate international production of refrigerant and air conditioner chemicals known as hydrofluorocarbons

Hydrofluorocarbons (HFCs) are the chemicals that replaced chlorofluorocarbons as a result of the 1987 Montreal Protocol to protect the ozone layer. HFCs account for only 2 percent of greenhouse gases (GHG), but are tens of thousands times more potent as a GHG than CO₂. Eliminating HFCs could potentially reduce GHG by the equivalent of 90 gigatonnes (Gt) of CO₂ by 2050. Obama and Xi Jinping also agree to work on persuading other nations, particularly holdouts Brazil and China, to cut HFC production and use. As the *Washington Post* reports: “ ‘This is a big deal,’ said John Podesta, chairman of the Center for American Progress, a liberal-leaning think tank. ‘Obama deserves a lot of credit for this. He said he would tackle climate change, and this is really an important achievement.’ He said experts at the think tank estimated that it could shave 0.5 degrees Celsius from the projected increase in global temperatures by the end of the century.”*

*Steven Mufson, “President Obama and Chinese President Xi Jinping agree to wind down production and use of hydrofluorocarbons or HFCs,” *The Washington Post*, June 8, 2015, http://www.washingtonpost.com/business/economy/president-obama-and-chinese-president-xi-jinping-agree-to-wind-down-production-and-use-of-hydrofluorocarbons-or-hfc/2013/06/08/92e4d79e-d08f-11e2-8845-d970ccb04497_story.html

2013 (June)

President Obama unveils his National Climate Action Plan, calling for regulating carbon emissions from both new and existing power plants under the Clean Air Act, doubling power generated in the United States from wind and solar, eliminating tax breaks for “big oil,” obtaining 20% of federal government energy needs from renewables within 7 years, and leading international efforts to combat climate change

The president tells the nation, “Americans across the country are already paying the price of inaction. ...The problem with all of the excuses for inaction is that they suggest a fundamental lack of faith in American business and American ingenuity. ...We need to be less concerned with the judgment of special interests and more concerned with the judgment of posterity. ...I don’t have much time for anyone who denies that this problem is real.” He urges citizen engagement: “Speak up at town halls, church groups, PTA meetings. Push back on

misinformation. Speak up for the facts. Broaden the circle of those who are willing to stand up for our future. Convince those in power to reduce our carbon pollution. Push your own communities to adopt smarter practices. Invest. Divest. Remind folks there's no contradiction between a sound environment and strong economic growth. And remind everyone who represents you at every level of government that sheltering future generations against the ravages of climate change is a prerequisite for your vote.”*

*President Barack Obama, “Remarks of the President on Climate Change,” June 25, 2013, <https://www.whitehouse.gov/the-press-office/2013/06/25/remarks-president-climate-change>

2013 (August)

A review published in *Science* of 60 studies on how climate change helps spark conflict throughout the world finds that a shift toward greater warmth or more extreme precipitation of one standard deviation caused personal violence to increase by 4% and intergroup conflict by 14%

The study is entitled “Studying the Impact of Climate on Human Conflict,” by Solomon Hsiang of Princeton University, and coauthors. As summarized in the abstract: “A rapidly growing body of research examines whether human conflict can be affected by climatic changes. Drawing from archaeology, criminology, economics, geography, history, political science, and psychology, we assemble and analyze the 60 most rigorous quantitative studies and document, for the first time, a remarkable convergence of results. We find strong causal evidence linking climatic events to human conflict across a range of spatial and temporal scales and across all major regions of the world. The magnitude of climate’s influence is substantial: for each 1 standard deviation... change in climate toward warmer temperatures or more extreme rainfall, median estimates indicate that the frequency of interpersonal violence rises 4% and the frequency of intergroup conflict rises 14%. Because locations throughout the inhabited world are expected to warm 2 to 4 [standard deviations] by 2050, amplified rates of human conflict could represent a large and critical impact of anthropogenic climate change.”*

*Solomon Hsiang and others, “Quantifying the Influence of Climate on Human Conflict,” *Science*, July 31, 2013, <http://www.sciencemag.org/content/early/2013/07/31/science.1235367.abstract>

2013 (August)

A study published in *Nature* is the first major examination of whether extreme weather events result in the presence of more CO₂ in the atmosphere; the answer is a notable yes.

In the study by Markus Reichstein of the Max Planck Institute for Biogeochemistry and coauthors, “Climate extremes and the carbon cycle,” the authors conclude that terrestrial ecosystems absorb approximately 11 billion tonnes less CO₂ every year as a result of the extreme climate events than they could if the events did not occur. That is equivalent to a third of global CO₂ emissions per year. As the press release regarding the report states, “In the past 50 years, plants and the soil have absorbed up to 30% of the carbon dioxide that humans have set free, primarily from fossil fuels. The indications that the part played by extreme weather

events in the carbon balance had been underestimated prompted scientists from eight countries to launch the CARBO-Extreme Project. For the first time, the consequences of various extreme climate events on forests, bogs, grass landscapes and arable areas throughout the world underwent systematic scrutiny." Extreme events like drought and wildfires cause damage to trees and other plants and impair their ability, over a short or a longer term, to absorb carbon dioxide. "As extreme climate events reduce the amount of carbon that the terrestrial ecosystems absorb and the carbon dioxide in the atmosphere therefore continues to increase, more extreme weather could result," explains Markus Reichstein. "It would be a self-reinforcing effect."*

* Markus Reichstein, "Climate extremes and the carbon cycle," *Nature*, doi:10.1038/nature12350, August 15, 2013, http://www.mpg.de/7501454/weather-extreme_carbon-cycle_climate-change

2013 (September)

Colorado sustains a “1000-year rainfall event,” described by the National Weather Service as “biblical”; more than the annual average of 17 inches of rain falls over three days, over 1700 homes are destroyed, and 16,000 are damaged, and property loss estimated at \$2 billion

As Andrew Friedman of Climate Central explains Colorado's recent radical swings between drought and flood: "An increase in the frequency and intensity of extreme precipitation events is expected to take place even though annual precipitation amounts are projected to decrease in the Southwest. Colorado sits right along the dividing line between the areas where average annual precipitation is expected to increase, and the region that is expected to become drier as a result of climate change. That may translate into more frequent, sharp swings between drought and flood, as has recently been the case. Last year, after all, was Colorado's second-driest on record, with the warmest spring and warmest summer on record, leading to an intense drought that is only just easing."*

* Andrea Real, "Colorado Flood Damage: Property Loss Estimated Around \$2 Billion," *HuffPost Green*, September 23, 2013, http://www.huffingtonpost.com/2013/09/23/colorado-flood-damage_n_3976222.html:

Bryan Walsh, "The Science Behind Colorado's Thousand Year Flood," *Time Ecocentric*, September 17, 2013, <http://science.time.com/2013/09/17/the-science-behind-colorados-thousand-year-flood/>

2013 (September)

A National Oceanic and Atmospheric Administration study concludes: “Climate-change related increases in sea level have nearly doubled today’s annual probability of a Sandy-level flood recurrence as compared to 1950”

The study finds: "The record-setting impacts of Sandy were largely attributable to the massive storm surge and resulting inundation from the onshore-directed storm path coincident with high tide. However, climate-change related increases in sea level have nearly doubled today's annual probability of a Sandy-level flood recurrence as compared to 1950. Ongoing natural and human-induced forcing of sea level ensures that Sandy-level inundation events will occur more frequently in the future from storms with less intensity and lower storm surge than Sandy."*

*NOAA, "New analyses find evidence of human-caused climate change in half of the 12 extreme weather and climate events analyzed from 2012," September 5, 2013, <http://www.noaanews.noaa.gov/stories2013/20130905-extremeweatherandclimateevents.html>

2013 (September)

A study of climate sensitivity by James Hansen and coauthors concludes that if all fossil fuels including unconventional reserves are burned, CO₂ "could reach a level as high as 16 times the 1950 atmospheric amount..."

The result would be "a planet on which humans could work and survive outdoors in the summer only in mountainous regions, and there they would need to contend with the fact that a moist stratosphere would have destroyed the ozone layer." The study notes that the current load of greenhouse gases will have effects that play out over centuries or longer; the experience of those effects "is slowed by the inertia of the global ocean and the great ice sheets on Greenland and Antarctica, which require centuries, millennia or longer to approach their full response to a climate forcing. This long response time makes the task of avoiding dangerous human alteration of climate particularly difficult, because the human-made climate forcing is being imposed rapidly, with most of the current forcing having been added in just the past several decades. Thus, observed climate changes are only a partial response to the current climate forcing, with further response still 'in the pipeline'." The study concludes with the observation that "humanity stands at a fork in the road. As conventional oil and gas are depleted, will we move to carbon-free energy and efficiency—or to unconventional fossil fuels and coal? If fossil fuels were made to pay their costs to society, costs of pollution and climate change, carbon-free alternatives might supplant fossil fuels over a period of decades. However, if governments force the public to bear the external costs and even subsidize fossil fuels, carbon emissions are likely to continue to grow, with deleterious consequences for young people and future generations. It seems implausible that humanity will not alter its energy course as consequences of burning all fossil fuels become clearer. Yet strong evidence about the dangers of human-made climate change have so far had little effect. Whether governments continue to be so foolhardy as to allow or encourage development of all fossil fuels may determine the fate of humanity."*

*James Hansen and coauthors, "Climate Sensitivity, Sea Level, and Atmospheric Carbon Dioxide," *The Royal Society*, 16 September 2013.DOI: 10.1098/rsta.2012.0294 ,<http://rsta.royalsocietypublishing.org/content/371/2001/20120294.full.pdf+html>

2013 (September)

The Intergovernmental Panel on Climate Change releases its Fifth Assessment of climate change science, concluding, "It is extremely likely [95-100%] that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic increase in greenhouse gas concentrations and other anthropogenic forcings together"

The report represents the work of 800 authors from 85 countries, reviewing 14,000 papers published on climate change over the previous five years. The report finds that "Each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850. In the Northern Hemisphere, 1983–2012 was likely the warmest 30-year period of the last 1400 years (medium confidence)." For the first time, the world's leading climate

scientists officially called for an absolute upper limit on greenhouse gas emissions to limit warming. The Intergovernmental Panel on Climate Change (IPCC) report adopts Meinhausen's "cumulative carbon budget" approach [see 2009 (April)]. As one Ryan Koronowski explains it, "To have a 66 percent chance of limiting warming to 2°C, the world can't emit more than 1,000 gigatons [gigatonnes] of carbon over amounts in the atmosphere as of 1880. Or 800 gigatons when accounting for methane emissions and land use changes. For context, by 2011, humans had already emitted 531 gigatons of carbon. At the current rate of emissions, the "carbon budget" will be exhausted in 30 years. Known fossil fuel reserves represent 2,795 gigatons, meaning burning more than 10 percent of them pushes the world over 2° of warming."*

* IPCC, *Climate Change 2013: The Physical Science Basis*, <https://www.ipcc.ch/report/ar5/wg1/>; see also, Ryan Koronowski, "15 Things You Should Know About the New IPCC Report on Climate Change," *ThinkProgress*, September 27, 2013, <http://thinkprogress.org/climate/2013/09/27/2681861/15-things-ipcc-report/>

2013 (November)

Typhoon Haiyan, estimated to be the largest storm ever to make landfall, hits the Philippines with 195 mph winds and a 20-ft storm surge, killing over 6000 people

Comments *Scientific American*: "These monster storms often raise the notion that scientists should expand the Saffir-Simpson hurricane scale. A category 1 storm has winds of 74 to 95 mph, and the stages rise every 20 mph or so. But because a category 5 storm is rated at 157 mph or higher, it makes sense to some observers to create a new category 6 for storms like Haiyan that are so far above that speed."* On the connection between these super storms and climate change, John Vidal and Damian Carrington write in *The Guardian*, "Logic, at least, suggests a clear link between Haiyan and a warming world. Storms receive their energy from the ocean and the warming oceans that we can expect from global warming should therefore make superstorms such as Haiyan more likely. New research suggests that the Pacific is, indeed, warming – possibly at its fastest rate in 10,000 years. If the extra heat stored in the oceans is released into the atmosphere, then the severity of storms will inevitably increase. In short, a warmer world will probably feature more extreme weather. This week, atmospheric scientists were clear. 'Typhoons, hurricanes and all tropical storms draw their vast energy from the warmth of the sea. We know sea-surface temperatures are warming pretty much around the planet, so that's a pretty direct influence of climate change on the nature of the storm,' said Will Steffen, director of the Australian National University (ANU) climate change institute."**

* Mark Fischetti, "Was Typhoon Haiyan a Record Storm?" *Scientific American* blogposts, November 12, 2013, <http://blogs.scientificamerican.com/observations/2013/11/12/was-typhoon-haiyan-a-record-storm/>

**John Vidal and Damian Carrington, "Is climate change to blame for Typhoon Haiyan?," *The Guardian*, November 12, 2013, <https://www.theguardian.com/world/2013/nov/12/typhoon-haiyan-climate-change-blame-philippines>

2013 (November)

The Global Carbon Project estimates that CO₂ emissions from fossil fuel burning and cement production increased by 2.1% in 2012, with a total of 9.7 gigatonnes carbon (GtC) emitted, 58% above 1990 emissions

China accounted for 27% of total emissions, a 71% increase over the previous year; the U.S. accounted for 14% of emissions, a 26% decline over the previous year. The global per capita carbon emissions is 1.4 tonnes (T); the per capita carbon emissions in the U.S. is 4.4 T; in China, 1.9 T.*

*The Global Carbon Project, “Global Carbon Budget 2013,” November 19, 2013,
<http://www.globalcarbonproject.org/carbonbudget/archive.htm#CB2012>

2013 (December)

A study by James Hansen and coauthors concludes that the “carbon budget” recommended by the Intergovernmental Panel on Climate Change will fail to protect the planet from severe consequences: “Cumulative emissions of ~1000 GtC [gigatonnes carbon], sometimes associated with 2°C global warming, would spur “slow” feedbacks and eventual warming of 3–4°C, with disastrous consequences”

The study, “Assessing ‘Dangerous Climate Change’: Required Reduction of Carbon Emissions to Protect Young People, Future Generations and Nature,” urges that “Rapid emissions reduction is required to restore Earth’s energy balance and avoid ocean heat uptake that would practically guarantee irreversible effects.” “Slow” feedbacks such as reduction of reflective ice sheet size with global warming or release of greenhouse gases from thawing tundra are not included in the IPCC models. The paper urges immediate cuts in global emissions of 6% a year as well as ambitious reforestation efforts to try to keep temperatures in check. The paper acknowledges such actions would be “exceedingly difficult” to achieve, but says it is urgent to begin reductions now, rather than wait until future decades. The paper advocates for a carbon fee or tax as the most effective way to achieve needed reductions: “Thus the essential underlying policy, albeit not sufficient, is for emissions of CO₂ to come with a price that allows these costs to be internalized within the economics of energy use.”*

*James Hansen and coauthors, “Assessing ‘Dangerous Climate Change’: Required Reduction of Carbon Emissions to Protect Young People, Future Generations and Nature,” *PONE*, DOI: 10.1371/journal.pone.0081648, December 3, 2013,
<http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0081648>

2013 (December)

A report by the Carbon Disclosure Project finds that at least 29 companies with close ties to Republicans, including ExxonMobil, Walmart, and American Electric Power, are incorporating a price on carbon into their long-term financial plans

From the report: “ExxonMobil now plans its financial future with the expectation that eventually carbon pollution will be priced at about \$60 a ton [tonne], which [an ExxonMobil spokesperson] acknowledged was at odds with some of the company’s Republican friends.”* As Coral Davenport observes in *The New York Times*, “The development is a striking departure from conservative orthodoxy and a reflection of growing divisions between the Republican Party and its business supporters....Both supporters and opponents of action to fight global warming say the development is significant because businesses that chart a financial course to make money in a carbon-constrained future could be more inclined to support policies that address climate change.”**

*Carbon Disclosure Project, “Use of Internal Carbon Price by Companies as Incentive and Strategic Planning Tool,” December 2013, <https://www.cdp.net/CDPResults/companies-carbon-pricing-2013.pdf>

**Coral Davenport, “Large Companies Prepared to Pay a Price on Carbon,” *New York Times*, December 5, 2013, <http://nyti.ms/1kcXJsy>

2013 (December)

A report by the Maine Department of Health and Human Services, and the Maine Department of Agriculture, warns of coming increases in dangerous mosquito-borne diseases.

The report, “Concerning the Development of a State Plan to Protect the Public Health from Mosquito-borne Diseases,” concludes that “Recent and projected changes in Maine weather patterns suggest conditions will favor increased mosquito-borne virus risk over the next 30 years. Warmer, wetter summers favor increases in mosquito populations. Longer, frost-free warm seasons favor increased virus amplification between birds and mosquitoes.” The threatened diseases include potentially fatal West Nile Virus and Equine Encephalitis.*

*Report to the Joint Standing Commission on Agriculture, Conservation and Forestry. Maine DHHS and Dept. of Agriculture. Dec.20, 2013, http://www.maine.gov/dacf/php/integrated_pest_management/documents/Mosq_Report_Plan_with_appendices_1-14.pdf

2014 (January)

California Governor Jerry Brown declares a drought emergency: California had its driest year in recorded history in 2013

The state is experiencing a severe reduction of the Sierra Nevada snowpack, which is at 20 to 15 percent of normal levels for this time of year.* California has experienced not only drought but extreme heat: January 15, 2014 was the hottest January day on record in the state. Even after four days of rainstorms in southern California in March, 95% of California will still be classified by the U.S. Drought Monitor as in drought, over 90% in Severe or Exceptional drought, the highest classifications. **

* Ryan Koronowski, “California Gov. Brown Declares Drought Emergency Amid Broken Heat Records and Low Reservoirs,” ThinkProgress.org, January 18, 2014, <http://thinkprogress.org/climate/2014/01/18/3182581/california-extreme-drought-emergency/>

** Bobby Magill, “Rains Ease California Drought, Make Wildfire Outlook Grimmer,” climatecentral.org, March 6, 2014, <http://www.climatecentral.org/news/rains-ease-calif-drought-make-wildfire-outlook-grimmer-17147>; U.S. Drought Monitor, California, <http://droughtmonitor.unl.edu/Home/StateDroughtMonitor.aspx?CA>

2014 (March)

A report of the World Meteorological Society concludes that the record hot calendar year of 2013 in Australia—where temperatures peaked at 125 degrees Fahrenheit—“would have been virtually impossible without human contributions of heat trapping gases”

The record high temperatures caused the Australian Open tennis tournament to be dubbed the Australian “Oven.” As tennis player Caroline Wozniacki described the experience of playing in the Australian Open in January, 2014, it was hot enough to melt her water bottle: “I put the

bottle down on the court and it started melting a little bit underneath. It felt like I was playing in a sauna.”*An analysis of the record-breaking 2013 Australian summer temperatures using computer modeling finds that “it is virtually impossible to reach such a high temperature due to natural climate variations alone. In simulations with only natural causes considered, none of the 13 000 model years analyzed exceed the previous hottest year in Australia, which was observed in 2005.” The analysis concludes that “comparing climate model simulations with and without human factors shows that the record hot Australian summer of 2012/2013 was about five times as likely as a result of human-induced influence on climate and that the record hot calendar year of 2013 would have been virtually impossible without human contributions of heat-trapping gases, illustrating that some extreme events are becoming much more likely due to climate change.”**

*David Sim, “Players Collapse as Heatwave Turns Australian Open into Oven,” *International Business Times*, January 14, 2014, <http://www.ibtimes.co.uk/players-collapse-heatwave-turns-australian-open-into-oven-1432259>

** World Meteorological Society, *WMO statement on the status of the global climate in 2013* (2014), 20-21, https://library.wmo.int/pmb_ged/wmo_1130_en.pdf

2014 (March)

A new report by Working Group II of the Intergovernmental Panel on Climate Change, “Climate Change 2014: Impacts, Adaptation, and Vulnerability,” cites a World Bank estimate that poor countries need as much as \$100 billion a year to try to offset the effects of climate change

The report projects that climate change will particularly impact poor countries: “Throughout the 21st century, climate-change impacts are projected to slow down economic growth, make poverty reduction more difficult, further erode food security, and prolong existing and create new poverty traps, the latter particularly in urban areas and emerging hot spots of hunger.” Poor countries are now only getting a few billion dollars a year in such aid from rich countries. Pressure from the United States and some other nations removed the \$100 billion figure from the executive summary of the Intergovernmental Panel on Climate Change (IPCC) report. As Justin Gillis writes in the *New York Times*, “Many rich countries argue that \$100 billion a year is an unrealistic demand; it would essentially require them to double their budgets for foreign aid, at a time of economic distress at home. That argument has fed a rising sense of outrage among the leaders of poor countries, who feel their people are paying the price for decades of profligate Western consumption.”*

*Justin Gillis, “Panel’s Warning on Climate Risk: Worst Is Yet to Come,” *New York Times*, March 31, 2014, <http://www.nytimes.com/2014/04/01/science/earth/climate.html?hp&r=0>; IPCC Press Release, March 31, 2014, http://ipcc.ch/pdf/ar5/pr_wg2/140330_pr_wgII_spm_en.pdf

2014 (March)

A poll by Gallup reveals that the percentage of Americans who believe global warming’s effects are happening or will happen during their lifetimes “is the same now as it was in 1997, 65%, when Gallup first asked the question, and is among the lower readings over that 17-year span...”

The highest percentage recorded by Gallup was 75% in 2008. During that same period from 1997 to 2014, the percentage who believe global warming will threaten their way of life has increased from 25% to 36%. But 18% say global warming effects will never happen, double the 9% who said this in 1997.*

*Jeffrey Jones, "In U.S. Most Do Not See Climate Change as Serious Threat," Gallup, March 13, 2014, <http://www.gallup.com/poll/167879/not-global-warming-serious-threat.aspx>

2014 (April)

Harvard History of Science professor Naomi Oreskes argues in favor of Harvard University's financial divestment from fossil fuels

Harvard History of Science professor Naomi Oreskes' analysis in *The Guardian* argues that colleges and universities have a particular reason to support divestment: "universities exist to foster knowledge, learning and understanding, and the fossil-fuel industry has worked systematically over the past 20 years to undermine that work. It has worked and continues to work in direct opposition to our mission as scientists and educators through the political process and PR campaigns. While giving money to support research, fossil-fuel companies also spend money to undermine its results, both directly through misleading advertising and indirectly by supporting think-tanks, trade organizations and other 'third party allies' who are continuing to promote disinformation and doubt." Oreskes stresses the urgency of ending our addiction to fossil fuels: "In 1750, atmospheric greenhouse gas concentrations sat below 280 parts per million (ppm). In 1992, when the framework convention was signed, the figure was 356. This year, it approaches 400. What's worse, the rate of increase is increasing: in the early 1960s, the rate of increase per decade was 3ppm; in the 1980s, it was 14, and today it is over 20. Things are not just getting worse—they are getting worse at a faster rate." Oreskes' op-ed is coauthored by her daughter, Clara Belitz, a freshman at Bowdoin College, "where more than half the student body has signed a letter endorsing divestment."* As of 2017, Harvard has not embraced a divestment policy; its President Drew Faust stating that Harvard can better combat climate change through research than through withdrawing its investments.** Bowdoin has similarly rejected divestment, students citing conflicts of interest of members of the Board of Trustees.***

* Naomi Oreskes and Clara Belitz, "Universities must end financial ties to climate denying fossil-fuel giants – now," *The Guardian*, April 17, 2014, <http://www.theguardian.com/commentisfree/2014/apr/17/universities-end-financial-ties-fossil-fuel-industry-now>

**Brandon J. Dixon, "Despite Divest Cheers, Harvard Maintains Investment Approach," *The Harvard Crimson*, April 28, 2017, <http://www.thecrimson.com/article/2017/4/28/divest-celebrates-university-announcement/>

***Bowdoin Climate Action, <https://bowdoinclimateaction.wordpress.com/>

2014 (April)

A draft report on Mitigation of Climate Change from Working Group III of the Intergovernmental Panel on Climate Change explores technological, economic, and regulatory responses to climate change, asserting that mitigating efforts need not wreck the global economy

As summarized by Damian Carrington in *The Guardian*: “The authoritative report, produced by 1,250 international experts and approved by 194 governments, dismisses fears that slashing carbon emissions would wreck the world economy. ...Diverting hundreds of billions of dollars from fossil fuels into renewable energy and cutting energy waste would shave just 0.06% off expected annual economic growth rates of 1.3%–3%...” “The report is clear: the more you wait, the more it will cost [and] the more difficult it will become,’ said European Union commissioner Connie Hedegaard. The U.S. Secretary of State, John Kerry, said: ‘This report is a wake-up call about global economic opportunity we can seize today as we lead on climate change.”*²

*Damian Carrington, “IPCC climate change report: averting catastrophe is eminently affordable,” *The Guardian*, April 13, 2014, <http://www.theguardian.com/environment/2014/apr/13/averting-climate-change-catastrophe-is-affordable-says-ipcc-report-un>

2014 (April)

Utah State University scientist S.-Y. Simon Wang posits that the extreme jet stream pattern that brought the worst winter drought conditions ever recorded in California and a “polar vortex” of cold air to the Midwest and Eastern United States likely could not have grown so extreme without the influence of human-caused global warming

The study, “Probable causes of the abnormal ridge accompanying the 2013–2014 California drought: ENSO precursor and anthropogenic warming footprint,” published in *Geophysical Research Letters*, concludes, “The connection between the dipole and [El Nino-Southern Oscillation] precursor has become stronger since the 1970’s, and this is attributed to increased greenhouse gas loading as simulated by the [Community Earth System Model]. Therefore, there is a traceable anthropogenic warming footprint in the enormous intensity of the anomalous ridge during winter 2013–14, the associated drought and its intensity.”* As Dr. Wang told Climate Progress’s Joe Romm, “I personally think that the debate over global warming leading to stronger blocking [of jet stream patterns] has passed. The ongoing challenge is how we predict WHEN and WHERE those blocking will happen and affect WHICH region.”

* S.-Y. Simon Wang, and coauthors, “Probable causes of the abnormal ridge accompanying the 2013–2014 California drought: ENSO precursor and anthropogenic warming footprint,” *Geophysical Research Letters*, Vol. 41, Issue 9, May 16, 2014, <http://onlinelibrary.wiley.com/doi/10.1002/2014GL059748/abstract>

**Joe Romm, “Bombshell: Study Ties Epic California Drought, ‘Frigid East,’ to Manmade Climate Change,” *ThinkProgress*, April 15, 2004, <https://thinkprogress.org/bombshell-study-ties-epic-california-drought-frigid-east-to-manmade-climate-change-84728def3420>

2014 (June)

The EPA announces its “Clean Power Plan,” proposed regulations under the Clean Air Act, setting a target to reduce CO₂ emission by 30 percent from 2005 levels by 2030

The strategies to achieve this goal will be determined by each state, which have until June 2016 to complete emission reduction plans. Emissions have already fallen by about 10 percent from 2005 levels by 2013, due in part to substitution of natural gas for coal-fired generation. Environmental Protection Agency Administrator Gina McCarthy estimates that the regulations could yield over \$90 billion in climate and health benefits; reductions in soot and smog would

translate to a \$7 health benefit for every dollar invested in the plan.* A concurrent Washington Post/ABC poll of over 1000 randomly selected Americans finds that 70% support regulation of greenhouse gases (GHG) from existing power plants, and 63% are willing to pay higher energy costs as a result of such regulation. This includes majorities in both parties.**

*Valerie Volcovici and Jeff Mason, "US unveils sweeping plan to slash power plant pollution," *Reuters*, June 2, 2014, <http://www.reuters.com/article/2014/06/02/us-usa-climatechange-epa-idUSKBN0EDOU020140602> ;

EPA, Proposed Rule, "Carbon Pollution Emission Guidelines for Existing Stationary Sources," 79 Fed Reg. 34830, June 18, 2014, <https://www.gpo.gov/fdsys/pkg/FR-2014-06-18/pdf/2014-13726.pdf>

**Scott Clement and Peyton Craighill, "A huge majority of Americans support regulating carbon pollution from power plants. And they're even willing to pay for it," *Washington Post*, June 2, 2014, <http://www.washingtonpost.com/blogs/the-fix/wp/2014/06/02/a-huge-majority-of-americans-support-regulating-carbon-from-power-plants-and-theyre-even-willing-to-pay-for-it/>

2014 (June)

The globally averaged temperatures over land and ocean surfaces for May and June 2014 are the highest for these months since recordkeeping began in 1880

As NOAA's National Center for Environmental Information's June, 2014 reports states: "Nine of the ten warmest Junes on record have occurred during the 21st century, including each of the past five years. June 2014 also marks the second consecutive month with record high global temperatures. With the exception of February (21st warmest), every month to date in 2014 has ranked among the four warmest for its respective month. Additionally, June 2014 marked the 38th consecutive June and 352nd consecutive month with a global temperature above the 20th century average. The last below-average global temperature for June was June 1976 and the last below-average global temperature for any month was February 1985."*

*NOAA National Center for Environmental Information, Global Climate Report – June 2014, <https://www.ncdc.noaa.gov/sotc/global/201406>

2014 (July)

The Australian Senate, by a vote of 39 to 32, repeals Australia's \$23/ton [tonne] carbon tax; Prime Minister Tony Abbott states that "Scraping the carbon tax is a foundation of the government's economic action strategy"; Greens leader Christine Milne declares the vote an "appalling day for Australia"

As the BBC reports, "Australia is the developed world's worst polluter per head of population. But critics, including Mr Abbott, said that the tax cost jobs and forced energy prices up. There were widespread protests against the introduction of the tax in Australia and its repeal formed a major part of Mr Abbot's election manifesto... 'Scraping the carbon tax is a foundation of the government's economic action strategy,' said Mr Abbott, calling the move 'great news for Australian families.' 'We are honouring our commitments to you and building a strong and prosperous economy for a safe and secure Australia.'"

**"Australia votes to repeal carbon tax," *BBC News*, July 14, 2014, <http://www.bbc.com/news/world-asia-28339663>

2014 (July)

The White House Council of Economic Advisers releases a report entitled “The Cost of Delaying Action to Stem Climate Change”

From the report: “If delayed action causes the mean global temperature increase to stabilize at 3° Celsius above preindustrial levels, instead of 2°, that delay will induce annual additional damages of 0.9 percent of global output. To put this percentage in perspective, 0.9 percent of estimated 2014 U.S. GDP is approximately \$150 billion. The next degree increase, from 3° to 4°, would incur greater additional annual costs of 1.2 percent of global output. These costs are not one-time: they are incurred year after year because of the permanent damage caused by additional climate change resulting from the delay.”* Coincident Senate hearings air varying economists’ perspectives on the report. Maine Senator Angus King argues that a reason to act now is to set an example for other nations: “I’m sure that us doing nothing is not going to provoke them to do something.”**

*White House press release, “New Report: the Cost of Delaying Action to Stem Climate Change,” July 29, 2014, <http://www.whitehouse.gov/blog/2014/07/29/new-report-cost-delaying-action-stem-climate-change>

**Tiffany Stecker, “Senators grill skeptic on costs of warming,” Greenwire, July 29, 2014, <http://www.eenews.net/greenwire/2014/07/29/stories/1060003707>

2014 (September)

An estimated 400,000 converge on New York City in the “Peoples Climate March,” the largest climate march in history; The march includes 1574 organizations and generates 630,000 social media posts; over 600 people from Maine attend, thanks to 11 charter buses organized by 350 Maine

Reports Susan Sharon, of Maine Public Radio: “The People's Climate March comes two days ahead of the United Nations Climate Summit, also taking place in New York next week. In addition to traveling to the event by bus, Maine climate activists are going by train, van, car pool and even by bicycle. "We're going to go out and go down the road and take a left onto the greenway," says Bob Klotz, of the group 350 Maine. Klotz and Dave Oakes, the founder of the Center for Ecological Living and Learning, set out from South Portland by bicycle Wednesday morning. They plan on being joined by bicyclists from around New England along the way and to reach New York City Saturday night. Not coincidentally, the distance they'll need to pedal is 350 miles, a reference to the 350 parts per million of carbon dioxide associated with climate change that has already been exceeded.”*

*Susan Sharon, “Hundreds of Mainers head to New York for People’s Climate March, September 17, 2014, <http://news.mpbn.net/post/hundreds-mainers-head-nyc-peoples-climate-march>

2014 (September)

The Global Carbon Project estimates that CO₂ emissions from fossil fuel burning and cement production increased by 2.3% in 2013 with a total of 9.9 gigatonnes carbon (GtC) (36 GtCO₂) emitted to the atmosphere; these emissions were the highest in human history and 61% higher than in 1990 (the Kyoto Protocol reference year)

China accounted for 27.6% of total emissions; the United States accounted for 14.5% of emissions. The global per capita CO₂ emissions is 5 tonnes (T); the per capita CO₂ emissions in the United States is 16.4 T; in China, 7.2 T.*

*The Global Carbon Project, “Global Carbon Budget 2013,” September 21, 2014,
<http://www.globalcarbonproject.org/carbonbudget/archive.htm>

2014 (September)

At the United Nations Climate Summit in New York City, President Obama observes that the United States and China “bear a special responsibility to lead,” saying, “that’s what big nations have to do;” China’s Vice Premier Zhang Gaoli states that China will “try” to achieve a peak in its carbon emissions “as early as possible”

Following these remarks, China’s top climate official, Xie Zhenhua, reiterates a previous pledge for a 45-percent drop in carbon emissions intensity—carbon emissions per unit of gross domestic product—by 2020 based on 2005 levels. Both the United States and China have delayed releasing post-2020 greenhouse gas (GHG) emissions targets until the deadline of March 2015, in the lead-up to the Paris climate summit at the end of 2015.*

*Ari Phillips, “At Summit, China Says It Will Peak Emissions ‘As Early As Possible,’ But Bold Pledges Come Later,” *ThinkProgress.org*, September 24, 2014, <http://thinkprogress.org/climate/2014/09/24/3571380/summit-china-peak-emissions/>

2014 (October)

Bill McKibben speaks at the University of Maine, where his book *Eaarth* is the 2014 Honors College Read; “I can’t promise you that we’re going to win, but I can promise you that we’re going to fight”

McKibben tells a near-capacity crowd at the Collins Center, “This is by far the biggest problem that humans have ever stumbled into. ...College kids are completely capable of organizing on the scale that we need... the next biggest push of this movement is this divestment campaign, and I was really encouraged to get here to Orono and to find out that students are at work getting divestment at the University of Maine.”*

*Lauren Abate, “Climate change activist Bill McKibben offers insights, hope at UMaine,” *Bangor Daily News*, October 8, 2014, <http://bangordailynews.com/2014/10/08/outdoors/climate-change-writer-and-activist-bill-mckibben-offers-insights-hope-at-umaine/>

2014 (October)

A study reported in *Nature Climate Change* concludes that previous estimates of the amount of warming absorbed by the ocean—generally understood to be more than 90% of total warming—may have been underestimated by as much as 25% globally

As Eli Kintisch reports in *Science*, “Seas pose a formidable challenge to climate scientists. On one hand, they are as big a player in the global climate system as the atmosphere. As a result, ‘global warming is ocean warming,’ oceanographer Gregory Johnson writes in a commentary on the new study, appearing today in *Nature Climate Change*. But vast swaths of

the ocean are poorly measured, particularly in the Southern Hemisphere. To fill that gap, the authors of the new study focused south of the equator in developing a new estimate of how much heat the ocean stores. In particular, scientists at the U.S. Department of Energy (DOE) and NASA looked at satellite measurements of sea-level height, which they can use as a proxy for heating. That's because as oceans warm, water expands, causing sea levels to rise.”* As the study by Paul Durack of the Lawrence Livermore National Laboratory and coauthors notes, “[u]sing satellite altimetry observations and a large suite of climate models, we conclude that observed estimates of 0–700 dbar global ocean warming since 1970 are likely biased low. This underestimation is attributed to poor sampling of the Southern Hemisphere, and limitations of the analysis methods that conservatively estimate temperature changes in data-sparse regions.”** The estimates in the Southern Hemisphere suggest that previous estimates were 48% to 152% too low, leading to an estimate that global figures could be as much as 25% off.*

*Eli Kintisch, “Past measurements may have missed massive ocean warming,” *Science*, October 5, 2014, <http://news.sciencemag.org/climate/2014/10/past-measurements-may-have-missed-massive-ocean-warming>

**Paul Durack and coauthors, “Quantifying underestimates of long-term upper ocean warming,” *Nature Climate Change*, October 5, 2014, <https://www.nature.com/nclimate/journal/v4/n11/full/nclimate2389.html>

2014 (November)

The Intergovernmental Panel on Climate Change releases its Fifth Assessment “Synthesis Report,” which emphasizes both the relatively low cost of acting to cut carbon now, and the “severe, pervasive, and irreversible impacts for people and ecosystems” if we do not act now

Major points of the report include: “Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen;” “Anthropogenic greenhouse gas emissions have increased since the pre-industrial era, driven largely by economic and population growth, and are now higher than ever. This has led to atmospheric concentrations of carbon dioxide, methane and nitrous oxide that are unprecedented in at least the last 800,000 years. Their effects, together with those of other anthropogenic drivers, have been detected throughout the climate system and are extremely likely to have been the dominant cause of the observed warming since the mid-20th century;” “In recent decades, changes in climate have caused impacts on natural and human systems on all continents and across the oceans;” “Changes in many extreme weather and climate events have been observed since about 1950. Some of these changes have been linked to human influences, including a decrease in cold temperature extremes, an increase in warm temperature extremes, an increase in extreme high sea levels and an increase in the number of heavy precipitation events in a number of regions;” “Continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. Limiting climate change would require substantial and sustained reductions in greenhouse gas emissions which, together with adaptation, can limit climate change risks.”* At the release of the report, UN secretary general Ban Ki-moon states, “Science has spoken. There is no ambiguity in the message...Leaders must act. Time is not on our side.” Ban adds a message to investors: “Please reduce your investments in the coal- and fossil fuel-based

economy and [move] to renewable energy.” Sir Nicholas Stern, author of *The Stern Review*, describes the report as the “most important assessment of climate change ever prepared” and states that it makes plain that “further delays in tackling climate change would be dangerous and profoundly irrational.”** *ThinkProgress*’s Joe Romm comments, “The authors clearly understand this is the last time they have a serious shot at influencing the world’s major governments while we still have a plausible chance of stabilizing at non-catastrophic levels.”***

* Intergovernmental Panel on Climate Change, “Climate Change 2014 Synthesis Report Summary for Policymakers, https://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf

**Damian Carrington, “IPCC: rapid carbon emission cuts vital to stop severe impact of climate change,” *The Guardian*, November 2, 2014, <https://www.theguardian.com/environment/2014/nov/02/rapid-carbon-emission-cuts-severe-impact-climate-change-ipcc-report>

*** Joe Romm, “World’s Scientists Warn: We Have ‘High Confidence’ In The ‘Irreversible Impacts’ Of Climate Inaction,” *ThinkProgress*, November 2, 2014, <http://thinkprogress.org/climate/2014/11/02/3587485/climate-panel-final-plea/>

2014 (November)

Meeting in Beijing, Barack Obama and Xi Jinping announce a mutual agreement to curtail greenhouse gas emissions; although not legally binding, this is the first Chinese international commitment to a cap on emissions

China pledges to peak emissions of CO₂ “around 2030,” and to increase the proportion of renewable energy to 20% by then. Obama pledges to reduce U.S. emissions by 26–28% below 2005 levels by 2025, an improvement over his previous pledge to reduce emissions by 17% by 2020. Together the two countries account for 40% of world emissions (China for 26%, with 19% of world population; the United States for 19%, with 4% of world population). These goals appear to be achievable under existing policies, if Obama’s regulatory initiatives survive. They will not, however, be enough to keep global temperature increases below 2 degrees Celsius, unless other countries make substantial reductions as well.*

*White House press release, November 11, 2014, <http://www.whitehouse.gov/the-press-office/2014/11/11/fact-sheet-us-china-joint-announcement-climate-change-and-clean-energy-c> ;

Henry Fountain and John Schwarz, “Climate Accord Relies on Environmental Policies Now in Place,” *New York Times*, November 13, 2014, <http://www.nytimes.com/2014/11/13/world/climate-pact-by-us-and-china-relies-on-policies-now-largely-in-place.html>

2014 (December)

United Nations Climate Change Conference negotiators conclude their meeting in Lima, Peru, with an agreement among 190 countries to submit plans over the next six months to control their carbon emissions

The Climate Change Conference plans will be a basis for an international agreement to be finalized in Paris in 2015. The document includes pleas for richer countries to financially support poorer countries in controlling their emissions, without firm commitments or an agreed-upon amount. Journalist Gwynne Dyer describes the negotiation process: “The final two days were spent watering down various parts of the text so that no country would just walk

away. That's where SHALL was changed to MAY, not once but many times. So quite a lot of the substance has been lost even before the final negotiations begin in Paris next December.”*

*UNFCCC Conference of the Parties 20, Lima, Peru, <http://unfccc.int/resource/docs/2014/cop20/eng/l14.pdf> ; Gwynne Dyer, “Climate Change: The Impossible Deal,” *Bangor Daily News*, December 15, 2014, <http://bangordailynews.com/2014/12/15/opinion/contributors/climate-change-the-impossible-deal/>

2015 (January)

The U.S. Senate votes 98–1 for a resolution, co-sponsored by Senator James Inhofe (R-OK), finding that “it is the sense of the Senate that climate change is real and not a hoax”

Senator James Inhofe deliberately avoids the question of the human role in climate change. On the same day, an amended resolution that climate change is real *and that humans significantly contribute to it* fails by a vote of 50–49. A vote of 60 was required to pass, but a slim majority of senators nonetheless formally acknowledge man-made climate change. Maine Senator Susan Collins is among the Republicans voting for the amended resolution.*

*Emily Atkin, “Senate Votes 98-1 That ‘Climate Change Is Real And Not A Hoax’,” ThinkProgress.org, January 21, 2015, <http://thinkprogress.org/climate/2015/01/21/3614028/so-much-senate-climate-change-trolling/>

2015 (January)

A New York Times/Stanford University poll of 1000 adults finds that two-thirds of Americans (and 48% of Republicans) say they are more likely to vote for a politician who campaigns on fighting climate change

According to the poll, 83% of Americans (61% of Republicans, 86% of Independents) say if we don’t reduce greenhouse emissions soon, global warming will be a serious problem in the future.*

*Coral Davenport and Marjorie Connelly, “Most Republicans Say They Back Climate Action, Poll Finds,” *New York Times*, January 30, 2015, <http://www.nytimes.com/2015/01/31/us/politics/most-americans-support-government-action-on-climate-change-poll-finds.html?&hp&action=click&pgtype=Homepage&module=first-column-region®ion=top-news&WT.nav=top-news&r=0>

2015 (January)

The University of Maine System (UMS) Board of Trustees votes unanimously to partially divest itself from investments in the coal industry, making it the first land-grant higher-education institution in the country to limit its fossil fuel investments

The trustees approved UMS’s new “coal divestiture policy,” which directs the UMS’s equity and fixed income investment managers to eliminate investments in coal mining companies from the system’s portfolio and to “negatively screen” for coal to prevent such investments in the future. The policy does not cover mutual fund investments.*

*Nick McCrea, "University of Maine System Partially Divests from Coal Investments," *Bangor Daily News*, January 26, 2015, <http://bangordailynews.com/2015/01/26/news/state/university-of-maine-system-partially-divests-from-coal-investments-closes-in-on-next-usm-president/>

2015 (January)

The National Oceanic and Atmospheric Administration (NOAA) declares 2014 the hottest year on record; “The year 2014 was the warmest year across global land and ocean surfaces since records began in 1880”

As NOAA reports, “The annually-averaged temperature was 0.69°Celsius (1.24°Fahrenheit) above the 20th century average of 13.9°Celsius (57.0°Fahrenheit), easily breaking the previous records of 2005 and 2010 by 0.04°Celsius (0.07°Fahrenheit). This also marks the 38th consecutive year (since 1977) that the yearly global temperature was above average. Including 2014, 9 of the 10 warmest years in the 135-year period of record have occurred in the 21st century. 1998 currently ranks as the fourth warmest year on record. The 2014 global average ocean temperature was also record high, at 0.57°Celsius (1.03°Fahrenheit) above the 20th century average of 16.1°Celsius (60.9°Fahrenheit), breaking the previous records of 1998 and 2003 by 0.05°Celsius (0.09°Fahrenheit). Notably, ENSO [El Niño/Southern Oscillation]-neutral conditions were present during all of 2014.”*

* Tom Randall and Blacki Migliozi, “2014 Was the Hottest Year on Record,” *Bloomberg*, January 16, 2015, <http://www.bloomberg.com/graphics/2014-hottest-year-on-record/>; NOAA, State of the Climate Report, Global Analysis, January, 2015, <http://www.ncdc.noaa.gov/sotc/global/>

2015 (February)

The University of Maine Climate Change Institute releases an update of its 2009 *Maine’s Climate Future* report, observing that “Human influence on the global climate system is emerging as the defining environmental, economic, and social issue of the twenty-first century”

Specific findings from updated report include: “Average annual temperature across Maine warmed by about 3.0 degrees Fahrenheit between 1895 and 2014.” “The spread of Lyme disease has been linked to temperatures that make habitat more suitable for deer ticks and their hosts. The rate of Lyme disease reached a record high in 2013 at... 1,377 cases.” “[T]wo-thirds of Maine’s plant and animal species are either highly or moderately vulnerable to climate change.” “A significant increase in extreme precipitation events (more frequent and intense storms) has been observed across Maine...” “A decade of above-average spring and summer precipitation patterns have fostered an epidemic of white pine needle disease...” “Snowfall has declined by about 15%” since 1895. “Since 1982, the average sea surface temperature in the Gulf of Maine increased at a rate of 0.05 degree Fahrenheit per year, slightly faster than the increase experienced by the global ocean.” “Since 2004, the rate of warming accelerated to 0.41 degree Fahrenheit per year, a rate that...[is] faster than 99% of the world’s oceans.”*

* Ivan Fernandez and coauthors, 2015. *Maine’s Climate Future: 2015 Update*. Orono, Me: University of Maine, 1,2,5,9,10,11,13. http://cci.siteturbine.com/uploaded_files/climatechange.umaine.edu/files/MainesClimateFuture_2015_Update2.pdf

2015 (April)

California Governor Jerry Brown orders mandatory water use reductions for the first time in the state's history, as California's four-year drought reaches near-crisis proportions after a winter of record-low snowfalls

California Governor Jerry Brown's executive order directs the State Water Resources Control Board to impose a 25-percent reduction on the state's 400 local water supply agencies, which serve 90 percent of California residents, over the coming year. As the *New York Times* reports, Governor Brown stated at a news conference that "People should realize we are in a new era... The idea of your nice little green lawn getting watered every day, those days are past."*

* Adam Nagourney, "California Imposes First Mandatory Water Restrictions to Deal With Drought," *New York Times*, April 2, 2015, https://www.nytimes.com/2015/04/02/us/california-imposes-first-ever-water-restrictions-to-deal-with-drought.html?_r=1

2015 (May)

Pope Francis issues a 180-page encyclical on climate and other environmental problems, entitled "On Care for Our Common Home"

Some key observations from the Pope's encyclical: "The climate is a common good, belonging to all and meant for all." The "idea of infinite or unlimited growth, which proves so attractive to economists, financiers and experts in technology... is based on the lie that there is an infinite supply of the Earth's goods, and this leads to the planet being squeezed dry beyond every limit." "Regrettably, many efforts to seek concrete solutions to the environmental crisis have proved ineffective, not only because of powerful opposition but also because of a more general lack of interest. Obstructionist attitudes, even on the part of believers, can range from denial of the problem to indifference, nonchalant resignation or blind confidence in technical solutions. We require a new and universal solidarity."* Damian Carrington of *The Guardian* calls this "the clearest and loudest moral case yet for action now, firmly rooted in justice for the world's poor."**

*Pope Francis, encyclical letter *Laudato-Si* on Care for Our Common Home, May 2015, paragraphs 23, 86, 22. http://w2.vatican.va/content/francesco/en/encyclicals/documents/papa-francesco_20150524_enciclica-laudato-si.html

** Damian Carrington, "Will Pope Francis's encyclical become his miracle that saved the planet?" *The Guardian*, June 18, 2015, <http://www.theguardian.com/environment/damian-carrington-blog/2015/jun/18/will-pope-franciss-encyclical-become-his-miracle-that-saved-the-planet>

2015 (August)

President Obama announces the final version of the Clean Power Plan to reduce greenhouse gas emissions from existing power plants; the plan is published in the Federal Register in October, to become effective December, 2015

The final Clean Power Plan calls for a 32-percent reduction in power sector emissions from 2005 levels by 2030, equivalent to 870 million short tons of CO₂ or the annual emissions resulting from the powering of 95 percent of U.S. homes. The cuts in CO₂ emissions will also reduce emissions of harmful co-pollutants; by 2030, emissions of sulfur dioxide will be 90

percent lower and emissions of nitrous oxides will be 72 percent lower, compared to 2005 levels. The Environmental Protection Agency (EPA) projects that in 2030, the final rule will have led to net benefits of \$26 to \$45 billion, avoided 3,600 premature deaths and 90,000 asthma attacks in children, and reduced the average American's yearly electricity bill by \$84.* As President Obama outlines the details of this rule, he states, "We're the first generation to feel the impact of climate change and we're the last generation that can do something about it. We only get one home. We only get one planet. There's no plan B."** Harvard environmental law professor Richard Lazarus describes the plan as "in many respects a brilliantly creative plan, both in terms of reducing greenhouse gas emissions and doing so in the most cost-effective and efficient way possible." The Power Plan rule creates three "building blocks" for greenhouse gas reduction in electricity generation: improving the efficiency of coal-fired power generation; increasing use of natural gas powered plants; and increasing development of renewable energy alternatives. The EPA leaves it to the states to determine in what proportion they will apply these approaches to achieve reduction targets.*** Twenty-four states and a coal mining company promptly sue, contending the EPA's mandate that states adjust the sources of their power supply is beyond the authority of the Clean Air Act. Lead counsel West Virginia Attorney General Patrick Morrisey calls the rule "the single most onerous and illegal regulations that we've seen coming out of D.C. in a long time."****

* Environmental Protection Agency, "Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units; Final Rule" 80 Fed. Reg. 64661–65120, October 23, 2015, <https://www.gpo.gov/fdsys/pkg/FR-2015-10-23/pdf/2015-22842.pdf>

**"Final Clean Power Plan vs. Draft Plan – What has Changed?" Environmental and Energy Study Institute, August 21, 2015, <http://www.eesi.org/articles/view/final-clean-power-plan-vs-draft-plan-what-has-changed>

*** Alan Powell, "Clean Power Plan's Legal Future 'a mess,'" *Harvard Gazette*, February 26, 2016, <http://news.harvard.edu/gazette/story/2016/02/clean-power-plans-legal-future-a-mess/>

**** Timothy Cama, "Two dozen states sue Obama over power plant emission rule," *The Hill*, October 23, 2015, <http://thehill.com/policy/energy-environment/257856-24-states-coal-company-sue-obama-over-climate-rule>

2015 (October)

Researchers at the Harvard School of Public Health determine that carbon dioxide at levels in indoor air to which Americans are routinely exposed can significantly impair cognitive function.

Led by Harvard School of Public Health professor Joseph Allen, a team of researchers compared performance on cognitive function tests after varying exposures to levels of carbon dioxide and VOC's in an office environment. The authors write: "the evidence mounts for CO₂ as a direct pollutant, not just a marker for other pollutants... We found statistically significant declines in cognitive function scores when CO₂ concentrations were increased to levels that are common in indoor spaces (approximately 950 ppm)." "The largest effects were seen for Crisis Response, Information Usage, and Strategy, all of which are indicators of higher-level cognitive function and decision making." Assessing this study's implications for climate policy, Joe Romm writes: "Carbon dioxide levels are inevitably higher indoors than the baseline set by the outdoor air used for ventilation, a baseline that is rising at an accelerating rate thanks to human activity, especially the burning of fossil fuels. So this seminal research has equally great importance for climate policy, providing an entirely new public health impetus for keeping global CO₂ levels as low as possible."**

*Joseph G. Allen and coauthors, “Associations of cognitive function scores with carbon dioxide, ventilation, and volatile organic compound exposures in office workers: a controlled exposure study of green and conventional office environments,” *Environmental Health Perspectives* 124:05-12; <https://ehp.niehs.nih.gov/15-10037/> October, 2015

**Joe Romm, “Exclusive: Elevated CO₂ Levels Directly Affect Human Cognition, New Harvard Study Shows,” *ThinkProgress*, October 26, 2015, <https://thinkprogress.org/exclusive-elevated-co2-levels-directly-affect-human-cognition-new-harvard-study-shows-2748e7378941/>

2015 (November)

Maine joins a coalition of 25 states, cities, and counties, intervening in the suit against the Clean Power Plan, to join the Environmental Protection Agency in defending the plan; Attorney General Janet Mills observes that “Maine people in particular bear the burden of dirty power plants to the west”

Maine Attorney General Janet Mills observes, “Fossil fuel burning power plants beyond Maine’s borders contribute not only to poor air quality locally, but they can also be blamed for fish consumption warnings due to mercury emitted from their smokestacks. The EPA needs to take steps to protect the health of Maine people and our environment by adopting the Clean Power Plan.”*

*Press Release, Office of the Maine Attorney General, November 4, 2015,
<http://www.maine.gov/ag/news/article.shtml?id=661467>

2015 (November)

President Obama nixes the controversial Keystone XL pipeline; the New York Times Editorial Board headline: “No Keystone, Yes to the Planet”

The *New York Times* editors write: “The decision, which ends seven years of legal and political wrangling, was correct, on moral as well as scientific grounds. The pipeline, when completed, would have carried about 800,000 barrels of oil a day from tar sands in Alberta, Canada, to refineries on the Gulf Coast. In the grand scheme of things, this would add little to a global output that now exceeds 90 million barrels a day. But the cumulative impact could be huge: The tar sands contain 170 billion barrels of oil recoverable with today’s technology and perhaps 10 times that amount in potential resources. Because the proposed pipeline was seen as crucial to the exploitation of these resources, allowing it to go forward would have put the United States in the position of enabling a project that, over time, would add significantly to already dangerous levels of atmospheric concentrations of carbon dioxide.”

*Editorial Board, “No to Keystone, Yes to the Planet,” *New York Times*, November 7, 2015,
<https://www.nytimes.com/2015/11/07/opinion/no-to-keystone-yes-to-the-planet.html>

2015 (November)

New York Attorney General Eric Schneiderman begins an investigation of Exxon Mobil to determine whether the company lied to the public about the risks of climate change or to investors about how such risks might hurt the oil business

New York issues a subpoena to Exxon Mobil, demanding extensive financial records, emails, and other documents, related to a period of at least a decade during which Exxon Mobil funded outside groups that sought to undermine climate science, even as its in-house scientists were outlining the potential consequences and uncertainties to company executives.*

* Justin Gillis and Clifford Kraus, “Exxon Mobil Investigated for Possible Climate Change Lies by New York Attorney General,” November 5, 2015, http://www.nytimes.com/2015/11/06/science/exxon-mobil-under-investigation-in-new-york-over-climate-statements.html?_r=0

2015 (December)

The Global Carbon Project estimates that global CO₂ emissions from fossil fuel burning and cement production increased by .6% in 2014, the highest in human history and 60% above 1990 emissions

The Global Carbon Project estimates global CO₂ emissions in 2014 to total 9.8 gigatonnes carbon (GtC) (35 gigatonnes CO₂ (GtCO₂)) emitted to the atmosphere. China accounted for 27% of these emissions; the United States for 15%. Average global per capita CO₂ emissions were 4.9 tonnes (T); China’s per capita emissions were 6.6 T; the United States’ per capita emissions were 17.4 T.*

*Global Carbon Project, Global Carbon Budget 2015 Media Highlights, December 7, 2015, <http://www.globalcarbonproject.org/carbonbudget/15/hl-compact.htm>

2015 (December)

At the United Nations Framework Convention on Climate Change Conference of the Parties in Paris, 195 countries sign on to an agreement to reduce greenhouse gas emissions

The *Guardian* hails the “Paris Climate Agreement” as “The World’s Greatest Diplomatic Success,” and Thomas Friedman in *The New York Times* calls a “big big deal.”* The agreement commits every signatory country, including India and China, to submit and periodically update a plan to reduce greenhouse gas emissions, but does not specify by how much, or by what means, the reductions are to be made. There are no penalties for failure to achieve national plans. The agreement affirms a commitment made in 2009 to make available \$100 billion annually for adaptation and mitigation in developing countries, extending the start date for that funding from 2020 to 2025, but rejected requests for an admission of liability of developed countries for climate change damage.** The United States led the opposition to mandatory quantified emissions reductions, recognizing that such an approach would require Congressional approval.*** A group of scientists in a letter to *The Independent* call the agreement “false hope” and full of “deadly flaws,” citing the fact that the CO₂ reduction commitments in the agreement don’t kick in until 2020.* Scientists estimate that at best, the agreement will cut global greenhouse gas emissions by about half the amount necessary to stave off an increase in atmospheric temperatures of 2 degrees Celsius.**** The Obama administration takes the position that the unquantified agreement to reduce emissions, coupled with mandatory reporting and periodic review provisions, comes within the scope of the 1992 Rio UNFCCC, signed by President George H.W. Bush, and unanimously ratified by the Senate,

a legal position disputed by Congressional Republicans.***** Notes the New York Times: “Negotiators from many countries have said that a crucial moment in the path to the Paris accord came last year in the United States, when Mr. Obama enacted the nation’s first climate change policy—a set of stringent new Environmental Protection Agency regulations designed to slash greenhouse gas pollution from the nation’s coal-fired power plants.” But Senate Majority Leader Mitch McConnell responds that “[before Obama’s] international partners pop the champagne, they should remember that this is an unattainable deal based on a domestic energy plan that is likely illegal, that half the states have sued to halt, and that Congress has already voted to reject.”****

*Adam Frank, “Paris Climate Agreement: Success or Failure?” *National Public Radio*, January 12, 2016, <http://www.npr.org/sections/13.7/2016/01/12/462753762/paris-climate-agreement-success-or-failure>

** Daniel Grossman, “Paris Climate Agreement: Between the Lines,” *YaleClimateConnections*, December 13, 2015, <http://www.yaleclimateconnections.org/2015/12/paris-climate-agreement-between-the-lines/>

*** Suzanne Goldenberg, “How US negotiators ensured US climate deal was Republican proof,” *The Guardian*, December 13, 2015, <http://www.theguardian.com/us-news/2015/dec/13/climate-change-paris-deal-cop21-obama-administration-congress-republicans-environment>

**** Coral Davenport, “Nations Approve Landmark Climate Accord in Paris,” *New York Times*, December 13, 2015, <http://www.nytimes.com/2015/12/13/world/europe/climate-change-accord-paris.html>

***** Karoun Dimirjian and Steven Mufson, “Trick or treaty? The legal question hanging over the Paris conference,” *Washington Post*, November 30, 2015, <https://www.washingtonpost.com/news/powerpost/wp/2015/11/30/trick-or-treaty-the-legal-question-hanging-over-the-paris-climate-change-conference/>

2016 (January)

The National Oceanic and Atmospheric Administration finds 2015 the Earth’s warmest year by the widest margin on record; December combined global land and ocean average surface temperature was the highest on record for any month in the 136 years since records have been kept

The report states that “[d]uring 2015, the average temperature across global land and ocean surfaces was 1.62°F (0.90°C) above the 20th century average. This was the highest among all 136 years in the 1880–2015 record, surpassing the previous record set last year by 0.29°F (0.16°C) and marking the fourth time a global temperature record has been set this century. This is also the largest margin by which the annual global temperature record has been broken. Ten months had record high temperatures for their respective months during the year. The five highest monthly departures from average for any month on record all occurred during 2015.”*

*NOAA, State of the Climate Reports, Global Summary December 2015, <http://www.ncdc.noaa.gov/sotc/summary-info/global/201512>

2016 (January)

The Maine Department of Environmental Protection reports that Maine is “on track to meet the medium-term goal of reducing GHG emissions to 10% less than 1990 level by 2020” under the 2004 Maine Climate Action Plan [see 2004 (December)]

The “Sixth Biennial Report on Progress Toward Greenhouse Gas Reduction Goals” states that “Maine is on track to meet the medium-term goal of reducing GHG emissions to 10% less than 1990 level by 2020, as set forth in 38 M.R.S.A. §576 . Gross statewide GHG emissions

increased from the initially measured levels in 1990, reaching a peak in 2003, and have since steadily declined. The Department's analysis indicates: Maine is creating 22% less GHG emissions per billion Btu of energy in 2013 than in 2003. ...In 2013, Maine's annual GHG emissions per million dollars of state gross domestic product GDP was 34% less than in 1990.”*

*Maine Department of Environmental Protection, “Sixth Biennial Report on Progress Toward Greenhouse Gas Reduction Goals,” January, 2016, <http://www.maine.gov/dep/legislative/reports.html>

2016 (February)

The Clean Power Plan rules, described by *Forbes* as “probably the most aggressively contested environmental rules in U.S. history,” are dealt an unexpected blow by the United States Supreme Court

In an extraordinary 5-4 decision in the case of West Virginia v. EPA, the Supreme Court overrules the D.C. Circuit Court’s denial of a stay of implementation and enforcement of the Clean Power Plan. The Supreme Court stays the Plan not only until the D.C. Circuit upholds the rule, but also until the Supreme Court reviews that decision.* The Supreme Court has never before stayed federal regulations before a federal court even heard the initial case against them. “One has to conclude that five justices have decided that the rule must go,” says Seth Jaffe, the former president of the American College of Environmental Lawyers. The situation is further complicated when Justice Antonin Scalia, one of the five who voted for the stay, dies, and the Senate Republicans vow not to consider any nominee President Obama proposes. The fate of the Clean Power Plan appears to hang in the balance of the presidential election.**

* Tracy Hester, “The Supreme Court Suspends Obama’s Clean Power Plan: Change The Law on Staying Put,” *Forbes*, February 18, 2016, <https://www.forbes.com/sites/uhenergy/2016/02/18/the-supreme-court-suspends-obamas-clean-power-plan-changing-the-law-on-staying-put/#7463b41e726d>; Supreme Court order at <http://www.scotusblog.com/wp-content/uploads/2016/02/15A773-Clean-Power-Plan-stay-order.pdf>

** Robinson Meyer, “Will a Reconfigured Supreme Court Help Obama’s Clean Power Plan Survive?” *The Atlantic*, February 14, 2016, <http://www.theatlantic.com/politics/archive/2016/02/antonin-scalia-clean-power-plan-obama-climate-change/462807/>; Alan Powell, “Clean Power Plan’s Legal Future ‘a mess,’” *Harvard Gazette*, February 26, 2016, <http://news.harvard.edu/gazette/story/2016/02/clean-power-plans-legal-future-a-mess/>

2016 (March)

James Hansen and 18 climate scientists publish an updated examination of climate indicators and warn, “There is a possibility, a real danger, that we will hand young people and future generations a climate system that is practically out of their control”

The article “Ice melt, sea level rise and superstorms: evidence from paleoclimate data, climate modeling, and modern observations that 2 °C global warming could be dangerous,” in *Atmospheric Chemistry and Physics*, is an updated examination of climate indicators to assess the adequacy of the objective of policymakers to limit global warming to 2° Celsius. The authors warn that even stabilizing at 2° Celsius warming could lead to devastating glacial melt, multimeter sea level rise and other catastrophic impacts. They urge policymakers: “We conclude that the message our climate science delivers to society, policymakers, and the public

alike is this: we have a global emergency. Fossil fuel CO₂ emissions should be reduced as rapidly as practical.”*

* James Hansen and coauthors, “Ice melt, sea level rise and superstorms: evidence from paleoclimate data, climate modeling, and modern observations that 2 °C global warming could be dangerous,” *Atmospheric Chemistry and Physics*, 16, 3761-3812, March 22, 2016, <http://www.atmos-chem-phys.net/16/3761/2016/acp-16-3761-2016.pdf>

2016 (March)

There is news of climate impacts at both poles; the maximum extent of winter sea ice at the Arctic is the *lowest* maximum since records began to be kept in 1979

National Snow and Ice Data Center director Mark Serreze reports: “I’ve never seen such a warm, crazy winter in the Arctic...The heat was relentless.”* And a new analysis of melting of the West Antarctic ice sheet, larger than Mexico and thought to be vulnerable to a relatively small amount of global warming, suggests that this may happen much sooner than previously predicted, with a potential major impact on global sea levels: “Antarctica has the potential to contribute more than a meter of sea-level rise by 2100 and more than 15 meters by 2500.”**

* Suzanne Goldenberg, “Arctic sea ice extent breaks record low for winter,” *The Guardian*, March 28, 2016, <http://www.theguardian.com/environment/2016/mar/28/arctic-sea-ice-record-low-winter>

** Robert DeConto and David Pollard, “Contribution of Antarctic to past and future sea-level rise,” *Nature*, 10.1038/Nature17145, <http://www.nature.com/nature/journal/v531/n7596/full/nature17145.html>; Justin Gillis, “Climate Model Predicts West Antarctic Ice Sheet Could Melt Rapidly,” *New York Times*, March 30, 2016, <http://www.nytimes.com/2016/03/31/science/global-warming-antarctica-ice-sheet-sea-level-rise.html?smid=nytnow-share&smprod=nytnow>

2016 (March)

An expert panel assembled by the U.S. National Academies of Science, Engineering, and Medicine issues a report assessing the emerging field of “event attribution science”—determining the extent to which extreme weather events can be blamed on climate change

Panel Chair David Titley remarks, “It is now possible to estimate [the] influence of climate change on some types of specific extreme weather events and in particular, heat and cold events, drought, and precipitation.”* Notes the journal *Science*: “Policymakers, meanwhile, are eyeing the possibility that attribution science could end up in the courtroom, as those harmed by climate-driven weather try to extract damage payments from those who produce greenhouse gases.”**

**Event Attribution of Extreme Weather Events in the Context of Climate Change* (Washington: National Academies Press 2016), <http://www.nap.edu/catalog/21852/attribution-of-extreme-weather-events-in-the-context-of-climate-change>; NAS Press Release, “New Report Says Science Can Estimate Influence of Climate Change on Some Types of Extreme Events”, March 11, 2016, <http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=21852>

**Warren Cornwall, “Efforts to link climate change to severe weather gain ground,” *Science*, Vol 351 Issue 6279, March 18, 2016, <http://science.sciencemag.org/content/351/6279/1249>

2016 (April)

A federal lawsuit described by Bill McKibben and Naomi Klein as “the most important lawsuit on the planet right now,” survives a Motion to Dismiss; the plaintiffs “seek relief from government action and inaction that allegedly results in carbon pollution of the atmosphere, climate destabilization, and ocean acidification”

A lawsuit brought by twenty-one young Americans aged 8 to 19, and other activists including Dr. James Hansen, Juliana v. United States, wins a ruling by U.S. Magistrate Judge Thomas Coffin in the Oregon Federal District Court allowing their lawsuit to proceed to discovery stages. Magistrate Judge Coffin describes the case in his ruling as “a relatively unprecedented lawsuit that, in essence, seeks relief from government action and inaction that allegedly results in carbon pollution of the atmosphere, climate destabilization, and ocean acidification.” The lawsuit was brought by the plaintiffs under the aegis of the organization “Our Children’s Trust.” The lawsuit alleges that failure to address climate change is a violation of Constitutional rights to life and liberty and equal protection, and a violation of the public trust doctrine. The court rejects the defendants’ arguments that the plaintiffs lack standing [the Constitutional right to sue], that they present a “non-justiciable political question,” and that they fail to allege a substantive due process claim. The court also holds that previous federal decisions on the public trust doctrine do not foreclose plaintiffs’ suit. It leaves open the possibility of limitations of the action after further proceedings: “The nascent nature of these proceedings dictate further development of the record before the court can adjudicate whether any claims or parties should not survive for trial.”* In November, 2016, Federal District Judge Ann Aiken will adopt Judge Coffin’s decision in a 54-page opinion. She will find that “Federal courts too often have been cautious and overly deferential in the arena of environmental law, and the world has suffered for it.”** In a 2012 case raising similar public trust claims in the Federal District Court for the District of Columbia, the court dismissed the case finding that public trust law was based on state, not federal law, and even if grounded in federal law, federal statutes supersede public trust law.***

*Kelsey Cascade Rose Juliana v. United States, U.S. District Court, District of Oregon, 6:15-cv-1517-TC, Order and Findings & Recommendation, April 8, 2016; <http://ourchildrenstrust.org/sites/default/files/16.04.08.OrderDenyingMTD.pdf>; “Victory in Landmark Climate Case,” Our Children’s Trust, April 8, 2016, <http://ourchildrenstrust.org/US/Federal-Lawsuit>

** Kelsey Cascade Rose Juliana v. United States, U.S. District Court, District of Oregon, 6:15-cv-1517-TC, Opinion and Order, November 10, 2016;

<https://static1.squarespace.com/static/571d109b04426270152febe0/t/5824e85e6a49638292ddd1c9/1478813795912/Order+MTD.Aiken.pdf>

*** Alec L. v. Jackson, Civil Action No. 2011-2235 (D.C. 2013), [https://www.courtlistener.com/opinion/2660626/alec-l-v-jackson/?q=cites%3A\(219098\)](https://www.courtlistener.com/opinion/2660626/alec-l-v-jackson/?q=cites%3A(219098))

2016 (May)

The Environmental Protection Agency announces first-ever regulatory standards to reduce methane release from oil and gas production facilities

The EPA’s final rule seeks to reduce “fugitive” methane emissions, as well as Volatile Organic Compounds (VOCs) and toxic air emissions from oil and gas production facilities. The rule is part of President Obama’s Climate Action plan, and is intended to help achieve the Plan’s goal of cutting methane emissions from the oil and gas sector by 40 to 45 percent from 2012 levels by 2025. The agency’s press release notes that “The final standards for new and modified

sources are expected to reduce 510,000 short tons of methane in 2025, the equivalent of reducing 11 million metric tons of carbon dioxide. Natural gas that is recovered as a result of the rule can be used on site or sold. EPA estimates the final rule will yield climate benefits of \$690 million in 2025, which will outweigh estimated costs of \$530 million in 2025.”*

*U.S. Environmental Protection Agency press release, “EPA Releases First-Ever Standards to Cut Methane Emissions from the Oil and Gas Sector,” May 12, 2016, <https://www.epa.gov/newsreleases/epa-releases-first-ever-standards-cut-methane-emissions-oil-and-gas-sector>; U.S. EPA, Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources, June 3, 2016, 81 Fed. Reg. 35823, <https://www.federalregister.gov/documents/2016/06/03/2016-11971/oil-and-natural-gas-sector-emission-standards-for-new-reconstructed-and-modified-sources>

2016 (September)

The Regional Greenhouse Gas Initiative reports that from inception in 2008 through 2014, “\$1.37 billion in RGGI proceeds have been invested in the energy future of New England and Mid-Atlantic states. This includes investments in energy efficiency, clean and renewable energy, greenhouse gas abatement, and direct bill assistance.”

The report, “The Investment of RGGI Proceeds Through 2014,” projects that RGGI investments will ultimately “return \$4.67 billion in lifetime energy bill savings to 4.6 million participating households and 21,400 businesses. Over their lifetime, RGGI investments are projected to save 76.1 million MMBtu of fossil fuels and 20.6 million MWh of electricity, avoiding the release of 15.4 million short tons of harmful carbon pollution.” The RGGI states “have experienced a reduction of more than 45 percent in power sector CO₂ pollution since 2005, even as the regional economy has grown 8 percent.”* [see 2005 (December) and 2010 (September)]

*Regional Greenhouse Gas Initiative, “Fact Sheet: The Investment of RGGI Proceeds Through 2014,” September 2016, http://www.rggi.org/docs/ProceedsReport/RGGI_Proceeds_FactSheet_2014.pdf

2016 (October)

ExxonMobil brings suit in federal court in Texas asking the court to invalidate the subpoena in the New York Attorney General’s investigation of its representations on climate change, based on “political bias” [see 2015(November)]

The suit comes after ExxonMobil has been cooperating in producing documents in the New York investigation for over a year, producing about one million pages of documents. A representative of the Attorney General’s office responds: “Exxon’s latest claims in its stunt litigation in Texas are meritless and are the same type of claims that have been rejected by courts for years.”* Six months later, the Texas federal court will transfer ExxonMobil’s lawsuit to New York, in a setback to ExxonMobil.**

* Anna Butler, “Exxon Mobil Attempts to Block New York Investigation into Climate Change,” *Dallas Business Journal*, <http://www.bizjournals.com/dallas/news/2016/10/18/exxon-mobil-climate-change-investigation.html>.

**David Hasemyer, In Setback for Exxon, Texas Judge Kicks Climate Change Case to New York, *InsideClimate News*, March 30, 2017, <https://insideclimatenews.org/news/30032017/exxonmobil-climate-change-research-ny-attorney-general-investigation>

2016 (October)

A federal appeals court rules that in considering a petition to list an endangered species, the National Marine Fisheries Service may consider climate projections, in addition to the current status of the species populations; the lower court had dismissed the use of climate projections as “speculative”

The decision is in relation to a petition by the Center for Biological Diversity (CBD), for listing of the bearded seal under the Endangered Species Act. “The seals’ winter sea-ice habitat in the Bering and Okhotsk seas off Alaska and Russia is projected to decline by at least 40 percent by 2050,” a CBD press release notes, “while summer sea ice across the Arctic is projected to largely disappear in the next 20 years.”*

*Press Release, “Appeals Court Reinstates Endangered Species Protections for Bearded Seals,” CBD, October 24, 2016, http://www.biologicaldiversity.org/news/press_releases/2016/bearded-seal-10-24-2016.html

2016 (October)

The International Energy Agency reports that renewable energy sources have surpassed coal in 2015 as the largest new source of electricity in the world

A record 153 gigawatts (GW) of new renewable energy was installed in 2015, 15% more than the previous year. Most of these gains were driven by record-level wind additions of 66 GW and solar photovoltaics additions of 49 GW. “About half a million solar panels were installed every day around the world last year. In China, which accounted for about half the wind additions and 40% of all renewable capacity increases, two wind turbines were installed *every hour* in 2015.”*

* Press Release, “IEA raises its five-year renewable growth forecast as 2015 marks record year,” IEA, October 25, 2016, <https://www.iea.org/newsroom/news/2016/october/iea-raises-its-five-year-renewable-growth-forecast-as-2015-marks-record-year.html>

2016 (October)

Studies of methane molecules in the global atmosphere bring good and bad news for the fossil fuel industry, and suggest increasing microbial production of methane is related to the warmer and wetter climate

The greenhouse gas methane is the next most significant contributor to global warming after carbon dioxide. Molecule for molecule, it is far more potent than carbon dioxide in trapping heat – 84 times more potent after 20 years and 28 times more potent after 100 years.* It is possible to identify the source of methane emissions – whether from fossil fuel fugitive emissions or combustion, from microbial activity in the decomposition of organic matter, or from burning forests and other vegetation – based on the isotopic variations of the molecules. Stefan Schweitzke of the NOAA Earth Systems Research Laboratory and coauthors, publishing in *Nature*, developed the largest global database of isotopic measurements of methane over the previous thirty years, and analyzed trends. The bad news for fossil fuel producers: “methane emissions from natural gas, oil and coal production and their usage are 20 to 60 per cent greater than [government greenhouse gas] inventories,” thus supporting the argument that there is “a

greater potential for the fossil fuel industry to mitigate anthropogenic climate forcing” via stricter controls on leakage. The better news: total methane leakage from fossil fuel production and use appears not to have increased over the last thirty years. The authors estimate leakage at 8% of production in 1985, compared with 2% in 2015.** The current 2% estimate offers support for the conclusion that burning natural gas instead of coal to produce electricity yields a net positive climate impact. * Numerous earlier studies, however, summarized by Joe Romm in *ThinkProgress*, have found methane leakage from gas production at levels that negate the favorable comparison to coal. And as Romm argues, “natural gas plants don’t replace only high-carbon coal plants. They often replace very low carbon power sources like solar, wind, nuclear, and even energy efficiency. That means even a very low leakage rate wipes out the climate benefit of fracking.”**** Schweitzke’s study also suggests that an abrupt rise in methane in the atmosphere since 2007 is related to increased microbial production, rather than fossil fuel production and use. A study published in *Global Biogeochemical Cycles* by Euan Nisbet of the University of London reaches a similar conclusion, and suggests that microbial methane production may be accelerating as a result of warmer and wetter global environments.**** As Nisbet observed in an interview with *YaleEnvironment360*, “there is a real danger that climate change is starting to accelerate the processes that release methane into the atmosphere, potentially triggering a troubling positive feedback in which further warming could produce more methane and yet more warming.”*****

*Environmental Defense Fund, “The Climate Impact of Methane Emissions,” April, 2012,
<https://www.edf.org/energy/methaneleakage>

**Stefan Schweitzke and coauthors, “Upward revision of global fossil fuel methane emissions based on isotope database,” *Nature*, 538: 88-91, October 6, 2016, <http://www.nature.com/nature/journal/v538/n7623/full/nature19797.html>

***Joe Romm, “Methane Leaks Erase Climate Benefit of Fracked Gas, Countless Studies Find,” *ThinkProgress*, February 17, 2016,
<https://thinkprogress.org/methane-leaks-erase-climate-benefit-of-fracked-gas-countless-studies-find-8b060b2b395d>

****Euan Nisbet and coauthors, “Rising atmospheric methane: 2007–2014 growth and isotopic shift,” *Global Biogeochemical Cycles*, v. 30, issue 9, September 27, 2016, <http://onlinelibrary.wiley.com/doi/10.1002/2016GB005406/full>

*****Fred Pearce, “What is Causing the Recent Rise in Methane Emissions?” *Yale Environment360*, October 25, 2016,
http://e360.yale.edu/features/methane_riddle_what_is_causing_the_rise_in_emissions

2016 (November)

The Paris Climate Agreement enters into force on November 4, 30 days after the date on which at least 55 parties to the Convention, including the United States, China, and India, accounting for at least 55% of total greenhouse gas emissions, had filed ratification papers
By year-end, 120 countries had ratified the agreement.* President Obama does not submit the ratification to the Senate, stating that this agreement is an “executive agreement,” which the President can enter without advice and consent of the Senate.**

*UNFCCC, Paris Agreement – Status of Ratification. http://unfccc.int/paris_agreement/items/9444.php

** Valerie Richardson, “White House defends Obama evading Senate on Paris climate deal,” *Washington Times*, August 29, 2016,
<http://www.washingtontimes.com/news/2016/aug/29/obama-will-bypass-senate-ratify-paris-climate-acco/>

2016 (November)

Donald Trump wins the U.S. Presidential election, though he loses the national popular vote by almost 2.9 million

In three Presidential and one Vice Presidential debate, not a single question was asked about climate change.* Trump had tweeted, however, that “The concept of global warming was created by and for the Chinese in order to make U.S. manufacturing non-competitive” (2012), and “Give me clean, beautiful and healthy air - not the same old climate change (global warming) bullshit! I am tired of hearing this nonsense” (2014). In campaign speeches he promised to dismantle the U.S. Climate Action Plan and Clean Power Plan, “cancel” the Paris Climate Agreement, and stop all payments of U.S. tax dollars to U.N. climate change programs. The online right-wing Breitbart News Network exults, “The liberal-left just lost the ‘battle’ against climate change. Donald Trump isn’t just skeptical about global warming. He is what the alarmists would call a full-on climate change ‘denier’.”** In short order President-elect Trump enlists climate contrarian Myron Ebell of the Competitive Enterprise Institute to oversee transitioning federal agencies that address climate change and environmental issues generally.*** Trump picks Oklahoma Attorney General Scott Pruitt to head the EPA, a climate denier closely aligned with the fossil fuel industry, and the architect of the federal lawsuit against the EPA’s Clean Power Plan.**** Trump names former Texas Governor Scott Perry, who had vowed to abolish the Department of Energy (DOE) if he were President, to head the DOE. The Trump transition team sends a list of 74 questions to the DOE asking for information about the agency's operations and personnel, including a list of employees and contractors who attended international meetings on climate change over the past five years, as well as their emails related to those meetings. The DOE declines to respond to the request for individual information.***** Trump chooses ExxonMobil CEO Rex Tillerson for his Secretary of State; Tillerson had personally negotiated a \$500 billion drilling deal in the Arctic with Russia, before international sanctions against Russia over its annexation of Crimea killed the deal.***** Meanwhile, Andrew Revkin argues in the *New York Times* that “the bad news about climate change is, in a way, the good news: The main forces determining emission levels of heat-trapping carbon dioxide will be just as much out of President Trump’s hands as they were out of President Obama’s. The decline in the United States has mainly been due to market forces shifting electricity generation from coal to abundant and cheaper natural gas, along with environmental regulations built around the traditional basket of pollutants that even conservatives agreed were worth restricting... At the same time, as well, other fundamental forces will continue to drive polluted China and smog-choked India to move away from unfettered coal combustion as a path to progress.”*****

* Brad Plummer, “That’s 4 straight debates without a single question about climate change. Good job, everyone.” *Vox*, Oct. 20, 2016, <http://www.vox.com/2016/10/19/13342250/presidential-debates-climate-change>

** James Delingpole, “Trump: The left just lost the war on climate change,” *Breitbart*, Nov. 9, 2016, <http://www.breitbart.com/london/2016/11/09/trump-left-just-lost-war-climate-change/>

*** Henry Fountain, “Trump’s Climate Contrarian: Myron Ebell Takes on the EPA.” *New York Times*, Nov. 11, 2016, <http://www.nytimes.com/2016/11/12/science/myron-ebell-trump-epa.html>

**** Coral Davenport and Eric Lipton, “Trump Picks Scott Pruitt, Climate Change Denialist, to Lead the EPA,” *New York Times*, Dec. 7, 2016, <http://www.nytimes.com/2016/12/07/us/politics/scott-pruitt-epa-trump.html>

***** James Conca, “Rick Perry’s Vow to Destroy the Energy Department Will Now Collide with Reality,” *Forbes*, Dec. 14, 2016, <http://www.forbes.com/sites/jamesconca/2016/12/14/oops-rick-perry-chosen-to-head-energy-department/#184cb97e3481>

***** Joe Romm, “Sorry, Media, Exxon CEO is Trump’s worst possible nominee for climate and America,” *Climate Progress*, December 18, 2016, <https://thinkprogress.org/exxon-ceo-trump-worst-nominee-for-climate-40c00f67ccfe#.gtkk8izeq>

***** Andrew Revkin, “Prospects for the Climate, and Environmentalism, under President Trump,” *New York Times*, November 9, 2016, <http://dotearth.blogs.nytimes.com/2016/11/09/prospects-for-the-environment-and-environmentalism-under-president-trump/>

2016 (November)

The World Meteorological Society announces that 2016 is on track to be hottest year on record, breaking the previous record set in 2015; 2015 broke the hottest year record set by 2014

2016's global temperatures are approximately 1.2 degrees Celsius above pre-industrial levels. Sixteen of the 17 hottest years on record have been in the 21st century; the other was 1998.*

* Sewall Chan, "2016 Likely to Top 2015 as Hottest Year on Record, Scientists Say," *New York Times*, November 14, 2016, <http://www.nytimes.com/2016/11/15/science/2016-hottest-year-on-record.html>

2016 (November)

The Global Carbon Project estimates that global carbon dioxide emissions from fossil fuel burning and cement production did not increase in 2015, with a total of 9.9 gigatonnes carbon (36.3 GtCO₂) emitted to the atmosphere

Emissions for 2015 and 2016 were the highest in human history and 60% above 1990 emissions. China accounted for 29% of these emissions; the United States for 15%. Average global per capita CO₂ emissions were 4.9 tonnes (T); China's per capita emissions were 7 T; the United States' were 16.8 T.*

* Global Carbon Project, Global Carbon Budget Media 2016 Media Highlights, November 14, 2016, <http://www.globalcarbonproject.org/carbonbudget/16/highlights.htm>

2016 (November)

A Sierra Club analysis of government energy data shows that U.S. power plants have already attained the Clean Power Plan's interim goal for 2024 in emissions reductions, through voluntary shifts to natural gas and renewables

U.S. power plants are on track to emit 1.76 billion tonnes of carbon in 2016, a 27-percent reduction from 2005, and close to the 32-percent reduction target for 2030. Notes *Politico*: "If you subtract emissions from the 71 operating coal plants that already have announced retirement dates, the electric sector has just about met the plan's final emissions goals 15 years early, even though the plan does not now have and may never have any legal teeth to compel compliance."

* Michael Grunwald, "Environmentalists get a dose of good news," *Politico*, November 18, 2016, <http://www.politico.com/agenda/story/2016/11/environmentalists-get-a-dose-of-good-news-000233>

2016 (November)

Air temperatures in the Arctic are reported peaking at an unheard-of 20 degrees Celsius higher than normal for the time of year, with sea temperatures averaging nearly 4C higher than usual in October and November*

The Arctic Resilience Report identifies 19 “tipping points” in the Arctic region related to warming that include “growth in vegetation on tundra, which replaces reflective snow and ice with darker vegetation, thus absorbing more heat; higher releases of methane, a potent greenhouse gas, from the tundra as it warms; shifts in snow distribution that warm the ocean, resulting in altered climate patterns as far away as Asia, where the monsoon could be affected; and the collapse of some key Arctic fisheries, with knock-on effects on ocean ecosystems around the globe.” The report notes that “The potential effects of Arctic regime shifts [or tipping points] on the rest of the world are substantial, yet poorly understood. Human-driven climate change greatly increases the risk of Arctic regime shifts, so reducing global greenhouse gas emissions is crucial to reducing this risk.”*

*John Vidal, “‘Extraordinarily hot’ Arctic temperatures alarm scientists,” *The Guardian*, November 22, 2016,

<https://www.theguardian.com/environment/2016/nov/22/extraordinarily-hot-arctic-temperatures-alarm-scientists>

** Fiona Harvey, “Arctic Ice Melt Could Trigger Uncontrollable Climate Change at Global Level,” *The Guardian*, November 25, 2016, <https://www.theguardian.com/environment/2016/nov/25/arctic-ice-melt-trigger-uncontrollable-climate-change-global-level>

2016 (November)

U.S. Secretary of the Interior Sally Jewell announces the Methane and Waste Prevention Rule – a final rule that will “reduce the wasteful release of natural gas into the atmosphere from oil and gas operations on public and Indian lands”

The press release regarding the new rule notes that the U.S. is the largest natural gas producer in the world, but significant quantities of gas are lost to the atmosphere through venting, flaring, and leaks because of lax standards and outdated technology in production: “enough natural gas was lost between 2009 and 2015 to serve more than 6 million households for a year. According to a 2010 Government Accountability Office (GAO) report, that amount of wasted gas means states, tribes and federal taxpayers lose millions of dollars annually in royalty revenue for the Federal Government and the states that share it.” The leakage is of major concern for climate change as well, as natural gas is “at least 25 times more potent than carbon dioxide” as a greenhouse gas. The rule sets new technical standards for cutting flaring of gas in oil production in half, inspecting for gas leaks, and limiting venting from storage tanks. “This rule to prevent waste of our nation’s natural gas supplies is good government, plain and simple,” said Sally Jewell. “We are proving that we can cut harmful methane emissions that contribute to climate change, while putting in place standards that make good economic sense for the nation. Not only will we save more natural gas to power our nation, but we will modernize decades-old standards to keep pace with industry and to ensure a fair return to the American taxpayers for use of a valuable resource that belongs to all of us.”*

*U.S. Department of the Interior press release, “Interior Department Announces Final Rule to Reduce Methane Emissions & Wasted Gas on Public, Tribal Lands,” November 15, 2016,

<https://www.doi.gov/pressreleases/interior-department-announces-final-rule-reduce-methane-emissions-wasted-gas-public>; Bureau of Land Management Final Rule: Waste Prevention, Production Subject to Royalties, and Resource Conservation, 81 Fed. Reg. 83008, November 18, 2016,

<https://www.federalregister.gov/documents/2016/11/18/2016-27637/waste-prevention-production-subject-to-royalties-and-resource-conservation>

2016 (November)

The Trump transition team announces a plan to strip NASA of funding for its Earth Science Division, including its work on temperature, ice, clouds, and other climate phenomena, in favor of exploration of deep space

Senior Trump campaign official Bob Walker comments, “climate research is necessary but it has been heavily politicized, which has undermined a lot of the work that researchers have been doing. Mr. Trump’s decisions will be based upon solid science, not politicized science.” Kevin Trenberth, senior scientist at the National Center for Atmospheric Research, responds that the elimination of Earth sciences would be “a major setback if not devastating”: “It could put us back into the ‘dark ages’ of almost the pre-satellite era... It would be extremely short sighted... We live on planet Earth and there is much to discover, and it is essential to track and monitor many things from space. Information on planet Earth and its atmosphere and oceans is essential for our way of life. Space research is a luxury, Earth observations are essential.”*

* Oliver Milman, “Trump to scrap Nasa climate research in crackdown on ‘politicized’ science,” *The Guardian*, November 23, 2016, <https://www.theguardian.com/environment/2016/nov/22/nasa-earth-donald-trump-eliminate-climate-change-research>

2016 (December)

A coalition of organizations devoted to fossil fuel divestment reports that “On the one-year anniversary of the Paris climate agreement, the value of assets represented by institutions and individuals committing to some sort of divestment from fossil fuel companies has reached \$5 trillion”

The value of assets diverted from fossil fuels has doubled over the last 15 months, as 688 institutions and 58,399 individuals across 76 countries have committed to divest from fossil fuel companies. Pension funds and insurance companies represent the largest sectors committing to divestment. The report observes, “From its start on American college campuses five years ago, fossil fuel divestment has grown into a truly global movement, with more than half of all divesting institutions and individuals based outside the United States. The sectors that initially propelled the movement—universities, foundations, and faith-based organizations—continue steady growth, accounting for 54 percent of new commitments made. However, as large private and institutional asset holders recognize the reputational, financial, and legal risks of remaining invested in fossil fuels, divestment has spread to new sectors, including large insurers, pension funds, and banking institutions. Today no single sector accounts for more than a quarter of commitments made.” The report adds that, “While the election of Donald Trump, who campaigned on a pledge to withdraw from the Paris Agreement, calls into question the United States’ ongoing commitment to reduce emissions, it does not affect the broader structural changes moving the energy sector away from fossil fuels. Any setback to official US climate policy elevates the importance of divestment as an organizing and financial tool to speed the clean energy transition.” A notable accomplishment of the divestment movement came in March, 2016, when the Rockefeller Family Fund pledged to divest as quickly as possible from all fossil fuels, including selling their shares of Exxon Mobil, as well as coal and Canadian tar sands. A century ago John D. Rockefeller Sr. made his fortune running Standard Oil, which

ultimately evolved into Exxon Mobil. The Fund stated: "there is no sane rationale for companies to continue to explore for new sources of hydrocarbons."**

* Global Divestment Report 2016, The Global Fossil Fuel Divestment and Clean Energy Investment Movement, December, 2016, https://www.arabellaadvisors.com/wp-content/uploads/2016/12/Global_Divestment_Report_2016.pdf

**Terry Wade and Anna Driver, "Rockefeller Family Fund hits Exxon, divests from fossil fuels," *Reuters*, March 24, 2016, <http://www.reuters.com/article/us-rockefeller-exxon-mobil-investments-idUSKCN0WP266>

2016 (December)

President Obama announces that 98 percent of U.S.-controlled Arctic waters (115 million acres) and 3.8 million acres of underwater canyon along the Atlantic coast will be permanently withheld from any future oil and gas leasing under the 1953 Outer Continental Shelf Lands Act

President Obama noted that "[These actions] reflect the scientific assessment that, even with the high safety standards that both our countries have put in place, the risks of an oil spill in this region are significant and our ability to clean up from a spill in the region's harsh conditions is limited... By contrast, it would take decades to fully develop the production infrastructure necessary for any large-scale oil and gas leasing production in the region—at a time when we need to continue to move decisively away from fossil fuels." Simultaneously, the Canadian government announces it will withdraw all oil and gas leases in Canadian Arctic waters.* The Wall Street Journal's editorial response: "This rule even purports to be 'permanent,' unchangeable by any future President for all time. We'll see about that, but in the meantime spare us the liberal panic about Donald Trump's supposed authoritarianism... No policy decisions are engraved in stone as if through holy stenography, and they're definitely not beyond democratic consent on the basis of a 63-year-old law."**

*Samantha Page, "Obama Permanently Protects Huge Portions of Arctic, Atlantic from Offshore Drilling," *ThinkProgress*, December 20, 2016, <https://thinkprogress.org/permanent-protections-arctic-atlantic-e6978298ea1#.xukkcm6dm>

**Editorial Board, "Obama's 'Permanent' Drilling Freeze," *Wall Street Journal*, December 21, 2016, <http://www.wsj.com/articles/obamas-permanent-drilling-freeze-1482364429>

2017 (January)

Donald Trump takes the oath of office on January 20. Within two days, significant changes are made to the EPA website, deleting references to climate change policies, concerns, and activities

The Environmental Data and Governance Initiative (EDGI), a newly founded network of academics, librarians, and technology professionals, goes to work rescuing and archiving scientific data in numerous government agencies regarded as at risk in the new administration, and monitoring website changes. Changes in the EPA website are apparent within two days of the inauguration. For example, as EDGI documents, EPA's page on "Federal Partner Collaboration" becomes "EPA Adaptation Collaboration" sometime between Jan. 16 and Jan. 22, with new text highlighting adaptation research as a core function of the EPA rather than climate change mitigation, preparedness or resilience. When E&E News enquires about these changes, EPA transition team spokesman Doug Erickson denies responsibility and points to the "old administration:" "We did not direct that," Erickson said, noting that changes occurred

over the Trump's first weekend in office, when transition aides were just 'meeting people and greeting people.'” * EDGI will continue its work in the ensuing months, archiving public databases in “archive-a-thons”, reviewing tens of millions of pages of websites from EPA, DOE, NASA, NOAA, and Whitehouse.gov, as well as conducting confidential interviews of agency personnel, “to illuminate the human sides of this versus earlier transitions.”** EDGI’s May, 2017 report, The EPA Under Seige: Trump’s Assault in History and Testimony, will present a compilation of interview quotations, including the following: “(February) this is unlike any transition I've been through...on so many different levels...Like do we have a president who really believes in democracy? We have not had to deal with that before. Then on another level down, he said nothing to say about EPA other than bad. So you are starting off with a lot of—there's a lot of overt hostility which we've never had before. Obviously, by comparison the Bush 2 years were sweetness and light.”***

*Hannah Hess, “Watchdogs report changes in website climate information,” *E&E News*, February 3, 2017, <https://www.eenews.net/greenwire/2017/02/03/stories/1060049539>

**Environmental Data and Governance Initiative, Introducing the Environmental Data and Governance Initiative, February 1, 2017, <https://envirodatagov.org/publication/introducing-edgi/>

***Environmental Data and Governance Initiative, The EPA Under Seige: Trump’s Assault in History and Testimony, May, 2017, <https://100days.envirodatagov.org/>

2017 (February)

A group of distinguished leaders of prior Republican administrations comes out with a “conservative climate solution,” taxing carbon pollution by burning fossil fuels

The group, calling themselves the Climate Leadership Council, is led by former Secretary of State James A. Baker III, with former Secretary of State George P. Shultz and Henry M. Paulson Jr., a former secretary of the Treasury, all not particularly noted for environmental activism. The group visits the White House to advocate for this approach as an alternative to the Clean Power Plan. They propose an initial \$40 a ton tax, which would raise \$200 to \$300 billion a year, and be adjusted upward over time. The proceeds would be returned to the public, in what the group calls a “carbon dividend” amounting to an estimated \$2,000 a year for the average family of four. The proposal is similar to legislation proposed by Maine Senator Susan Collins in 2009 [see 2009 (June)]. Baker is quoted in the *Washington Post* as saying that the plan follows classic conservative principles of free-market solutions and small government. He suggests that even former President Ronald Reagan would have blessed the plan: “I’m not at all sure the Gipper wouldn’t have been very happy with this.” He says he has no idea how the proposal would be received by the current White House or Congress.* By June 20, 2017, the Council will announce a substantially expanded roster of “founding” individual and corporate members committed to the carbon tax plan, in a full page ad in the *Wall Street Journal*. Business members include Bp, ExxonMobil, Shell, GM, Unilever; individual members include Michael Bloomberg, Steven Chu, Stephen Hawking, and Rob Walton. **

*John Schwartz, “‘A Conservative Climate Solution’: Republican Group Calls for Carbon Tax,” *The New York Times*, February 7, 2017, <https://www.nytimes.com/2017/02/07/science/a-conservative-climate-solution-republican-group-calls-for-carbon-tax.html?r=0>

** Climate Leadership Council, <https://www.clcouncil.org/founding-members/>

2017 (March)

The EPA cancels Obama era request for information about methane emissions from oil and gas companies

In November, 2016, the Obama EPA had sent a notice requiring oil and gas producers to provide a broad range of information about their methane emissions and equipment and the feasibility of controls designed to limit methane release. The information was gathered as part of a project to regulate methane emissions in oil and gas production, which grew out of an agreement between President Obama and Canadian Prime Minister Justin Trudeau.* A March 2, 2017 notice to the affected companies states, “EPA has withdrawn the 2016 information request for the oil and gas industry, effective immediately. If you received a letter requiring you to fill out a survey, you are no longer required to respond.”** The notice is issued one day after the new EPA Administrator Scott Pruitt receives a letter from nine state Attorneys General and the Governors of Mississippi and Kentucky, expressing concern about the pending information request.***

*Suzanne Goldenberg, “US and Canada continue climate alliance with move to curb methane emissions,” *The Guardian*, April 6, 2016, <https://www.theguardian.com/environment/2016/apr/06/us-canada-obama-trudeau-climate-change-methane-emissions>

**U.S. Environmental Protection Agency, “Background on the Information Request for the Oil and Natural Gas Industry,” March 2, 2017, <https://www.epa.gov/controlling-air-pollution-oil-and-natural-gas-industry/background-information-request-oil-and>

***Rafi Letzter, “The EPA will no longer require oil and gas companies to report their methane emissions,” *Business Insider*, March 2, 2017, <http://www.businessinsider.com/epa-requirement-methane-emissions-2017-3>

2017 (March)

President Trump announces an Executive Order for review of the Obama Administration’s fuel efficiency standards at a ceremony in Detroit.

As Reuters reports, “In a move widely seen as a preamble to loosening fuel standards, Trump told an audience of cheering union workers, he would ‘ensure that any regulations we have protect and defend your jobs, your factories,’ and promised he would encourage growth in the U.S. auto sector. ‘The assault on the American auto industry is over,’ Trump said, standing in front of a banner that read ‘Buy American-Hire American.’” When a member of the audience expressed concern about environmental issues, Trump “said he agreed but did not want an “extra thimbleful of fuel” to get in the way of growth.”*

*Nick Carey and David Shepardson, Big win for automakers as Trump orders fuel economy standards review, *Reuters*, March 16, 2017, <http://www.reuters.com/article/us-usa-trump-autos-idUSKBN16M2CS>

2017 (March)

President Trump approves the Keystone XL Pipeline

The pipeline will bring Alberta, Canada’s tar sands crude 1,200 miles to refineries in Texas. President Obama had rejected the pipelines because of climate impacts [see November, 2015]. President Trump describes the project as “the first of many infrastructure projects” that will put Americans back to work. Trump says that “government too often failed its citizens and companies over the past long period of time. Today we begin to make things right.” The pipeline still requires approval by the Nebraska Public Service Commission. *

*Brady Dennis and Steven Mufson, “As Trump administration grants approval for Keystone XL pipeline, an old fight is reignited,” *The Washington Post*, March 24, 2017, https://www.washingtonpost.com/news/energy-environment/wp/2017/03/24/trump-administration-grants-approval-for-keystone-xl-pipeline/?utm_term=.8112262f2c99

2017 (March)

Arctic winter sea ice sets a record low for the third consecutive year – measuring the least extent in nearly four decades of satellite measurements

Mark Serreze, the director of the National Snow and Ice Data Center reports that “This is just another exclamation point on the overall loss of Arctic sea ice coverage that we’ve been seeing. We’re heading for summers with no sea ice coverage at all.” Much of the ice appears thinner than normal as well.*

*Henry Fountain, “Arctic’s Winter Sea Ice Drops to Its Lowest Recorded Level,” *The New York Times*, March 22, 2017, <https://www.nytimes.com/2017/03/22/climate/arctic-winter-sea-ice-record-low-global-warming.html>

2017 (March)

A new study by climate scientist Michael Mann and coauthors explores the link between climate change, changes in northern hemisphere wind patterns like the jet stream, and extreme weather events such as heat waves, droughts and extreme precipitation events

As Damian Carrington in *The Guardian* explains, “Planetary waves are a pattern of winds, of which the jet stream is a part, that encircle the northern hemisphere in lines that undulate from the tropics to the poles. Normally, the whole wave moves eastwards but, under certain temperature conditions, the wave can halt its movement. This leaves whole regions under the same weather for extended periods, which can turn hot spells into heatwaves and wet weather into floods.” The study by Michael Mann, of Pennsylvania State University, found new scientific support for the conclusion that climate change increases the likelihood that these wind patterns will be stalled. The wind patterns are affected by the temperature differences between the poles and the tropics, and consequently are altered when the Arctic is heating up faster than lower latitudes. One of the coauthors of the study, Stefan Rahmstorf, of the Potsdam Institute for Climate Impact Research, stated that the warming of the Arctic “is not just a problem of nature conservation or polar bears, it is about a threat to human society that comes from these rapid changes. This is because it hits us with increasing extreme events in the highly populated centres in the mid-latitudes. It also affects us through sea level rise, which is hitting shores globally. So these changes that are going on in the Arctic should concern everyone.”*

*Damian Carrington, “Climate change: ‘human fingerprint’ found on global extreme weather,” *The Guardian*, March 27, 2017, <https://www.theguardian.com/environment/2017/mar/27/climate-change-human-fingerprint-found-on-global-extreme-weather>; Michael Mann and coauthors, “Influence of Anthropogenic Climate Change on Planetary Wave Resonance and Extreme Weather Events,” *Scientific Reports* 7, article number 45242, March 27, 2017, <https://www.nature.com/articles/srep45242>

2017 (March)

President Trump issues an Executive Order “Promoting Energy Independence and Economic Growth,” calling for review of Obama’s Clean Power Plan and rescinding numerous other actions and policies related to climate change

The order states that “It is in the national interest to promote clean and safe development of our Nation's vast energy resources, while at the same time avoiding regulatory burdens that unnecessarily encumber energy production, constrain economic growth, and prevent job creation....Accordingly, it is the policy of the United States that executive departments and agencies (agencies) immediately review existing regulations that potentially burden the development or use of domestically produced energy resources and appropriately suspend, revise, or rescind those that unduly burden the development of domestic energy resources beyond the degree necessary to protect the public interest or otherwise comply with the law.” The order specifically repeals or rescinds seven actions of President Obama related to climate change dating from 2013 to 2016, including an Executive Order “Preparing the United States for the Impacts of Climate Change,” Presidential Memoranda on “Power Sector Carbon Pollution Standards,” and “Climate Change and National Security,” and the Climate Action Plan. It calls for the EPA Administrator to review the Clean Power Plan, including regulations on greenhouse gas emissions from new and existing power plants, and regulations on methane emissions from oil and gas production, and, “if appropriate, shall, as soon as practicable, suspend, revise, or rescind the guidance, or publish for notice and comment proposed rules suspending, revising, or rescinding those rules.” It calls for review of the EPA estimates of the social cost of carbon for regulatory impact analyses, to ensure that it is based “on the best available science and economics,” “disbands” the Interagency Working Group on Social Cost of Greenhouse Gases, which developed the social cost of carbon estimates, and “withdraw[s] as no longer representative of governmental policy,” six technical support documents on the social cost of carbon, dating from 2010 to 2016. It directs the Secretary of the Interior to “lift any and all moratoria on Federal land coal leasing activities,” and to review five regulations enacted during the Obama presidency on hydraulic fracturing, oil and gas drilling rights, and methane emissions on federal and Indian lands.* In his remarks at the signing ceremony, President Trump says of the Clean Power Plan, “perhaps no single regulation threatens our miners, energy workers and companies more than this crushing attack on American industry.” *The Hill* quotes Jason Bordoff, director of Columbia University’s Center on Global Energy Policy and a former aide in Obama’s White House, as saying that Trump was giving coal miners “false hope:” “‘We’ve seen coal production and coal employment in decline for many years now, driven by market forces. And those factors will still be there,’ he said. As for energy independence — which mainly relates to using domestic oil instead of oil imported from unfriendly countries — Bordoff said it isn’t much of a problem. ‘U.S. oil production nearly doubled under President Obama,’ he said. ‘These regulations may have had some marginal costs to them, but regulation did not stand in the way of a dramatic surge in U.S. oil production.’” Sierra Club Executive Director Michael Brune says in a statement, “Donald Trump is attacking clean-energy jobs purely in order to boost the profits of fossil fuel billionaires.”** And an EPA employee expresses his or her opinion in a creative way: at the top of an EPA press release highlighting praise the President has received for the Executive Order is the following quote, attributed to Republican Senator Shelly Moore Capito

of West Virginia: “With this Executive Order, President Trump has chosen to recklessly bury his head in the sand. Walking away from the Clean Power Plan and other climate initiatives, including critical resiliency projects is not just irresponsible – it’s irrational. Today’s executive order calls into question America’s credibility and our commitment to tackling the greatest environmental challenge of our lifetime. With the world watching, President Trump and Administrator Pruitt have chosen to shirk our responsibility, disregard clear science and undo the significant progress our country has made to ensure we leave a better, more sustainable planet for generations to come.” The press release is quickly corrected, the quote deleted. It is in fact a quote by Senator Tom Carper of Delaware, a Democrat. Michael Brune’s comment: “That quote is the first true thing Scott Pruitt’s office has put out yet.”***

*The White House, Presidential Executive Order on Promoting Energy Independence and Economic Growth, March 28, 2017, <https://www.whitehouse.gov/the-press-office/2017/03/28/presidential-executive-order-promoting-energy-independence-and-economics-1>

**Timothy Cama, “Trump signs order to roll back Obama’s climate moves,” *The Hill*, March 28, 2017, <http://thehill.com/policy/energy-environment/326124-trump-signs-order-to-roll-back-obamas-climate-moves>

***Rebecca Leber, “Irrational,”“Reckless,”“Irresponsible”: The EPA Just Accidentally Told the Truth About Trump’s Climate Plan, *Mother Jones*, March 30, 2017, <http://www.motherjones.com/environment/2017/03/pruitts-epa-capito-carper-lol>

2017 (April)

A study finds that anthropogenic emissions need to peak within the next ten years in order to achieve targets of the Paris Agreement

The Paris Agreement set a goal of keeping global temperatures “well below” 2 degrees Celsius above preindustrial temperatures, and encouraged a more ambitious goal of 1.5 degrees Celsius. The Agreement did not detail a strategy for achieving those goals, leaving those decisions to the individual nations. A group of researchers led by Brian Walsh of the International Institute for Applied Systems Analysis in Austria set about to plot through computer modeling a realistic pathway to achieving those goals. Their conclusion: “We find that, barring unforeseen and transformative technological advancement, anthropogenic emissions need to peak within the next 10 years, to maintain realistic pathways to meeting the COP21 emissions and warming targets. Fossil fuel consumption will probably need to be reduced below a quarter of primary energy supply by 2100 and the allowable consumption rate drops even further if negative emissions technologies remain technologically or economically unfeasible at the global scale.”* As Tim Radford of *Climate News Network* notes, fossil fuel consumption now represents 95% of global energy supply. At the same time that we reduce fossil fuel consumption to 25%, humans must stop clearing forests and restore them, to serve as carbon sinks. “Once achieved, this would mean a 42% drop in cumulative emissions by the century’s end – compared to the notorious “business as usual” scenario. But to make this happen would require a global economy in which wind, solar and bio-energy output increase by 5% a year, and carbon emissions peak by 2022. Unless humans find some way of actively taking carbon dioxide out of the atmosphere, that would deliver a final temperature rise of 2.5°C, well above the Paris target. If the peak comes at the end of the century, that commits the world to a 3.5°C rise.”**

*Brian Walsh and coauthors, “Pathways for balancing CO₂ emissions and sinks,” *Nature Communications* 8, Article number: 14856, April 13, 2017, <https://www.nature.com/articles/ncomms14856>

**Tim Radford, “Next decade critical for climate targets,” *Climate News Network*, May 2, 2017, <http://climatenewsnetwork.net/next-decade-critical-climate-targets/>

2017 (April)

Despite lack of leadership in government, the nation’s largest companies are maintaining and somewhat expanding carbon reduction policies

A report from World Wildlife Fund, Calvert Investments, CDP and Ceres finds nearly half of Fortune 500 companies—48 percent—have at least one climate or clean energy target, up five percent from an earlier 2014 report. Key findings include: “Nearly 80,000 emission-reducing projects by 190 Fortune 500 companies reporting data showed nearly \$3.7 billion in savings in 2016 alone,” and “The annual emission reductions from these efforts are equivalent to taking 45 coal-fired power plants offline for one year.”*

*World Wildlife Fund, “Power Forward 3.0: How the largest US companies are capturing business value while addressing climate change,” April 25, 2017, <https://www.worldwildlife.org/publications/power-forward-3-0-how-the-largest-us-companies-are-capturing-business-value-while-addressing-climate-change>

2017 (April)

President Trump signs an Executive Order to expand offshore drilling in the Arctic and Atlantic Oceans, and to assess whether drilling can take place in marine sanctuaries in the Pacific and Atlantic

The order, “ Implementing an America-First Offshore Energy Strategy,” seeks, among other actions, to rescind President Obama’s action in December permanently withholding areas of the Arctic and the Atlantic from oil and gas development.* In signing the Order, Trump commented, “We can’t spend too much time talking about drilling in the Arctic, right? And we’re opening it up.” Notes the *Washington Post*: “Still, even Trump administration officials said it would take years to rewrite federal leasing plans and open up these areas to drilling. And global energy prices may deter investors from moving ahead with additional drilling in the Arctic Ocean in the near term, despite the effort to make more areas eligible for development.” The response from Kristen Miller, interim executive director of the Alaska Wilderness League: “In no point in history has a president challenged another administration’s permanent withdrawals. Trump’s action could set a dangerous precedent, which will only undermine the powers of the office of the president.” And from Jamie Williams, president of the Wilderness Society, regarding drilling in the Arctic: “the chance of a tragic spill in those remote, icy waters is simply too high, and the impacts to marine life and the pristine coastal plain of the Arctic National Wildlife Refuge could be devastating.”**

*The White House, Presidential Executive Order Implementing an America-First Offshore Energy Strategy, April 28, 2017, <https://www.whitehouse.gov/the-press-office/2017/04/28/presidential-executive-order-implementing-america-first-offshore-energy>

**Juliet Eilperin, “Trump signs executive order to expand drilling off America’s coasts: ‘We’re opening it up.’” *The Washington Post*, April 28, 2017, <https://www.washingtonpost.com/news/energy-environment/wp/2017/04/28/trump-signs-executive-order-to-expand-offshore-drilling-and-analyze-marine-sanctuaries-oil-and-gas-potential/>

2017 (April)

Hours before the Climate March on Washington, the Environmental Protection Agency removes its websites related to climate science and policy

The *Washington Post* reports that “The change was approved by [EPA Administrator Scott] Pruitt, according to an individual familiar with the matter who spoke on the condition of anonymity to discuss internal deliberations, to avoid a conflict between the site’s content and the policies the administration is now pursuing.” Gone is the information related to the Clean Power Plan, as well as sites explaining climate science and the impacts of climate change which have been maintained by the EPA for nearly two decades. Some of the deleted language: “Recent climate changes, however, cannot be explained by natural causes alone. Research indicates that natural causes do not explain most observed warming, especially warming since the mid-20th century. Rather, it is extremely likely that human activities have been the dominant cause of that warming.” On March 9, Pruitt had argued on CNBC that “measuring with precision human activity on the climate is something very challenging to do and there’s tremendous disagreement about the degree of impact, so no, I would not agree that it’s a primary contributor to the global warming that we see.”* In an op-ed in *The Washington Post*, Jason Samenow, a meteorologist who had maintained the EPA’s climate science website for five years, writes that the removal of the climate science website “signifies a declaration of war on climate science by EPA Administrator Scott Pruitt. There can be no other interpretation:” “Some 20 years in the making, the breadth and quality of the website’s content was remarkable. It lasted through Democratic and Republican administrations, partly because its information mirrored the findings of the mainstream scientific community, including the National Academy of Sciences… In its heyday in the early 2000s, if you Googled “climate change” or “global warming,” the EPA’s site was the first hit. The site not only presented climate science , it was also a portal to data on warming’s effects and greenhouse gas emissions, along with guidance and tools to help people, municipalities and states reduce their carbon footprints. It included a vibrant kids’ site treasured by educators, featuring interactive teaching tools and videos, which was also taken down.”**

*Chris Mooney and Juliet Eilperin, “EPA website removes climate science site from public view after two decades,” *The Washington Post*, April 29, 2017, https://www.washingtonpost.com/news/energy-environment/wp/2017/04/28/epa-website-removes-climate-science-site-from-public-view-after-two-decades/?utm_term=.5ed4791c7020

**Jason Samenow, “I worked on the EPA’s climate change website; its removal is a declaration of war,” *The Washington Post*, June 22, 2017, https://www.washingtonpost.com/outlook/i-worked-on-the-epas-climate-change-website-its-removal-is-a-declaration-of-war/2017/06/22/735f0858-5697-11e7-a204-ad706461fa4f_story.html?utm_term=.1b4290dc9ff8; see also, Juliet Eilperin, “The EPA just buried its climate change website for kids,” *The Washington Post*, May 6, 2017, https://www.washingtonpost.com/news/energy-environment/wp/2017/05/06/epa-buries-climate-change-site-for-kids/?utm_term=.6ef516baac1c

2017 (May)

The Environmental Protection Agency’s fiscal year 2018 budget proposal cuts science and technology spending by more than \$282 million, almost a 40 percent reduction. The Greenhouse Gas Reporting Program is zeroed out; air and energy research are cut by 66 percent

Three EPA administrators from prior Republican administrations, William D. Ruckelshaus, Lee M. Thomas and William K. Reilly, write an op-ed in the *Washington Post* declaring that the Trump Administration budgetary proposal “is putting us on a dangerous path.” After describing

President Reagan's successful efforts to address the threats to the ozone layer through international lawmaking, the former administrators write, "Today, presented with the undeniable warming of the planet, we are faced with a global environmental threat whose potential harm to people and other living things exceeds any we have seen before... Yet...this week's final 2018 budget plan say[s] we should look the other way; [President Trump] has chosen ignorance over knowledge. The need for extensive and accelerated scientific research about the nature of the problem and its possible policy solutions should be beyond question. Not to get more information is inexcusable. Trump's budget proposals have scrubbed every agency and department of expenditures that would provide us with vital information about the pace and impacts of climate change. Among those severely cut or eliminated altogether are programs in the departments of Energy, State, Interior and Homeland Security, and at the National Science Foundation, National Oceanic and Atmospheric Administration, NASA, and EPA."*

* William D. Ruckelshaus, Lee M. Thomas and William K. Reilly, "Three Republican EPA administrators: Trump is putting us on a dangerous path," *The Washington Post*, May 26, 2017, https://www.washingtonpost.com/opinions/three-republican-epa-administrators-trump-is-putting-us-on-a-dangerous-path/2017/05/26/10060ad2-424b-11e7-9869-bac8b446820a_story.html?utm_term=.990696c4d5e7

2017 (May)

The monthly average of carbon dioxide concentration measured in the atmosphere at Mauna Loa Observatory reaches a record high of nearly 410 parts per million

As Joe Romm writes in *ThinkProgress*, "now CO₂ levels have surpassed those seen not just during modern civilization, but during all of human evolution. Indeed, current levels haven't been seen for many millions of years." In addition to the impact of fossil fuel emissions on spiking CO₂ levels, scientists suspect that warming and melting permafrost is releasing significant CO₂. The Earth's permafrost "contains twice as much carbon as the atmosphere does today." Romm adds, "The last time the Earth sustained CO₂ levels near the 400 ppm range, a few million years ago, the Arctic was 14°F warmer, and 'the West Antarctic Ice sheet did not exist,' according to a 2013 study in the journal *Science*. Sea levels were about 80 feet higher." "That's why," Romm concludes, "a rational and moral society would be scrambling to strengthen [the] Paris [Agreement], not destroy it."

*Joe Romm, "7 reasons to be alarmed by record-setting levels of CO₂," *ThinkProgress*, June 6, 2017, <https://thinkprogress.org/record-setting-levels-of-co2-3acbbdbf0a6>, quoting from Julie Brigham-Grette and coauthors, "Pliocene Warmth, Polar Amplification, and Stepped Pleistocene Cooling Recorded in NE Arctic Russia," *Science* Vol. 340, Issue 6139, June 21, 2013, <http://science.sciencemag.org/content/340/6139/1421>

2017 (May)

In an unexpected setback for the fossil fuel industry, the Senate rejects a move to override President Obama's regulation on methane emissions from drilling on public lands

The Congressional Review Act allows Congress to override any regulation by a federal agency within sixty days of its going into effect, and, even more consequently, provides that any regulation that is "substantially similar" may not be enacted any time in the future without Congressional approval. This legislation had only been used once since its enactment in 1996,

until the election of Donald Trump with a Republican majority in both Houses of Congress. Congress quickly proceeded to override more than a dozen Obama administration regulations,* but hit a roadblock on the regulation designed to reduce fugitive methane emissions from oil and gas facilities on public lands [see 2016 (November)]. Override of the regulation which would have prevented an estimated 180,000 tons of methane leaks annually from oil and gas facilities on public lands was approved by the House, but fell three votes short in the Senate, with a vote of 49 to 51. Republicans Lindsey Graham of South Carolina, Susan Collins of Maine and John McCain of Arizona vote against the measure, as does Independent Senator Angus King of Maine. Senator McCain says that "While I am concerned that the BLM [Bureau of Land Management] rule may be onerous, passage of the resolution would have prevented the federal government, under any administration, from issuing a rule that is 'similar,' according to the plain reading of the Congressional Review Act. I believe that the public interest is best served if the Interior Department issues a new rule to revise and improve the BLM methane rule."** Senator Collins state that "Reducing harmful air pollutants— including emissions of methane, a major climate driver — is important for public health and the environment...There is no doubt that climate change poses a significant threat to public health as well as our state's natural resources economy, from our working forests, fishing, and agricultural industries, to tourism and recreation."***

*Brian Naylor, "Republicans Are Using An Obscure Law To Repeal Some Obama-Era Regulations," *National Public Radio*, April 9, 2017, <http://www.npr.org/2017/04/09/523064408/republicans-are-using-an-obscure-law-to-repeal-some-obama-era-regulations>

**Georgina Gustin, "GOP Fails to Kill Methane Rule in a Capitol Hill Defeat for Oil and Gas Industry," *Insideclimate News*, May 10, 2017, <https://insideclimatenews.org/news/10052017/methane-climate-rule-oil-gas-flaring-congress-vote-rejec>

***Bangor Daily News Editorial Board, "Three Republicans stopped a methane rule rollback. They must continue to buck Trump," May 13, 2017, <http://bangordailynews.com/2017/05/13/opinion/editorials/three-republicans-stopped-a-methane-rule-rollback-they-must-continue-to-buck-trump/>

2017 (May)

A study finds that sea level is rising three times as fast as before 1990

As the *Washington Post* reports, the study, by Sonke Dangendorf of the University of University of Siegen and coauthors, published in the *Proceedings of the National Academies of Sciences*, "isn't the first to find that the rate of rising seas is itself increasing — but it finds a bigger rate of increase than in past studies. The new paper concludes that before 1990, oceans were rising at about 1.1 millimeters per year, or just 0.43 inches per decade. From 1993 through 2012, though, it finds that they rose at 3.1 millimeters per year, or 1.22 inches per decade." Dangendorf explains that sea level rise for most of the 20th century was caused by the melting of glaciers and the expansion of warming seawater, but in the 21st century sea level rise is accelerated by melting ice sheets of Greenland and Antarctica.*

*Chris Mooney, "Scientists say the pace of sea level rise has nearly tripled since 1990," *The Washington Post*, May 22, 2017, https://www.washingtonpost.com/news/energy-environment/wp/2017/05/22/scientists-say-the-rate-of-sea-level-rise-has-nearly-tripled-since-1990/?utm_term=.780139663f82; Sonke Dangendorf and coauthors, "Reassessment of 20th century global mean sea level rise," *Proceedings of the National Academies of Sciences*, Vol. 114, no. 23, June 6, 2017, <http://www.pnas.org/content/114/23/5946>

2017 (June)

President Trump announces that the United States will withdraw from the Paris Climate Agreement

Stephen Bannon and the anti-globalist, climate denying contingent of White House advisors trump the personal entreaties of Al Gore, Leonardo DiCaprio, Pope Francis, Ivanka Trump, Rex Tillerson, European Union heads of state and many others. Oblivious to the fact that the emissions standards under the Agreement are voluntary, subject to revision, and entail no penalties for noncompliance, the President calls the deal “draconian,” imposing unfair standards on American companies and employees. “At what point does America get demeaned? At what point do they start laughing at us as a country?” Trump says. “We don’t want other leaders and other countries laughing at us anymore. And they won’t be.” The *New York Times* observes that “Mr. Trump’s decision to abandon the agreement for environmental action signed by 195 nations is a remarkable rebuke to heads of state, climate activists, corporate executives and members of the president’s own staff, who all failed to change his mind with an intense, last-minute lobbying blitz. The Paris agreement was intended to bind the world community into battling rising temperatures in concert, and the departure of the Earth’s second-largest polluter is a major blow,”* and its editorial board calls the withdrawal “disgraceful.”** *Wall Street Journal* headlines declare: “U.S. Climate Pivot Puts a Reluctant China in Driver’s Seat: Trump’s withdrawal from Paris accord gives China a new opening to exert sway on a big global issue” *** Some find a May 30 op-ed in the *Wall Street Journal* by presidential advisors H. R. McMaster and Gary Cohn as illuminating on the withdrawal decision in: “The president embarked on his first foreign trip with a cleareyed outlook that the world is not a ‘global community’ but an arena where nations, nongovernmental actors and businesses engage and compete for advantage.” Writes David Brooks in *The New York Times*: “That sentence is the epitome of the Trump project. It asserts that selfishness is the sole driver of human affairs.”**** Al Gore’s statement on the withdrawal declares that “Removing the United States from the Paris Agreement is a reckless and indefensible action. It undermines America’s standing in the world and threatens to damage humanity’s ability to solve the climate crisis in time. But make no mistake: if President Trump won’t lead, the American people will. Civic leaders, mayors, governors, CEOs, investors and the majority of the business community will take up this challenge. We are in the middle of a clean energy revolution that no single person or group can stop. President Trump’s decision is profoundly in conflict with what the majority of Americans want from our president; but no matter what he does, we will ensure that our inevitable transition to a clean energy economy continues.”***** Former Treasury Secretary Lawrence Summers states that “We may have our first post-rational president,” and that “It is possible that last week will be remembered as a hinge in history — a moment when the United States and the world started moving on a path away from the peace, prosperity and stability that have defined the past 75 years.”***** The Yale Program on Climate Change Communication reports that US voters favor staying in the Paris Agreement by a margin of 5 to 1, and that half of Trump voters support staying in, with fewer than 3 in 10 saying we should *not* stay in.***** The formal process of withdrawal will likely take four years, and not be final until after the 2020 presidential election.

*Michael Shear, “Trump Will Withdraw U.S. From Paris Climate Agreement,” *The New York Times*, June 1, 2017, <https://www.nytimes.com/2017/06/01/climate/trump-paris-climate-agreement.html>

**Editorial Board, “Our Disgraceful Exit From the Paris Accord,” *The New York Times*, June 1, 2017, <https://www.nytimes.com/2017/06/01/opinion/trump-paris-climate-change-agreement.html>

***Brian Spegele and Te-Ping Chen, “U.S. Climate Pivot Puts a Reluctant China in Driver’s Seat,” *The Wall Street Journal*, June 2, 2017, <https://www.wsj.com/articles/u-s-climate-pivot-puts-a-reluctant-china-in-drivers-seat-1496380249>

****David Brooks, “Donald Trump Poisons the World,” *The New York Times*, June 2, 2017, <https://www.nytimes.com/2017/06/02/opinion/donald-trump-poisons-the-world.html>

*****The Climate Reality Project, Statement by Former Vice President Al Gore on Today’s Decision by the Trump Administration to Withdraw from the Paris Agreement, June 1, 2017, <https://www.climaterealityproject.org/press/statement-al-gore-us-commitment-paris-agreement>

*****Lawrence Summers, “After 75 years of progress, was last week a hinge in history?” *The Washington Post*, June 4, 2017, https://www.washingtonpost.com/opinions/after-75-years-of-progress-was-last-week-a-hinge-in-history/2017/06/04/2085b91e-47cf-11e7-bcde-624ad94170ab_story.html?utm_term=.7ccf9ee984ec

*****Jennifer Marlon and coauthors, “Majorities of Americans in Every State Support Participation in the Paris Agreement,” Yale Program on Climate Change Communication, May 8, 2017, http://climatecommunication.yale.edu/publications/paris_agreement_by_state/

2017 (June)

President Trump announces that the United States will “terminate” payments into the Green Climate Fund; the former U.S. representative to the Fund writes that “Nearly everything Trump said about the Green Climate Fund to justify his decision was wrong or misleading”

Matthew J. Kotchen, a professor of economics at Yale University who served as the deputy assistant secretary of energy and the environment at the U.S. Department of the Treasury in 2013, writes in *The Washington Post* that the President’s decision “reverses decades of bipartisan agreement on the need for climate-related assistance to developing countries,” strongly supported by both Presidents G.H.W. Bush and G.W. Bush. Professor Kotchen’s response to some of Trump’s assertions: Trump: the Green Climate Fund “calls for developed countries to send \$100 billion to developing countries.” In fact, 37 developed countries plus the European Union agreed to “mobilize” “a combined \$100 billion in climate finance to developing countries by 2020. But that money is intended to come from both the private and public sectors. The Green Climate Fund is only one of many potential sources, most of which are aimed at using public money to leverage much larger pools of private sector investment. In 2016, the combined flows from all the developed countries were already at \$66.8 billion.” Trump: the Fund is “costing the United States a vast fortune.” In reality, “the United States has contributed to date \$1 billion out of a total pledge of \$3 billion. Which is to say that what we’ve spent so far amounts to about .026 percent of the annual federal budget.... [W]hile the United States is the largest contributor in absolute dollars, on a per capita basis, the U.S. pledge ranks 11th among the 45 contributing countries, and as a fraction of gross domestic product, the United States ranks 32nd. Every country with an official pledge has made a contribution, and nearly all have already paid a larger share of their total pledge than the United States.”*

*Matthew J. Kotchen, “Trump will stop paying into the Green Climate Fund. He has no idea what it is.” *The Washington Post*, June 2, 2017, https://www.washingtonpost.com/posteverything/wp/2017/06/02/trump-will-stop-paying-into-the-green-climate-fund-he-has-no-idea-what-it-is/?utm_term=.b7be2b3a2d57

2017 (June)

World leaders respond with disapproval and resolve to President Trump's announced withdrawal from the Paris Climate Agreement

As *Al Jazeera* reports, "The leaders of Germany, France and Italy issued a joint statement, saying the "Paris Agreement remains a cornerstone in the cooperation" between the three countries. They also dismissed Trump's claim that the agreement could be renegotiated.

'We deem the momentum generated in Paris in December 2015 irreversible and we firmly believe that the Paris Agreement cannot be renegotiated, since it is a vital instrument for our planet, societies and economies,' their statement added. French President Emmanuel Macron also said in a televised statement that 'there is no plan B' on climate because 'there is no planet B'." Macron also tweets, "Make our planet great again."*

**Al Jazeera News*, "World reacts to Trump's Paris climate accord withdrawal," June 2, 2017, <http://www.aljazeera.com/news/2017/06/170602051722262.html>

2017 (June)

The EPA issues a 90 day stay of the Obama administration's standards for reducing fugitive emissions of methane in the oil and gas sector, and the stay is promptly vacated in environmentalists' appeal to the D.C. Court of Appeals

The EPA not only issues a 90 day stay of the regulations designed to control methane emissions from the oil and gas sector [See 2016 (May)] on June 5, * but also announces that it "is proposing a two-year stay of the fugitive emissions, pneumatic pump and professional engineer certification requirements in the rule while the agency reconsiders them."** In a 2 to 1 ruling in a lawsuit brought by the Clean Air Council and five other environmental organizations, the District of Columbia Court of Appeals holds that the Trump administration can reconsider the Obama era rules, but cannot stay them without following the procedures of the Administrative Procedures Act for publishing notice of the proposed changes, the reasons for the changes and a regulatory impact analysis, and soliciting and reviewing public comment on their proposal. The court holds that the EPA's decision to stay the methane rule is "arbitrary and capricious – that is, unlawful..." The court concludes that each of the four reasons asserted by the EPA for justifying the stay, on the grounds that the regulated industries did not have adequate notice and opportunity to comment when the original Obama rules were developed, are "inaccurate and thus unreasonable."*** The *Washington Post* quotes Harvard Law professor Richard Lazarus as opining that "The court's ruling is yet another reminder, now in the context of environmental protection, that the federal judiciary remains a significant obstacle to the president's desire to order immediate change... The D.C. Circuit's ruling today makes clear that neither the president nor his EPA administrator, Scott Pruitt, can by fiat unilaterally and instantaneously repeal or otherwise stay the effectiveness of the environmental protection rules put into place during the Obama administration... Changing the rules midstream can occur only after a thorough administrative review, including public notice and opportunity to comment, that ensures that there are good reasons for the change, backed up by sound policy and science." The *Washington Post* notes that "The ruling could affect myriad agencies that have delayed the Obama administration's regulations, some for long periods."****

*U.S. Environmental Protection Agency, Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources; Grant of Reconsideration and Partial Stay, 82 Fed. Reg. 25730, June 5, 2017,

<https://www.federalregister.gov/documents/2017/06/05/2017-11457/oil-and-natural-gas-sector-emission-standards-for-new-reconstructed-and-modified-sources-grant-of>

** U.S. Environmental Protection Agency, Actions and Notices about Oil and Natural Gas Air Pollution Standards, June 12, 2017, <https://www.epa.gov/controlling-air-pollution-oil-and-natural-gas-industry/actions-and-notices-about-oil-and-natural-gas>

***Clean Air Council v. E. Scott Pruitt, U.S. Court of Appeals for the District of Columbia Circuit, No. 17-1145, On Emergency Motion For A Stay Or, In the Alternative, Summary Vacatur, July 3, 2017,

[https://www.cadc.uscourts.gov/internet/opinions.nsf/A86B20D79BEB893E85258152005CA1B2/\\$file/17-1145-1682465.pdf](https://www.cadc.uscourts.gov/internet/opinions.nsf/A86B20D79BEB893E85258152005CA1B2/$file/17-1145-1682465.pdf)

****Juliet Eilperin and Steven Mufson, “Federal court blocks Trump EPA on air pollution,” *The Washington Post*, July 3, 2017, https://www.washingtonpost.com/politics/federal-court-blocks-trump-epa-on-air-pollution/2017/07/03/464a7344-601e-11e7-84a1-a26b75ad39fe_story.html?utm_term=.77526981d619

2017 (June)

Senator Al Franken questions U.S. Secretary of Energy chief Rick Perry about climate science in a Senate budget hearing; Perry is flabbergasted when Franken states that “humans are entirely the cause” of recent warming

Perry’s response is “I don’t believe it” and “I don’t buy it.” And when Franken reminds him this was the conclusion of a team of climate science skeptics funded by no less than the Koch Brothers [see 2011 (October), 2013 (January)], Perry raises his voice and says: “To stand up and say that 100 percent of global warming is because of human activity, I think on its face, is just indefensible.” As Joe Romm of *ThinkProgress* responds: “Perry is so used to denying the overwhelming consensus that humans are responsible for most recent warming, he simply couldn’t get his head around the fact that scientists’ best estimate is humans are actually responsible for all recent warming. Franken, I think, has hit on a winning message—one that is also factually accurate, as the latest scientific literature makes clear.”*

*Joe Romm, “Al Franken just set climate deniers’ last strawman on fire,” *ThinkProgress*, June 28, 2017, <https://thinkprogress.org/al-franken-is-right-humans-are-entirely-the-cause-of-recent-warming-ddda0077308a>

2017 (June)

UNESCO’s World Heritage Centre releases a first global assessment of the threats to World Heritage-designated coral reefs from climate change, finding “reefs likely to disappear by 2100 unless CO₂ emissions drastically reduce”

As the press release on the report explains, “Bleaching is a stress response that causes coral animals to expel the microscopic algae (*zooxanthellae*) whose photosynthesis provides the energy needed to build three-dimensional reef structures. Mass bleaching is caused by rising water temperatures associated with climate change.” Over the last three years, record high ocean temperatures have damaged 21 of the 29 World Heritage reefs, causing extensive bleaching across the globe, from the Great Barrier Reef in Australia to the Papahānaumokuākea reefs in Hawaii. The conclusions of the World Heritage Centre assessment are that “delivering on the Paris Agreement target of ‘holding the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to

1.5°C’ offers the only opportunity to prevent coral reef decline globally, and across all 29 reef-containing natural World Heritage sites.”* The report follows upon and is consistent with the conclusions of a study of bleaching of the Great Barrier Reef in 2015-16, published in the journal *Nature*, by Terry Hughes of the Australian Research Council Centre of Excellence for Coral Reef Studies and coauthors. The study concluded that neither local measures to reduce fishing pressure or improve water quality, nor the corals’ ability to adapt over time to increased ocean temperatures, were likely to save the reefs: “Water quality and fishing pressure had minimal effect on the unprecedented bleaching in 2016, suggesting that local protection of reefs affords little or no resistance to extreme heat. Similarly, past exposure to bleaching in 1998 and 2002 did not lessen the severity of bleaching in 2016. Consequently, immediate global action to curb future warming is essential to secure a future for coral reefs.”**

*UNESCO press release, “Assessment: World Heritage coral reefs likely to disappear by 2100 unless CO₂ emissions drastically reduce,” June 23, 2017, <http://whc.unesco.org/en/news/1676/>

**Terry Hughes and coauthors, “Global warming and recurrent mass bleaching of corals” *Nature* 543, 373-377 (March 16, 2017), <https://www.nature.com/nature/journal/v543/n7645/full/nature21707.html>

2017 (June)

An analysis of satellite data measuring temperatures over time in the lower troposphere finds 36% faster warming since 1979 and nearly 140% faster warming since 1998 than the previous analysis in 2009

The analysis is performed by scientists at Remote Sensing Systems (RSS) in California, one of two groups producing satellite temperature records globally, and is published in the *Journal of Climate*. In this analysis, the researchers make adjustments to take into account the “drift” of satellites in their orbits over time, which results in temperature readings not being taken at the same time each day. Adjusting results to compensate for skewed readings from drift yields substantially higher temperature readings, particularly in the period after 2000. These results refute claims of a 15 year “hiatus” in surface air temperature rise after 1998. As CarbonBrief explains, “Climate sceptics have long claimed that satellite data shows global warming to be less pronounced than observational data collected on the Earth’s surface. This new correction to the RSS data substantially undermines that argument. The new data actually shows more warming than has been observed on the surface, though still slightly less than projected in most climate models.” *

*Zeke Hausfather, “Major correction to satellite data shows 140% faster warming since 1998,” *CarbonBrief*, June 30, 2017, <https://www.carbonbrief.org/major-correction-to-satellite-data-shows-140-faster-warming-since-1998>; Carl Mears and Frank Wenz, “A satellite-derived lower tropospheric atmospheric temperature dataset using an optimized adjustment for diurnal effects,” *American Meteorological Society Journal of Climate*, June 26, 2017, <http://journals.ametsoc.org/doi/abs/10.1175/JCLI-D-16-0768.1>

2017 (June)

Researchers estimating the economic impacts of climate change in the United States through the end of the century find dramatic disparities from region to region, with the South exposed to as much as a 20% decline in G.D.P.

Writing in the journal *Science*, Solomon Hsiang of the University of California at Berkeley and coauthors estimate, on a county by county basis, the combined value of market and nonmarket damage across sectors of U.S. agriculture, crime, coastal storms, energy, human mortality, and labor, as a function of increased temperature. They estimate that as a national average increasing temperatures will cost “roughly 1.2% of gross domestic product per +1° C,” but that “[i]mportantly risk is distributed unequally across locations, generating a large transfer of value northward and westward that increases economic inequality. By the late 21st century, the poorest third of counties are projected to experience damages between 2 and 20% of county income...under business-as usual emissions [no carbon reduction policies].”* As summarized in the *New York Times*, “The greatest economic impact would come from a projected increase in heat wave deaths as temperatures soared, which is why states like Alabama and Georgia would face higher risks while the cooler Northeast would not. If communities do not take preventative measures, the projected increase in heat-related deaths by the end of this century would be roughly equivalent to the number of Americans killed annually in auto accidents. Higher temperatures could also lead to steep increases in energy costs in parts of the country, as utilities may need to overbuild their grids to compensate for heavier air-conditioning use in hot months. Labor productivity in many regions is projected to suffer, especially for outdoor workers in sweltering summer heat. And higher sea levels along the coasts would make flooding from future hurricanes far more destructive.”**

*Solomon Hsiang and coauthors, “Estimating economic damage from climate change in the United States,” *Science*, Vol. 356, Issue 6345, June 30, 2017, <http://science.sciencemag.org/content/356/6345/1362.full>

**Brad Plumer and Nadja Popovich, “As Climate Changes, Southern States Will Suffer More Than Others,” *The New York Times*, June 29, 2017, <https://www.nytimes.com/interactive/2017/06/29/climate/southern-states-worse-climate-effects.html>

2017 (July)

An iceberg the size of Delaware breaks off from the Antarctic Ice Sheet

The iceberg weighs an estimated trillion metric tons and is one of the largest icebergs ever recorded. It results from a crack in the ice shelf 120 miles long. The remaining Antarctic ice shelf “will be at its smallest ever known size,” according to Antarctic researcher Adrian Luckman. Reports the *New York Times*: “Some climate scientists believe the warming in the region was at least in part a consequence of human-caused climate change, while others have disputed that, seeing a large role for natural variability — and noting that icebergs have been breaking away from ice shelves for many millions of years. But the two camps agree that the breakup of ice shelves in the peninsula region may be a preview of what is in store for the main part of Antarctica as the world continues heating up as a result of human activity.”*

*Jugal K. Patel and Justin Gillis, “An Iceberg the Size of Delaware Just Broke Away from Antarctica,” *The New York Times*, July 12, 2017, https://www.nytimes.com/interactive/2017/06/09/climate/antarctica-rift-update.html?emc=edit_na_20170712&nl=breaking-news&nlid=37873277&ref=headline&r=0

2017 (August)

President Trump signs an executive order rescinding President Obama's requirement that recipients of federal funds for infrastructure projects take climate change and rising sea levels into consideration in planning construction

President Trump asserts that red tape in approving federally funded projects is a “massive self-inflicted wound on our country” and that “no longer” would there be “one job-killing delay after another.” The Obama rules sought to reduce the burden on taxpayers when storms and rising sea levels damaged projects in flood prone regions.*

*Darryl Fears and Steven Mufson, “Trump to reverse Obama-era rule aimed at planning for climate change,” *The Washington Post*, August 15, 2017, https://www.washingtonpost.com/news/energy-environment/wp/2017/08/15/trump-to-reverse-obama-era-order-aimed-at-planning-for-climate-change/?utm_term=.7843e78f60fb

2017 (August)

President Trump disbands the 15-person Advisory Committee for the Sustained National Climate Assessment, which advised federal agencies, states, cities, and the private sector on concrete responses to the impacts of climate change

The Washington Post quotes Seattle Mayor Ed Murray as saying that the move to dissolve the climate advisory committee represents “an example of the president not leading, and the president stepping away from reality.”**

Juliet Eilperin, “The Trump Administration just disbanded a federal advisory committee on climate change,” *The Washington Post*, August 20, 2017, https://www.washingtonpost.com/news/energy-environment/wp/2017/08/20/the-trump-administration-just-disbanded-a-federal-advisory-committee-on-climate-change/?utm_term=.285e8527b396

2017 (August, September)

The United States and the Caribbean experience a hurricane season of unusual intensity and frequency

The New York Times quotes Bob Henson, a meteorologist for the forecasting service Weather Underground, as saying (in mid-September) that “This season has been an overachiever by almost every index... We’ve had more than a year’s worth of named storms when you look at the long-term average, and that’s being just past the midpoint of the season.” Four of those storms, Harvey, Irma, Jose and Maria reach Category 3 or higher, the threshold for a major hurricane on the Saffir-Simpson scale. The *Times* adds the caveat that “the phrase ‘above average’ loses some of its significance when 10 of the 15 most active hurricane seasons since antebellum America have occurred in the past two decades.”* The National Weather Service tweets that Hurricane Harvey, which dumped at least 20 inches of rain over an area of 29,000 square miles, and 60 inches in some areas,** is “unprecedented & all impacts are unknown & beyond anything experienced.”*** President Trump tweets: “Wow - Now experts are calling [#Harvey](#) a once in 500 year flood!”**** It is in fact classified as a once in 1000 year flood.** Stamford professor of earth science systems Noah Dieffenbaugh opines in the *Times* that “Hurricane Harvey Was No Surprise:” “Climate science has repeatedly shown that global warming is increasing the odds of extreme precipitation and storm surge flooding.

Refusing to acknowledge this impairs our ability to prepare for future extreme weather and endangers American lives and property. .. Refusing to account for climate change is an expensive proposition. We won't know the full costs of Hurricane Harvey for some time. But extreme weather causes billions of dollars of damage in the United States each year. The number of these events and their costs have been increasing, with the toll over the last decade exceeding \$250 billion. And that number doesn't include the full humanitarian and ecological destruction left in their wake." ***** The 2017 hurricane season is the costliest in U.S. history, costing over \$200 billion.***** An EPA spokesperson accuses climate scientists of trying to "politicize" Hurricane Harvey, and EPA chief Scott Pruitt states that it is "very, very insensitive to this people in Florida" to focus on the [climate related] cause of Hurricane Irma. *Washington Post* opinion writer Eugene Robinson responds: "No rational U.S. administration would look at the devastation from Hurricanes Harvey and Irma and seek to deny climate change. At present, however, there is no rational U.S. administration."*****

*Maggie Astor, "The 2017 Hurricane Season Really Is More Intense Than Normal," The New York Times, September 19, 2017, <https://www.nytimes.com/2017/09/19/us/hurricanes-irma-harvey-maria.html?emc=eta1>

**Jason Samenow, "60 inches of rain fell from Hurricane Harvey in Texas, shattering U.S. storm record," The Washington Post, September 22, 2017, https://www.washingtonpost.com/news/capital-weather-gang/wp/2017/08/29/harvey-marks-the-most-extreme-rain-event-in-u-s-history/?utm_term=.00aa30b64f12; Jason Samenow, "Harvey is a 1,000-year flood event unprecedented in scale," The Washington Post, August 31, 2017, https://www.washingtonpost.com/news/capital-weather-gang/wp/2017/08/31/harvey-is-a-1000-year-flood-event-unprecedented-in-scale/?tid=a_inl&utm_term=.5ab5eaac04e4

***<https://twitter.com/NWS/status/901832717070983169>

****<https://twitter.com/realDonaldTrump/status/901797906046439426>

*****Noah S. Dieffenbaugh, "Hurricane Harvey Was No Surprise," The New York Times, August 28, 2017, <https://www.nytimes.com/2017/08/28/opinion/hurricane-harvey-global-warming.html>

*****Bryan K. Sullivan, "The Most Expensive U.S. Hurricane Season Ever: By the Numbers," Bloomberg, November 26, 2017, <https://www.bloomberg.com/news/articles/2017-11-26/the-most-expensive-u-s-hurricane-season-ever-by-the-numbers>

*****Valerie Volcovski, "EPA says climate scientists trying to 'politicize' Texas storm," Reuters, August 29, 2017, https://www.reuters.com/article/us-storm-harvey-climatechange/epa-says-climate-scientists-trying-to-politicize-texas-storm-idUSKCN1B92V0?utm_medium=email&utm_source=actionkit; Lisa Friedman, "Hurricane Irma Linked to Climate Change? For Some, a Very 'Insensitive' Question," The New York Times, September 11, 2017, https://www.nytimes.com/2017/09/11/climate/hurricane-irma-climate-change.html?_r=0; Eugene Robinson, "The crudest insult to Harvey and Irma's victims," The Washington Post, September 11, 2017, https://www.washingtonpost.com/opinions/the-cruelest-insult-to-harvey-and-irmas-victims/2017/09/11/60e54caa-9715-11e7-82e4-f1076f6d6152_story.html?utm_term=.a049bea33ca1

2017 (October)

The EPA announces a proposed rule to repeal the Clean Power Plan greenhouse gas emissions regulations for existing power plants

The EPA states that it has concluded that the Clean Power Plan (CPP) "exceeds the EPA's statutory authority." It is not forthcoming on the content of any replacement rulemaking: "EPA has not determined the scope of any potential rule...to regulate greenhouse gas emissions from existing [power plants], and, if it will issue such a rule, when it will do so and what form that rule will take." The repeal is motivated by "substantial concerns that the CPP would necessitate changes to a state's energy policy, such as a grid-wide shift from coal-fired to natural gas-fired generation, and from fossil fuel generation to renewable generation," and the interpretation that the EPA may only regulate on-site technologies under the Clean Air Act, not the energy mix. In an important footnote to the proposed rule, the EPA states that it is *not* seeking to rescind the Obama Administration's 2009 "endangerment finding" determining that greenhouse gas production "may be reasonably anticipated to endanger public health and welfare" [see 2009 (December)]: "The substance of the 2009 Endangerment Finding is not at issue in this

proposed rulemaking, and we are not soliciting comment on the EPA's assessment of the impacts of GHGs with this proposal.”* In a follow-up action on December 18, 2017, the EPA issues an Advance Notice of Proposed Rulemaking (ANPRM) to “solicit information from the public about a potential future rulemaking to limit greenhouse gas emissions from existing electric utility generating units.”** An editorial in the *Bangor Daily News* comments:

“Despite the outcry from the fossil-fuel industry and the legal challenges, led by Pruitt when he was attorney general of Oklahoma, the Clean Power Plan was far from draconian. Half the states are on track to surpass the Clean Power Plan’s 2030 targets, according to an analysis by the Rhodium Group. Maine and the eight other northeastern states that participate in the Regional Greenhouse Gas Initiative... are among them... [W]hile states like Maine could easily comply with the plan’s targets, it still would be harmed by other states’ slow progress in reducing emissions. Gutting the Clean Power Plan simply puts off action that is needed to avert much worse climate disasters than we are already experiencing.”***

*U.S. Environmental Protection Agency, Repeal of Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, Proposed Rule, 82 Fed. Reg. 48035, October 16, 2017, <https://www.federalregister.gov/documents/2017/10/16/2017-22349/repeal-of-carbon-pollution-emission-guidelines-for-existing-stationary-sources-electric-utility#footnote-3-p48037>

** U.S. Environmental Protection Agency, Advance Notice of Proposed Rulemaking: State Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating Units, December 18, 2017, <https://www.epa.gov/sites/production/files/2017-12/documents/anprm-state-guidelines-ghg-emissions-existing-egu.pdf>

***Editorial Board, Bangor Daily News, “Gutting the Clean Power Plan puts off steps needed to avert climate disasters,” October 16, 2017, <http://bangordailynews.com/2017/10/16/opinion/gutting-the-clean-power-plan-puts-off-the-steps-needed-to-avert-climate-disasters/>

2017 (October)

The EPA moves to purge its scientific advisory committee of scientists who receive EPA grant money, substituting representatives of industry and environmental regulators from conservative states

EPA administrator Scott Pruitt first announces his intentions to change the composition of the agency’s Scientific Advisory Board (SAB) at a meeting of the conservative Heritage Foundation: “What’s most important at the agency is to have scientific advisers that are objective, independent-minded, providing transparent recommendations...If we have individuals who are on those boards, sometimes receiving money from the agency . . . that to me causes questions on the independence and the veracity and the transparency of those recommendations that are coming our way.” He does not raise questions about the objectivity of the industry representatives whom he substitutes on the committee. The *Washington Post* quotes Terry F. Yosie, who was the advisory board’s director during the Reagan administration, as saying the changes “represent a major purge of independent scientists and a decision to sideline the SAB from major EPA decision-making in the future.”* In December, more than 1000 scientists will submit a letter to Congress protesting the EPA’s assaults on science and scientists: “Congress has long recognized that experts with the most relevant expertise who have no stake in regulatory outcomes are best positioned to provide independent scientific advice. Advisors should be selected based on scientific and technical expertise, not on the stakeholders they represent. Administrator Pruitt has fundamentally rejected this principle, further endangering the independence of the EPA. Scientists are therefore given a false choice: apply for EPA grant funding or serve your country as a science advisor. Unfortunately, the

decision to compromise the independence of science advisory panels is just one example of how science has been sidelined and politicized at the EPA. Former Republican and Democratic EPA Administrators have repeatedly expressed concern about the impact of Administrator Pruitt's actions on public health and safety.”**

*Juliet Eilperin, Brady Dennis and Chris Mooney, “In unprecedeted move, EPA to block scientists who get agency funding from serving as advisers,” *The Washington Post*, October 30, 2017, https://www.washingtonpost.com/news/energy-environment/wp/2017/10/30/in-unprecedented-shift-epa-to-prohibit-scientists-who-receive-agency-funding-from-serving-as-advisers/?utm_term=.527bc5499bcc

**December 5, 2017 letter to Chairs, Senate Environment and Public Works Committee and House Energy and Commerce Committee, <https://www.nrcm.org/wp-content/uploads/2017/12/ScientistsLetterHouseSenateScienceAdvice.pdf>

2017 (October)

The New York Times publishes a list of 60 environmental regulations that the Trump Administration has sought to roll back in its first nine months.

The Trump Administration has overturned 29 environmental guidances, rules or regulatory actions, is in the process of concluding another 24 rollbacks, and 7 proposed rollbacks are “in limbo.” The list is compiled from Harvard Law School’s [Environmental Regulation Rollback Tracker](#), Columbia Law School’s [Climate Tracker](#) and other sources.*

*Nadja Popovich, Livia Albeck-Ripka, Kendra Pierre-Louis, “60 Environmental Rules on the Way Out Under Trump,” *The New York Times*, October 5, 2017, <https://www.nytimes.com/interactive/2017/10/05/climate/trump-environment-rules-reversed.html>

2017 (November)

The Trump Administration releases the Fourth National Climate Assessment, with scientific conclusions that are starkly at odds with administration actions and policies

Mandated by the Global Climate Research Act of 1990, the report is an “authoritative assessment of the science of climate change, with a focus on the United States.” It reflects the work of hundreds of scientists in government and academia, and is peer-reviewed by the National Academy of Sciences. The Executive Summary states:

“Global annually averaged surface air temperature has increased by about 1.8°F (1.0°C) over the last 115 years (1901–2016). **This period is now the warmest in the history of modern civilization.** The last few years have also seen record-breaking, climate-related weather extremes, and the last three years have been the warmest years on record for the globe. These trends are expected to continue over climate timescales. This assessment concludes, based on extensive evidence, that it is extremely likely that **human activities, especially emissions of greenhouse gases, are the dominant cause of the observed warming since the mid-20th century.** For the warming over the last century, there is no convincing alternative explanation supported by the extent of the observational evidence. In addition to warming, many other aspects of global climate are changing, primarily in response to human activities. **Thousands of studies conducted by researchers around the world have documented changes in surface, atmospheric, and oceanic temperatures; melting glaciers; diminishing snow cover; shrinking sea ice; rising sea levels; ocean acidification; and increasing atmospheric water vapor.... The global atmospheric carbon dioxide (CO₂) concentration has now passed 400**

parts per million (ppm), a level that last occurred about 3 million years ago, when both global average temperature and sea level were significantly higher than today. Continued growth in CO₂ emissions over this century and beyond would lead to an atmospheric concentration not experienced in tens to hundreds of millions of years. There is broad consensus that the further and the faster the Earth system is pushed towards warming, the greater the risk of unanticipated changes and impacts, some of which are potentially large and irreversible.”* The *New York Times* quotes Philip B. Duffy, president of the Woods Hole Research Center: “This report has some very powerful, hard-hitting statements that are totally at odds with senior administration folks and at odds with their policies...It begs the question, where are members of the administration getting their information from? They’re obviously not getting it from their own scientists.”**

*D.J. Wuebbles and coauthors, “Climate Science Special Report: Fourth National Climate Assessment, Volume I, U.S. Global Change Research Program, Washington, D.C., 2017, pp. 12-34, <https://science2017.globalchange.gov/chapter/executive-summary/> (emphasis in original)

**Lisa Friedman and Glenn Thrush, “U.S. Report Says Humans Cause Climate Change, Contradicting Top Trump Officials,” *The New York Times*, November 3, 2017, <https://www.nytimes.com/2017/11/03/climate/us-climate-report.html>

2017 (November)

The Global Carbon Project estimates that global carbon dioxide emissions from fossil fuel burning and cement production will increase by 2% in 2017, after three years of almost no growth, with a total of 10.0 gigatonnes carbon (36.8 GtCO₂) emitted to the atmosphere, a new high

In 2016 China accounted for 28% of these emissions; the United States for 15%. Average global per capita CO₂ emissions were 4.8 tonnes (T); China’s per capita emissions were 7 T; the United States’ were 16.5 T.*

*Global Carbon Project, Global Carbon Budget, Summary Highlights 2017,
<http://www.globalcarbonproject.org/carbonbudget/17/highlights.htm>

2017 (November)

President Trump’s nominee to head the Council on Environmental Quality, Kathleen Hartnett White, has asserted that carbon dioxide, the “gas for life,” is not a harmful pollutant

White, former head of the Texas Commission on Environmental Quality and a fellow of the conservative Texas Public Policy Foundation, has written an article in *The Federalist* titled “Signing the Paris Agreement is the Worst Way to Celebrate Earth Day.” White contends that the “Paris agreement represents the first energy regression in mankind’s history,” where “accelerating a transition from fossil fuels to renewables means subsidizing and mandating a return to pre-industrial energy scarcity when the energy upon which fundamental human welfare depended was far more expensive but less efficient, versatile, and reliable.”* Amanda Lynch, a climate scientist at Brown University and head of the Institute at Brown for

Environment and Society, drafts a letter signed by 300 scientists in opposition to the nomination. Brown explains: "The thing that tipped me over the edge was her appearance before the Senate [Environment and Public Works Committee] where she just couldn't answer fundamental questions about environmental science that would affect her ability to do her job." As InsideClimate News reports on White's Committee confirmation hearing: "White seemed to question whether warm water expands, which is basic physical science. When asked if the law of thermal expansion applies to sea water ..., White replied: 'Again, I do not have any kind of expertise or even much layman study of the ocean dynamics and the climate change issues.' Asked about her understanding of fossil fuels' impact on oceans, White said: 'I have a very superficial understanding as far as that. Acidification issues are one. I have not read widely or deeply.' Asked about her previous statements that carbon dioxide is not dangerous, White said at the hearing: 'CO₂ in the atmosphere has none of the characteristics of a pollutant that contaminates and fouls and all of that that can have direct impact on human health. As an atmospheric gas, it is a plant nutrient.'"**

*Kathleen Hartnett White, "Signing the Paris Agreement is the Worst Way to Celebrate Earth Day," *The Federalist*, April 22, 2016, <https://thefederalist.com/2016/04/22/signing-the-paris-agreement-is-the-worst-way-to-celebrate-earth-day/>

**InsideClimate News, "300 Scientists Oppose Trump Nominee: 'More Dangerous Than Climate Change is Lying'" November 29, 2017, <https://insideclimatenews.org/news/28112017/kathleen-harnett-white-senate-confirmation-ceq-vote-trump-climate-change-carbon-dioxide>

2017 (December)

The UN COP 23 meeting in Bonn faces grim realities: goals too modest to achieve objectives, emissions not on track for meeting goals, and the United States bailing
A New York Times interactive demonstrates how far the commitments of the Paris Agreement are from greenhouse gas emissions cuts necessary to keep global temperatures under 2° above preindustrial levels, and notes that "no major industrialized country is currently on track to fulfill its pledge, according to new data from the [Climate Action Tracker](#)."^{*} The *Times* reports that "the office of the official American delegation at the international climate talks here is almost always closed. A sign taped to the door informs the curious that entry is for authorized staff members only." But Al Gore, Jerry Brown, a handful of Democratic Senators, and Michael Bloomberg are on hand as a "shadow delegation" at the American pavilion, funded largely by Bloomberg, to send the message that "the U.S. has not gone dark on climate action."^{**} Syria announces on the eve of the talks that it will sign the Paris Agreement, meaning that every country in the world has signed or signaled an intent to sign on, and only the U.S. has stated its intention to withdraw.^{***} Accomplishments of the meeting include a new "Powering Past Coal Alliance" of 19 nations pledging to "quickly phase out coal," which now accounts for 40% of global electricity,^{****} and progress on developing a process for nations to regularly and publicly disclose their progress toward their voluntary goals, and acknowledge failures. As *The New York Times* aptly characterizes it, the Paris Agreement "is, in effect, a giant bet on the power of peer pressure," a bet with longer odds since the United States announced its withdrawal.^{*****}

*Brad Plumer and Nadja Popovich, "Here's How Far the World Is From Meeting Its Climate Goals," *The New York Times*, November 6, 2017, https://www.nytimes.com/interactive/2017/11/06/climate/world-emissions-goals-far-off-course.html?_r=0

**Lisa Friedman, "A Shadow Delegation Stalks the Official U.S. Team at Climate Talks," *The New York Times*, November 11, 2017, <https://www.nytimes.com/2017/11/11/climate/un-climate-talks-bonn.htm>

***Jonathan Ellis, "The Bonn Climate Conference: All Our Coverage in One Place," *The New York Times*, November 13, 2017 <https://www.nytimes.com/2017/11/13/climate/bonn-climate-change-conference.html>

****Damian Carrington, “ ‘Political watershed’ as 19 countries pledge to phase out coal,” *The Guardian*, November 6, 2017,

https://www.theguardian.com/environment/2017/nov/16/political-watershed-as-19-countries-pledge-to-phase-out-coal?CMP=Share_iOSApp_Other

****Brad Plumer, “At Bonn Climate Talks, Stakes Get Higher in Gamble on Planet’s Future,” *The New York Times*, November 19, 2017, <https://www.nytimes.com/2017/11/18/climate/un-bonn-climate-talks.html>

2017 (December)

President Trump’s National Security Strategy does not characterize climate change as a threat, and suggests rather that climate change mitigation efforts threaten U.S. dominance

In stark contrast to President Obama’s 2015 National Security Strategy, which stated that rising global temperatures were an “urgent and growing threat to our national security, contributing to increased natural disasters, refugee flows, and conflicts over basic resources like food and water,” the Trump Administration’s National Security Strategy (NSS) eliminates any reference to climate change as a threat to U.S. security.* As *Breitbart News* points out, the document instead suggests that “ efforts to push a climate change agenda [are] a potential threat to national security.” The relevant passage of the NSS, with emphasis added by *Breitbart*, is: “Climate policies will continue to shape the global energy system. **U.S. leadership is indispensable to countering an anti-growth energy agenda that is detrimental to U.S. economic and energy security interests.** Given future global energy demand, much of the developing world will require fossil fuels, as well as other forms of energy, to power their economies and lift their people out of poverty.”**

*The White House, National Security Strategy of the United States, December, 2017, <https://www.whitehouse.gov/wp-content/uploads/2017/12/NSS-Final-12-18-2017-0905.pdf>; Lisa Friedman, “Planet Insecurity,” *The New York Times*, December 20, 2017, <https://www.nytimes.com/newsletters/2017/12/20/climate-change?nlid=37873277>

**Joel B. Pollak, “Trump’s National Security Strategy Suggests Climate Change Lobby Is a Threat,” *Breitbart News*, December 18, 2017, <http://www.breitbart.com/national-security/2017/12/18/trump-national-security-strategy-doesnt-ignore-climate-change-names-climate-change-lobby-threat/>

2017 (December)

China announces a national emissions trading system, the “world’s biggest ever mechanism to reduce carbon”

Years in the making, this plan will start by mandating emissions trading in the electric generating sector, then expand to other parts of the Chinese economy. *The Guardian* describes it as the “world’s biggest ever mechanism to reduce carbon.” Nathaniel Keohane, vice president at the Environmental Defense Fund, describes the plan as “a game-changer:” “This shows global leadership on the part of the Chinese government.” He suggests that this plan could allow China’s still growing emissions to peak years before its goal under the Paris Agreement of 2030.*

*Fiona Harvey, “China aims to drastically cut greenhouse gas emissions through trading scheme,” *The Guardian*, December 19, 2017, <https://www.theguardian.com/environment/2017/dec/19/china-aims-to-drastically-cut-greenhouse-gas-emissions-through-trading-scheme>

2017 (December)

More than 700 employees have left the EPA under the Trump Administration, 200 of them scientists

Few of those employees have been replaced. The Trump Administration is nearly a quarter of the way toward its goal of achieving a 20% reduction in the EPA workforce, a cut of 3,200 positions. This is after substantial cuts during the Obama Administration, due to Republican led budget cuts. During his campaign, President Trump pledged to whittle the EPA down to “little tidbits.”*

*Lisa Friedman, Marina Affo, and Derek Kravitz, “E.P.A. Officials, Disheartened by Agency’s Direction, Are Leaving in Droves,” *The New York Times*, December 22, 2017, https://www.nytimes.com/2017/12/22/climate/epa-buyouts-pruitt.html?_r=0

