



Landscape of Change by Jill Pelto

A Climate Chronology

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Foreword to *A Climate Chronology*

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The Industrial Revolution brought unprecedented innovation, manufacturing efficiency, and human progress, ultimately shaping the energy-intensive technological world that we live in today. But for all its merits, this transformation of human economies also set the stage for looming multi-generational environmental challenges associated with pollution, energy production from fossil fuels, and the development of nuclear weapons – all on a previously unimaginable global scale.

More than a century of painstaking scientific research has shown that Earth’s atmosphere and oceans are warming as a result of human activity, primarily through the combustion of fossil fuels (*e.g.*, oil, coal, and natural gas) with the attendant atmospheric emissions of carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and other greenhouse gases.* Emissions of co-pollutants, such as nitrogen oxides (NO_x), toxic metals, and volatile organic compounds, also degrade air quality and cause adverse human health impacts. Warming from greenhouse-gas emissions is amplified through feedbacks associated with water vapor, snow and sea-ice cover, and changes in atmospheric circulation. The Arctic in particular has undergone a dramatic transformation over recent decades, where temperatures have risen twice as fast as in the middle latitudes, and where late summer sea-ice extent is now on average 50% less than in the 1980s.**

We have also come to better understand natural climate variability caused by subtle changes in solar output, volcanic eruptions that eject materials that scatter sunlight, and ocean-atmosphere phenomena such as the El Niño Southern Oscillation (ENSO). Enormous strides have been made in understanding how changes in Earth’s orbital geometry and feedbacks within the climate system have periodically produced ice ages over the past two million years.

The growing body of climate science research, including sophisticated computer models of Earth’s connected atmosphere, oceanosphere, cryosphere, and biosphere, consistently indicate that climate warming driven by greenhouse-gas emissions emerged from the noisy signal of natural variability by at least the 1960s.*** Projections using these models suggest that Maine’s climate is likely to warm 2–4 °F by 2050, and up to 10 °F by 2100 depending on the trajectory of greenhouse-gas emissions controlled by humans. The warming climate also brings rising sea level, more intense storms, regional changes in precipitation and predominant weather patterns, and can facilitate the spread of vector-borne diseases. In addition to meteorological and terrestrial effects, increasing atmospheric CO₂ concentrations drive ocean acidification, which affects the function and health of marine ecosystems and fisheries.

Researchers at the Climate Change Institute and across the University of Maine community have made significant contributions to the scientific understanding of Earth’s climate and human connections – including in the fields of abrupt climate change, climate modeling, ice core proxy records, glaciology, atmospheric chemistry, acid rain, lake ecology, environmental monitoring, and anthropology in addition to effects on marine, forest, and agricultural systems. *A Climate Chronology* joins this effort by providing a comprehensive timeline of climate research, climate policy, law, and some related events in society and technology. *A Climate Chronology* also makes clear that implementation of climate solutions currently lags far behind our understanding of the situation acquired through climate science.

As highlighted in the Maine’s Climate Future reports, human-caused climate change has become the “defining environmental, economic, and social issue of the twenty-first century.”**** In keeping with the State of Maine motto, *Dirigo*, Maine has launched one of the most ambitious state plans in the nation to address both mitigation of greenhouse gas emissions and adaptation to climate change impacts already underway or expected to occur in the foreseeable future. The newly released Climate Action Plan developed by the Maine Climate Council is to be updated every four years.***** The plan has a name that underscores the urgency of responding to climate change: Maine Won’t Wait.

*IPCC (Intergovernmental Panel on Climate Change). 2014a. Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. <https://www.ipcc.ch/report/ar5/syr/>

**IPCC (Intergovernmental Panel on Climate Change). 2019b. Summary for Policymakers, IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC). <https://www.ipcc.ch/srocc/>

***Maine Climate Council, [Scientific and Subcommittee report: Scientific Assessment of Climate Change and Its Effects in Maine \(2020\)](#). See Natural Variability and Human Attribution, p. 30–31.

****[Maine’s Climate Future reports \(2009, 2015, 2020\)](#). Quoted text is from the 2015 report.

*****<https://climatecouncil.maine.gov/>

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 nine years, and continues to grow. By juxtaposing developments in climate science, U.S. policy, and international policy over the previous two centuries, 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 Anya, who joined me at the 2017 Boston Women's March with the sign, "Climate Change Matters;" to my son Jacob, an outdoor adventurer who knows how it's changed.

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 them 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 ways 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 Chimie et de Physique* 27: 136-67 (1824), translation by Ebeneser 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, ; 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. See also, re Fourier’s work, John Mason, [“At a glance – Has the greenhouse effect been falsified?”](#), *Skeptical Science*, December 5, 2023 ([Skeptical Science Inc.](#) is a charitable educational non-profit with the goal of “debunking climate change misinformation using peer-reviewed science.”).

1856

American scientist Eunice Foote predicts the warming impact of “carbonic acid” (carbon dioxide) on the atmosphere.

Foote describes an experiment where she filled separate glass jars with water vapor, carbon dioxide, and air and then measured how they heated up in the sun: “The highest effect of the sun’s rays I have found to be in the carbonic acid glass... The receiver containing the gas became itself much heated — very sensibly more so than the other — and on being removed, it was many times

as long in cooling.” Foote goes on to consider what this might mean for our atmosphere: “An atmosphere of that gas would give to our earth a high temperature,” she wrote, “and if as some suppose, at one period of its history the air had mixed with it a larger proportion than at present, an increased temperature from its own action as well as from increased weight must have necessarily resulted.” These findings are presented in a paper titled “Circumstances affecting the heat of the sun’s rays” on August 23, 1856 at the annual meeting of the American Association for the Advancement of Science (AAAS).^{*} Foote was able to have her paper presented because her husband, Elisha Foote, was a member of the organization. As reported in *ThinkProgress*, “She did not present her own work, however. Instead, Professor Joseph Henry of the Smithsonian Institute, spoke on her behalf. In acknowledging that it was Foote’s work, Henry introduced the findings by stating, ‘Science was of no country and of no sex. The sphere of woman embraces not only the beautiful and the useful, but the true.’” As Texas Tech climate scientist Katherine Hayhoe told *ThinkProgress*, due to the rudimentary set-up of the experiment, Foote “wasn’t measuring what she thought she was measuring, but she actually serendipitously ended up with an understanding that is correct today... She very presciently speculated that the temperature of the planet would be higher if CO₂ were higher and as far as I know she was the first person to speculate that.” Hayhoe noted that she didn’t have enough information to be able to say whether John Tyndall [see 1861] was aware of Foote’s work when he published his better known work five years later.^{**}

^{*}Eunice Foote, [“Circumstances affecting the Heat of the Sun’s Rays.”](#) *The American Journal of Science and Arts*, v. XXII (November, 1856), 382.

^{**}Kyla Mandel, [“This woman fundamentally changed climate science — and you’ve probably never heard of her.”](#) *ThinkProgress*, May 18, 2018; see also, John Schwartz, [“Overlooked No More: Eunice Foote, Climate Scientist Lost to History.”](#) *The New York Times*, April 21, 2020; Joseph D. Ortiz and Roland Jackson, [“Understanding Eunice Foote's 1856 experiments: heat absorption by atmospheric gases.”](#) *The Royal Society Journal of the History of Science*, August 26, 2020; Zoe Kurland, Katie Hafner, Elah Feder, [“The Woman who Demonstrated the Greenhouse Effect.”](#) *Scientific American*, November 9, 2023.

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 opaque 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), <https://babel.hathitrust.org/cgi/pt?id=hvd.hs17sj&view=1up&seq=5>

1896

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 19th century scientists Jean-Baptiste Fourier, Eunice Foote 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* will bring 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.”** Arrhenius’ distant 21st century relation will be youth climate activist Greta Thunberg [see 2019 (September)].***

* Svante Arrhenius, “On the influence of carbonic acid in the air upon the temperature of the ground,” *Philosophical Magazine Series* 5 41, no. 251 (1896), 1, <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.”

https://twitter.com/PeterGleick/status/873181910427549697/photo/1?ref_src=twsrc%5Etfw&ref_url=https%3A%2F%2Fclimatecrops.com%2F

***Brenda Ekwurzel, “I’m a Scientist and Greta Thunberg’s Speech to Congress Inspires Me,” *Union of Concerned Scientists Blog*, September 20 2019, <https://blog.ucsusa.org/brenda-ekwurzel/im-a-scientist-greta-thunbergs-speech-to-congress-inspires-me>

1897

American geologist Thomas Chrowder Chamberlin explains changes in carbon dioxide levels in the atmosphere impacting global temperature

Chamberlin embraced Svante Arrhenius' theory that high carbon dioxide concentrations in the atmosphere increased global temperatures, observing that "All our attempts at the solution of climatic problems, proceeded on some conscious or *unconscious* assumption concerning the extent and nature of the atmosphere at the stage involved."* Chamberlin proposed physical explanations for the release of carbon dioxide into the atmosphere and its subsequent depletion through natural forces. As summarized in a National Academy of Sciences biographical memoir of Chamberlin's analysis: "This reduction in the amount of carbon dioxide in the atmosphere lowers its temperature by permitting more rapid radiation of the sun's heat from the earth. The oceans in turn become cooler, and consequently absorb more carbon dioxide from the atmosphere. This further removal of carbon dioxide from the atmosphere results in a still further lowering of its temperature...Cold climates result...With enrichment of the atmospheric carbon dioxide, the earth is favored with warm, equable climates, such as have prevailed during much of the geologic time."**

*Thomas C. Chamberlin, "A Group of Hypotheses Bearing on Climatic Changes," *Journal of Geology* Vol. V (1897), 653.

** Rollin Thomas Chamberlin, ["Biographical Memoir of Thomas Chrowder Chamberlin 1843-1928."](#) National Academy of Sciences (1932), 345-348.

1922

British geologist Robert Lionel Sherlock argues that humans' impact on the Earth from burning fossil fuels and other impacts now rivals natural geological and geophysical forces

Sherlock presents his thesis in a book entitled *Man as a Geological Agent: An Account of His Action on Inanimate Nature*. In the ensuing century, his argument will inspire the naming of a new geological epoch the "Anthropocene." Sherlock's final chapter addresses climate change, citing the work of Svante Arrhenius and American geologist Thomas Chrowder Chamberlin. Sherlock argued: "T.C. Chamberlin thinks that the Permian glaciation was a consequence of the removal from the atmosphere of the vast mass of carbon locked up by animals and plants, in the forms of limestone and coal, during the Carboniferous period. This leads us to speculate on the probable effect on climate, when the carbon or coal and petroleum is restored to the atmosphere, as carbon dioxide by combustion." Sherlock went on to observe: "The world's annual consumption of coal now exceeds 1,000 million tons. Taking the average percentage of carbon in coal as 84, and supposing that 4% remains unburned in the ash, then 800 million tons of carbon are annually burnt to make 2,933 million tons of carbon dioxide, which passes into the atmosphere. This also receives a considerable amount of carbon dioxide from burnt petroleum...The average percentage of carbon in petroleum is 86, so that the quantity of carbon dioxide added to the atmosphere by burning ...oil is 1, 209,079,563 tons. In reality, this is far below the true amount for there has been an appalling waste of oil and natural gas by fires at the wells and the real figure is probably 200 million tons of carbon dioxide."*As Naomi Oreskes notes in her essay on the significance of Sherlock's book, "It is common for people to say (or think) that as climate change proceeds, we can 'just adapt.' ... No doubt some people will become climate refugees, either voluntarily or under duress. But the definition of the Anthropocene reminds us that the challenge we face is geological in scale. It affects the whole Earth. It reminds us that as this new epoch unfolds, there won't be anywhere to hide."**

*Robert Lionel Sherlock, *Man as a Geological Agent: An Account of His Action on Inanimate Nature* (London: H.F. & G. Witherby, 1922), 302 - 305.

** Naomi Oreskes, “[Does the Anthropocene Matter?](#)” *Scientific American*, December 19, 2023; see also, Colin Waters and Simon Turner, “[Defining the onset of the Anthropocene.](#)” *Science* 378 (2022): 706-708.

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 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* 64, no. 275 (April 1938): 223,

<https://doi.org/10.1002/qj.49706427503>

**Spencer Weart, *The Discovery of Global Warming* (January 2017), https://history.aip.org/climate/simple.htm#L_M085

1951

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,” American marine biologist and writer 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

Gilbert Plass publishes a lucid explanation of the “carbon dioxide theory”

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* 44, no. 3 (July 1956): 302-316; reprinted in *American Scientist* 98, no.1 (January-February 2010): 58, <https://www.americanscientist.org/article/carbon-dioxide-and-the-climate>

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, “SCIENCE IN REVIEW; Warmer climate on the earth may be due to more carbon dioxide in the air,” *New York Times*, October 28, 1956, <https://www.nytimes.com/1956/10/28/archives/science-in-review-warmer-climate-on-the-earth-may-be-due-to-more.html>

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.”* As Spencer Weart comments, “When [Revelle] wrote this sentence, which has since been quoted more than any other statement in the history of global warming, he was not warning against future perils. He did feel some concern about potential harm over the long run, and had begun to point to the problem in public. But the word "experiment" sounded benign and progressive to Revelle as to most scientists....** In a hearing on May 1 before the Independent Offices Subcommittee, House Committee on Appropriations, Revelle’s forecast seemed considerably more serious: “The last time that I was here I talked about the responsibility [*sic*] of climatic changes due to the changing carbon dioxide content of the atmosphere . . . it is fairly easy to predict that the carbon dioxide content of the atmosphere could easily increase by about 20 percent. This might, in fact, make a considerable change in the climate. It would mean that the lines of equal temperature on the earth would move north and the lines of equal rainfall would move north and that southern California and a good part of Texas, instead of being just barely livable as they are now, would become real deserts.”***

* 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, no. 1 (1957): 19-20.

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

** 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*, August 2021, <https://history.aip.org/climate/Revelle.htm>, https://history.aip.org/climate/impacts.htm#L_0791

***Brad Johnson, *A Timeline of Climate Science and Policy*, <https://climatebrad.medium.com/climate-hearings-af27a3886a43>

1965

Roger Revelle contributes to the first mention of global warming in a government report, comparing it to 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* (Washington, DC: GPO, 1965), App. Y4, 116, <http://dgc.stanford.edu/labs/caldeiralab/Caldeira%20downloads/PSAC,%201965,%20Restoring%20the%20Quality%20of%20Our%20Environment.pdf>

1965

President Lyndon Johnson raises an alarm about the accumulation of carbon dioxide in the atmosphere, and other "darker sides" of technology

President Johnson's "Special Message on Conservation and Restoration of Natural Beauty" states that "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." His speech 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" (Speech, Washington, D.C., February 8, 1965), The Association of Centers for the Study of Congress, <http://acsc.lib.udel.edu/items/show/292>

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."** For this work Manabe will share in the 2021 Nobel Prize for Physics.***

* Syukuro Manabe and Richard Wetherald, "Thermal Equilibrium of the Atmosphere with a Given Distribution of Relative Humidity," *Journal of the Atmospheric Sciences* 24, no. 3 (May, 1967), [https://doi.org/10.1175/1520-0469\(1967\)024%3C0241:TEOTAW%3E2.0.CO;2](https://doi.org/10.1175/1520-0469(1967)024%3C0241:TEOTAW%3E2.0.CO;2)

** 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.

***Ben Guarino, "Nobel Prize in physics awarded to trio who described climate change, other complex natural systems," *Washington Post*, October 5, 2021, <https://www.washingtonpost.com/science/2021/10/05/nobel-prize-physics/>; Stephen Witt, "The Man Who Predicted Climate Change," *The New Yorker*, December 10, 2021, <https://www.newyorker.com/news/persons-of-interest/the-man-who-predicted-climate-change>

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 proposes 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” (Speech, Washington, D.C., July 9, 1970), EPA Web Archive, <https://archive.epa.gov/epa/aboutepa/reorganization-plan-no-3-1970.html>

** National Environmental Policy Act of 1969, Sec. 102, 42 USC 4332, redline text showing original language and 2023 amendments [2023 (June)],

https://climate.law.columbia.edu/sites/default/files/content/NEPA%20as%20amended%20by%20Fiscal%20Responsibility%20Act%20of%202023_redline.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,” *New York Times*, September 23, 1970, <https://www.nytimes.com/1970/09/23/archives/tough-new-cleanair-bill-passed-by-senate-73-to-0-a-tough-cleanair.html>

**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, Cited in; “40th Anniversary of the Clean Air Act,” United States Environmental Protection Agency, last updated November 1, 2017, <https://www.epa.gov/clean-air-act-overview/40th-anniversary-clean-air-act>

****American Chemical Society Journal, *Environmental Science & Technology* 5, no. 2 (1971): 106

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.*

*“Thematic Guide to Integrated Assessment Modeling,” NASA Socioeconomic Data and Applications Center, last updated 1995, <http://sedac.ciesin.columbia.edu/mva/iamec.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, <https://pdfs.semanticscholar.org/51e2/55ee1e32368df19d41ab1ac5d34a04e7a6e5.pdf>

1972

The United Nations Conference on the Human Environment is the first global meeting of nations to consider environmental concerns.

The conference, held in Stockholm, is attended by 113 nations. 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.”*

*United Nations, *Report of the United Nations Conference on the Human Environment*, (Stockholm: United Nations, 5-16 June, 1972), 1, <http://www.un-documents.net/aconf48-14r1.pdf>

1972

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

The Club of Rome 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 their chances of success.”* The study is translated into thirty languages and sells 30 million copies, more than any other environmental book.**

*Donella Meadows *et al.*, *Limits to Growth* (New York: Signet, 1972), 1, http://collections.dartmouth.edu/texts/meadows/diplomatic/meadows_ltg-diplomatic.html#pg-17

**Bill McKibben, *Eaarth* (New York: Henry Holt, 2011), 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* 189, no. 4201 (August 8, 1975): 460-463, <http://www.jstor.org/stable/1740491>

1975

California nuclear physicist Howard Wilcox predicts melting polar ice caps and flooded populous areas of the earth in 80 to 180 years

Wilcox’s theory, detailed in his book *Hothouse Earth*, focuses on the heat generated by combustion of fossil fuels, not the atmospheric impact of greenhouse gases, and is characterized by the *New York Times* as the “most provocative theory to attract attention of weather experts.” Wilcox’s time frame is far shorter than the centuries or millennia of previous warming estimates. He anticipates not only the impact of polar melting on sea level rise but other positive feedback mechanisms. As summarized in the *Times*, “a one-degree temperature change would mean that a greater portion of the ice cap would melt. There would then be less ice to reflect heat back into the atmosphere (known as the albedo effect) and more water to absorb the sun’s warming rays. This, in turn, would lead to an accelerating temperature rise for the whole region, causing an ever-faster melting rate, according to the Wilcox theory.” The *Times* quotes NOAA senior research climatologist Murray Mitchell’s comment “that the more immediate danger will come from the increasing amounts of carbon dioxide that are thrown off into the atmosphere along with the heat that Dr. Wilcox talks about,” and quotes William Kellogg, senior scientist at the National Center for Atmospheric Research, as offering a comforting perspective: “I don’t agree that we will continue to have an exponential energy growth rate. I think the world will begin to be aware of the problem and start to conserve energy and slow down growth before it gets to the point Dr. Wilcox proposes.”*

*Baynard Webster, “Scientist Warns of Great Floods if Earth’s Heat Rises,” *New York Times*, December 22, 1975, <https://www.nytimes.com/1975/12/22/archives/scientist-warns-of-great-floods-if-earths-heat-rises.html>

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 *et al.*, “Atmospheric carbon dioxide variations at Mauna Loa Observatory, Hawaii,” *Tellus* 28, no. 6, December, 1976, <https://doi.org/10.1111/j.2153-3490.1976.tb00701.x> ; 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

The National Academy of Sciences (NAS) report, “Energy and Climate: Studies in Geophysics,” predicts that global temperatures could rise by 6 degrees Celsius by 2150 due to fossil fuel emissions, and 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 Research Council, *Energy and Climate: Studies in Geophysics*, (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

The plan has 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. It is 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 includes 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), 106, 110, 141.

1977

Senior Exxon Corporation scientist advises that CO₂ from the world’s use of fossil fuels would warm the planet

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”, *InsideClimate News*, Sept. 15, 2015, <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

Funds are directed to the National Climate Program Office of the National Oceanic and Atmospheric Administration. The law includes a Congressional finding 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 (February)

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* 58, no. 3, 2009, 1, <https://public.wmo.int/en/bulletin/history-climate-activities>

**For a narrative and graphic review of the decade following this conference, “the decisive decade when humankind first came to a broad understanding of the causes and dangers of climate change,” see Nathaniel Rich and George Steinmetz, “Losing Earth: The Decade We Almost Stopped Climate Change,” *New York Times*, August 1, 2018. As noted by the editor, “It will come as a revelation to many readers — an agonizing revelation — to understand how thoroughly they grasped the problem and how close they came to solving it.” <https://www.nytimes.com/interactive/2018/08/01/magazine/climate-change-losing-earth.html>; see also Michael Mann’s critique of this analysis, as falsely tending to absolve the fossil fuel industry and the Republican Party from blame for the failure of the climate movement in this decade. Michael Mann, *The New Climate War* (New York: PublicAffairs, 2021), 64-65.

1979 (April)

A technical report for the Department of Energy predicts a doubling of CO 2 concentration in the atmosphere by 2035 and an increase of surface temperatures by 2.4 degrees Celsius

Written by geophysicist Gordon MacDonald and other members of an elite group of scientists called the “Jasons,” the “Jason report,” titled *Long term impact of atmospheric carbon dioxide on climate*, is based on analytic modeling, and concludes its abstract with the statement that “The warming of climate will not necessarily lead to improved living conditions everywhere. Changes in sea level, in agricultural productivity, and in water availability can be anticipated, but the dimensions of their economic, political, or social consequences can not.”*

*Gordon MacDonald *et al.*, *Long term impact of atmospheric carbon dioxide on climate. Technical report JSR-78-07, [Calculations using JASON Climate Model]*, (Washington, D.C.: U.S. Department of Energy Office of Scientific and Technical Information 1979), 1, <https://www.osti.gov/biblio/5851500-long-term-impact-atmospheric-carbon-dioxide-climate-technical-report-jsr-calculations-using-jason-climate-model>

1979

Rafe Pomerance joins forces with Gordon Macdonald to engage with policymakers on the understated but startling conclusions of the “Jason report”

Pomerance, a historian by training working as the deputy legislative director of the Friends of the Earth, joins with MacDonald to conduct informal briefings with the E.P.A., the National Security Council, The New York Times, the Council on Environmental Quality, the Energy Department, and the senior staff of the president’s Office of Science and Technology Policy (OSTP). As a result of the meeting with the OSTP, President Jimmy Carter’s chief science advisor Frank Press requests the National Research Council of the National Academy of Sciences to prepare a full assessment of the carbon-dioxide issue.*

* Nathaniel Rich and George Steinmetz, “Losing Earth: The Decade We Almost Stopped Climate Change,” *New York Times*, August 1, 2018, <https://www.nytimes.com/interactive/2018/08/01/magazine/climate-change-losing-earth.html>

1979 (June)

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, 2021 (September)]

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

A National Research Council report 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 Ad Hoc Study Group on carbon dioxide and climate is chaired by MIT meteorologist Jule Charney. The 22 page “Charney report” estimates that based on then current trends in fossil fuel combustion, these temperatures will be reached some time in the first half of the 21st century. The foreword to the 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.”* Forty years later, Marcia McNutt, President of the National Academy of Sciences, will write in an editorial in the journal *Science* that the Charney report’s calculations “have proven to be remarkably on target:” “The Charney report demonstrates the power of scientific prediction. Since its release, scientists have built a formidable evidence base on climate change. At no time since 1979 has the science backed down from its dire predictions for the prospects of human civilization to prosper in a world warming well beyond limits encountered in all of human history.”**

*Jule G. Charney *et al.*, *Carbon Dioxide and Climate: A Scientific Assessment* (Washington: The National Academic Press, 1979), <https://www.nap.edu/catalog/12181/carbon-dioxide-and-climate-a-scientific-assessment>

*Marcia McNutt, “Time’s Up, CO₂,” *Science* 365, no. 6452 (August 2, 2019): 411, <https://science.sciencemag.org/content/365/6452/411>

1980

Three years after its first climate report, a second National Academy of Sciences report on anthropogenic warming 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. The study is chaired by economist Thomas Schelling. According to the 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, will criticize 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 3, no. 3 (1981): 223-225, <https://doi.org/10.1007/BF02423215>

1980 (July)

Report commissioned by President Carter foresees a threatened environmental future

In 1977, President Carter called upon government scientists to tell us what the world might look like at the turn of the millennium. The report, *Global 2000: Entering the Twenty-First Century*, represents a collaboration of more than a dozen federal agencies. *Newsweek* notes: “It reads like something out of ‘The Empire Strikes Back.’ The time: the year 2000. The place: Earth, a desolate planet slowly dying of its own accumulating follies. Half of the forests are gone; sand dunes spread where fertile farm lands once lay. Nearly 2 million species of plants, birds, insects and animals have vanished. Yet man is propagating so fast that his cities have grown as large as his nations of a century before.” *Time*: “By now such grim warnings have become all too familiar. But this particular forecast is different. For the first time, the U.S. Government has added its full voice to the chorus of environmental Cassandras deeply distressed about the future.”* As Peter Dykstra observes in a 2020 review in *Environmental Health News*, “One area where *Global 2000* treads lightly is in climate change. Bear in mind that the report preceded the first major focus on climate by eight years—NASA scientist James Hansen's riveting 1988 testimony before Congress. Nevertheless, our Carter-era climate science foresaw the possibility of melting polar ice caps ‘forcing the (eventual) abandonment of coastal cities.’”

*Gerald O. Barney, *Global 2000: Entering the Twenty-First Century* (Arlington, Va., Seven Locks Press, 1980),

<https://www.cartercenter.org/resources/pdfs/pdf-archive/global2000reporttothepresident--enteringthe21stcentury-01011991.pdf>

**Peter Dykstra, “A global I-told-you-so,” *Environmental Health News*, July 26, 2020, <https://www.ehn.org/global-2000-jimmy-carter-2646793523.html>

1981

A prescient study by NASA scientist James Hansen warns of new drought-prone regions, worldwide rise in sea levels, and opening of the Northwest Passage in the 21st century

The study by James Hansen and coauthors, 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 *et al.*, “Climate impact of increasing atmospheric carbon dioxide,” *Science* 213 (1981): 957-966, <https://pubs.giss.nasa.gov/abs/ha04600x.html>

1980's

The Reagan Administration cuts energy R&D funding by more than half and reduces funding for climate research

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. 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,” writes 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 the Intergovernmental Panel on Climate Change, 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.

<https://pdfs.semanticscholar.org/51e2/55ee1e32368df19d41ab1ac5d34a04e7a6e5.pdf>

**Richard Cohen, “Wish Upon A Pump,” *Washington Post*, July 8, 2008, <http://www.washingtonpost.com/wp-dyn/content/article/2008/07/07/AR2008070702215.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 [see 1957, 1965]. 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.

<https://pdfs.semanticscholar.org/51e2/55ee1e32368df19d41ab1ac5d34a04e7a6e5.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,” *CleanTechnica*, Dec. 8, 2015, <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

As reported in a 2015 *InsideClimate News* investigative report, “Exxon: The Road Not Taken,” 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.” The primer is marked “not to be distributed externally.” 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 Hasemyer, “Exxon: The Road Not Taken”, *InsideClimate News*, Sept. 15, 2015, <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 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 [see 1957, 1965], and two chapters by economists, including Thomas Schelling [see 1980]. 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?”*[see 1989]

* 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 achieving 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* (New York: United Nations, March 22, 1985), https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-2&chapter=27&clang=en

** 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,” *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

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 in Maine, 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, 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.”* [see 1979]

*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

The Act articulates a substantially higher level of Congressional concern than did the 1978 National Climate Program Act, which it amends. Congressional findings 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 (June)

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 [see 1967], 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.”**

*Dr. James Hansen, “Statement from Dr. James Hansen, Director, NASA Goddard Institute for Space Studies” (Speech, New York, June 23, 1988) <http://image.guardian.co.uk/sys-files/Environment/documents/2008/06/23/ClimateChangeHearing1988.pdf>

**Philip Shabecoff, “Global Warming Has Begun, Experts tell Senate,” *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 (June)

Politicians from 46 nations and more than 300 scientists convene in Toronto at the World Conference on the Changing Atmosphere

Dubbed “Woodstock for climate change” by *The New York Times*, the final unanimous recommendation of the participants endorses a call for a 20 percent reduction in global carbon emissions by 2005.*

* Nathaniel Rich and George Steinmetz, “Losing Earth: The Decade We Almost Stopped Climate Change,” *New York Times*, August 1, 2018, <https://www.nytimes.com/interactive/2018/08/01/magazine/climate-change-losing-earth.html>

1988

The Intergovernmental Panel on Climate Change (IPCC) is created by the World Meteorological Organization and the United Nations Environment Programme

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, accessed January 14, 2020,

<https://www.ipcc.ch/organization/organization.shtml>

1988

The United Nations General Assembly starts the process of creating a treaty on climate change

Declaring that “climate change is a common concern of mankind,” the General Assembly establishes an international committee to negotiate a climate change treaty at the 1992 Rio Conference on Environment and Development. The General Assembly resolution “[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, Conference on Environment and Development,” 43/196, United Nations, December 6, 1988, <https://undocs.org/en/A/RES/43/196>

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."* Bush appears to be inspired by James Hansen's Congressional testimony [June, 1988] when the candidate states: "1988 is the year the Earth spoke back... Our land, water and soil support a remarkable range of human activities. But they can only take so much. We must remember to treat them not as a given, but as a gift."** Eight months later *The New York Times* will note 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,” *New York Times*, May 9, 1989, <http://www.nytimes.com/1989/05/09/opinion/the-white-house-and-the-greenhouse.html>

**Scott Waldman and Benjamin Hulac, “This is when the GOP turned away from climate policy,” *E&E News*, December 5, 2018, <https://www.eenews.net/stories/1060108785/>

1989

A Department of State briefing memorandum urges the G.H.W. Bush Administration to engage proactively on the issue of climate change

According to the February 15, 1989 Department of State briefing memorandum (declassified March 2015), climate change is “the most far reaching environmental issue of our time:”

“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 [see 1983] 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; Nathaniel Rich and George Steinmetz, "Losing Earth: The Decade We Almost Stopped Climate Change," *New York Times*, August 1, 2018, <https://www.nytimes.com/interactive/2018/08/01/magazine/climate-change-losing-earth.html>

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)," (Speech, New York, November 8, 1989, <https://www.margaretthatcher.org/document/107817>)

1990

First assessment report of the Intergovernmental Panel on Climate Change: increase in global temperatures during the next century "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/site/assets/uploads/2018/03/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” (lecture, University of Maine, Orono, ME, March 31, 2011); 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 D.C. 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* 58, no. 3 (2009): 1, <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. <https://pdfs.semanticscholar.org/51e2/55ee1e32368df19d41ab1ac5d34a04e7a6e5.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, <https://pdfs.semanticscholar.org/51e2/55ee1e32368df19d41ab1ac5d34a04e7a6e5.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 [see 1983, 1989] 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* 101, no. 407 (July 1991): 920-937, https://www.jstor.org/stable/2233864?seq=1#page_scan_tab_contents

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

1991

The G.H.W. Bush Administration presents a report entitled “A Comprehensive Approach to Addressing Potential Climate Change” to the United Nations

The report, in preparation for the 1992 United Nations Conference on Environment and Development (“Rio Conference”), 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* (New York: 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, 14, <https://pdfs.semanticscholar.org/51e2/55ee1e32368df19d41ab1ac5d34a04e7a6e5.pdf>

1991

Sweden becomes the first nation to institute a carbon tax.

As the World Bank reports in 2016, “Sweden has the rare distinction of having consistently curbed carbon dioxide emissions over the past two-and-a-half decades while enjoying solid growth. In so doing, it has set a model that much of the world could emulate. Sweden introduced a CO2 tax in 1991. At the time, the price was EUR29 per ton, and it has since risen to today’s price of EUR137 per ton – the highest CO2 tax rate in the world. The effect of such a tax on fossil fuel consumption has been, among other things, a rise in the contribution of biomass to district-level heating from 25 percent in 1990, to 70 percent in 2012. Speaking at a recent High Level Assembly of the Carbon Price Leadership Coalition, Swedish Minister of Finance Magdalena Andersson, said ‘We’ve had GDP growth of 60 percent, and at the same time, our emissions have been reduced by 25 percent. So, it shows that absolute decoupling is possible.’”*

*World Bank Group, “When It Comes to Emissions, Sweden Has Its Cake and Eats It Too,” May 16, 2016, *World Bank*, <http://www.worldbank.org/en/news/feature/2016/05/16/when-it-comes-to-emissions-sweden-has-its-cake-and-eats-it-too>

1991

Information Council on the Environment (“ICE”) initiates a campaign to “reposition global warming as a theory (not fact)”

In anticipation of the Rio Conference, the Edison Electric Institute, the Western Fuels Association, and the National Coal Association create “ICE.” ICE initiates a \$500,000 public relations campaign that tests 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

1991 (June)

The Cato Institute hosts the first known climate-change-denial conference

David and Charles Koch are owners of Koch Industries, the largest privately held fossil fuel interest. They founded the libertarian think tank the Cato Institute in 1977, and turned in the 1990’s to challenging the need to respond to climate change. Jane Mayer writes in *The New Yorker*, in a 2019 review of the book *Kochland: The Secret History of Koch Industries and Corporate Power in America*,” by Christopher Leonard, that “Charles Koch and other fossil-fuel magnates sprang into action [in 1991], after President George H. W. Bush announced that he would support a treaty limiting carbon emissions, a move that posed a potentially devastating threat to the profits of Koch Industries. At the time, Bush was not an outlier in the Republican Party. Like the Democrats, the Republicans largely accepted the scientific consensus on climate change, reflected in the findings of expert groups such as the Intergovernmental Panel on Climate Change...” The conference is titled “Global Environmental Crisis: Science or Politics?,” and features a presentation by “Richard S. Lindzen, a professor of meteorology at M.I.T., who is quoted in the brochure as saying there was ‘very little evidence at all’ that climate change would be ‘catastrophic.’” Mayer cites environmental activist Kirt Davies on the importance of the recent revelations about this conference in Leonard’s *Kochland*: “it makes it clear that ‘you’d have a carbon tax, or something better, today, if not for the Kochs. They stopped anything from happening back when there was still time.’”*

*Jane Mayer, “‘Kochland’ Examines the Koch Brothers’ Early, Crucial Role in Climate-Change Denial,” *The New Yorker*, August 13, 2019, <https://www.newyorker.com/news/daily-comment/kochland-examines-how-the-koch-brothers-made-their-fortune-and-the-influence-it-bought>; Christopher Leonard, *Kochland: The Secret History of Koch Industries and Corporate Power in America* (New York: Simon & Schuster 2019); for a discussion of Richard Lindzen’s climate work, see Michael Mann, *The New Climate War* (New York: PublicAffairs, 2021), 26-27.

1992 (June)

The Rio Conference achieves a signed commitment of 154 nations to work toward preventing “dangerous anthropogenic interference with the climate system”

The United Nations Conference on Environment and Development in Rio de Janeiro (Rio Conference) draws 178 countries and 140 heads of state. In his opening remarks, Canadian businessman and diplomat Maurice Strong, Secretary General of the conference, describes the moral imperative for its work 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,” and Principle 22: “Indigenous people and their communities and other local communities have a vital role in environmental management and development because of their knowledge and traditional practices. States should recognize and duly support their identity, culture and interests and enable their effective participation in the achievement of sustainable development.” 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” (Speech, Stockholm, June 3, 1992), <https://www.scribd.com/document/418667374/Opening-Statement-pdf>

** United Nations, *Framework Convention on Climate Change*, New York, May 9, 1992, <https://unfccc.int/resource/docs/convkp/conveng.pdf>; Agenda 21, *United Nations Sustainable Development: United Nations Conference on Environment and Development, Rio de Janeiro, Brazil, 3 June, 1992* <https://sustainabledevelopment.un.org/content/documents/Agenda21.pdf>

***“United Nations Framework Convention on Climate Change,” Congress.gov, accessed January 14, 2020, <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,” (Speech, United Nations Headquarters, New York, N.Y. October 13, 1992), <https://bush41library.tamu.edu/archives/public-papers/4953?fbclid=IwAR3vp0zzELT8zzmJL-RYqw6-qDY-h-c3o5D5Oo-vjJ7M8Vkd9HfExUw6NE>

The Clinton Administration submits its Climate Change Action Plan for stabilizing emissions at 1990 levels by 2000, pursuant to the UNFCCC

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* (Washington, D.C.: Executive Office of the President, 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,” *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?* (Tokyo: United Nations University Press 1993), <http://archive.unu.edu/unupress/unupbooks/80836e/80836E00.htm#Contents>

1995

The Intergovernmental Panel on Climate Change’s Second Assessment Report: “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.”* Climate scientist Michael Mann [April, 1998] notes that the original draft of the report’s Summary for Policy Makers read that “the balance of evidence suggests an *appreciable* human influence on climate.” [emphasis added] Upon vigorous objection by the Saudi Arabian and Kuwaiti government delegates, scientists argued with the delegates for two whole days before agreeing on the term “discernible.” Comments Mann: “The fact that two entire days at the final plenary were devoted to debating a single word in the report’s summary gives you some idea of how politically charged the debate over climate change had become by late 1995.”**

*Intergovernmental Panel on Climate Change, *Second Assessment Report* (1995), 22, <https://www.ipcc.ch/report/ipcc-second-assessment-full-report/>

** Michael Mann, *The New Climate War* (New York: PublicAffairs, 2021), 28-31.

1997

Marshall Institute Board Chair Fred Seitz calls changes made to the IPCC Report of Working Group I a “corruption of the peer-review process”

In a letter to the *Wall Street Journal*, 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

Exxon Chief Executive Officer claims that “the earth is cooler today than it was twenty years ago”

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. In a speech before the World Petroleum Congress, 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?” 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,” *InsideClimate News*, Sept. 15, 2015, <http://insideclimatenews.org/news/15092015/Exxons-own-research-confirmed-fossil-fuels-role-in-global-warming>

1997

At the Kyoto Conference on Climate Change, more than 150 countries meet to develop a plan to assign mandatory national targets to reduce greenhouse gas emissions

The Kyoto Protocol is an extension of the United Nations Framework Convention on Climate Change, intended to implement, though enforceable mandates, the goals of reducing global 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 passes a unanimous resolution (the “Byrd-Hagel” resolution) expressing its sense that the United States should not enter the Kyoto Protocol unless targets apply to developing nations such as China and India, and unless it would not “result in serious harm to the US economy.”** President Clinton never submits the protocol to the Senate for ratification.

* Bud Ward, “Kyoto: The Mother of E-Law Battles,” *Environmental Law Institute* 15, no. 1(1998):1, Reprinted by permission from *The Environmental Forum*, Jan/Feb 1998, <https://www.eli.org/the-environmental-forum/kyoto-mother-e-law-battles>

**S. 98, 105th Congress, (1997), <https://www.congress.gov/bill/105th-congress/senate-resolution/98>

1998 (April)

A study introduces the iconic “hockey stick” graph demonstrating the dramatic increase in global surface temperatures over the past century

In an article in the journal *Nature* Michael Mann of the University of Massachusetts and colleagues identify greenhouse gases as the “dominant” cause of temperature increases over the 20th century. They write that “Time-dependent correlations of the reconstructions [of surface temperature patterns] with time-series records representing changes in greenhouse-gas concentrations, solar irradiance, and volcanic aerosols suggest that each of these factors has contributed to the climate variability of the past 400 years, with greenhouse gases emerging as the dominant forcing during the twentieth century. Northern Hemisphere mean annual temperatures for three of the past eight years are warmer than any other year since (at least) AD 1400.”*

*Michael Mann, Raymond Bradley, and Malcolm Hughes, “Global-Scale Temperature Patterns and Climate Forcing over the Past Six Centuries,” *Nature* 392 (1998): 779-787, <https://www.nature.com/articles/33859#Abs1>; see also, Michael Mann, *The New Climate War* (New York: PublicAffairs, 2021), 5, 33.

1999 (October)

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 2003 (September), 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>

** Second Presidential Debate (2000), 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* (London: 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 Rivkin 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? Report on the Cop 6, Part I 13-25 November 2000 The Hague, the Netherlands" *Fondazione Eni Enrico Mattei*, March 28, 2001, 29, <https://papers.ssrn.com/sol3/papers.cfm>

2000

The Environmental Protection Agency reports that U.S. greenhouse gas emissions are 13.5% higher in 2000 than in 1990.

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* (Washington, D.C., 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)

IPCC Third Assessment Report 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* (Geneva, Switzerland: IPCC Working Group II, 2001), 5, 8, 14, <https://www.ipcc.ch/site/assets/uploads/2018/07/wg2TARsummaries.pdf>

** Originally published as “Scientists Issue Dire Prediction on Warming: Faster Climate Shift Portends Global Calamity This Century,” *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

President Bush simultaneously announces 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 recognize 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 Bush administration seeks unsuccessfully to enlist the National Academy of Sciences in debunking the findings of the IPCC

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*, (Washington, D.C.: The National Academic Press, May, 2001), <https://www.nap.edu/read/10139/chapter/2>

2001 (November)

165 nations, excluding the U.S., reach final agreement in a meeting in Marrakech, Morocco on the Kyoto Protocol

Participant nations agree 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.”*[see 2004 (December), 2005 (February)]

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

2002 (June)

A study suggests that seeking to limit global mean temperatures to 2 degrees above 1990 levels 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* 296, no. 5575 (June 14, 2002): 1971-1972, [https://doi.org/10.1016/S0169-5347\(02\)02587-9](https://doi.org/10.1016/S0169-5347(02)02587-9)

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, says party strategists agree 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.”** Michael Mann [see 1998, April], in his 2021 book *The New Climate War*, will comment that “ironically, the very same scientific community that climate-change deniers accuse of being alarmist would increasingly favor the use of [“climate change”] as well, simply because it’s a more comprehensive description of the problem. Climate change involves not only the warming of the Earth’s surface, but the melting of ice, sea-level rise, the shifting of rainfall and desert belts, altered ocean currents, and so on. Luntz also suggested that Republicans ‘reposition global warming as theory [rather than fact].’ This, too, is ironic, for a *theory* is the most powerful of scientific entities. Gravity is just ‘a theory.’ That hardly makes it safe to jump off a cliff.” Mann also points out that in Senate testimony in 2019, Luntz “flipped”

on the reality and seriousness of climate change, and offered to “advise the senators... on how best to frame the climate crisis to get buy-in from the electorate.”***

*Frank Luntz, memorandum to Bush White House, “The Environment: A Cleaner, Safer, Healthier America,” (Luntz Research Companies, 2002), <https://www.the-republican-reversal.com/uploads/1/2/0/2/120201024/luntzresearch.memo2.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>

*** Michael Mann, *The New Climate War* (New York: PublicAffairs, 2021), 33, 229.

2002 (October)

Analysis suggests rising carbon dioxide concentrations may adversely impact nutritional qualities of plants

In a paper published in *Trends in Ecology & Evolution*, Irakli Loladze writes that “Here, I apply stoichiometric theory to argue that high [CO₂], as a rule, should alter the elemental composition of plants, thus affecting the quality of human nutrition. The first compilation, to my knowledge, of published data supports the claim and shows an overall decline of the (essential elements):C ratio. Therefore, high [CO₂] could intensify the already acute problem of micronutrient malnutrition.”* A 2017 follow up article in *Politico* documents the challenges Loladze faced in gaining acceptance of his theory, and summarizes current research: “Within the category of plants known as “C3”—which includes approximately 95 percent of plant species on earth, including ones we eat like wheat, rice, barley and potatoes—elevated CO₂ has been shown to drive down important minerals like calcium, potassium, zinc and iron. The data we have, which look at how plants would respond to the kind of CO₂ concentrations we may see in our lifetimes, show these important minerals drop by 8 percent, on average. The same conditions have been shown to drive down the protein content of C3 crops, in some cases significantly, with wheat and rice dropping 6 percent and 8 percent, respectively.”**

*Irakli Loladze, “Rising atmospheric CO₂ and human nutrition: toward globally imbalanced plant stoichiometry?” *Trends in Ecology and Evolution* 17, no. 10 (October 2002): 457-461, [https://doi.org/10.1016/S0169-5347\(02\)02587-9](https://doi.org/10.1016/S0169-5347(02)02587-9)

**Helena Evich, “The Great Nutrient Collapse”, *Politico*, September 13, 2017, <https://www.politico.com/agenda/story/2017/09/13/food-nutrients-carbon-dioxide-000511?cid=apn>

2002 (October)

The United States joins with OPEC, India, and China to block the European Union from establishing a more inclusive regime after Kyoto expires in 2012

Once the foremost advocate of requiring developing countries to control greenhouse gas emissions [see 1997], the U.S. does another about face. 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 *et al.*, *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 warns of the possibility of 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 the first formal assessment of climate change impacts on plant and animal species

The report entitled “A globally coherent fingerprint of climate change impacts across natural systems” in the journal *Nature*, by Camille Parmesan of the University of Texas and Gary Yohe of Wesleyan University, analyzes more than 1,700 species. It finds that “recent biological trends match climate change predictions:” “[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 (January 2, 2003): 37-42, <https://doi.org/10.1038/nature01286>

2003 (July, August)

Chief of staff of the White House Council on Environmental Quality embarks on a campaign to rewrite government scientific reports

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*. The edits are 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 *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 (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*.** [see 2007 (January), 2015 (January)]

*DeSmog: Clearing the PR Pollution that Clouds Climate Science, accessed January 7, 2020, <https://www.desmogblog.com/james-inhofe>

**Brendan Demille, “Top 10 Climate Deniers,” last updated 2019, <https://www.befortheflood.com/explore/the-deniers/top-10-climate-deniers/>

2003 (September)

The Environmental Protection Agency denies the petition of states and environmental organizations to regulate greenhouse gases in new motor vehicles

The EPA concludes that, contrary to the opinions of two former EPA general counsels, the Clean Air Act does not authorize it to issue regulations to address climate change, and that even if it had the authority, it would be unwise to set mandatory greenhouse gas 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 states, “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 1999 (October), 2007 (April)]

*U.S. Environmental Protection Agency, “Control of Emissions from New Highway Vehicles and Engines,” *Federal Register* 68 (September 8, 2003): 52922-52923, <https://www.gpo.gov/fdsys/pkg/FR-2003-09-08/pdf/03-22764.pdf>

2004 (August)

An influential study analyzes policy alternatives for CO₂ reduction as “stabilization wedges”

Steven Pacala and Robert Socolow, Princeton professors of Ecology and Engineering, respectively, publish “Stabilization wedges: Solving the climate problem for the next 50 years with current technologies,” in the journal *Science*. The authors note that 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. They provide and graphically illustrate a menu of technological and policy “stabilization wedge” alternatives to achieve these goals. The authors caution: “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.”* [see 2008 (June)]

*Steven Pacala and Robert Socolow, “Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies,” *Science* 305, no. 5686 (August 13, 2004): 968-972, <https://science.sciencemag.org/content/305/5686/968/tab-article-info>

2004 (August)

Annual Report of the US Climate Change Science Program states: greenhouse gases are the “only likely explanation” for global warming over the last three decades

Andrew Revkin writing in the *New York Times*, calls this a “striking shift in the way the Bush administration has portrayed the science of climate change:” “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,” *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,” *Guardian*, September 14, 2004, <https://www.theguardian.com/politics/2004/sep/15/greenpolitics.uk>

2004 (December)

Study of peer-reviewed scientific journals over a ten-year period confirms consensus on climate change

University of California History of Science Professor Naomi Oreskes performs a review of articles in peer-reviewed scientific journals from 1993 to 2003, 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, and listed in the ISI database with the keywords “global climate change.” “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* 306, no. 5702, (December 3, 2004): 1686, <http://science.sciencemag.org/content/306/5702/1686.full>

** John Cook *et al.*, “Consensus on Consensus: A synthesis of consensus estimates on human-caused global warming,” *Environmental Research Letters* 11, no. 4, (April 13, 2016): 1, <http://iopscience.iop.org/article/10.1088/1748-9326/11/4/048002>; see also Cook *et al.*, “The 97% consensus on global warming,” *Skeptical Science*, 2016, <https://www.skepticalscience.com/global-warming-scientific-consensus-intermediate.htm>

2004 (December)

A Maine Climate Action Plan aims to reduce Maine’s greenhouse gas emissions to 1990 levels by 2010

It also aims to be 10% below 1990 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%” Prepared by the Maine Department of Environmental Protection and State Planning Office, pursuant to state legislation, 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 [*sic*] 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 UNFCCC Conference of the Parties (COP) in Buenos Aires explores next steps after expiration of the Kyoto Protocol in 2012, over strong U.S. objections

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.”*** [see 2001 (November)]

* Gardiner *et al.*, *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.climatenetwork.org/sites/default/files/ECOCOP1009.pdf>

*** Climate Action Network, “CAN Releases Scorecard Results,” *ECO NGO Newsletter*, December 10, 2004, <http://www.climatenetwork.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.”**[see 2001 (November), 2004 (December)]

*United Nations FCCC, “Kyoto Protocol - Targets for the first commitment period”, accessed January 7, 2020, http://unfccc.int/kyoto_protocol/items/2830.php

2005 (November)

Prime Minister Tony Blair of Britain speaks frankly to the G8 about “division” over the Kyoto Protocol

Blair acknowledges 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.” He 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,” (Speech, London, November 1, 2005), The National Archives, <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)

This is the the first mandatory, market based CO₂ trading program; RGGI aims 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: “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.”**

*RGGI States, Regional Greenhouse Gas Initiative Memorandum of Understanding (December 20, 2005), https://www.rggi.org/sites/default/files/Uploads/Design-Archive/MOU/MOU_12_20_05.pdf

** Hannah Fairfield, “Best of Both Worlds? Northeast Cut Emissions and Enjoyed Growth,” *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, accessed on January 7, 2020, <https://www.pbl.nl/en/Chinanowno1inCO2emissionsUSAinsecondposition>

2006 (March)

Study 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 reports 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* 19, 5686 (March 2006), <https://doi.org/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.”** Gore moves on to train thousands of people around the world to present his slide show through his nonprofit organization, The Climate Reality Project.***

*“An Inconvenient Truth,” Wikipedia, The Free Encyclopedia, accessed June 8, 2017,

https://en.wikipedia.org/wiki/An_Inconvenient_Truth

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

***The Climate Reality Project, accessed January 7, 2020, <https://www.climaterealityproject.org/>

2006 (July)

Nobel laureate Paul Crutzen sparks debate about whether geoengineering solutions would be a viable response to climate change

Nobel laureate Paul Crutzen, of the Scripps Institution of Oceanography, publishes the editorial essay “Albedo Enhancement by Stratospheric Sulphur Injections” in the journal *Climatic Change*. He 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, (2006): 211-219,

<https://doi.org/10.1007/s10584-006-9101-y>

2006 (September)

California passes the Global Warming Solutions Act, intended to begin in 2012 to reduce emissions to 1990 levels by 2020

This legislation aims for a 15% reduction over emissions expected under a “business-as-usual” scenario, and authorizes, but does not require, 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.*

*“Assembly Bill 32 Overview”, California Environmental Protection Agency, accessed on January 2019, <https://www.arb.ca.gov/cc/ab32/ab32.htm>

2006 (October)

Sir Nicholas Stern releases the 700 page “Stern Review: The Economics of Climate Change,” the most in depth such study to date

Stern is head of the British Government Economic Service, and a London School of Economics professor. 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* (London: 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 climate legislation

The U.S. Climate Action Partnership is 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. Organized by James Rogers, Duke CEO and Chair of the Edison Electric Institute, and Fred Krupp, director of the Environmental

Defense Fund, the coalition seeks to achieve U.S. emissions reductions of 10 to 30 percent from 2007 levels within the next 15 years, and a 60 to 80 percent reduction by 2050. In hearings before the U.S. Senate Committee on Environment and Public Works, USCAP is represented by Peter Darbee, CEO of PG&E, California's largest energy provider. Darbee describes USCAP's proposal for "a program that creates a long-term price signal for carbon by creating a mandatory cap on greenhouse gas emissions, combined with a trading program that uses the market to establish that long-term price signal and lets companies figure out how best to meet the goals." USCAP members share, Darbee explains, "a view that climate change is the most pressing environmental issue of our time and ...we agree that as the world's largest source of global warming emissions, our country has an obligation to lead." But Senator James Inhofe of Oklahoma [see 2003 (July)] is a nay-sayer: "Some companies are coming together in an attempt to profit from Government intervention where they have failed in the marketplace. Economists call this rent-seeking. But I think the Wall Street Journal is right: they are climate profiteers. These companies will gain market share against their competitors, while the economy flattens and jobs are sent to China, which in an ironic twist of fate will soon become the biggest emitter of CO₂, passing the United States by 2009." The coalition will become divided in future years on specifics of U.S. legislative proposals.* [see 2009 (January)]

* Eric Pooley, *The Climate War: True Believers, Power Brokers, and the Fight to Save the Earth* (New York: Harper Collins, 2010) 6, 160, 161; U.S. Congress, Senate, Committee on Environment and Public Works, *The U.S. Climate Action Partnership Report*, 110th Cong., 1st sess., 1997, 3-10, <https://www.govinfo.gov/content/pkg/CHRG-110shrg53824/html/CHRG-110shrg53824.htm>

2007 (February)

The IPCC's Fourth Assessment report finds that "[w]arming of the climate system is unequivocal"

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)." Warming is 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 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>

** 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 questions climate science in a television interview

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.”* As Vice President, Cheney, former head of the oil-services company Halliburton, has advocated for “a government-backed push to find new domestic sources of oil and gas, including in protected areas of the Arctic National Wildlife Refuge, and an all-out drive to build power plants.”** [see 2007 (October)]

*ABC News, “Exclusive: Cheney on Global Warming,” *ABC News*, February 23, 2007,

<http://abcnews.go.com/Technology/story?id=2898539&page=1>

**Joseph Kahn, “Cheney Promotes Increasing Supply as Energy Policy,” *New York Times*, May 1, 2001,

<https://www.nytimes.com/2001/05/01/us/cheney-promotes-increasing-supply-as-energy-policy.html>

2007 (March)

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

As Hansen testifies, “[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 that the Clean Air Act authorizes regulation of greenhouse gases in motor vehicles

In *Massachusetts v. Environmental Protection Agency* the U.S. Supreme Court rules in favor of states, municipalities, and organizations claiming the Environmental Protection Agency's (EPA's) 2003 refusal to regulate greenhouse gas (GHG) emissions from motor vehicles under the Clean Air Act (CAA) was illegal. [see 1999 (October), 2003 (September)] The court rules 5/4, in a decision by Justice John Paul Stevens, in favor of plaintiff petitioners on all three highly contested legal issues. It concludes that petitioners have a *right* to sue even if the harm is widely shared and the 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 CAA gives the EPA *authority* to regulate 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

China pledges 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 *ABA 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* 22, no. 3 (Winter 2008): 1,

http://www.americanbar.org/content/dam/aba/publications/natural_resources_environment/2008_winter/nre_win08_kim_jones.authcheckdam.pdf

2007 (October)

Al Gore and the IPCC win the Nobel Peace Prize

The prize is awarded to former Vice President Gore and the Intergovernmental Panel on Climate Change 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,” (Lecture, Oslo, 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 climate change warning deleted from Congressional testimony of the director of the CDC

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, reports 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 (CDC), 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. "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."* [see 2007 (February)]

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

2007 (December)

UNFCCC approves action plan for greenhouse gas reductions following 2012 expiration of the Kyoto Protocol

At the United Nations Framework Convention on Climate Change (UNFCCC) 13th Conference of the Parties (COP13) in Bali, 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 COP13 are achieved despite 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.”***

* United Nations, *Framework Convention on Climate Change; Part Two: Action taken by the Conference of the Parties at its thirteenth session* (Bali: United Nations, 2008), 3, <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.climatenetwork.org/sites/default/files/ECOp13n11.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 (2007) *et seq.*, <https://www.epa.gov/laws-regulations/summary-energy-independence-and-security-act>

**Congressional Research Service, *Congressional Review Service Report for Congress: The Energy Independence and Security Act of 2007; A Summary of Major Provisions* (Washington, D.C.: Congressional Research Service, 2007), 1. https://www1.eere.energy.gov/manufacturing/tech_assistance/pdfs/crs_report_energy_act_2007.pdf

2007 (December)

EPA 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) has 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," press release, Nov. 8, 2009. Cited in Jerry McNerney and Martin Cheek, *Clean Energy Nation: Freeing America from the Tyranny of Fossil Fuels* (New York: AMACON, 2012): 1 <https://epdf.pub/clean-energy-nation-freeing-america-from-the-tyranny-of-fossil-fuels.html>

2007 (December)

White House refuses to read, and attempts to suppress, a draft EPA finding that greenhouse gases "endanger the public health and welfare"

A finding that pollutants “endanger the public health and welfare” is a prerequisite to regulating them under the Clean Air Act, as confirmed by the Supreme Court in *Massachusetts v. EPA*. [see 2007 (April)] As a result of the court decision, Environmental Protection Agency (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 asks the EPA to retract the email and say it had been sent in error. EPA Administrator Stephen Johnson refuses to do this, saying it had not been sent in error. As the Union of Concerned Scientist study finds, “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 is ultimately worked into a May, 2008 draft Advanced Notice of Proposed Rulemaking, which is leaked to the press.*

*Union of Concerned Scientists, “The EPA’s Elusive Climate Change Endangerment Report,” December 1, 2008, <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’s analysis suggests that IPCC estimates of the dangers from increasing temperatures are significantly understated

Based on Intergovernmental Panel on Climate Change (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 *et al.*, “Target atmospheric CO₂: Where should humanity aim?” *Open Atmos. Sci. J.* 2 (2008): 217-231, <https://arxiv.org/abs/0804.1126>

2008 (June)

Joseph Romm delivers a critique and reanalysis of the Pacala/Socolow “stabilization wedges”

Physicist and climate expert 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 Climate Change* 1 (June 2008): 85-87, <https://www.nature.com/articles/climate.2008.59#citea>

2008

Author Bill McKibben and a group of students at Middlebury College found activist organization 350.org

Based in part on the recent work of James Hansen [2008 (April)], 350.org calls 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,” accessed January 10, 2020, <http://350.org/our-history/>

2008 (July)

The EPA issues a rulemaking notice arguing that the Clean Air Act is “ill-suited for the task of regulating global greenhouse gases”

In a first formal public response to the *Massachusetts v. EPA* decision [see 2007 (April), (October), (December)] Environmental Protection Agency (EPA) Administrator Stephen Johnson 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*.” 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 CAA, 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,” *Federal Register* 73 (July 30, 2008): 44354, <https://www.gpo.gov/fdsys/pkg/FR-2008-07-30/pdf/E8-16432.pdf>

2008 (October)

The United Kingdom parliament enacts the Climate Change Act of 2008

Spurred by the Stern Review [see 2006 (October)], the law “established the world’s first national legislation mandating greenhouse gas reductions by 2050 of 80%, relative to 1990 levels.” Passing by a near-unanimous vote with multiparty consensus, it creates a Committee on Climate Change led by experts who set carbon budgets every five years, and report periodically to Parliament and the cabinet. A 2019 policy analysis published in *Science* will note that the Act “inspired the Paris Agreement’s inclusion of a long-term target and ratchet mechanism, and its institutional features have been adopted by other jurisdictions.” [see 2015 (December)] * A 2018 review by the Grantham Research Institute will find that the Act “has been instrumental in advancing British climate change policy over the 10 years it has been in force.”** From 2010 to 2017, UK greenhouse gas emissions will fall by 23%.***

* J.D. Farmer et. al “Sensitive intervention points in the post-carbon transition,” *Science* 364, no. 6436 (April 12, 2019): 1, <https://science.sciencemag.org/content/364/6436/132>; Climate Change Act of 2008, <http://www.legislation.gov.uk/ukpga/2008/27>

** Michal Nachmany and Joana Setzer, *Global trends in climate change legislation and litigation: 2018 snapshot*, (London: Grantham Research Institute, May, 2018), 1, <http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2018/04/Global-trends-in-climate-change-legislation-and-litigation-2018-snapshot.pdf>

***U.K. National Statistics, Annex: *1990-2017 UK Greenhouse Gas Emissions, Final Figures by End User*, (Crown, March 28, 2019): 1, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/789830/1990-2017-uk-emissions-final-figures-by-end-user-sector-fuel-type.pdf

2008 (November)

Barack Obama runs against John McCain for President, and wins; 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

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

2009 (January)

NOAA study concludes that climate impacts will be largely irreversible for more than a thousand years after CO₂ emissions completely stop

As National Oceanic and Atmospheric Administration Senior Scientist Susan Solomon and coauthors 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 *et al.*, “Irreversible climate change due to carbon dioxide emissions,” *Proc.Natl.Acad.Sci. USA* 106, no. 6 (January 2009): 1704-1709, <https://doi.org/10.1073/pnas.0812721106>

**Andrew Revkin, “The Greenhouse Effect and the Bathtub Effect,” *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 releases *A Blueprint for Legislative Action*

The plan calls for a national 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. Cited in Jennifer Layke, “The USCAP Blueprint for Legislative Action”, *Worlds Resources Institute*, January 15, 2009, <https://www.wri.org/blog/2009/01/uscap-blueprint-legislative-action>

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

2009

85 percent of lobbyists registered to work on climate change in Congress aim to slow down government action

About six lobbyists per member of Congress—2,340 lobbyists—are registered to work on climate change on Capitol Hill. 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.

** “Federal Lobbying Climbs in 2009 as Lawmakers Execute Aggressive Congressional Agenda,” *OpenSecrets.org*, Center for Responsive Politics, 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 *et al.*, *Maine's Climate Future: An Initial Assessment* (Orono, ME: University of Maine, 2009). https://climatechange.umaine.edu/wp-content/uploads/sites/439/2018/08/Maines_Climate_Future.pdf

2009 (April)

Malte and Nicolai Meinshausen initiate the “carbon budget” approach to measuring progress on climate change

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 maneuver and increasing the probabilities of dangerous consequences.”**

*Malte Meinshausen *et al.*, “Greenhouse-gas emissions targets for limiting global warming to 2 degrees C,” *Nature* 458 (April 30, 2009): 1158-1162, <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 denies on ABC that carbon dioxide is a carcinogen

As Boehner argues: “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,” *ThinkProgress*, 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 EPA approves California motor vehicles emissions waiver, allowing it and 13 other states to regulate greenhouse gas emissions from cars and trucks

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 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>, *Federal Register* 74 (July 8, 2009): 32744 <https://www.gpo.gov/fdsys/pkg/FR-2009-07-08/pdf/E9-15943.pdf>

** Jim Tankersley, “California wins EPA waiver on greenhouse emissions”, *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,” *Environmental Defense Fund*, June 30, 2009, <https://www.edf.org/news/13-states-adopting-california-clean-car-standards-would-reap-significant-economic-and-environe>

2009 (June)

The House approves legislation for a national cap-and-trade system for regulating greenhouse gases, but the proposal fails in the Senate

The Waxman/Markey bill, H.R. 2454, entitled the American Clean Energy and Security Act, is approved by a vote of 219 to 212 in the House of Representatives. It 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. Lizza’s analysis 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 deigned to conceal backroom deals and giveaways, our framework is a straight path that all Americans can follow.’”*** This proposal gets little traction in the Senate.

*Ryan Lizza, “As the World Burns,” *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://insideclimateneeds.org/news/20090506/cap-and-trade-temple-doom>

2009 (October)

A Pew Research Center survey finds a sharp decline in the percentage of Americans who say there is solid evidence that global temperatures are rising

Believers that there is “solid evidence” of global warming have declined from 71% to 57% in the past year. 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,” (Washington, D.C.: Pew Research Center Oct. 22, 2009), <http://people-press.org/2009/10/22/fewer-americans-see-solid-evidence-of-global-warming/>

2009 (November)

Hacked scientist emails fan the flames of climate denial

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 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 are 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.”** Of this hack, dubbed “Climategate” in the media, Michael Mann [see 1998 (April)] writes: “Two years later, roughly a dozen...different investigations in the United States and the United Kingdom had exonerated the scientists. There had been no data fudging, no attempt to mislead the public about climate change. The only wrongdoing that was established was the criminal theft of the emails in the first place...The Climategate thieves were never caught. What we do know is that Russia and Saudi Arabia both played roles in hosting and helping to distribute the stolen emails.”*** [see 2010 (February)]

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

**Sir Muir Russell *et al.*, *The Independent Climate Change E-mails Review* (Norwich, U.K.: University of East Anglia July, 2010), <http://www.cce-review.org/pdf/FINAL%20REPORT.pdf>

***Michael Mann, *The New Climate War* (New York: PublicAffairs, 2021), 36-39; Mann also discusses the Russian role, and motivations, in manipulating social media related to climate politics through “bots” at 68-72, 105-107.

2009 (December)

Obama administration EPA issues a final “endangerment finding” on greenhouse gases.

In compliance with the ruling in *Massachusetts v. Environmental Protection Agency*, the Obama Environmental Protection Agency (EPA) issues a final “endangerment finding,” concluding that six greenhouse gases (GHG) “may reasonably be anticipated to endanger public health and welfare.” The EPA 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 [EPA] 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.”* [see 2007 (April), (October), (December), 2019 (December)]

*U.S.Environmental Protection Agency, “Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act,” *Federal Register* 74 (December 15, 2009): 66495, <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)

UNFCCC 15th COP meeting in Copenhagen ends with a three-page “accord” that is neither legally binding, nor formally accepted

The United Nations Framework Convention on Climate Change Conference of the Parties “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, <https://www.independent.co.uk/voices/commentators/joss-garman-copenhagen-historic-failure-that-will-live-in-infamy-1845907.html>

2010 (February)

For the first time, the U.S. Department of Defense assesses the impact of climate change on global stability and defense operations

This assessment, in the Department’s primary planning document, the Quadrennial Defense Review, is 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/>

** U.S. Department of Defense, *Quadrennial Defense Review Report* (Washington D.C.: United States Department of Defense, February, 2010):1, <https://archive.defense.gov/qdr/QDR%20as%20of%2029JAN10%201600.pdf>

2010 (February)

Senator James Inhofe releases a report calling for criminal prosecution of 17 climate scientists

The initiative by Senator Inhofe, ranking Republican on the Environment and Public Works Committee, is in response to the hacked e-mails from University of East Anglia, United Kingdom. [see 2009 (November)] 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.”*

* Editorial, “Climate of fear,” *Nature* 464, no.141 (March 11, 2010): 1, <https://doi.org/10.1038/464141a>

2010 (May)

The EPA takes the first U.S. regulatory action to control greenhouse gases

The Environmental Protection Agency finally takes the action that a group of environmental organizations, states, and municipalities asked it to do eleven years ago [see 1999 (October)]. Jointly with the National Highway Traffic Safety Administration, the Obama administration EPA 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. 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 rules set standards for combined average fuel efficiency for passenger vehicles and light trucks beginning in 2012, increasing in stringency through model year 2016, when all fleets will be required to achieve a fuel economy level of 34.1 mpg. 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.”* [see also 2012 August]

*U.S.Environmental Protection Agency, “Light-duty Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards; Final Rule,” *Federal Register* 75 (May 7, 2010): 25323, <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 EPA issues a final “tailoring” rule under the Clean Air Act for applying greenhouse gas (GHG) emission standards to stationary sources

The rule applies to permit proceedings for factories and power plants, and 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,” *Federal Register* 75 (June 3, 2010): 32513, <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,” *Federal Register* 73 (July 30, 2008), 44354, <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.*

*Dan Huber and Jay Gullede, "Extreme Weather and Climate Change," *Center for Climate and Energy Solutions* (December 2011): 1, <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." *

*Connor Gibson, "Koch Front Groups Attack RGGI- the Northeast Regional Greenhouse Gas Initiative: A Case Study," *Greenpeace*, accessed January 10, 2020, <https://www.greenpeace.org/usa/global-warming/climate-deniers/koch-industries/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/a-capper-for-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-rggi-withdrawal-bill/?printmode=1>

2010 (November)

Researchers foresee warming of 4 degrees Celsius relative to preindustrial averages by the 2070's, in absence of regulatory action

Richard Betts of the Hadley Centre for Climate Prediction and Research in the United Kingdom and coauthors release an analysis concluding that based on the Intergovernmental Panel on Climate Change (IPCC) scenarios their 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." The 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. The Betts study takes 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. The researchers' goal was to determine the approximate time that temperatures could reach 4°C 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 *et al.*, "When Could Global Warming Reach 4 degrees Centigrade?" *Royal Society* 369, no. 1934 (November 29, 2010): 1, <https://doi.org/10.1098/rsta.2010.0292>

2010

Total U.S. greenhouse gas emissions (CO₂ equivalent) in 2000 are 6985 million metric tons [tonnes], 9.2% higher than in 1990

2010 marks the twentieth year that the Environmental Protection Agency has prepared an annual Emissions Inventory of [U.S.] Greenhouse Emissions and Sinks pursuant to obligations under the United Nations Framework Convention on Climate Change. The good news is that there has been some progress in the last decade. U.S. emissions in 2010 are 3.8% lower than in 2000.*

*U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2014* (Washington, D.C.: U.S. Environmental Protection Agency 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 discusses the potential for "abrupt climate change" as temperatures greenhouse gases have risen 100 times faster in the last century than in the past

Paul Mayewski, director of the University of Maine Climate Change Institute, 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 links growth in international trade from 1990 to 2008 to a doubling of greenhouse gas emissions in developing countries

The study in *Proceedings of the National Academy of Sciences* 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 *et al.*, “Growth in Emissions Transfers via International Trade from 1990 to 2008,” *PNAS* 108, no. 21 (April 19, 2011): 1, <https://doi.org/10.1073/pnas.1006388108>

2011 (June)

The U.S. Supreme Court rejects a common law nuisance claim for greenhouse gas emissions

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,” *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 *et al.*, “Projecting Coral Reef Futures Under Global Warming and Ocean Acidification,” *Science* 333, no. 6041 (July 22, 2011): 418-422, <http://science.sciencemag.org/content/333/6041/418.full>

2011 (October)

Global warming skeptic funded by the Koch brothers confirms global temperature rise

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 they are: “[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,” *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)

Estimates of global 2010 carbon emissions show a record 6% increase over 2009

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, accessed January 10, 2020, <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)

UNFCCC climate talks in Durban, South Africa conclude with a distinctly "modest" agreement to work toward a future agreement

Delegates to the United Nations Framework Convention on Climate Change 17th Conference of the Parties in Durban agree on a 2015 deadline for reaching a "protocol, legal instrument or an agreed outcome with legal force" that includes developing countries like China, India, and Brazil, 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."*

*Staff, "Canada pulls out of Kyoto Protocol," *Guardian*, 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*, contending: "No Need to Panic about Global Warming"

The scientists argue 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." * 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 is 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,

<https://www.wsj.com/articles/no-need-to-panic-about-global-warming-1386195856>

**Suzanne Goldenberg, “Wall Street Journal rapped over climate change stance,” *Guardian*, February 1, 2012,

<https://www.theguardian.com/environment/2012/feb/01/wall-street-journal-climate-change>

***Peter Gleick *et al.*, “Climate Change and the Integrity of Science,” *Science* 328, no. 5979 (May 7, 2010): 690,

<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,” *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,” *Federal Register* 77 (April 13, 2012): 22391

<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,” *New York Times*, 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, founder of 350.org, speaks at the University of Maine

McKibben 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,” *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,” *Guardian*, May 4, 2012, <https://www.theguardian.com/environment/blog/2012/may/04/heartland-institute-global-warming-murder>

2012 (June)

Study concludes that no matter how quickly we cut emissions, sea levels are likely to rise 5 feet in 100 to 300 years

Michiel Schaeffer and coauthors publish a letter in the journal *Nature Climate Change*. They 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 *et al.*, “Long-term sea level rise implied by 1.5 C and 2 C warming levels,” *Nature Climate Change* 2 (2012): 867-870, <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 averages 54.5 miles per gallon by 2025

According to the Washington Post, this is “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.”* [see 2017 (March), 2018 (August)]

*Juliet Eilperin, “Autos must average 54.5 mpg by 2025, new EPA standards say,” *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; Office of the Press Secretary, “Obama Administration Finalizes Historic 54.5 MPG Fuel Efficiency Standards,” The White House, 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 introduces the concept that “climate dice”

Publishing in the *Proceedings of the National Academy of Sciences*, Hansen and coauthors explain that the chance of unusually warm or cool seasons have become more and more “loaded” in the past 30 years, coincident with rapid global warming. “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* 109, no. 37 (September 11, 2012): E2415-E2423, <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

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.*****

* "Obama's 'Climate Change is Not a Hoax' Declaration at DNC Challenges Romney," *The Huffington Post*, 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>

*** "Obama Ends His Climate Silence," *Climatesilence.org*, http://climatesilence.org/graph/#.WT5_WevyvIU

**** "Transcript: President Obama's Convention Speech, September 6, 2012," *National Public Radio*, <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," *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*, 337, no. 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 (September)].

* NOAA, Frequently Asked Questions, accessed January 10, 2020, <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>

**** Ashleigh Banfield, 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 Hertzberg, “Into the Storm,” *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, “With Mayor Mike Bloomberg’s endorsement of Obama for his handling of Hurricane Sandy and his (alleged, activists might sniff) commitment to battling climate change, environmental issues will get a strong boost inside the Beltway. The House, under Nancy Pelosi, passed a cap-and-trade bill at Obama’s request in 2009. But instead of revising that complex scheme, how about a straightforward carbon tax? Yes, it’s a tax. But it’s much simpler. Everyone can understand it. Some experts have estimated that across a range of activities—freight shipping, aviation, electricity use, personal travel—emissions would fall impressively. It could be phased in slowly, and it could be offset by other tax decreases for manufacturers and consumers to soften the blow.”

*Michael Tomasky, “The Morning After: Start Now,” *Newsweek*, November 19, 2012, <https://www.newsweek.com/second-term-priorities-fiscal-cliff-climate-change-immigration-and-foreign-policy-63763>

2012 (November)

Bill McKibben's 350.org calls for America's colleges and universities to divest their investments in fossil fuel companies

The Go Fossil Free: Divest from Fossil Fuels! campaign is announced in an article in *Rolling Stone*, where McKibben [see 2008] declares: “We need to view the fossil-fuel industry in a new light. It has become a rogue industry, reckless like no other force on Earth. It is Public Enemy Number One to the survival of our planetary civilization.” The stated goal of the campaign is to “revoke the social license of the fossil fuel industry.”* Unity College in Maine is the first in the country to sign on to the “divestiture movement.” Unity College President Stephen Mulkey joins McKibben in an event in Portland announcing the campaign. 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) , 2021 (September)]

*Todd Schifeling and Andrew Hoffman, “How Bill McKibben’s radical idea of fossil-fuel divestment transformed the climate debate,” *The Conversation*, December 11, 2017, <https://theconversation.com/how-bill-mckibbens-radical-idea-of-fossil-fuel-divestment-transformed-the-climate-debate-87895>

**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 (November)

A World Bank report suggests that adapting to a 4°C world may be impossible

Prepared by the Potsdam Institute for Climate Impact Research and Climate Analytics, the report, entitled “Turn Down the Heat: Why a 4°C Warmer World Must be Avoided,” is premised on the concern that “Even with the current mitigation commitments and pledges fully implemented, there is roughly a 20 percent likelihood of exceeding 4°C by 2100. If they are not met, a warming of 4°C could occur as early as the 2060s. Such a warming level and associated sea-level rise of 0.5 to 1 meter, or more, by 2100 would not be the end point: a further warming to levels over 6°C, with several meters of sea-level rise, would likely occur over the following centuries.” After considering impacts of high temperature extremes on agriculture and ecosystems, sea level rise, increased tropical cyclone intensity, and increased aridity and drought, the report concludes that “there is ...no certainty that adaptation to a 4°C world is possible. A 4°C world is likely to be one in which communities, cities and countries would experience severe disruptions, damage, and dislocation, with many of these risks spread unequally. It is likely that the poor will suffer most and the global community could become more fractured, and unequal than today. The projected 4°C warming simply must not be allowed to occur—the heat must be turned down. Only early, cooperative, international actions can make that happen.”*

*The World Bank, *Turn Down the Heat: Why a 4°C Warmer World Must be Avoided*, (Washington D.C.: The World Bank 2012), <http://documents.worldbank.org/curated/en/865571468149107611/pdf/NonAsciiFileName0.pdf>

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, more than 365 billion tons [tonnes] of carbon has been added to the atmosphere as a result of fossil fuel combustion and cement manufacturing

These emissions, all from fossil fuel combustion and cement manufacturing, are according to data from the U.S. Department of Energy's Carbon Dioxide Information Analysis Center. 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, U.S. Department of Energy, 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

President Obama promises: "We will respond to the threat of climate change, knowing that the failure to do so would betray our children and future generations." 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)

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*, Robert Rohde, Richard Muller [see 2011 (October)] and coauthors 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 *et al.*, “A New Estimate of the Average Earth Surface Land Temperature Spanning 1753 to 2011,” *Geoinformatics & Geostatistics: an Overview* 1, no. 1 (2013):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

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)

Study compares escalating relative rates of climate change over the last 11,300 years

The study in the journal *Science*, “A Reconstruction of Regional and Global Temperature for the Past 11,300 Years,” by researchers at Oregon State University and Harvard University finds 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 *et al.*, “A Reconstruction of Regional and Global Temperature for the Past 11,300 Years,” *Science* 339, no. 6124 (May 8, 2013): 1198-1201, <http://www.sciencemag.org/content/339/6124/1198.abstract>

2013 (April)

62% of self-identified Republicans and GOP-leaning Independents in a national survey say that the United States should take action to address climate change

According to a report released by George Mason and Yale universities, 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 *et al.*, *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)

NOAA reports the annual average sea temperature for the Northeast Shelf Ecosystem in 2012 reached 14 degrees Celsius (57.2 degrees Fahrenheit)

The Northeast Shelf extends from the Gulf of Maine to Cape Hatteras, North Carolina. This, according to the National Oceanic and Atmospheric Administration report, is the highest average ever calculated since measurements were first collected in 1854. 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,” *Guardian*, May 2, 2013, <http://m.guardian.co.uk/environment/earth-insight/2013/may/02/white-house-arctic-ice-death-spiral>

2013 (May)

NOAA announces the first occurrence of CO₂ levels at 400 ppm for a 24-hour average at Mauna Loa Observatory, Hawaii

The National Oceanic and Atmospheric Administration (NOAA) then revises the levels 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,” says NOAA’s Pieter P. Tans.** 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.*** National Aeronautics and Space Administration 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>

**** National Aeronautics and Space Administration, “NASA Scientists React to 400 PPM Milestone,”

<http://climate.nasa.gov/400ppmquotes/>

2013 (May)

The Obama Administration OMB increases the social cost of carbon used in calculating costs and benefits of environmental policies and legislation proposals by 60%

This action by the Office of Management and Budget is in part due to increased estimates of rising sea levels and consequent property damage associated with climate change. 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 writes for *Grist*, 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 and United States Government, “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,” *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

This sets a record and suggests 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,” *Washington Post*, June 10, 2013, http://www.washingtonpost.com/business/economy/carbon-dioxide-emissions-rose-14-percent-in-2012-ia-report-says/2013/06/09/35d32bac-d123-11e2-8cbe-1bcbee06f8f8_story.html

2013 (June)

President Obama and Chinese President Xi Jinping agree to work together to eliminate international production of hydrofluorocarbons

Hydrofluorocarbons (HFCs) are the refrigerant and air conditioner 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, meeting in California, 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.”* [see 2018 (October), 2020 (April)]

*Steven Mufson, “President Obama and Chinese President Xi Jinping agree to wind down production and use of hydrofluorocarbons or HFCs,” *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-hfcs/2013/06/08/92e4d79e-d08f-11e2-8845-d970ccb04497_story.html

2013 (June)

President Obama unveils his National Climate Action Plan

The plan calls 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)

Review finds that a shift toward greater warmth or more extreme precipitation of one standard deviation causes significant increases in personal violence and conflict

The review published in *Science* examines 60 studies on how climate change helps spark conflict throughout the world. It finds that a shift toward greater warmth or more extreme precipitation of one standard deviation causes personal violence to increase by 4% and intergroup conflict by 14%. 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, Marshall Burke, and Eduard Miguel, “Quantifying the Influence of Climate on Human Conflict,” *Science* 341, no. 6151 (July 31, 2013):1235367, <http://www.sciencemag.org/content/early/2013/07/31/science.1235367.abstract>

2013 (August)

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* 500 no. 7462 (August 15, 2013): 287-295, <https://www.ncbi.nlm.nih.gov/pubmed/23955228>

2013 (September)

Colorado sustains a “1000-year rainfall event,” described by the National Weather Service as “biblical”

The state experiences more than the annual average of 17 inches of rain falls over just three days; over 1700 homes are destroyed and 16,000 are damaged. Property loss is 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)

NOAA 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 National Oceanic and Atmospheric Administration 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."*[see 2012 (October)]

*National Oceanic and Atmospheric Administration, "New analyses find evidence of human-caused climate change in half of the 12 extreme weather and climate events analyzed from 2012," *NOAA*, September 5, 2013, <https://www.noaa.gov/new-analyses-find-evidence-human-caused-climate-change-half-12-extreme-weather-and-climate-events>

2013 (September)

A study of climate sensitivity concludes that if all existing fossil fuels are burned, most of the earth might essentially be uninhabitable

The study by James Hansen and coauthors calculates 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 *et al.*, “Climate Sensitivity, Sea Level, and Atmospheric Carbon Dioxide,” *Royal Society* 371, no. 2001, (September 16, 2013), <http://rsta.royalsocietypublishing.org/content/371/2001/20120294.full.pdf+html>

2013 (September)

IPCC Fifth Assessment report ramps up certainty on human cause of climate change

The Intergovernmental Panel on Climate Change (IPCC) report concludes that “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 report adopts Meinhausen’s “cumulative carbon budget” approach [see 2009 (April)]. As Ryan Koronowski explains it for *ThinkProgress*, “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.”* [see 2013 (December)]

* Intergovernmental Panel on Climate Change, *Climate Change 2013: The Physical Science Basis* (Cambridge, U.K.: Cambridge University Press, 2013), 1, <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?,” *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

A total of 9.7 gigatonnes carbon (GtC) were 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)

Study challenges adequacy of IPCC’s “carbon budget” to protect the planet

A study by James Hansen and coauthors concludes that the “carbon budget” recommended by the Intergovernmental Panel on Climate Change (IPCC) 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 *et al.*, “Assessing ‘Dangerous Climate Change’: Required Reduction of Carbon Emissions to Protect Young People, Future Generations and Nature,” *PLoS ONE* 8, no. 12 (December 3, 2013): e81648, <https://doi.org/10.1371/journal.pone.0081648>

2013 (December)

Report finds that at least 29 major U.S. corporations are incorporating a price on carbon into their long-term financial plans

These are companies that have close ties to Republicans, including ExxonMobil, Walmart, and American Electric Power. From the report by the Carbon Disclosure Project: “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: A review of findings from CDP 2013 disclosure* (New York, N.Y.: Carbon Disclosure Project, 2013), 1, <https://big.assets.huffingtonpost.com/22Nov2013-CDP-InternalCarbonPriceReprt.pdf>

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

2013 (December)

Maine government report warns of increases in dangerous mosquito-borne diseases

The report, “Concerning the Development of a State Plan to Protect the Public Health from Mosquito-borne Diseases” by the Maine Department of Health and Human Services, and the Maine Department of Agriculture 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.*

*Maine Department of Agriculture, Conservation and Forestry in Cooperation with the Maine Department of Health and Human Services, *Report to the Joint Standing Commission on Agriculture, Conservation and Forestry Pursuant to Resolve 2013 Chapter 13: Directing the Department of Agriculture, Conservation and Forestry to Develop a Plan for the Protection of the Public Health from Mosquito-borne Diseases* (Maine Department of Health and Human Services and Department of Agriculture, Conservation and Forestry, 2013): 1, http://www.maine.gov/dacf/php/integrated_pest_management/documents/Mosq_Report_Plan_with_appendices_1-14.pdf

2013 (December)

NAS panel assesses the potential for abrupt climate change

The report of the National Academy of Sciences confirms that there is a risk of rapid, dramatic changes including the collapse of polar sea ice, mass extinction of plant and animal life, and a threat of immense dead zones in the ocean. As summarized by the *New York Times*, however, “some worst-case fears about climate change that have entered the popular imagination can be ruled out as unlikely, at least over the next century, the panel found. These include a sudden belch of methane from the ocean or the Arctic that would fry the planet, as well as a shutdown of the heat circulation in the Atlantic Ocean that would chill nearby land areas — the fear on which the 2004 movie “The Day After Tomorrow” was loosely based.”*

*Justin Gilles, “Panel Says Global Warming Carries Risk of Deep Changes,” *New York Times*, December 3, 2013, <https://www.nytimes.com/2013/12/04/science/earth/panel-says-global-warming-risks-sudden-deep-changes.html?hpw&rref=us>; National Research Council, *Abrupt Impacts of Climate Change: Anticipating Surprises* (Washington, D.C.: National Academic Press 2013), <https://nas-sites.org/americasclimatechoices/other-reports-on-climate-change/abrupt-impacts-of-climate-change/>

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, <https://www.climatecentral.org/news/rains-ease-calif.-drought-make-wildfire-outlook-grimmer-17147>; United States Drought Monitor, accessed January 11, 2020, <https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?CA>

2014 (March)

Study links climate change with record hot year in Australia

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*, World Meteorological Association, no. 1130 (2014): 20-21, https://library.wmo.int/pmb_ged/wmo_1130_en.pdf

2014 (March)

IPCC report estimates that poor countries need collectively as much as \$100 billion a year to try to offset the effects of climate change

The report by Working Group II of the Intergovernmental Panel on Climate Change (IPCC), “Climate Change 2014: Impacts, Adaptation, and Vulnerability,” cites a World Bank analysis for the estimate. 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 remove the \$100 billion figure from the executive summary of the 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, <https://www.nytimes.com/2014/04/01/science/earth/climate.html>; Intergovernmental Panel on Climate Change, *IPCC Report: A changing climate creates pervasive risks but opportunities exist for effective responses* (March 31, 2014), https://www.ipcc.ch/site/assets/uploads/2018/06/140330_pr_wgII_spm_en.pdf

2014 (March)

Percentage of Americans who think global warming is real has retreated to the same level as in 1997

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 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.** In 2021, Harvard will announce a divestment policy [see 2021 (September)]. 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,” *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,” *Harvard Crimson*, April 28, 2017, <http://www.thecrimson.com/article/2017/4/28/divest-celebrates-university-announcement/>

***Bowdoin Climate Action, accessed January 11, 2020, <https://bowdoinclimateaction.wordpress.com/>

2014 (April)

IPCC report asserts that greenhouse gas reductions need not wreck the global economy

The 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. 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.’”*

*Damian Carrington, “IPCC climate change report: averting catastrophe is eminently affordable,” *Guardian*, April 13, 2014, <http://www.theguardian.com/environment/2014/apr/13/averting-climate-change-catastrophe-is-affordable-says-ipcc-report-un>; Intergovernmental Panel on Climate Change, Working Group III, *AR5: Mitigation of Climate Change* (Cambridge, U.K.: Cambridge University Press, 2014), <https://www.ipcc.ch/report/ar5/wg3/>

2014 (April)

Study links climate change to extreme winter drought and polar vortex

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 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 Niño-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 *ClimateProgress*’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.SimonWang, *et al.*, “Probable causes of the abnormal ridge accompanying the 2013–2014 California drought: ENSO precursor and anthropogenic warming footprint,” *Geophysical Research Letters* 41, no. 9 (May 16, 2014): 1, <https://doi.org/10.1002/2014GL059748>

**Joe Romm, “Bombshell: Study Ties Epic California Drought, ‘Frigid East,’ to Manmade Climate Change,” *ThinkProgress*, April 15, 2014, <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 for existing stationary sources under the Clean Air Act

The regulations aim 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.** Harvard Constitutional law professor Laurence Tribe joins Peabody Energy Corporation in filing an objection to the proposal, contending that the rules would be unconstitutional.*** In a *Wall Street Journal* opinion piece, Professor Tribe argues, “The brute fact is that the Obama administration failed to get climate legislation through Congress. Yet the EPA is acting as though it has the legislative authority anyway to re-engineer the nation’s electric generating system and power grid. It does not.”**** What follows is a heated debate between Tribe and two of his Harvard Law colleagues, Jody Freeman and Richard Lazarus, on the constitutionality of the proposed regulations.***** [see 2015 (August)]

*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-idUSKBN0ED0U020140602> ;

Environmental Protection Agency, Proposed Rule, “Carbon Pollution Emission Guidelines for Existing Stationary Sources,” *Federal Register* 79 (June 18, 2014): 34830, <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/>

***Comments of Laurence H. Tribe and Peabody Energy Corporation on Carbon Pollution Emission Guidelines for Existing Stationary Sources, U.S. Environmental Protection Agency, December 1, 2014, [https://www.masseygail.com/pdf/Tribe-Peabody_111\(d\)_Comments_\(filed\).pdf](https://www.masseygail.com/pdf/Tribe-Peabody_111(d)_Comments_(filed).pdf)

****Laurence H. Tribe, “The Clean Power Plan is Unconstitutional,” *Wall Street Journal*, December 22, 2014, <https://www.wsj.com/articles/laurence-tribe-the-epas-clean-power-plan-is-unconstitutional-1419293203>

***** “Experts debate the constitutionality of the president’s climate change plan,” *Harvard Law Today*, March 20, 2015, <https://today.law.harvard.edu/experts-debate-constitutionality-presidents-climate-change-plan/>

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 the National Oceanic and Atmospheric Administration’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.”*

* National Oceanic and Atmospheric Administration, National Center for Environmental Information, *Global Climate Report – June 2014* (Springfield, MD: NOAA, 2014): 1, <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 carbon tax

Prime Minister Tony Abbott states that “Scrapping 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... ‘Scrapping 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 Senate 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.”**

*The White House, “New Report: the Cost of Delaying Action to Stem Climate Change,” July 29, 2014, <https://obamawhitehouse.archives.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, <https://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,” *Maine Public*, 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

A total of 9.9 gigatonnes carbon (GtC) (36 GtCO₂) were 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)

President Obama speaks at the United Nations Climate Summit in New York City

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

McKibben tells a near-capacity crowd at the Collins Center: “I can’t promise you that we’re going to win, but I can promise you that we’re going to fight... 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)

Study concludes estimates of warming absorbed by ocean erroneously low

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 Kintsch 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 Kintsch, “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 *et al.*, “Quantifying underestimates of long-term upper ocean warming,” *Nature Climate Change* 4 (October 5, 2014): 999-1005, <https://www.nature.com/articles/nclimate2389>

2014 (November)

World Resources Institute study: U.S. ranks first for historic cumulative CO² emissions from 1850 to 2011, responsible for 27% of the world’s emissions.

The World Resources Institute analysis covers the world’s top 10 greenhouse gas emitters, by current annual emissions, per capita emissions, and historic cumulative emissions.

The next ranked country is China, at 11% of cumulative emissions. The European Union, representing 28 nations, accounted for 25%. For all greenhouse gases, complete data is only available starting in 1990. For 1990 to 2011, the U.S. is also the highest ranked contributor, responsible for 17%, while China comes in at a close 16%. Canada, the United States, and the

Russian Federation are the top three per capita emitters, each contributing more than double the world average, while India's per capita emissions are one third of the world average.*

*Menpin Ge *et al.*, "6 Graphs Explain the World's Top 10 Emitters," *World Resources Institute*, November 25, 2014, <https://www.wri.org/blog/2014/11/6-graphs-explain-world-s-top-10-emitters>

2014 (November)

IPCC Fifth Assessment "Synthesis Report," emphasizes the "severe, pervasive, and irreversible impacts for people and ecosystems" if we do not act now

Major points of the report of the Intergovernmental Panel on Climate Change 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* (Geneva, Switzerland: Intergovernmental Panel on Climate Change, 2014): 1 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," *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.*

*The White House, “Fact SHEET: U.S.-China Joint Announcement on Climate Change and Clean Energy Cooperation,” November 11, 2014, <https://obamawhitehouse.archives.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)

UNFCCC 20th COP sets stage for Paris conference in 2015

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 plans will be a basis for an international agreement to be finalized in Paris in 2015. The agreement 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.”*

*United Nations Framework Convention on Climate Change, Conference of the Parties 20, Lima, Peru, <http://unfccc.int/resource/docs/2014/cop20/eng/114.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 finding that “it is the sense of the Senate that climate change is real and not a hoax”

Senator James Inhofe (R-OK) [see 2003 (January)] 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*, January 21, 2015, <http://thinkprogress.org/climate/2015/01/21/3614028/so-much-senate-climate-change-trolling/>

2015 (January)

Two-thirds of Americans (and 48% of Republicans) in poll say they are more likely to vote for a politician who campaigns on fighting climate change

According to the New York Times/Stanford University poll of 1000 adults, 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, <https://www.nytimes.com/2015/01/31/us/politics/most-americans-support-government-action-on-climate-change-poll-finds.html>

2015 (January)

The University of Maine System (UMS) Board of Trustees votes unanimously to partially divest itself from investments in the coal industry

This is 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)

NOAA declares 2014 “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 Migliozzi, “2014 Was the Hottest Year on Record,” *Bloomberg*, January 16, 2015, <http://www.bloomberg.com/graphics/2014-hottest-year-on-record/>; NOAA, *Global Climate Report- January 2015*, (Silver Spring, MD: NOAA, 2015): 1, <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

The report observes 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 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 *et al.*, *Maine’s Climate Future: 2015 Update* (Orono, Me: University of Maine 2015): 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

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>

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 to bishops of the Roman Catholic Church, *Encyclic Letter of the Holy Father on Care for Our Common Home* (May 2015): 23, 86, 22, http://w2.vatican.va/content/francesco/en/encyclicals/documents/papa-francesco_20150524_enciclica-laudato-si.html (accessed January 11, 2020)

** Damian Carrington, “Will Pope Francis’s encyclical become his miracle that saved the planet?” *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 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.”***[see 2014 (June), 2017 (October)]

* Environmental Protection Agency, “Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units; Final Rule,” *Federal Register* 80 (October 23, 2015): 64661–65120, <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)

Study finds 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 *et al.*, “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, no. 6 (2016): 5-12, <https://doi.org/10.1289/ehp.1510037>

**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 support the EPA’s defense of the plan

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.”*

* Office of the Maine Attorney General, “Maine joins in coalition of 25 states, cities and countries in defense of EPA Clean Power Plan”, 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 a climate-related investment fraud investigation of Exxon Mobil

Schneiderman seeks 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.* [see 2016 (October)]

* Justin Gillis and Clifford Kraus, “Exxon Mobil Investigated for Possible Climate Change Lies by New York Attorney General,” *New York Times*, November 5, 2015, <http://www.nytimes.com/2015/11/06/science/exxon-mobil-under-investigation-in-new-york-over-climate-statements.html>

2015 (December)

Global CO₂ emissions from fossil fuel burning and cement production increased by 0.6% in 2014, the highest emissions level 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, https://www.globalcarbonproject.org/carbonbudget/archive/2015/gcp_budget_2015_v1.02.pdf

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 it 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 adopts a goal of “Holding the increase in the global average temperature to well below 2 degrees C (3.6 degrees F) above pre-industrial levels” and a more ambitious commitment to “pursue efforts,” to keep warming under a 1.5 degrees C (2.7 degrees F) benchmark. 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,” concerned that the CO₂ reduction commitments don’t become effective until 2020.* Scientists estimate that at best, the agreement will cut global greenhouse gas emissions by about half the amount necessary to prevent 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.”*****

[see 2017 (June)]

*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,” *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)

NOAA 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 of the National Oceanic and Atmospheric Administration 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.”*

**National Oceanic and Atmospheric Administration, *Global Summary December 2015* (Silver Spring, MD.: NOAA, 2015): 1, <http://www.ncdc.noaa.gov/sotc/summary-info/global/201512>

2016 (January)

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

The “Sixth Biennial Report on Progress Toward Greenhouse Gas Reduction Goals” by the Maine Department of Environmental Protection 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.”* [see 2004 (December)]

*Maine Department of Environmental Protection, *Sixth Biennial Report on Progress Toward Greenhouse Gas Reduction Goals* (Augusta, ME: Maine Department of Environmental Protection, 2016): 1, <http://www.maine.gov/dep/legislative/reports.html>

2016 (February)

The United States Supreme Court deals an unexpected blow to the Obama Administration’s Clean Power Plan rules

Described by *Forbes* as “probably the most aggressively contested environmental rules in U.S. history,” President Obama’s plan for regulating carbon emissions from existing power plants meets a temporary roadblock at the 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 [see 2015 (August)]. 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?" *Atlantic*, February 14, 2016, <http://www.theatlantic.com/politics/archive/2016/02/antonin-scalia-clean-power-plan-obama-climate-change/462807/>; Alvin 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)

Study warns, "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 by James Hansen and 18 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," 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 *et al.*, "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 (March 22, 2016): 3761-3812, <https://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 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. This may produce a 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," *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* 531 (2016): 591-597, <https://www.nature.com/articles/nature17145>; Justin Gillis, "Climate Model Predicts West Antarctic Ice Sheet Could Melt Rapidly," *New York Times*, March 30, 2016, <https://www.nytimes.com/2016/03/31/science/global-warming-antarctica-ice-sheet-sea-level-rise.html>

2016 (March)

A major National Academies of Sciences report assesses the emerging field of “event attribution science”

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.”**

*National Academies of Sciences, Engineering, and Medicine, *Event Attribution of Extreme Weather Events in the Context of Climate Change* (Washington: National Academies Press 2016), 1, <http://www.nap.edu/catalog/21852/attribution-of-extreme-weather-events-in-the-context-of-climate-change>; National Academy of Sciences, “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* 351, no. 6279 (March 18, 2016): 1249-1250, <http://science.sciencemag.org/content/351/6279/1249>

2016 (April)

A landmark climate lawsuit against the United States survives a motion to dismiss

In a federal lawsuit described by Bill McKibben and Naomi Klein as “the most important lawsuit on the planet right now,” the plaintiffs “seek relief from government action and inaction that allegedly results in carbon pollution of the atmosphere, climate destabilization, and ocean acidification.” The lawsuit, *Juliana v. United States*, is brought by twenty-one young Americans aged 8 to 19, and other activists including Dr. James Hansen under the aegis of the organization “Our Children’s Trust.” The plaintiffs win 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 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 Magistrate Judge 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 Magistrate Judge also holds that previous federal decisions on the public trust doctrine do not foreclose plaintiffs’ suit. The decision 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.** [see 2020 (January), 2023 (June)]

**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/571d109b04426270152febc0/t/5824e85e6a49638292ddd1c9/1478813795912/Order+MTD.Aike.n.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 EPA announces first-ever regulatory standards to reduce methane release from oil and gas production facilities

The Environmental Protection Agency’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.”* [see 2017 (June)]

*U.S. Environmental Protection Agency, “EPA Releases First-Ever Standards to Cut Methane Emissions from the Oil and Gas Sector,” May 12, 2016, <https://archive.epa.gov/epa/newsreleases/epa-releases-first-ever-standards-cut-methane-emissions-oil-and-gas-sector.html>; U.S. EPA, “Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources”, final rule, *Federal Register* 81 (June 3, 2016): 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)

RGGI 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 Regional Greenhouse Gas Initiative (RGGI) 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, *The Investment of RGGI Proceeds Through 2014* (New York, N.Y.: Regional Greenhouse Gas Initiative, September 2016), 1, https://www.rggi.org/sites/default/files/Uploads/Proceeds/RGGI_Proceeds_Report_2014.pdf

2016 (October)

Exxon Mobil sues to stop N.Y. Attorney General fraud investigation

Exxon Mobil 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 Exxon Mobil 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 Exxon Mobil’s lawsuit to New York, in a setback to Exxon Mobil.**

* 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)

Court ruling: agency may consider future climate impacts in deciding to list an endangered species

The 9th Circuit Court of Appeals 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.”* In 2018, the U.S. Supreme Court will reject a petition by the Alaska Oil and Gas Association, American Petroleum Institute and state of Alaska to review and overturn this decision. **

*Center for Biological Diversity, “Appeals Court Reinstates Endangered Species Protections for Bearded Seals,” October 24, 2016, http://www.biologicaldiversity.org/news/press_releases/2016/bearded-seal-10-24-2016.html; *Alaska Oil & Gas Association v. Pritzker*, 840 F.3d 671 (9th Cir. Oct. 24, 2016), <https://cdn.ca9.uscourts.gov/datastore/opinions/2016/10/24/14-35806.pdf>

**Center for Biological Diversity, “Supreme Court Rejects Oil Industry Challenge to Endangered Species Protection for Bearded Seals,” January 22, 2018, https://www.biologicaldiversity.org/news/press_releases/2018/bearded-seals-01-22-2018.php

2016 (October)

Renewable energy sources surpassed coal in 2015 as the largest new source of electricity in the world

According to the International Energy Agency a record 153 gigawatts (GW) of new renewable energy were 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.”*

*International Energy Agency, “IEA raises its five-year renewable growth forecast as 2015 marks record year,” 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

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* (New York, N.Y.: Environmental Defense Fund, April, 2012): 1, <https://www.edf.org/energy/methaneleakage>

**Stefan Schweitzke *et al.*, “Upward revision of global fossil fuel methane emissions based on isotope database,” *Nature* 538 (October 6, 2016): 88-91, <https://doi.org/10.1038/nature19797>

***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 *et al.*, “Rising atmospheric methane: 2007–2014 growth and isotopic shift,” *Global Biogeochemical Cycles* 30, no. 9, (September 27, 2016): 1, <https://doi.org/10.1002/2016GB005406>

*****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

The Agreement becomes effective 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.**

*United Nations, “Paris Agreement – Status of Ratification” enacted November 4, 2016, *United Nations Treaty Series* 54113, 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)

2016 is on track to be hottest year on record

As reported by the World Meteorological Society, 2016’s global average temperature is approximately 1.2 degrees Celsius above pre-industrial levels. 2015 previously broke the hottest year record set by 2014. 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)

Global carbon dioxide emissions from fossil fuel burning and cement production did not increase in 2015

As reported by the Global Carbon Project, emissions for 2015 and 2016 were the highest in human history and 60% above 1990 emissions. A total of 9.9 gigatonnes carbon (36.3 GtCO₂) were

emitted to the atmosphere in 2015. 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)

Study: U.S. power plants have already attained the Obama Clean Power Plan's interim goal for 2024 in emissions reductions

According to a study of government data by the Sierra Club, 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. This has been achieved by voluntary shifts to natural gas and renewables. 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 peaking at an unheard-of 20 degrees Celsius higher than normal for the time of year; international report underscores threats

Sea temperatures are averaging nearly 4 degrees C higher than usual in October and November.* As summarized in *The Guardian*, the *Arctic Resilience Report*, a first comprehensive examination of ecosystems and societies in the Arctic identifies 19 "tipping points" in the Arctic region related to warming. These 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," *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," *Guardian*, November 25, 2016,

<https://www.theguardian.com/environment/2016/nov/25/arctic-ice-melt-trigger-uncontrollable-climate-change-global-level>

*** Marcus Carson *et al.*, *Arctic Resilience Report*, Arctic Council, Stockholm Environment Institute and Stockholm Resilience Centre (Stockholm 2016), <https://www.sei.org/publications/arctic-resilience-report/>

2016 (November)

Obama Administration releases final methane rule for operations on public and Indian lands

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.”* [see 2017 (May), 2018 (September)]

*U.S. Department of the Interior, “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,” *Federal Register* 81 (November 18, 2016): 83008, <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

The Earth Science Division of the National Aeronautics and Space Administration works on temperature, ice, clouds, and other climate phenomena; the Trump transition team wants to shift efforts to 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.”* These plans will play out in the 2017 NASA Transitions Authorization Act, and future Trump Administration budgets, and will face some pushbacks from Congress. **

* Oliver Milman, “Trump to scrap Nasa climate research in crackdown on ‘politicized’ science,” *Guardian*, November 23, 2016, <https://www.theguardian.com/environment/2016/nov/22/nasa-earth-donald-trump-eliminate-climate-change-research>

**Orion Rodriguez, “Trump plans to strip NASA’s earth science division, promote mission to Mars,” *inhabitat*, March 22, 2017, <https://inhabitat.com/trump-plans-to-strip-nasas-earth-science-division-promote-mission-to-mars/>; Scott Waldman, “Congress May Shift Climate Research Away from NASA,” reprinted from *E&E News* in *Scientific American*, February 17, 2017, <https://www.scientificamerican.com/article/congress-may-shift-climate-research-away-from-nasa/>;

Ethan Siegal, “Trump’s Plan To Destroy NASA Science Laid Bare In FY2020 Budget,” *Forbes*, May 22, 2019, <https://www.forbes.com/sites/startwithabang/2019/03/12/trumps-plan-to-destroy-nasa-science-laid-bare-in-fy2020-budget/#6174c1765818>

2016 (December)

Assets covered by fossil fuel divestment pledges reaches \$5 trillion

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 states: “there is no sane rationale for companies to continue to explore for new sources of hydrocarbons.”**

*Arabella Advisors, *The Global Fossil Fuel Divestment and Clean Energy Investment Movement* (Washington, D.C.: Arabella Advisors, December, 2016), 1, 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 moves to protect Arctic waters and Atlantic coast from oil and gas leasing

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 notes 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.”** [see 2017 (April)]

*Samantha Page, “Obama Permanently Protects Huge Portions of Arctic, Atlantic from Offshore Drilling,” *ThinkProgress*, December 20, 2016, <https://thinkprogress.org/permanent-protections-arctic-atlantic-e6978298eae1#.xukkm6dm>

**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)

Within two days of President Donald Trump’s swearing in, numerous references to climate change disappear from the EPA website

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 Environmental Protection Agency (EPA) website are apparent within two days of the January 20 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 Ericksen denies responsibility and points to the “old administration:” “ ‘We did not direct that,’ Ericksen says, 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 and years, 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 Siege: 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* (n.p.: Environmental Data and Governance Initiative, February 1, 2017), 1, <https://envirodatagov.org/publication/introducing-edgi/>

***Christopher Sellers *et al.*, *The EPA Under Siege: Trump’s Assault in History and Testimony* (n.p.: Environmental Data and Governance Initiative, May, 2017), 1, <https://100days.envirodatagov.org/epa-under-siege/>

2017 (February)

A group of distinguished leaders of prior Republican administrations comes out with a “conservative climate solution,” taxing carbon pollution

The group, 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, none 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,” *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, accessed January 12, 2020, <https://www.elcouncil.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 Environmental Protection Agency (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,” *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-idUSKBN16M2C5>

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,” *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,” *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)

Study explores the link between climate change, changes in northern hemisphere wind patterns like the jet stream, and extreme weather 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, finds 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, states 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,” *Guardian*, March 27, 2017, <https://www.theguardian.com/environment/2017/mar/27/climate-change-human-fingerprint-found-on-global-extreme-weather>; Michael Mann *et al.*, “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-economy>

**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)

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 *et al.*, "Pathways for balancing CO2 emissions and sinks," *Nature Communications* 8, Article no. 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 Executive Order expands offshore drilling in the Arctic and Atlantic Oceans, and seeks to assess possible drilling in Pacific and Atlantic marine sanctuaries

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.[see 2016 (April)]* In signing the Order, Trump comments, “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.”**[see 2019 (March)]

* “Presidential Executive Order Implementing an America-First Offshore Energy Strategy”, The White House, April 28, 2017, <https://biotech.law.lsu.edu/blog/EO-America-First-Offshore-Energy-Strategy.pdf>

**Juliet Eilperin, “Trump signs executive order to expand drilling off America’s coasts: ‘We’re opening it up.’” *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 EPA 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 Environmental Protection Agency (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,” *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/>

**Jason Samenow, “I worked on the EPA’s climate change website; its removal is a declaration of war,” *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; see also, Juliet Eilperin, “The EPA just buried its climate change website for kids,” *Washington Post*, May 6, 2017, <https://www.washingtonpost.com/news/energy-environment/wp/2017/05/06/epa-buries-climate-change-site-for-kids/>

2017 (May)

The EPA’s 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 Environmental Protection Agency (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," *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 *et al.*, "Pliocene Warmth, Polar Amplification, and Stepped Pleistocene Cooling Recorded in NE Arctic Russia," *Science* 340, no. 6139 (June 21, 2013): 1421-1427, <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,” *insideclimatenews*, May 10, 2017, <https://insideclimatenews.org/news/10052017/methane-climate-rule-oil-gas-flaring-congress-vote-rejec>

*** Editorial Board, “Three Republicans stopped a methane rule rollback. They must continue to buck Trump,” *Bangor Daily News*, 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 Univesity 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/>; Sonke Dagenorf *et al.*, “Reassessment of 20th century global mean sea level rise,” *Proceedings of the National Academies of Sciences* 114, no. 23 (June 6, 2017): 5946-5951, <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" *** An op/ed in the *Wall Street Journal* by presidential advisors H. R. McMaster and Gary Cohn as comments that: "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." Responds 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. [see 2015 (December)]

*Michael Shear, "Trump Will Withdraw U.S. From Paris Climate Agreement," *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," *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," *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," *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?" *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, Eric Fine, and Anthony Keiserowitz, "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, Matthew J. Kotchen, writes in *The Washington Post* that “Nearly everything Trump said about the Green Climate Fund to justify his decision was wrong or misleading.” 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 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.” *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.”*

* “World reacts to Trump’s Paris climate accord withdrawal,” *Al Jazeera News*, 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

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, proposed rule, *Federal Register* 82 (June 5, 2017): 25730, <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,” *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

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

The report finds “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 concludes that neither local measures to reduce fishing pressure or improve water quality, nor the corals’ ability to adapt over time to increased ocean temperatures, are 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.”**

* “Assessment: World Heritage coral reefs likely to disappear by 2100 unless CO2 emissions drastically reduce,” UNESCO, June 23, 2017, <http://whc.unesco.org/en/news/1676/>

**Terry Hughes *et al.*, “Global warming and recurrent mass bleaching of corals” *Nature* 543 (March 16, 2017): 373-377, <https://www.nature.com/nature/journal/v543/n7645/full/nature21707.html>

2017 (June)

Analysis of satellite data measuring temperatures over time in the lower troposphere finds warming dramatically faster than previous 2009 analysis

The study finds 36% faster warming since 1979 and nearly 140% faster warming since 1998 when compared to 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 denialist 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* 30 (June 26, 2017): 7695-7718, <https://doi.org/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

The greatest impact is in 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 *et al.*, “Estimating economic damage from climate change in the United States,” *Science* 356, no. 6345 (June 30, 2017):1362-1369, <http://science.sciencemag.org/content/356/6345/1362.full>

**Brad Plumer and Nadja Popovich, “As Climate Changes, Southern States Will Suffer More Than Others,” *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,” *New York Times*, July 12, 2017, <https://www.nytimes.com/interactive/2017/06/09/climate/antarctica-rift-update.html>

2017 (August)

President Trump executive order: no consideration of climate change and rising sea levels in infrastructure projects

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,” *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/>

2017 (August)

President Trump disbands the 15-person Advisory Committee for the Sustained National Climate Assessment

This committee 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.”* [see 2019 (April)]

*Juliet Eilperin, “The Trump Administration just disbanded a federal advisory committee on climate change,” *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/>

2017 (August, September)

The United States and the Caribbean experience a hurricane season of unusual intensity

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,” *New York Times*, September 19, 2017, <https://www.nytimes.com/2017/09/19/us/hurricanes-irma-harvey-maria.html>

**Jason Samenow, “60 inches of rain fell from Hurricane Harvey in Texas, shattering U.S. storm record,” *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/>; Jason Samenow, “Harvey is a 1,000-year flood event unprecedented in scale,” *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/>

*** National Weather Service, Twitter Post, August 27, 2017, 11:44am,

https://twitter.com/NWS/status/901832717070983169?ref_src=twsrc%5Etfw%7Ctwcamp%5Etweetembed%7Ctwterm%5E901832717070983169&ref_url=https%3A%2F%2Fwww.vox.com%2F2017%2F8%2F27%2F16211428%2Fharvey-flooding-houston-national-weather-service-tweet

**** Donald Trump, Twitter Post, August 27, 2017, 9:25am, <https://twitter.com/realDonaldTrump/status/901797906046439426>

*****Noah S. Dieffenbaugh, “Hurricane Harvey Was No Surprise,” *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 Volcovisi, “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>;

Lisa Friedman, “Hurricane Irma Linked to Climate Change? For Some, a Very ‘Insensitive’ Question,” *New York Times*, September 11, 2017, <https://www.nytimes.com/2017/09/11/climate/hurricane-irma-climate-change.html>;

Eugene Robinson, “The cruelest insult to Harvey and Irma’s victims,” *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

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) [see 2015 (August)] “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.”*** [see 2018 (August)]

*U.S. Environmental Protection Agency, “Repeal of Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, Proposed Rule,” *Federal Register* 82 (October 16, 2017): 48035,

<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, “Gutting the Clean Power Plan puts off steps needed to avert climate disasters,” *Bangor Daily News*, 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)

EPA purges its Scientific Advisory Board of scientists who receive EPA grants, substituting industry representatives and 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.”** In July, 2019, an investigation by the Government Accountability Office will conclude that the restructuring of the advisory committees violated federal ethics requirements, by failing to properly vet the replacements.*** [see 2020 (April)]

*Juliet Eilperin, Brady Dennis and Chris Mooney, “In unprecedented move, EPA to block scientists who get agency funding from serving as advisers,” *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/>

**Letter to Chairs and Ranking Members, Senate Environment and Public Works Committee and House Energy and Commerce Committee, December 5, 2017, <https://www.nrcm.org/wp-content/uploads/2017/12/ScientistsLetterHouseSenateScienceAdvice.pdf>

***Lisa Friedman, “E.P.A. Broke Rules in Shake-Up of Science Panels, Federal Watchdog Says,” *New York Times*, July 15, 2019, <https://www.nytimes.com/2019/07/15/climate/epa-advisory-panels-gao-report.html>

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,” *New York Times*, October 5, 2017, <https://www.nytimes.com/interactive/2017/10/05/climate/trump-environment-rules-reversed.html>; see also Environmental and Energy Law Program, Harvard Law School, *Regulatory Rollback Tracker*, <https://eelp.law.harvard.edu/regulatory-rollback-tracker/>; Sabin Center for Climate Law, Columbia Law School, *Climate Deregulation Tracker*, <https://climate.law.columbia.edu/climate-deregulation-tracker>

2017 (November)

The Trump Administration releases the Fourth National Climate Assessment, with scientific conclusions 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.”** *The Wall Street Journal* publishes an assessment by Steven

Koonin, undersecretary of energy for science during President Obama's first term, who argues that "While much is right in the report, it is misleading in more than a few important places," including the characterization of historic trends in sea-level rise.***

*D.J. Wuebbles *et al.*, *Climate Science Special Report: Fourth National Climate Assessment, Volume I* (U.S. Global Change Research Program, Washington, D.C., 2017), 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>

***Steven Koonin, "A Deceptive New Report On Climate," *Wall Street Journal*, November 3, 2017, <https://www.wsj.com/articles/a-deceptive-new-report-on-climate-1509660882>

2017 (November)

The Global Carbon Project estimates that global carbon dioxide emissions will increase by 2% in 2017, after three years of almost no growth

The Project predicts 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," *Earth System Science Data* 10, no. 1 (2018): 405-448, <https://www.earth-syst-sci-data.net/10/405/2018/>

2017 (November)

President Trump's nominee to head the CEQ, Kathleen Hartnett White, has asserted that carbon dioxide, the "gas for life," is not a harmful pollutant

White, President Trump's nominee to head the Council on Environmental Quality, is former head of the Texas Commission on Environmental Quality and a fellow of the conservative Texas Public Policy Foundation. She 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.”**In February, 2018, the White House will withdraw White’s nomination.**

*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/>

** “300 Scientists Oppose Trump Nominee: 'More Dangerous Than Climate Change is Lying'” *InsideClimateNews*, November 29, 2017, <https://insideclimatenews.org/news/28112017/kathleen-hartnett-white-senate-confirmation-ceq-vote-trump-climate-change-carbon-dioxide>

***Juliet Eilperin and Brady Davis, “White House withdraws controversial nominee to head Council on Environmental Quality,” *Washington Post*, February 4, 2018, <https://www.washingtonpost.com/news/energy-environment/wp/2018/02/03/white-house-to-withdraw-controversial-nominee-to-head-council-on-environmental-quality/>

2017 (December)

The UNFCCC 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

The United States has a notably low profile at the United Nations Framework Convention on Climate Change 23rd Conference of the Parties in Bonn. 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,” *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,” *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,” *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,” *Guardian*, November 6, 2017, <https://www.theguardian.com/environment/2017/nov/16/political-watershed-as-19-countries-pledge-to-phase-out-coal>

*****Brad Plumer, “At Bonn Climate Talks, Stakes Get Higher in Gamble on Planet’s Future,” *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," *New York Times*, December 20, 2017, Cited in Sherri Goodman, "Planet Insecurity", *Linked In*, December 21, 2017, <https://www.linkedin.com/pulse/planet-insecurity-sherri-goodman>

**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.* [see 2021 (July)]

*Fiona Harvey, "China aims to drastically cut greenhouse gas emissions through trading scheme," *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,” *New York Times*, December 22, 2017, <https://www.nytimes.com/2017/12/22/climate/epa-buyouts-pruitt.html>

2018 (January)

NOAA releases its updated historical table of disasters costing more than \$1 billion since 1980, with 2017 a record-breaking year

NOAA’s National Centers for Environmental Information tracks the frequency, severity, and costs of extreme weather and climate events over the years.* 2017 was the year with the greatest damages, by far. As summarized by David Leonhardt in his *New York Times* newsletter, “Major weather events caused \$306 billion of damage in the United States last year, with floods, wildfires, tornadoes and, of course, three big hurricanes all contributing to the toll. The previous record-holder had been 2005, the year of Hurricane Katrina, when the combined cost was slightly above \$200 billion (inflation adjusted). The only other year with a toll above \$100 billion was 2012.” Leonhardt concludes: “it’s time for climate advocates to shed their fear about having weather be central to their arguments. The changes in weather --- in part because of how damaging and worrisome they are --- are one of the most effective tools that advocates have.”**

* National Oceanic and Atmospheric Administration, National Centers for Environmental Information, *Billion Dollar Weather and Climate Disasters Overview*, <https://www.ncdc.noaa.gov/billions/overview>

**David Leonhardt, Newsletters, *The New York Times*, January 11, 2018, <https://www.nytimes.com/newsletters/david-leonhardt>

2018 (February)

High temperatures records are broken in Maine and the Arctic

While recordbreaking February high temperatures are experienced in much of the eastern United States, including 70 degrees F. in Maine,* temperatures in the Arctic winter soar 45 degrees above normal. **

*Angela Fritz, “This weird February heat dome on the East Coast could be unprecedented,” *Washington Post*, February 22, 2018, <https://www.washingtonpost.com/news/capital-weather-gang/wp/2018/02/21/this-weird-february-heat-dome-on-the-east-coast-could-be-unprecedented/>

**Jason Samenow, “Arctic temperatures soar 45 degrees above normal, flooded by extremely mild air on all sides,” *Washington Post*, February 22, 2018, <https://www.washingtonpost.com/news/capital-weather-gang/wp/2018/02/21/arctic-temperatures-soar-45-degrees-above-normal-flooded-by-extremely-mild-air-on-all-sides/>

2018 (March)

Study finds first evidence that fresh meltwater from Arctic or Greenland sea ice is slowing ocean convection currents

A metaphorical “conveyor belt” of ocean currents in the Atlantic bring colder water southward in the deep Atlantic, circulating warmer water to the north near the surface to warm Europe and

North America. This process has been observed to have slightly slowed down since 2008, but it was unclear whether that was causally linked to climate change. However, models have suggested that as freshwater from melting sea ice floods into the North Atlantic, and is more buoyant than saltwater, its presence could slow the sinking of cooling waters beginning the southward flow of the circular, or “convection,” currents.* A study reported in *Nature Climate Change* by scientists from the GEOMAR Helmholtz Center for Ocean Research in Germany, based on 13 years of data observing ocean currents in the Irminger sea in the far north Atlantic, finds evidence to suggest those models are on target: “warm and fresh summers, characterized by increased sea surface temperatures, freshwater concentrations and melting, are accompanied by reduced heat and buoyancy losses in winter, which entail a longer persistence of the freshwater near the surface and contribute to delaying convection. By shortening the time span for the convective freshwater export, the identified seasonal dynamics introduce a potentially critical threshold that is crossed when substantial amounts of freshwater from one summer are carried over into the next and accumulate.”** [see 2021 (February)]

*Chris Mooney, “The fast-melting Arctic is already messing with the ocean’s circulation, scientists say,” *Washington Post*, March 14, 2018, <https://www.washingtonpost.com/news/energy-environment/wp/2018/03/14/the-melting-arctic-is-already-messing-with-a-crucial-part-of-the-oceans-circulation-scientists-say/>

** Marilena Oltmanns, Johannes Karstensen & Jürgen Fischer, “Increased risk of a shutdown of ocean convection posed by warm North Atlantic summers,” *Nature Climate Change* 8 (April 2018): 300-304, <https://www.nature.com/articles/s41558-018-0105-1>

2018 (March)

Study finds methane emissions from melting permafrost may play a larger role than previously thought

Scientists have long been concerned about “positive feedbacks,” where warming conditions in the Arctic regions cause melting permafrost to release more greenhouse gases. While field studies have detected significant quantities of the potent greenhouse gas methane from warming permafrost, lab studies have generally downplayed exposure to methane releases, suggesting less potent, longer lasting carbon dioxide will be the major feedback contributor, from dryer soils.* A study conducted at the Institute of Soil Science at the University of Hamburg in Germany incubated samples of permafrost in the laboratory for seven years, and found that it took more than three years for microorganisms generating methane to develop stable communities, and start producing as much methane as carbon dioxide: “These findings challenge the view of a stronger permafrost carbon-climate feedback from drained soils and emphasize the importance of CH₄ [methane] production in thawing permafrost on climate-relevant timescales.”**

*Chris Mooney, “The Arctic’s carbon bomb might be even more potent than we thought,” *Washington Post*, March 19, 2018, <https://www.washingtonpost.com/news/energy-environment/wp/2018/03/19/the-arctics-carbon-bomb-might-be-even-more-potent-than-we-thought/>

**Christian Knobauch, *et al.*, “Methane production as key to the greenhouse gas budget of thawing permafrost,” *Nature Climate Change* 8 (March 19, 2018): 309-312, <https://www.nature.com/articles/s41558-018-0095-z>

2018 (March)

The International Energy Agency reports a 1.4% increase in global carbon dioxide emissions in 2017, after three years of flat emission levels

Global energy-related CO₂ emissions “reach[ed] a historic high of 32.5 gigatonnes (Gt), a resumption of growth after three years of global emissions remaining flat. The increase in CO₂ emissions, however, was not universal. While most major economies saw a rise, some others experienced declines, including the United States, United Kingdom, Mexico and Japan. The biggest decline came from the United States [.5%], mainly because of higher deployment of renewables.” While global growth in renewables in 2017 was “unprecedented,” it did not make a dent in fossil fuels’ domination of energy production: “The overall share of fossil fuels in global energy demand in 2017 remained at 81 percent, a level that has remained stable for more than three decades despite strong growth in renewables.”*

*Brad Plumer, “Greenhouse Gas Emissions Rose Last Year. Here Are the Top 5 Reasons,” *New York Times*, March 22, 2018, <https://www.nytimes.com/2018/03/22/climate/global-energy-demand.html>; International Energy Agency, *Global Energy & CO₂ Status Report 2017* (Paris, France: International Energy Agency, 2017), 1, <https://webstore.iea.org/global-energy-co2-status-report-2017>

2018 (May)

An analysis by the Grantham Institute finds that the number of laws across the globe addressing climate change has increased more than 20 fold since the Kyoto Treaty of 1997
The analysis finds 1500 laws and policies related to climate presently, compared with 97 in 1997. “From 2009 to 2015, the period that included the Copenhagen climate summit and ended in the Paris Agreement, between 100 and 143 new climate change laws were passed each year. It is likely that this wave of action not only supported but enabled the Paris Agreement on climate change.” The authors note that implementing the Paris Agreement requires “a stable, long-term and overarching approach to climate governance, rooted in law.” 139 countries have adopted such “framework laws.”*

* Michal Nachmany and Joana Setzer, *Global trends in climate change legislation and litigation: 2018 snapshot* (London, U.K., Grantham Research Institute, May, 2018), <http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2018/04/Global-trends-in-climate-change-legislation-and-litigation-2018-snapshot.pdf>

2018 (June)

Pope Francis convenes a Vatican climate change conference, urging top fossil fuel executives to keep most fossil fuels underground

At a meeting attended by top executives of oil and gas corporations including Exxon Mobil and BP, as well as investors, Pope Francis warns that “civilization requires energy, but energy use must not destroy civilization.” Failure curb use of fossil fuels will lead to a “spiral of extreme climate changes due to a catastrophic rise in global temperatures, harsher environments and increased levels of poverty.” He commends companies for accounting for “assessment of climate risk” in their businesses, but warns that “markets and technology” alone will not stop climate change, since our “current economic system thrives on ever-increasing extraction, consumption, and waste.” *

*Bradley Olson and Francis X. Rocca, “Pope Francis Criticizes Continued Search for Fossil Fuels at Meeting with Oil Executives,” *Wall Street Journal*, June 9, 2018, <https://www.wsj.com/articles/pope-francis-criticizes-continued-search-for-fossil-fuels-at-meeting-with-oil-executives-1528547509>; Pope Francis, ADDRESS OF HIS HOLINESS POPE FRANCIS TO PARTICIPANTS AT THE MEETING FOR EXECUTIVES OF THE MAIN COMPANIES IN THE OIL AND NATURAL GAS SECTORS, AND OTHER

2018 (June)

The rate of melting of the Antarctic ice sheet has tripled in the last ten years

A study report by a team of 80 Antarctic experts known formally as the Ice Sheet Mass Balance Inter-Comparison Exercise, publishing in the Journal *Nature*, begins with the sobering observation that “The ice sheets of Antarctica hold enough water to raise global sea level by 58m.” As summarized by Chris Mooney in the *Washington Post*, “Antarctica, the planet’s largest ice sheet, lost 219 billion tons of ice annually from 2012 through 2017 — approximately triple the 73 billion-ton melt rate of a decade ago, the scientists concluded. From 1992 through 1997, Antarctica lost 49 billion tons of ice annually.” Mooney points out that the “controversial study” by James Hansen and his team of climate scientists in 2016 (see 2016(March)) estimated that if the rate of polar ice-sheet melt doubled every decade, sea levels could rise above one meter within 50 years. “A tripling every decade, were it to continue, would reach that volume of sea level rise even sooner. There is no proof the current rate of change in Antarctica will continue. Scientists can’t see the future, but they do fear continuing and even worsening losses.”*

*Chris Mooney, “Antarctic ice loss has tripled in a decade. If that continues, we are in serious trouble.” *Washington Post*, June 13, 2018, <https://www.washingtonpost.com/news/energy-environment/wp/2018/06/13/antarctic-ice-loss-has-tripled-in-a-decade-if-that-continues-we-are-in-serious-trouble/>;

Andrew Shepherd *et al.* (IMBIE team), “Mass balance of the Antarctic Ice Sheet from 1992 to 2017,” *Nature* 558 (2018):219-202, <https://www.nature.com/articles/s41586-018-0179-y>

2018 (June)

Study finds leakage of methane from U.S. oil and gas production is 60% more than EPA estimates

In a five-year study by scientists with the Environmental Defense Fund and a team of “140 research and industry experts from 40 institutions and 50 companies”* published in *Science*, researchers find that methane leakage has been significantly underreported, raising questions about the accuracy of greenhouse gas inventories, and pointing to the need to substantially ramp up leak detection and prevention. As detailed in the abstract: “Methane emissions from the U.S. oil and natural gas supply chain were estimated by using ground-based, facility-scale measurements and validated with aircraft observations in areas accounting for ~30% of U.S. gas production. When scaled up nationally, our facility-based estimate of 2015 supply chain emissions is 13 ± 2 teragrams per year, equivalent to 2.3% of gross U.S. gas production. This value is ~60% higher than the U.S. Environmental Protection Agency inventory estimate, likely because existing inventory methods miss emissions released during abnormal operating conditions. Methane emissions of this magnitude, per unit of natural gas consumed, produce radiative forcing over a 20-year time horizon comparable to the CO₂ from natural gas combustion. Substantial emission reductions are feasible through rapid detection of the root causes of high emissions and deployment of less failure-prone systems.”** *E&E News* reports Jeff Peischl, a scientist from the Cooperative Institute for Research in Environmental Sciences, as describing the climate impact of the oil and gas industry's methane leaks as “roughly the climate impact of carbon dioxide emissions from all U.S. coal-fired power plants” operating in the United States in

2015. Steven Hamburg, EDF's chief scientist who led the investigation, says the leakage amounts to a "huge problem, but also an enormous opportunity." Reducing the industry's methane leaks would be "the fastest, most cost-effective way we have to slow the rate of warming today."***

*Environmental Defense Fund, "Major studies reveal 60 percent more methane emissions," <https://www.edf.org/climate/methane-studies>

**Ramon Alvarez *et al.*, "Assessment of methane emissions from the U.S. oil and gas supply chain," *Science* 361, no. 6398 (June 13, 2018): 186-188, <http://science.sciencemag.org/content/361/6398/186>

***John Fialka, "More gas is leaking than previously estimated — study," *E&E News*, June 22, 2018, <https://www.eenews.net/climatewire/stories/1060086093/>

2018 (July)

Summer heat records broken across the world

Numerous locations across the planet set all time heat records during one week in July. Most notable is in Siberia: "In Northern Siberia, along the coast of the Arctic Ocean – where weather observations are scarce – model analyses showed temperatures soaring 40 degrees above normal on July 5, to over 90 degrees. 'It is absolutely incredible and really one of the most intense heat events I've ever seen for so far north,' wrote meteorologist Nick Humphrey, who offers more detail on this extraordinary high-latitude hot spell on his blog."* And on August 8, "Sea surface temperatures in the vast Gulf of Maine hit a near-record high of 68.93 degrees Fahrenheit on Aug. 8, part of what scientists called a month-long 'marine heat wave'"**

*Jason Samenow, "Red-hot planet: All-time heat records have been set all over the world during the past week," *Washington Post*, July 5, 2018, <https://www.washingtonpost.com/news/capital-weather-gang/wp/2018/07/03/hot-planet-all-time-heat-records-have-been-set-all-over-the-world-in-last-week/>

**Steven Mufson, "An ocean 'heat wave' just drove temperatures off Maine to near-record highs," *Washington Post*, August 31, 2018, https://www.washingtonpost.com/national/health-science/an-ocean-heat-wave-just-drove-temperatures-off-maine-to-near-record-highs/2018/08/31/3db85126-ad2d-11e8-a8d7-0f63ab8b1370_story.html

2018 (August)

Study estimates global mortality toll of rising temperatures in 2099 will exceed current global toll of traffic accidents

A study by the Climate Impact Lab at the University of Chicago is the first global examination of both costs and benefits of rising temperatures alone on human mortality. It considers both lives lost to extreme heat, and lives saved from less extreme cold. The study concludes that by 2099, 1.5 million more people will die each year from increased heat, compared with current estimates that 1.25 million died in all traffic accidents in 2013.* Writes Greg Ip in *The Wall Street Journal*: "the study concludes the heat-related costs incurred by one additional metric ton of carbon dioxide is \$39, far larger than existing estimates of around \$1.50...It also suggests that an even bigger carbon tax is justified than the \$24-a-metric ton that Republican Congressman Carlos Curbelo of Florida recently proposed."**

* Energy Policy Institute at the University of Chicago, "New Global Mortality Study Estimates Climate Damages," August 1, 2018, <https://epic.uchicago.edu/news-events/news/new-global-mortality-study-estimates-climate-damages>; Tamma Carleton *et al.*, *Valuing the Global Mortality Consequences of Climate Change Accounting for Adaptation Costs and Benefits* (Chicago, IL: University of Chicago Becker Friedman Institute for Economics, August 1, 2018), http://www.impactlab.org/wp-content/uploads/2018/08/CIL_mortality_SSRN.pdf

** Greg Ip, “The Mortality Toll of Rising Temperatures,” *Wall Street Journal*, August 2, 2018, <https://www.wsj.com/articles/adding-up-the-cost-of-climate-change-in-lost-lives-1533121201>

2018 (August)

The Trump Administration issues notice of proposed rule rolling back Obama era greenhouse gas and fuel efficiency standards for motor vehicles

The joint notice of the Environmental Protection Agency and National Highway Traffic Safety Administration announced August 1 solicits public comment and proposes a “preferred alternative” of freezing fuel efficiency and emissions standards at 2020 levels through 2026, instead of ratcheting up standards every year as envisioned by the Obama regulations [see 2012 (August)]. The agencies claim that the “Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule,” would “save over 500 billion dollars in societal costs and reduce highway fatalities by 12,700 lives (over the lifetimes of vehicles through MY 2029). U.S. fuel consumption would increase by about half a million barrels per day (2–3 percent of total daily consumption, according to the Energy Information Administration) and would impact the global climate by 3/1000th of one degree Celsius by 2100, also when compared to the standards set forth in 2012.” The agencies contend their revisions are driven by consumer demand and safety concerns. Due in part to lower gasoline prices, consumers are “demonstrating a preference for more powerful engines and vehicles with higher seating positions and ride height ...all of which present challenges for achieving increased fuel economy levels and lower CO₂ emission rates.” And “unreasonable fuel economy and CO₂ standards” cause “increased vehicle prices [which] keep consumers in older, dirtier, and less safe vehicles.” They also proposed revoking California’s ability to set stricter emissions standards. * Coming at a time when U.S. motor vehicle greenhouse gas emissions have recently outpaced emissions from electricity generation, this move is predicted to be the administration’s “biggest step backwards on greenhouse gas.” *E&E News* quotes Danny Cullenward, a research associate at the think tank Near Zero, as noting that “the scale of transportation sector emissions and the lack of other successful drivers in reducing GHG emissions in this sector make the impact of any rollback in state and/or federal standards extremely potent.” *E&E News* cites an analysis by the Rhodium Group concluding that “the cumulative increases of carbon dioxide between 2022 and 2035 could surpass the total annual emissions of 82 percent of countries today — just from freezing the car rules.”** Internal EPA documents suggest that the EPA questioned the safety justifications for the proposed rule, finding that the freeze would in fact lead to 17 more fatalities on the roads annually, and that it would lead to loss of 35,000 jobs per year.*** Climate scientists are startled at how the administration sought to minimize the relative impact of these rules on warming, by envisioning, under a worst case scenario without any emissions controls, that the planet would have a carbon dioxide concentration of 789.76 ppm, nearly double current levels. As noted by *E&E News*, “The last time carbon dioxide levels hit the mark the Trump administration envisions for the end of the century, crocodiles roamed the poles and palm trees existed where glaciers are today. In fact, there were no glaciers — not even in Antarctica.”**** California and 16 other states, including Maine, file a preemptive suit in May contending that the rollback violates the Clean Air Act. Says Governor Jerry Brown, “States representing 140 million Americans are getting together to sue Outlaw Pruitt — not Administrator Pruitt, but Outlaw Pruitt.”***** The editorial board of the *Wall Street Journal* applauds “Trump’s Car Freedom Act:” “The Trump Administration’s

deregulation is improving consumer choice and reducing costs from health care to appliances. Its proposed revisions Thursday to fuel economy rules continue this trend to the benefit of car buyers, not that you'd know it from the political hyperventilation." ***** [see 2019 (June – November), 2020 (March)]

* Environmental Protection Agency and National Highway Traffic Safety Administration, "The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks," Notice of Proposed Rulemaking, *Federal Register* 83 (August 24, 2018): 42986-43500, <https://www.govinfo.gov/content/pkg/FR-2018-08-24/pdf/2018-16820.pdf>

**Zack Colman, "Trump makes his biggest move on climate with car rules," *E&E News*, August 3, 2018, <https://www.eenews.net/climatewire/2018/08/03/stories/1060092681>

***Zack Colman and Maxine Joselow, "EPA argued rollback could mean more deaths – documents," *E&E News*, August 15, 2018, <https://www.eenews.net/climatewire/2018/08/15/stories/1060094161>

**** Zack Colman and Scott Waldman, "Trump admin sees grim climate outcome in car rule," *E&E News*, August 7, 2018, <https://www.eenews.net/climatewire/2018/08/07/stories/1060092895>

*****Hiroko Tabuchi and Coral Davenport, "California Sues Trump Administration Over Car Emission Rules," *New York Times*, May 1, 2018, https://www.nytimes.com/2018/05/01/climate/california-sues-trump-administration.html?emc=edit_na_20180501&nl=breaking-news&nid=37873277ing-news&ref=cta

*****Editorial Board, "Trump's Car Freedom Act," *Wall Street Journal*, August 3, 2018, <https://www.wsj.com/articles/trumps-car-freedom-act-153337130>

2018 (August)

The Trump Administration issues notice of proposed rule replacing Obama era regulations on greenhouse gas emissions from existing power plants

The proposed rule published by the EPA on August 31, dubbed the "Affordable Clean Energy Rule (ACE)," differs fundamentally from the Obama Clean Power Plan (CPP) [see 2015 (August)] by eliminating a federally mandated cap on greenhouse gas emissions from power plants. And while states choosing to enforce emissions reductions could under the CPP employ energy efficiency and renewables as part of their emissions strategy, the Trump plan limits their options to improvements in coal plant efficiency.* An analysis by Resources for the Future estimates that carbon dioxide emissions under ACE would be 63 percent higher than under the CPP, and that emissions under ACE would only be 2.6 percent lower than if EPA did nothing.** As the *New York Times* observes, "the administration's own analysis... revealed on Tuesday that the new rules could also lead to as many as 1,400 premature deaths annually by 2030 from an increase in the extremely fine particulate matter that is linked to heart and lung disease, up to 15,000 new cases of upper respiratory problems, a rise in bronchitis, and tens of thousands of missed school days." By contrast, the CPP by the Obama EPA's projections could have prevented between 1,500 and 3,600 premature deaths per year by 2030, and would reduce the number of school days missed by 180,000 annually.*** Comments submitted by the Attorney Generals of 18 states, including Maine, declare that "the 'Affordable Clean Energy' rule neither promotes 'clean energy' generation nor does it implement a policy that Americans can 'afford' given the need to aggressively cut carbon pollution from power plants and other sources to adequately confront the dangers of climate change... At its core, rule represents a fundamental abdication of EPA's critical role in curbing greenhouse gas pollution..."**** The editorial board of the *Wall Street Journal* counters that the proposed rule is "Not the Climate Apocalypse:" "Of the Obama Administration's many power grabs, none was more audacious than its bid to regulate coal-fired electric power out of business. The Trump Administration is now proposing to rewrite the rule

in a way that honors the law and still reduces carbon emissions, yet it is being portrayed as radical.”***** [see 2019 (June)]

*Environmental Protection Agency, “Emission Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating Units; Revisions to Emission Guideline Implementing Regulations; Revisions to New Source Review Program,” 83 Federal Register 44,746 - 44813 (Aug. 31, 2018), <https://www.govinfo.gov/content/pkg/FR-2018-08-31/pdf/2018-18755.pdf>

**Amelia Keyes *et al.* “Carbon Standards Examined: A Comparison of At-the-Source and Beyond-the-Source Power Plant Carbon Standards” (Washington, D.C.: Resources for the Future, August 21, 2018), <https://www.rff.org/publications/working-papers/carbon-standards-examined-a-comparison-of-at-the-source-and-beyond-the-source-power-plant-carbon-standards/>

***Lisa Friedman, “Cost of New E.P.A. Coal Rules: Up to 1,400 More Deaths a Year,” *New York Times*, August 21, 2018, <https://www.nytimes.com/2018/08/21/climate/epa-coal-pollution-deaths.html>

****The Attorney General of New York *et al.*, “Comments on the Environmental Protection Agency’s Proposed Emission Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating Units,” 83 Fed. Reg. 44746 (October 31, 2018), https://www.mass.gov/files/documents/2018/11/01/October%20comments%20opposing%20proposal%20to%20replace%20Clean%20Power%20Plan_0.pdf

*****Editorial Board, “Not the Climate Apocalypse,” *Wall Street Journal*, August 22, 2018, <https://www.wsj.com/articles/not-the-climate-apocalypse-1534894336>

2018 (August)

Scientists predict dramatic changes to land-based ecosystems in the 21st century and beyond if emissions are not reined in

A team of scientists publishing in *Science* led by Stephen Jackson, director of the U.S. Geological Survey’s Southwest Climate Adaptation Science Center, studied the ecological record, including pollen fragments and fossils from 594 sites around the world from the interglacial time 16,000 to 10,000 years ago, in an effort to predict what a future planet would look like if it reached 4 to 7° C. The report concludes: “terrestrial vegetation over the entire planet is at substantial risk of major compositional and structural changes in the absence of markedly reduced GHG emissions. Much of this change could occur during the 21st century, especially where vegetation disturbance is accelerated or amplified by human impacts. Many emerging ecosystems will be novel in composition, structure, and function, and many will be ephemeral under sustained climate change; equilibrium states may not be attained until the 22nd century or beyond.”* Comments Jackson in *The Washington Post*: “It is concerning to me to think about how much change and how rapidly the change is likely to happen, and how little capacity we have to predict the exact course...which creates very large challenges for all of us out there who are trying to manage wildfire, fish, water, soil, endangered species — all those different ways in which natural ecosystems affect us.”**

*Connor Nolan *et al.*, “Past and future global transformation of terrestrial ecosystems under climate change,” *Science* 361, no. 6405 (August 31, 2018): 920-923, <http://science.sciencemag.org/content/361/6405/920>

**Sarah Kaplan, “Climate change could render many of Earth’s ecosystems unrecognizable,” *Washington Post*, August 30, 2018, <https://www.washingtonpost.com/science/2018/08/30/climate-change-could-render-many-earths-ecosystems-unrecognizable/>

2018 (September)

The Trump Administration issues a final rule repealing the Obama Administration’s 2016 Methane Waste Prevention Rule

The Obama rule would have set new technical standards for cutting flaring of gas in oil production in half, inspecting for gas leaks, and limiting venting from storage tanks; it was intended to curb fugitive methane leak contributions to global warming, and recapture lost federal royalty payments on wasted methane gas production. [see 2016 (November), 2017 (May)] Amid a host of regulatory and litigation challenges* the Trump Bureau of Land Management (BLM) finally repeals the rule opposed by the oil and gas industry. BLM's cost-benefit analysis of the repeal drastically cut the estimate of climate costs from methane leakage. As *E&E News* reports: "BLM estimates the revised rule could result in close to \$1 billion in net gains over 10 years. Those benefits were tied to expected savings for oil and gas firms, which would no longer have to pay to comply with the Obama rule. The Trump administration's proposed rule anticipated a loss of at least \$26.4 million in royalty payments, which benefit taxpayers. The draft revision rule applied a severe discount to the climate impact of methane, a potent greenhouse gas. Obama's BLM estimated its rule would have a minimum annual net benefit of \$46 million once oil and gas operators were forced to internalize the costs of emitting methane into the atmosphere."** In an opinion piece published in the *Wall Street Journal*, Harvard Law professor Cass Sunstein critiques the Trump administration's cost-benefit analysis premised on a much lower "social cost of carbon": "It's perfectly legitimate for the administration to reassess the numbers used by its predecessor. But the Trump administration's math suffers from two flaws. It does not take account of the latest science and economics, which support a higher number, and its approach considers only the damage that U.S. emissions do domestically, ignoring the damage that such emissions do to people in other countries. If every nation did that, Americans themselves would be big losers."*** [see 2020 (July)]

*Hana Vizcarra, BLM Methane Waste Prevention Rule, Harvard Environment & Energy Law Program Regulatory Rollback Tracker, <https://eelp.law.harvard.edu/2017/09/bam-methane-waste-prevention-rule/>

**Pamela King, "BLM to lock in methane rule revision," *E&E News*, September 18, 2018,

<https://www.eenews.net/stories/1060098233>; Bureau of Land Management, "Waste Prevention, Production Subject to Royalties, and Resource Conservation; Rescission or Revision of Certain Requirements," Final Rule, 83 Federal Register 49184 (September 28, 2018), <https://www.federalregister.gov/documents/2018/09/28/2018-20689/waste-prevention-production-subject-to-royalties-and-resource-conservation-rescission-or-revision-of>

***Cass Sunstein, "A Quiet Revolution Has Given the U.S. Smarter Regulations," *Wall Street Journal*, October 21, 2018, <https://www.wsj.com/articles/a-quiet-revolution-has-given-the-u-s-smarter-regulations-1540148307>

2018 (October)

The IPCC releases a Special Report on Global Warming of 1.5°C

The Intergovernmental Panel on Climate Change report, requested by the UNFCCC following the 2015 Paris Conference, seeks to assess what a 1.5°C warmer world would look like and the different pathways by which global temperature rise could be limited to 1.5°C.* The report affirms the view advocated by many at the Paris Conference, that the original 2° C limit of the long term global goal should be rethought and is not a "guardrail" up to which all would be safe." It warns that if the current warming rate continues, the world would reach human-induced global warming of 1.5°C around 2040, and that over a fifth of the global population live in regions that have already experienced warming in at least one season that is greater than 1.5°C above preindustrial levels. It projects that reaching this milestone as a global average would result in "warming of extreme temperatures in many regions ...increases in frequency, intensity, and/or amount of heavy precipitation in several regions.... and an increase in intensity or frequency of

droughts in some regions.” “Global warming of 1.5°C is projected to shift the ranges of many marine species to higher latitudes as well as increase the amount of damage to many ecosystems. It is also expected to drive the loss of coastal resources and reduce the productivity of fisheries and aquaculture (especially at low latitudes). ...Coral reefs...are projected to decline by a further 70–90% at 1.5°C...”** As summarized in the IPCC’s press release, “limiting global warming to 1.5°C would require ‘rapid and far-reaching’ transitions in land, energy, industry, buildings, transport, and cities. Global net human-caused emissions of carbon dioxide (CO₂) would need to fall by about 45 percent from 2010 levels by 2030, reaching ‘net zero’ around 2050. This means that any remaining emissions would need to be balanced by removing CO₂ from the air. ‘Limiting warming to 1.5°C is possible within the laws of chemistry and physics but doing so would require unprecedented changes,’ said Jim Skea, Co-Chair of IPCC Working Group III.” Gareth Dale, writing in the journal *The Ecologist*, criticizes the IPCC for being too conservative, both in its economic models and its approach to tipping points: “the IPCC continues to underplay the risk of catastrophic nonlinearities, ... which, via cascading climate tipping points, could before long propel runaway warming.”*** Elizabeth Kolbert, writing in *The New Yorker*, comments that “Perhaps the most important takeaway from the report is that every extra half a degree is world-altering.”**** In response to renewed Trump Administration denials in response to the report, Paul Krugman writes in the *New York Times*: “I’d say it was a shocking spectacle, except that it’s hard to get shocked these days. But it was a reminder that we’re now ruled by people who are willing to endanger civilization for the sake of political expediency, not to mention increased profits for their fossil-fuel friends.”***** The Editorial Board of the *Wall Street Journal* responds: “Have we reached peak alarmism on climate change? The question occurs after the muted reaction last week to the latest forecast from the United Nation’s Intergovernmental Panel on Climate Change. In case you hadn’t heard we’re all doomed, yet the world mostly yawned. This is less complacency than creeping scientific and political realism.”***** The following December, at the UNFCCC COP24 meeting in Poland, the United States joins with Saudi Arabia, Russia, and Kuwait in an unprecedented refusal to “welcome” the IPCC report, leaving its status in limbo. Alden Meyer, director of strategy and policy for the Union of Concerned Scientists, comments that the U.S. position is “deeply irresponsible and must not prevail.” “I don’t blame the professional US diplomats here in Poland,” Meyer said. “The problem is right at the top - with President Trump.”*****[see 2018 (December)] Ecological economist Jason Hickel will note some months later that this U.N. report represents a “major milestone in climate mitigation theory.” An IPCC report for the first time introduces a scenario that prioritizes reduced emissions as called for by advocates of “degrowth,” rather than relying on speculative negative emissions technologies: “Developed by Grubler et al. (2018) and known as Low Energy Demand (LED), the scenario works by reducing global energy consumption by 40% by 2050, which makes it much more feasible to achieve a transition to 100% clean energy. The key feature of this scenario is that global material production and consumption declines significantly: ‘The aggregate total material output decreases by close to 20 per cent from today, one-third due to dematerialization, and two-thirds due to improvements in material efficiency.’” Hickel argues that this is both a more realistic and more equitable approach to meeting the goals of the Paris Accord. *****

* Intergovernmental Panel on Climate Change, , “Summary for Policymakers of IPCC Special Report on Global Warming of 1.5 °C approved by governments,” October 8, 2018, <https://www.ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-special-report-on-global-warming-of-1-5c-approved-by-governments/>

**Intergovernmental Panel on Climate Change, *Global Warming of 1.5° C, Summary for Policy Makers*, and *Frequently Asked Questions*, October, 2018, <https://www.ipcc.ch/sr15/>

***Gareth Dale, “The Nobel Prize in climate chaos,” *The Ecologist*, October 12, 2018, <https://theecologist.org/2018/oct/12/nobel-prize-climate-chaos-romer-nordhaus-and-ipcc>

****Elizabeth Kolbert, “Global Warning,” *New Yorker*, October 22, 2018, <https://www.newyorker.com/magazine/2018/10/22/what-is-donald-trumps-response-to-the-uns-dire-climate-report>

*****Paul Krugman, “Donald and the Deadly Deniers,” *New York Times*, October 15, 2018, <https://www.nytimes.com/2018/10/15/opinion/trump-climate-change-deniers-republican.html>

*****Editorial Board, “The U.N.’s Doomsday Climate Clock,” *Wall Street Journal*, October 15, 2018, <https://www.wsj.com/articles/the-u-n-s-doomsday-climate-clock-1539645402>

***** “Saudi, US snub of climate report unsettles UN talks,” *Straits Times*, December 11, 2018, <https://www.straitstimes.com/world/europe/saudi-us-snub-of-climate-report-unsettles-un-talks>

*****Jason Hickel, “Degrowth: a theory of radical abundance,” *real world economic review*, March 19, 2019, <http://www.paecon.net/PAERReview/issue87/whole87.pdf>

2018 (October)

Carbon removal and sequester focus of major National Academies report

In the face of dismantling federal policies to cut back greenhouse gas emissions, the National Academies of Sciences, Engineering and Medicine issues a report proposing a major research agenda to develop “Negative Emissions Technologies” (NETs) that remove and sequester carbon from the air. Headed by Princeton climate scientist Stephen Pacala [see 2004 (August)], the authors acknowledge that “to meet the climate goals laid out under the Paris Agreement, humanity may have to start removing around 10 billion tons of carbon dioxide from the air each year by midcentury, in addition to reducing industrial emissions... That’s nearly as much carbon as all the world’s forests and soils currently absorb each year.”* The report concludes that “recent analyses of economically optimal solutions to the climate problem have concluded that NETs will play as significant a role as any mitigation technology available... Nonetheless, existing options (coastal blue carbon, afforestation/reforestation, forest management, agricultural soils and [bioenergy with carbon capture and storage]) cannot yet provide enough negative emissions at reasonable cost, without substantial unintended harm. A substantial research investment is needed to improve existing NETs and to reduce their negative impacts and costs. In addition, direct air capture and carbon mineralization have essentially unlimited capacity and are almost unexplored.” Aside from the necessity of developing these technologies to meet the goals of the Paris Agreement, and acknowledging that the authors are “acutely aware” of the Trump Administration’s plan to withdraw from the Agreement, the report argues that “intellectual property and economic benefits will likely accrue to the nations that develop the best technology.”**

*Brad Plumer, “Scientists Push for a Crash Program to Scrub Carbon From the Air,” *New York Times*, October 24, 2018, <https://www.nytimes.com/2018/10/24/climate/global-warming-carbon-removal.html>

** National Academies of Sciences, Engineering, and Medicine, *Negative Emissions Technologies and Reliable Sequestration: A Research Agenda* (Washington, DC: The National Academies Press 2018), <https://www.nap.edu/resource/25259/Negative%20Emissions%20Technologies.pdf>

2018 (October)

The Supreme Court declines to review a ruling striking down Obama era regulation of potent greenhouse gases hydrofluorocarbons

In 2017, the D.C. Court of Appeals, in a decision written by Justice Brett Kavanaugh, struck down President Obama's 2015 regulation phasing out the use of hydrofluorocarbons (HFCs) in refrigeration on the theory that it exceeded the EPA's authority under the Clean Air Act. HFCs were adopted as substitutes for chlorofluorocarbons, which damage the ozone layer, but turned out to be highly potent greenhouse gases [see 2013 (June)]. The Trump administration had defended the Obama regulations in the Court of Appeals, but then requested that the Supreme Court not review the decision, as it was considering an alternative approach to regulating HFCs. The Supreme Court's decision not to review means that HFCs remain unregulated pending further Trump administration action.* [see 2020 (April)]

*Miranda Green, "Supreme Court declines to hear appeal in greenhouse gas case ruled on by Kavanaugh," *The Hill*, October 9, 2018, <https://thehill.com/policy/energy-environment/410590-scotus-wont-hear-appeal-of-greenhouse-gas-case-ruled-on-by>
See also: Amanda Reilly, "U.S. court rejects Obama-era plan to eliminate some potent planet warming chemicals," *Science*, August 8, 2017, <https://www.sciencemag.org/news/2017/08/us-court-rejects-obama-era-plan-eliminate-some-potent-planet-warming-chemicals>

2018 (October)

The Trump Administration announces first approval of oil and gas drilling in federal waters off Alaska

In a "major victory for the oil industry and a blow to conservation groups that fought it, fearing a possible leak in a sensitive and pristine natural environment," Interior Secretary Ryan Zinke announces that Hilcorp Energy, based in Houston, will build a nine-acre gravel island about 20 miles east of Prudhoe Bay, not far from the Arctic National Wildlife Refuge, proposing to tap into a reservoir of oil on Alaska's North Slope, containing as much as 150 million barrels.* A coalition of environmental groups led by the Center for Biological Diversity sue in December to stop the project. The Center's oceans legal director Kristen Monsell states that the project "is the bad step down a very dangerous path. An oil spill in the Arctic would be impossible to clean up in a region already stressed by climate change."**

*Darryl Fears, "The Trump administration just approved a plan to drill for oil in Alaska's federal waters. It's a major first." *Washington Post*, October 24, 2018, <https://www.washingtonpost.com/energy-environment/2018/10/24/trump-administration-just-approved-plan-drill-oil-alaskas-federal-waters-its-major-first/>

**Center for Biological Diversity, "Lawsuit Challenges Trump Approval of Offshore Oil Drilling Project in the Arctic," December 17, 2018, https://www.biologicaldiversity.org/news/press_releases/2018/liberty-project-12-17-2018.php

2018 (October)

Exxon Mobil announces commitment of \$1 million to promote a carbon tax

The *Wall Street Journal* reports that the company, "once a powerful skeptic of global warming, will now be among the first oil companies to put money into the fight to make climate change a political priority in Washington. The U.S.'s largest energy producer will commit \$1 million over two years to promote a national tax on carbon as a way to address the environmental issue. The funding will back an initiative designed to appeal to the Republicans who now control Washington, and may open the door for Exxon's peers in the oil industry to follow."*

*Timothy Puko and Bradley Olson, "Exxon Puts Up \$1 Million to Promote Carbon Tax," *Wall Street Journal*, October 9, 2018, <https://www.wsj.com/articles/exxon-puts-up-1-million-to-campaign-for-a-carbon-tax-1539079200>

2018 (October)

New York sues Exxon Mobil on accounting for climate change

New York Acting Attorney General Barbara Underwood concludes a three year investigation into Exxon's accounting practices related to climate change by filing a civil suit alleging that the company engaged in a "longstanding fraudulent scheme" to deceive investors, analysts and underwriters "concerning the company's management of the risks posed to its business by climate change regulation." *The New York Times* observes that "not only does [the suit] pose a financial threat to Exxon that could run into the hundreds of millions of dollars or more, but it could also strike a blow to the reputation of a company that has worked to rehabilitate its image, framing itself as a leader on global warming." Exxon Mobil spokesman Scott Silvestri, says that the New York attorney general's "baseless allegations are a product of closed-door lobbying by special interests, political opportunism and the attorney general's inability to admit that a three-year investigation has uncovered no wrongdoing."*The Editorial Board of the *Wall Street Journal* issues a strongly worded criticism: "Ms. Underwood is charging Exxon under New York's notorious Martin Act, which doesn't require evidence of intent to prove fraud in civil cases. She may be hoping that Exxon agrees to settle and pay a fine so she can declare victory. Yet in this case there's not even evidence of fraudulent conduct, much less intent. The only party guilty of misrepresentation in this lawsuit is the New York AG."** [see 2015 (November), 2016 (October)]

*John Schwartz, "New York Sues Exxon Mobil, Saying It Deceived Shareholders on Climate Change," *New York Times*, October 24, 2018, <https://www.nytimes.com/2018/10/24/climate/exxon-lawsuit-climate-change.html>

**Editorial Board, "Peak Embarrassment in War on Oil," *Wall Street Journal*, October 25, 2018, <https://www.wsj.com/articles/peak-embarrassment-in-war-on-oil-1540509533>

2018 (November)

The University of Maine Climate Change Institute releases the report "Coastal Maine Climate Futures"

The report assesses the impact of climate change on the Maine coast and its natural resource based enterprises in the recent past, and projects various scenarios for the future.* The report notes that warming of the Gulf of Maine presents obstacles to the recovery of the cod ground fishery, decimated due to overfishing, but has in the short term contributed to expanding populations of lobster, which may continue up to a point: "Lobster abundance in Maine has meanwhile increased four-fold since the late 1980s due to both the decline of cod (predators of juvenile lobsters) and warming waters that are favorable to the species at least to a threshold. As found during summer in coastal waters off southern New England, lobster mortality increases significantly if [sea surface temperatures] exceed ~68°F." For coastal agriculture, warming since 2000 has brought a longer growing season of about two weeks over the 20th century average, but "potential benefits from this longer growing season... are balanced by a number of negative impacts of the changing weather, including the northward migration

of pests, extreme rainfall events..., sedimentation in associated surface waters from the accelerated soil loss, as well as more frequent ‘blocking’ patterns in the atmosphere that increase the likelihood of heatwaves and seasonal drought.” Comparing blueberry yield data with sea surface temperatures and mean sea level pressure (tied to precipitation), the authors found positive correlations between higher crop yields, and warmer, wetter summers: “commodity measures such as production and area yield are influenced by weather, and the implications of a changing climate are extremely important to consider.” **

*Sean Birkel and Paul Mayewski, *Coastal Maine Climate Futures* (Orono, ME: Climate Change Institute, University of Maine, 2-18). <https://climatechange.umaine.edu/2018/11/08/coastal-maine-climate-futures-s-birkel/>

**Editor’s note: while outside the scope of the Birkel and Mayewski report, it is worth considering as well the negative economic impact on the Maine blueberry crop of expanded competition from the Canadian provinces to the north, due to more favorable conditions linked with the same warming trends identified in the report for Maine. Beth Daley, “Climate change brings blueberries – and competition,” *New York Times*, October 2, 2007, <https://www.nytimes.com/2007/10/02/world/americas/02iht-berries.1.7713299.html>; Joyce Kryszak, “Blueberry Blues,” *DownEast*, July 27, 2018, <https://downeast.com/blueberry-blues/>

2018 (November)

The Trump administration issues Volume II of the National Climate Assessment, dramatically challenging its own climate policies

The Global Change Research Act of 1990 mandates that U.S. federal agencies produce a report every four years assessing climate change science and impacts for the United States. Volume II of the Fourth National Climate Assessment [see Vol. I, 2017 (November)] strongly affirms both the integrity of climate science and the seriousness of consequences of inaction. As characterized in *The Washington Post*, “while it avoids policy recommendations, the report’s sense of urgency and alarm stands in stark contrast to the lack of any apparent plan from President Trump to tackle the problems, which, according to the government he runs, are increasingly dire.”* Highlights from the Report’s Summary Findings: “rising temperatures, sea level rise, and changes in extreme events are expected to increasingly disrupt and damage critical infrastructure and property, labor productivity, and the vitality of our communities;” “Changes in temperature and precipitation are increasing air quality and health risks from wildfire and ground-level ozone pollution. Rising air and water temperatures and more intense extreme events are expected to increase exposure to waterborne and foodborne diseases, affecting food and water safety. ... Climate change is also projected to alter the geographic range and distribution of disease-carrying insects and pests, exposing more people to ticks that carry Lyme disease and mosquitoes that transmit viruses such as Zika, West Nile, and dengue...;” “continued warming that is projected to occur without substantial and sustained reductions in global greenhouse gas emissions is expected to cause substantial net damage to the U.S. economy throughout this century, especially in the absence of increased adaptation efforts. With continued growth in emissions at historic rates, annual losses in some economic sectors are projected to reach hundreds of billions of dollars by the end of the century—more than the current gross domestic product (GDP) of many U.S. states.”** Although the administration releases the report on “Black Friday,” one of the slowest news days of the year, a spokesperson for the National Oceanic and Atmospheric Administration confirms that “This report has not been altered or revised in any way because of political considerations.” * Holman Jenkins, writing in the *Wall Street Journal*, argues that the media has generally ignored

the good news in the report: “The clear lesson of last week’s U.S. government report and every other official assessment is that climate change is not the end of the world. We can handle the cost and we can also handle the cost of avoiding a portion of climate change through sensible tax policy. (It should not be necessary at this point to rehearse the case for a carbon tax that is simultaneously pro-growth and anti-carbon.)”***

*Brady Dennis and Chris Moody, “Major Trump administration climate report says damage is ‘intensifying across the country,’” *Washington Post*, November 23, 2018, https://www.washingtonpost.com/energy-environment/2018/11/23/major-trump-administration-climate-report-says-damages-are-intensifying-across-country/?utm_term=.dfccbeb327fe

**U.S. Global Change Research Program, *Fourth National Climate Assessment, Volume II: Impacts, Risks, and Adaptation in the United States, Summary Findings*, 2018; <https://nca2018.globalchange.gov/>

***Holman Jenkins, “Press is the Enemy of Climate,” *Wall Street Journal*, December 4, 2018, <https://www.wsj.com/articles/press-is-the-enemy-of-climate-1543966906>

2018 (November)

Replanting trees and better management of forests and farmland soils in the U.S. could save as much as 21% of current U.S. greenhouse gas emissions, study finds.

A study team of 26 scientists led by three scientists from The Nature Conservancy quantified the potential of “natural climate solutions:” conservation, restoration, and improved land management interventions on natural and agricultural lands—to increase carbon storage and avoid greenhouse gas emissions in the United States. Their report, published in *Science Advances*, concluded that techniques such as broader use of cover crops, restricting suburban sprawl, and reforesting unused land across the nation “are the most mature approaches available for carbon conservation and uptake compared to nascent carbon capture technologies and could complement increases in zero-carbon energy production and energy efficiency to achieve needed climate change mitigation.” Modeling a combination twenty-one different natural climate solution scenarios, the report found that by the year 2025 up to 21% of 2016 U.S. emissions could be avoided, the bulk of which would come from carbon sequestration by trees. These techniques also would have substantial additional benefits for air and water quality, aesthetics, biodiversity, and soil enrichment.* California has joined 15 other states to explore how better land management can help mitigate climate change. As Claire Jahns, assistant secretary for climate issues at the California Natural Resources Agency, tells *The New York Times*, “I’d say we’re still learning, but there’s a growing recognition that we’re not going to hit our state climate targets without paying attention to our lands and the physical environment.”**

*Joseph Fargione *et al.*, “Natural climate solutions for the United States,” *Science Advances* 4, no. 11 (November 14, 2018):eaat1869, <http://advances.sciencemag.org/content/4/11/eaat1869/tab-figures-data>

**Brad Plumer, “Part of the Answer to Climate Change May Be America’s Trees and Dirt, Scientists Say,” *New York Times*, November 14, 2018, <https://www.nytimes.com/2018/11/14/climate/climate-change-natural-solutions.html>

2018 (November)

Study published in *Science* finds warming Atlantic sea surface temperatures a major factor in generating the extraordinary 2017 hurricane season

The 2017 hurricane season in the North Atlantic was highly active, with six major hurricanes including Harvey, Irma and Maria, causing widespread damage over the Gulf Coast and the

Caribbean. Equating climate change with hurricane activity remains a controversial subject, but a study published in *Science* by National Atmospheric and Oceanic Administration scientist Hiroyuki Murakami and coauthors strengthened the argument for this connection: “Using a suite of high-resolution model experiments, we show that the increase in 2017 major hurricanes was not primarily caused by La Niña conditions in the Pacific Ocean but rather triggered mainly by pronounced warm sea surface conditions in the tropical North Atlantic. Further, we superimpose a similar pattern of North Atlantic surface warming on data for long-term increasing sea surface temperature (a product of increases in greenhouse gas concentrations and decreases in aerosols) to show that this warming trend will likely lead to even higher numbers of major hurricanes in the future.”*

*Hiroyuki Murakami *et al.*, “Dominant effect of relative tropical Atlantic warming on major hurricane occurrence,” *Science* 362, no. 6416 (November 16, 2018): 794-799, <http://science.sciencemag.org/content/362/6416/794>

2018 (November)

Spurred by French President Macron’s planned fuel tax hike, tens of thousands of protesters wearing yellow high-visibility vests take to the streets with violent protests

After weeks of repeated protests across the nation, Macron is forced to repeal the 20% tax, part of his plan to “Make the Planet Great Again.” Protests continue with other demands for social and economic equality. *Al Jazeera* commentator Rokhaya Diallo argues that the French protest movement, “one of the most significant social mobilisations in its recent history, ... bare the country's social ills, anti-elite sentiment, growing inequalities and thirst for social justice,” and “is not a rejection of green policies. It's a revolt against the 1 percent.”* George Melloan argues in the *Wall Street Journal* that the rioting “Yellow Jackets” “are right about green policies: They have distinguished company in questioning the science behind climate-change dogma.” Melloan cites the November rejection of ballot measures in Washington and Arizona aimed at reducing carbon emissions: “Seek out the most basic cause of the French riots and you’ll come to a bizarre answer: carbon dioxide. More specifically, the demonization by political activists of that vital element of the earth’s atmosphere.... Mr. Macron has learned the hard way that voters don’t see climate change as a threat demanding personal sacrifices.”** But Michael Mann argues that the Yellow Vest protesters played into the hands of Russian trolls: “Russia is ...believed to have played a role in the 2018 ‘Yellow Vest’ revolts...Russian trolls helped incite protests and rioting in the streets using messaging that played upon class conflict and perceived economic injustice. Ironically, although most of the protesters actually supported action on climate, they opposed a proposed fuel tax, which they were led to believe would be financed by the working class and poor to the benefit of multinational corporations.”***

*Rokhaya Diallo, “Why are the 'yellow vests' protesting in France?” *Al Jazeera*, December 10, 2018,

<https://www.aljazeera.com/indepth/opinion/yellow-vests-protesting-france-181206083636240.html>

**George Melloan, “The Yellow Jackets Are Right About Green Policies,” *Wall Street Journal*, December 16, 2018,

<https://www.wsj.com/articles/the-yellow-jackets-are-right-about-green-policies-11544991717>

***Michael Mann, *The New Climate War* (New York: PublicAffairs, 2021), 106.

2018 (November)

The World Meteorological Organization reports that carbon dioxide levels reached a new record high global average of 405.5 ppm in 2017

Since 1990, there has been a 41 percent increase in warming driven by greenhouse gases. WMO Secretary-General Petteri Taalas notes that “The last time the Earth experienced a comparable concentration of CO₂ was 3-5 million years ago, when the temperature was 2-3°C warmer and sea level was 10-20 meters higher than now... The science is clear. Without rapid cuts in CO₂ and other greenhouse gases, climate change will have increasingly destructive and irreversible impacts on life on Earth. The window of opportunity for action is almost closed.”* Bloomberg news notes that a sea level rise of 10 meters higher “would wipe out low-lying island nations and much of Manhattan.” **

* World Meteorological Organization, “Greenhouse gas levels in atmosphere reach new record,” November 20, 2018,

<https://public.wmo.int/en/media/press-release/greenhouse-gas-levels-atmosphere-reach-new-record>

**Rachel Morison, “Greenhouse gases hit level last seen when seas covered Manhattan,” *Bloomberg*, November 22, 2018,

<https://www.bloomberg.com/news/articles/2018-11-22/climate-changing-greenhouse-gas-levels-climb-to-record-high>

2018 (December)

Royal Dutch Shell announces plan to link executive pay to achieving short term carbon reduction goals

After intense shareholder pressure, the company agrees to provide three- to five-year targets beginning in 2020 to reduce its net carbon footprint on an annual basis, and incorporate the targets into a revised remuneration policy, subject to a shareholder vote in 2020. The *Wall Street Journal* notes that this sends “a clear signal to other big oil companies about the kind of pressure and investor demands they can expect to face going forward.”*

*Sarah Kent, “Shell to Link Carbon Emissions Targets to Executive Pay,” *Wall Street Journal*, December 3, 2018,

<https://www.wsj.com/articles/shell-to-link-carbon-emissions-targets-to-executives-pay-1543843441>

2018 (December)

The EPA publishes a proposed rule to revise New Source Review Standards, significantly relaxing requirements to build new coal-fired plants

Citing “high costs and limited geographic availability of CCS [Carbon Capture and Storage],” the rule reverses an Obama era standard that identified CCS as the “best system of emission reduction” for greenhouse gas regulation of new plants, * Acting EPA Administrator Andrew Wheeler states that the Obama EPA’s requirement of CCS or emissions control equivalent to what could be achieved by CCS was “disingenuous”: “They knew the tech was not adequately demonstrated, which is what was required under the law.” Clare Lakewood, a senior attorney at the Center for Biological Diversity, comments that “Trump’s proposal is an act of flailing, die-hard climate denial.”**

*Environmental Protection Agency, “Review of Standards of Performance for Greenhouse Gas Emissions From New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units,” *Federal Register* 83 (December 20, 2018): 65424 – 65464,

<https://www.federalregister.gov/documents/2018/12/20/2018-27052/review-of-standards-of-performance-for-greenhouse-gas-emissions-from-new-modified-and-reconstructed>

**Miranda Green, “EPA announces new plan to weaken Obama-era greenhouse gas rule,” *The Hill*, December 6, 2018,

<https://thehill.com/policy/energy-environment/420072-epa-announces-new-plan-to-weaken-obama-era-greenhouse-gas-rule>

2018 (December)

Global carbon dioxide emissions projected to increase by more than 2% in 2018, with a total of 37.1 GtCO₂ emitted to the atmosphere, a new high

According to the report of the Global Carbon Project, emissions from India are predicted to grow by 6.3%; from China by 4.7%; from the U.S. by 2.5%; and emissions from the E.U. to decline by .7%. The final figures for 2017 are reported as follows: “In 2017, global CO₂ emissions were dominated by emissions from China (27%), the USA (15%), the EU (28 member states; 10%) and India (7%). Growth rates of these countries from 2016 to 2017 were +1.7% for China, -0.5% for the USA, 1.4% for the EU28, and 4.0% for India. The per-capita CO₂ emissions in 2017 were 4.8 tCO₂ tonnes of carbon person⁻¹yr⁻¹ for the globe, 16.2 tCO₂ for the USA, 7.0 tCO₂ for China, 7.1 tCO₂ for the EU28, and 1.8 tCO₂ for India.”* Reflecting on these figures for *The Washington Post*, Rob Jackson, a researcher at Stanford University who contributed research for the report, noted that “We’re not seeing declines in wealthy countries that outpace the increases in other parts of the world... India is providing electricity and energy to hundreds of millions of people who don’t have it yet... “That’s very different than in China, where they are ramping up coal use again in part because their economic growth has been slowing. They’re greenlighting coal-based projects that have been on hold.”**

*Global Carbon Project, *Global Carbon Budget, Summary Highlights 2018*, December 5, 2018,

<https://www.globalcarbonproject.org/carbonbudget/18/highlights.htm>

**Brady Dennis and Chris Mooney, “‘We are in trouble.’ Global carbon emissions reached a record high in 2018.” *Washington Post*, December 5, 2018, <https://www.washingtonpost.com/energy-environment/2018/12/05/we-are-trouble-global-carbon-emissions-reached-new-record-high/>

2018 (December)

Poll suggests a record high 45% of Americans believe global climate change is serious enough to merit action immediately.

The Wall Street Journal/NBC News poll, surveying 900 adults, finds that two-thirds of Americans believe action is needed to address global climate change, and only 30% of adults in the survey say they believe the evidence for climate change is inconclusive or that concern about the issue is unwarranted. Reports Andrew Duehren in the *Wall Street Journal*: “The 45% share calling for immediate action was the highest since the survey began asking the question in 1999 and compares with 39% who supported immediate action in 2017.” Duehren suggests increasing concerns may stem from extraordinary recent wildfire and hurricane activity in the U.S., and “two major scientific reports in the past two months, one from the Trump administration and the other from the United Nations [which] detailed an enormous societal toll from unchecked climate change.”*

*Andrew Duehren, “Americans Show Growing Support for Climate-Change Policies, Poll Says,” *Wall Street Journal*, December 17, 2018, <https://www.wsj.com/articles/americans-show-growing-support-for-climate-change-policies-poll-says-11545072498>

2018 (December)

At the UNFCCC COP24 in Katowice, Poland, delegates approve a “rule book” for moving forward with the Paris Agreement

The 24th United Nations Framework Convention on Climate Change Conference of the Parties faces serious problems including the United States’ announced withdrawal from the Paris Agreement, violent protests in Paris against a fuel tax hike, expanding coal use around the world, and several countries’ backsliding on meeting the goals of the voluntary commitments made in Paris in 2015. And for the first time in the history of the UN process of responding to climate change, the Conference fails to formally accept a report by the Intergovernmental Panel on Climate Change that it had commissioned, on the impact of a 1.5° C increase in global temperatures [see 2018 (October)]. Saudi Arabia, the United States, Russia and Kuwait join in objecting to “welcoming” the report, agreeing only to “take note” of it.* The parties’ final agreement on a “rule book” for going forward, including some flexibility on the mandatory emissions reporting requirements for the poorest countries, and confirming methods for uniformly accounting for greenhouse gas inventories* is described by *The Washington Post* as “somewhat miraculous.” It is generally acknowledged that the world is not on track to meet the goal of keeping global temperatures from increasing 2° C above preindustrial levels by 2100. While activists’ hopes are dashed that participants would commit to specific higher voluntary reductions at this meeting, several countries, including India, Canada, Ukraine, and Jamaica, pledge to increase their commitments by 2020. ** And in response to the rejection of the IPCC’s 1.5° C report, the EU, Canada, New Zealand and scores of developing countries join a “High Ambition Coalition,” pledging to toughen their existing commitments to help the world to stay within a 1.5° C rise in global warming. Wendel Trio, director of the Climate Action Network Europe, is quoted in *The Guardian*: “The spirit of Paris is back. The statement will boost greater ambition at the crunch time of these so far underwhelming talks. ... We call upon the countries that have not signed the statement so far to stop ignoring the science.” Frank Bainimarama, the prime minister of Fiji, warns that by ignoring the IPCC report we will go down in history as “the generation that blew it – that sacrificed the health of our world and ultimately betrayed humanity because we didn’t have the courage and foresight to go beyond our short-term individual concerns: craven, irresponsible and selfish.”*** Comments Rupert Darwall in the *Wall Street Journal*: “As interest rates rise, renewable energy can’t compete without carbon pricing—economists’ magic bullet to solve global warming. Therein lies the biggest cause of despair at Katowice. Thanks to French President Emmanuel Macron’s carbon-tax folly, politicians of all stripes are likely to treat carbon pricing like the plague. ... Reality has a way of fighting back.”****

*Matt McGrath, “Climate change: COP24 fails to adopt key scientific report,” *BBC News*, December 8, 2018, <https://www.bbc.com/news/science-environment-46496967>

**Joshua Busby, “The latest global climate negotiations just finished. Here’s what happened,” *Washington Post*, December 17, 2018, <https://www.washingtonpost.com/news/monkey-cage/wp/2018/12/17/the-latest-global-climate-negotiations-just-finished-heres-what-happened/>

***Fiona Harvey, Ben Doherty and Jonathan Watts, “Climate change talks lead to heightened pledge to cut emissions,” *Guardian*, December 12, 2018, <https://www.theguardian.com/environment/2018/dec/12/un-chief-antonio-guterres-attempts-to-revive-flagging-climate-change-talks>

****Rupert Darwall, “Defeat in the Air at the Climate Conference,” *Wall Street Journal*, December 18, 2018, <https://www.wsj.com/articles/defeat-in-the-air-at-the-climate-conference-11545178525>

2018 (December)

The *Wall Street Journal*, in its series “The Price of Climate,” publishes a report on the dramatic impact on fisheries of climate-driven species migrations

As Robert Lee Hotz reports in “Climate Change Drives Fish Into New Waters, Remaking an Industry,” there are winners and losers up and down the U.S. coasts and around the world. A haddock fisherman on the Bering Sea complains that each voyage to find fish takes twice as long and yields half as many fish as a decade ago: “‘It keeps me up at night,’ he says. ‘I woke up at three in the morning. I couldn’t sleep thinking about where the fish are going.’” As Hotz explains: “This year, the winter ice that normally covers the northern Bering Sea never formed and, for the first time since the surveys started 34 years ago, a vast pool of cold bottom water that normally kept many fish at the southeastern end of the Bering Sea was gone.... So far, there are no real climate-change winners in Alaska’s fisheries from the northward migration of the catch.” Meanwhile in Rhode Island, “squid have become so important to the Rhode Island economy that the legislature recently voted calamari the state’s official appetizer. The U.S. catch of *Illex* squid, usually used in calamari, tripled between 2016 and 2017,” and U.S. landings of Jonah crab are 17 times over what they were 20 years ago.*

*Robert Lee Hotz, “Climate Change Drives Fish Into New Waters, Remaking an Industry,” *Wall Street Journal*, December 22, 2018, <https://www.wsj.com/articles/climate-change-drives-fish-into-new-waters-remaking-an-industry-11545454860>

2019 (January)

Study confirms more rapid warming of ocean temperatures than previously observed

Research published in the journal *Science* assesses four independent recent studies of ocean heat content (OHC), a better measure of overall global warming trends than more variable surface air temperatures. The authors report that these studies “show highly consistent changes since the late 1950s,” and that the degree of observed ocean warming is more rapid than that reported in the 2013 IPCC’s Fifth Assessment Report. This ocean warming can partially account for an observed slowdown in surface air temperatures: “Although climate model results ...have been criticized during debates about a ‘hiatus’ or ‘slowdown’ of global mean surface temperature, it is increasingly clear that the pause in surface warming was at least in part due to the redistribution of heat within the climate system from Earth surface into the ocean interiors.” The report concludes: “The fairly steady rise in OHC shows that the planet is clearly warming. The prospects for much higher OHC, sea level, and sea-surface temperatures should be of concern given the abundant evidence of effects on storms, hurricanes, and the hydrological cycle, including extreme precipitation events.”*

*Lijing Cheng *et al.*, “How fast are the oceans warming?” *Science* 363, no. 6423 (January 11, 2019): 128-129, <https://science.sciencemag.org/content/363/6423/128>

2019 (January)

Brookings study reveals a political disconnect: Trump voters live in regions more exposed to harm from climate change

The study compares county-based data on the economic costs of future climate change through the end of the century in the United States, with voting behavior and climate perspectives of elected leaders. The authors note that while projected climate impacts are widespread in the U.S., they are highly uneven: “climate change could actually bestow net economic benefits by the years 2080-2099 ...on the Pacific Northwest, parts of the Interior West, the upper Midwest, and New England, even as it creates stark losses in the Southwest, Southeast, and Florida... [W]hile increases in agricultural yields will significantly benefit the nation’s Northwest, climate-caused deaths will hurt the Southwest as coastal storms and sea-level issues batter the Southeast, Florida, and the Gulf Coast. These patterns suggest that many red-voting states...are likely disproportionately exposed to climate change’s negative impacts.”; “9 of the 10 states contending with the highest losses of county income voted for President Trump in 2016, including, in order, Florida, Mississippi, Louisiana, Arkansas, and Alabama. Fifteen of the 16 highest-harm states were also red.” The study concludes with some grounds for optimism for climate policy: “a poisonous cocktail of right-wing ideology, distrust of distant Washington, and fear of short-term job losses will continue to make it hard to implement any sort of federal legislation to tackle climate change. Yet with that said, some public opinion polls suggest that Republican attitudes on climate change are already softening—and with that, the prospects for bipartisan federal legislation may brighten as the damage from storms, drought, and fire accumulates.”*

*Mark Muro, David G. Victor, Jacob Whiton, *How the geography of climate damage could make the politics less polarizing* (Brookings Institute, January 29, 2018, <https://www.brookings.edu/research/how-the-geography-of-climate-damage-could-make-the-politics-less-polarizing/>)

2019 (February)

Major report explores impact of climate change on the Hindu Kush Himalaya glaciers and the populations that depend on them

The Hindu Kush Himalaya Assessment is 600 page report issued by the International Centre for Integrated Mountain Development (ICIMOD). Engaging hundreds of scientists from around the world, it examines a region sometime called the “Third Pole,” for its concentration of glaciers, in eight countries from Afghanistan to Myanmar, feeding waterways that support billions of people. Around 240 million people live in these mountains, while 1.9 billion live in the ten river valleys that the glaciers feed with fresh water, and another 3 billion enjoy the food produced in these river valleys.* “This is the climate crisis you haven't heard of,” notes Philippus Wester, an ICIMOD scientist and the report's lead coordinator. As noted by *E&E News* reporter Chelsea Harvey, “These water supplies are closely dependent on both rainfall during the monsoon season and trickling meltwater from the glaciers, especially during the dry season. That means climate change has the potential to affect a huge population.” The dire projections are that these glaciers “could lose more than a third of their volume by the end of the century — even if world nations meet their most ambitious climate targets. And if greenhouse gas emissions continue at their current levels, the region could lose as much as two-thirds of its ice.”**

*Philippus Wester et al., *The Hindu Kush Himalaya Assessment* (International Centre for Integrated Mountain Development 2019), sec. 1.2, <https://link.springer.com/book/10.1007%2F978-3-319-92288-1>

**Chelsea Harvey, “World's 'Third Pole' is melting away,” *Climatewire*, February 4, 2019, <https://www.eenews.net/climatewire/2019/02/04/stories/1060119363>

2019 (February)

Senator Edward Markey and Representative Alexandria Ocasio-Cortez release a proposal for a “Green New Deal”

The fourteen page proposal is contained in a pair of proposed Congressional resolutions, House Resolution 109 and S. Res. 59, and described as a response to the IPCC’s Special Report on Global Warming of 1.5° C and the November 2018 Fourth National Climate Assessment report. It proposes a “10-year national mobilization” whose primary goals include "Guaranteeing a job with a family-sustaining wage, adequate family and medical leave, paid vacations, and retirement security to all people of the United States;" "Providing all people of the United States with – (i) high-quality health care; (ii) affordable, safe, and adequate housing; (iii) economic security; and (iv) access to clean water, clean air, healthy and affordable food, and nature;" "Providing resources, training, and high-quality education, including higher education, to all people of the United States;" "Meeting 100 percent of the power demand in the United States through clean, renewable, and zero-emission energy sources;" and "Repairing and upgrading the infrastructure in the United States, including . . . by eliminating pollution and greenhouse gas emissions as much as technologically feasible."* On January 10, 626 environmental organizations send a letter to every member of Congress supporting the Green New Deal.** However, a number of leading environmental advocacy organizations decline to sign on to the endorsement, including the Sierra Club, the Natural Resources Defense Council, the Environmental Defense Fund, Mom’s Clean Air Force, Environment America, the Audubon Society, the Climate Reality Project and NextGen America.*** David Leonhardt argues in *The New York Times* that a main flaw of the proposal is that “Although the plan does a good job laying out the problem of climate change, it doesn’t offer a clear vision for a solution. It asserts that it will solve the problem and skips huge questions — like the roles of a carbon tax, nuclear energy and urban density.” But Leonhardt agrees with the plan’s broad scope: “The Green New Deal rightly rejects the choice between helping American workers and taking on climate change. The country needs to do both, and it can. By focusing on the terrifying state of the climate, the plan will likely nudge other Democrats toward their own ambitious climate proposals.”****

*Alexandria Ocasio-Cortez, Resolution Recognizing the Duty of the United States to create a Green New Deal, United States Congress House Resolution 109, <https://ocasio-cortez.house.gov/sites/ocasio-cortez.house.gov/files/Resolution%20on%20a%20Green%20New%20Deal.pdf>

**Brian Kahn, “More Than 600 Environmental Groups Just Backed Ocasio-Cortez’s Green New Deal,” *Earther*, January 10, 2019, <https://earther.gizmodo.com/more-than-600-environmental-groups-just-backed-ocasio-c-1831640541>

***Emily Atkin, “Some of the Biggest Green Groups Have Cold Feet Over the ‘Green New Deal,’” *New Republic*, January 15, 2019, <https://newrepublic.com/article/152885/biggest-green-groups-cold-feet-green-new-deal>

****David Leonhardt, “Bad Policy, Good Politics,” *New York Times*, February 13, 2019, <https://www.nytimes.com/2019/02/13/opinion/green-new-deal-democrats.html>

2019 (February)

NOAA and NASA report that 2018 was the fourth hottest year globally since 1880

Only the years 2015, 2016, and 2017 were hotter. The past five years were collectively the hottest years on record. NASA’s Goddard Institute for Space Studies (GISS) Director Gavin Schmidt

states that “2018 is yet again an extremely warm year on top of a long-term global warming trend.” The NASA press release notes that “This warming has been driven in large part by increased emissions into the atmosphere of carbon dioxide and other greenhouse gases caused by human activities, according to Schmidt. Since the 1880s, the average global surface temperature has risen about 2 degrees Fahrenheit (1 degree Celsius).” *

*National Aeronautics and Space Administration, “2018 fourth warmest year in continued warming trend, according to NASA, NOAA,” press release, February 6, 2019, <https://climate.nasa.gov/news/2841/2018-fourth-warmest-year-in-continued-warming-trend-according-to-nasa-noaa/>

2019 (February)

Study finds the case for greenhouse gases “endangering” human health and welfare is stronger than ever, bolstering legal foundation for regulation

In 2009, the Obama Environmental Protection Agency (EPA) issued an “endangerment finding,” concluding that six long-lived greenhouse gases, under the terms of the Clean Air Act, “cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare.”[see 2009 (December)] This finding was prompted by the 2007 U.S. Supreme Court decision in *Massachusetts v. EPA*, which agreed with the argument of the petitioner states (including Maine) that the Bush administration had wrongly refused to issue such a finding. [see 2007 (April)] Once such a finding was made, the Court held that the EPA had not only the *authority* but also the *obligation* to regulate those gases. The Obama administration then issued a panoply of greenhouse gas regulations on motor vehicle emissions, power plant pollution, and methane releases from oil and gas operations. As the Trump administration rolled back those regulations, Trump advisors argued that he should as well revoke the Obama administration’s “endangerment finding,” and the Conservative Enterprise Institute filed a petition with the EPA to reconsider the finding.* With that petition pending, Philip Duffy, of Woods Hole Research Center, Christopher Field of Stanford, and thirteen contributing scientists publish an assessment of the strength of the basis for the endangerment finding (EF) as of 2018 in the journal *Science*. The study’s findings include: “For each of the areas addressed in the EF, the amount, diversity, and sophistication of the evidence has increased markedly, clearly strengthening the case for endangerment ... New evidence about the extent, severity, and interconnectedness of impacts detected to date and projected for the future reinforces the case that climate change endangers the health and welfare of current and future generations. ... In many cases, new evidence points to the risk of impacts that are more severe or widespread than those anticipated in 2009. Further, several categories of climate change impacts, including effects on ocean acidification, violence, national security, and economic well-being, are now supported by such broad evidence that they warrant inclusion in the framing of endangerment finding.”**

*Nick Sobczuk and Geof Koss, “Conservatives warn endangerment finding fight is ‘still alive,’” *E&E Daily*, August 22, 2018, <https://www.eenews.net/stories/1060094933>

**Philip Duffy *et al.*, “Strengthened scientific support for the Endangerment Finding for atmospheric greenhouse gases,” *Science* 363, no. 6427 (February 8, 2019): eaat5982, <http://science.sciencemag.org/content/363/6427/eaat5982>

2019 (March)

Study questions feasibility of limiting warming to 1.5° C

As summarized in the *National Geographic*, the study in *Nature Climate Change* looks at the feasibility of achieving global temperature targets, with three practical constraints suggested by both technological limits and political feasibility: “spending to cut carbon emissions would be no more than three percent of global GDP per year; no use of geoengineering or technologies to remove carbon; and the climate’s response to doubling carbon in the atmosphere [“climate sensitivity”] would be at the median level or higher.” With these constraints, the study concludes that in order to meet the original 2° C UNFCCC target, carbon emissions must reach zero by 2030 in every country of the world. Lead author Jonathan Lamontagne of Tufts University notes that this target will be exceptionally difficult, and there is no path to 1.5° C given the constraints used in the paper.*

*Stephen Leahy, “Climate study warns of vanishing safety window—here’s why,” *National Geographic*, March 12, 2019, <https://www.nationalgeographic.com/environment/2019/03/climate-change-model-warns-of-difficult-future/>; Jonathan R. Lamontagne *et al.*, “Robust abatement pathways to tolerable climate futures require immediate global action,” *Nature Climate Change* 9 (March 11, 2019): 290; <https://www.nature.com/articles/s41558-019-0426-8>

2019 (March)

Two federal district court decisions put hurdles in the way of the Trump Administration’s “energy dominance” agenda

A judge in Alaska rules that the Trump Administration’s action to reverse President Obama’s withdrawal of 128 million acres from drilling [see 2017 (April)] is illegal. The court rules that while the Outer Continental Shelf Lands Act expressly allows for leasing withdrawals by a president, it does not permit a subsequent president to revoke those withdrawals without congressional approval. *The Washington Post* quotes Earthjustice attorney Eric Grafe, who lead the effort to reinstate the protections: “President Trump’s lawlessness is catching up with him...The judge’s ruling today shows that the president can not just trample on the constitution to do the bidding of his cronies in the fossil fuel industry at the expense of our oceans, wildlife, and climate.”* The Trump administration has appealed the decision to the 9th Circuit Court of Appeals.** And a judge in Washington temporarily blocks drilling on 300,000 acres of land in Wyoming, holding that the Obama administration “did not sufficiently consider climate change” when making decisions to auction off federal land for drilling in 2015 and 2016. As summarized in *The Washington Post*, “Since greenhouse gas emissions are driving climate change, the judge wrote, these analyses did not provide policymakers and the public with a sufficient understanding of drilling’s impact, as required under the National Environmental Policy Act.”***As noted in Natural Gas Intelligence’s *Shale Daily*, “The case could have wider implications for oil and gas drilling in the West. Court records show the plaintiffs have challenged BLM's approval and issuance of 473 leases totaling more than 460,000 acres in Colorado, Utah and Wyoming. ... The case could also impact the Trump administration's "energy dominance" agenda, which includes support for robust domestic oil and gas drilling.”****

*Juliet Eilperin, “Federal judge declares Trump’s push to open up Arctic and Atlantic oceans to oil and gas drilling illegal,” *Washington Post*, March 30, 2019, <https://www.washingtonpost.com/climate-environment/2019/03/30/federal-judge-declares-trumps-push-open-up-arctic-atlantic-ocean-oil-gas-drilling-illegal/>

**For an ongoing summary of regulatory actions and court decisions concerning offshore drilling, as well as other environmental issues, see the Harvard Law School’s Environmental and Energy Law Program’s Regulatory Rollback Tracker, at <https://eelp.law.harvard.edu/2018/08/offshore-oil-and-gas-drilling-leasing-rules-and-guidance/>

***Juliet Eilperin, “Federal judge demands Trump administration reveal how its drilling plans will fuel climate change,” *Washington Post*, March 20 2019, <https://www.washingtonpost.com/climate-environment/2019/03/20/federal-judge-casts-doubt-trumps-drilling-plans-across-us-because-they-ignore-climate-change/>

***David Bradley, “Judge Denies Enviro Request to Halt Wyoming Drilling, with Warning to BLM,” *Shale Daily*, July 22, 2019, <https://www.naturalgasintel.com/articles/119038-judge-denies-enviro-request-to-halt-wyoming-drilling-with-warning-to-blm>

2019 (April)

Climate advisory committee disbanded by Trump nonetheless releases report

The federal Advisory Committee for the Sustained National Climate Assessment, whose purpose was to develop guidance for local governments and private companies based on climate science laid out in the National Climate Assessment, was disbanded by the Trump administration in 2017. [see 2017 (August)] New York Governor Andrew Cuomo reconstituted the panel, and twelve members of the original committee, with eight additional experts, spent a year preparing a report entitled "Evaluating Knowledge to Support Climate Action," designed to help local officials incorporate the latest climate science in their planning.*

*Robert Waldman, “Climate advisory panel disbanded by Trump releases report,” *Climatewire*, April 4, 2019, <https://www.eenews.net/climatewire/2019/04/04/stories/1060142391>; R.H. Moss *et al.*, “Evaluating Knowledge to Support Climate Action: A Framework for Sustained Assessment,” *Weather, Climate, and Society* 11, no. 3 (May 21, 2019):465, <https://journals.ametsoc.org/doi/10.1175/WCAS-D-18-0134.1>

2019 (April)

House Oversight and Reform Committee hearings on climate change cast spotlight on industry’s role in inaction

Witnesses include two veterans of the original 1988 congressional hearings on climate: former Colorado Senator Tim Wirth, who chaired the 1988 hearings, and Princeton University scientist Michael Oppenheimer [see 1988 June]. As reported in *Climatewire*, Senator Wirth notes how dramatically perspectives have changed in the last 30 years: “Back then, Wirth said, scientists and lawmakers recognized this would be an intergenerational struggle, but they didn't expect such a fight from industry — or Republicans, who had been eager partners in other landmark environmental issues... Industry got spooked by how rapidly Congress ratified the [1988 Montreal Protocol] treaty... It worried what might happen if Congress acted the same way with greenhouse gases... and their fears redoubled after both parties worked cooperatively and quickly to strengthen the Clean Air Act in 1990. So industry organized against climate policy before environmentalists realized what they were up against...”*

*Adam Aton, “'Astonishing' delay 30 years after landmark climate hearing,” *Climatewire*, April 10, 2019, <https://www.eenews.net/climatewire/2019/04/10/stories/1060151849>

2019 (April)

Climate change outranks all other political priorities in CNN poll of Democrats and Democrat-leaning registered independents

In response to the question “How important is it to you that the Democratic candidate for president supports _____,” 96% of over 1000 polled identified “Taking aggressive action to slow the effects of climate change” as “very important” (82%) or “somewhat important” (14%). This

outranked “health insurance for all” (91%), “taking executive action if Congress fails to pass stricter gun laws” (85%), “making public colleges tuition free” (78%), and “impeaching Donald Trump” (71%).*

*Adam Aton, “Climate change tops primary poll,” *Climatewire*, May 1, 2019, <https://www.eenews.net/climatewire/2019/05/01/stories/1060249345>, CNN/SSRS poll, <https://cdn.cnn.com/cnn/2019/images/04/29/rel6a.-.2020.democrats.pdf>

2019 (May)

Carbon Dioxide levels at Hawaii’s Mauna Loa Observatory hits 415.2 ppm on May 11

Meanwhile the temperature in Arkhangelsk, Russia, near the Arctic Ocean, is 84 degrees Fahrenheit, thirty degrees higher than normal. This carbon dioxide concentration is estimated to be the highest on the planet in 800,000 years, and possibly in over three million years.* A World Meteorological Organization (WMO) press release the following November will note: “ ‘There is no sign of a slowdown, let alone a decline, in greenhouse gases concentration in the atmosphere despite all the commitments under the Paris Agreement on Climate Change,’ said WMO Secretary-General Petteri Taalas. ‘We need to translate the commitments into action and increase the level of ambition for the sake of the future welfare of the mankind,’ he said. ‘It is worth recalling that the last time the Earth experienced a comparable concentration of CO₂ was 3-5 million years ago. Back then, the temperature was 2-3°C warmer, sea level was 10-20 meters higher than now,’ said Mr Taalas.”**

*Jason Samenow, “It was 84 degrees near the Arctic Ocean this weekend as carbon dioxide hit its highest level in human history,” *Washington Post*, May 14, 2019, <https://www.washingtonpost.com/weather/2019/05/14/it-was-degrees-near-arctic-ocean-this-weekend-carbon-dioxide-hit-its-highest-level-human-history/>; M. Willeit, *et al.*, “Mid-Pleistocene transition in glacial cycles explained by declining CO₂ and regolith removal,” *Science Advances* 5, no. 4 (April 3, 2019): eaav7337, <https://advances.sciencemag.org/content/5/4/eaav7337>

**World Meteorological Organization, “Greenhouse gas concentrations in atmosphere reach yet another high,” press release, November 25, 2019, <https://public.wmo.int/en/media/press-release/greenhouse-gas-concentrations-atmosphere-reach-yet-another-high>

2019 (May)

CEOs of 13 U.S. and Global Fortune 500 companies in collaboration with four leading environmental groups issue a call for an economy-wide price on carbon

The group, including BP, Dominion Energy, DuPont, Dow, Shell, and Ford, calling itself the CEO Climate Dialogue “urges the President and Congress to put in place a long-term federal policy as soon as possible, in accordance with a set of six Guiding Principles for climate legislation. The group aims to build bipartisan support for climate policies that will increase regulatory and business certainty, reduce climate risk, and spur investment and innovation needed to meet science-based emissions reduction targets.”* The *Washington Post* editorial board praises the initiative: “As the evidence piles up and more voices admit the need to act, it becomes all the more astonishing that Mr. Trump ignores climate change and celebrates his administration’s drive to tear up environmental rules. He ought to listen to the corporate executives who are demanding a very different policy.”** But an opinion by James Stoll in the *Wall Street Journal* the following November will question industry’s actual commitment: “the world’s top 24 publicly listed oil-and-gas companies spent 1.3% of \$260 billion in total capital expenditures on low-carbon solutions last year. Energy consultant Wood Mackenzie estimates spending on clean-energy-

related mergers and acquisitions was a measly \$6 billion over the past four years.” John Stoll quotes Mark Mills, a partner with Cottonwood Venture Partners, as saying that oil executives “have to genuflect in the direction of what’s going on in climate-change circles:” “Governments are pressing us to reduce our carbon footprint; investor appetite for all-things-sustainable is growing; no one wants to be labeled a climate-change denier. But executives realize they’ve got more immediate headaches.”***

*CEO Dialogue, “Leading U.S. Businesses Call on Congress to Enact a Market-Based Approach to Climate Change,” press release, May 15, 2019, https://docs.wixstatic.com/ugd/ab534e_4b3f934392ec447a9d24e0c9360025c0.pdf

**Editorial board, “Wake up, Republicans. Even corporations are calling for action on climate change,” *Washington Post*, May 15, 2019, https://www.washingtonpost.com/opinions/wake-up-republicans-even-corporations-are-calling-for-action-on-climate-change/2019/05/15/7c07e918-7745-11e9-b3f5-5673edf2d127_story.html

***John D. Stoll, “Don’t Hold Your Breath Waiting for Oil Companies to Turn Green,” *Wall Street Journal*, November 8, 2019, <https://www.wsj.com/articles/dont-hold-your-breath-waiting-for-oil-companies-to-turn-green-11573228802>

2019 (May)

Trump administration proposes major constraint on National Climate Assessment

Following the issuance of two National Climate Assessment (NCA) reports markedly at odds with the administration’s aggressive energy policies [see 2017 (November), (2018 (November))], the Trump administration proposes a partial fix for the disconnect. The *New York Times* reports that “in what could be Mr. Trump’s most consequential action yet, his administration will seek to undermine the very science on which climate change policy rests.” The NCA estimated climate impacts through the end of the century, projecting that if fossil fuel emissions remained unchecked, temperatures could warm by eight degrees Fahrenheit. The report detailed the consequent potential for drastically higher sea levels, more damaging storms and droughts, crop failures, and severe health consequences. The *Times* reports that “White House-appointed director of the United States Geological Survey, James Reilly, a former astronaut and petroleum geologist, has ordered that scientific assessments produced by that office use only computer-generated climate models that project the impact of climate change through 2040, rather than through the end of the century, as had been done previously.” This would omit the major adverse consequences of climate change, which would take place in the second half of the century. The report quotes Philip B. Duffy, the president of the Woods Hole Research Center, who served on a National Academy of Sciences panel that reviewed the government’s most recent National Climate Assessment, as saying: “What we have here is a pretty blatant attempt to politicize the science — to push the science in a direction that’s consistent with their politics... It reminds me of the Soviet Union.”*

*Coral Davenport and Mark Landler, “Trump Administration Hardens Its Attack on Climate Science,” *New York Times*, May 27, 2019, <https://www.nytimes.com/2019/05/27/us/politics/trump-climate-science.html?smid=nytcore-ios-share>

2019 (June – November)

Trump administration rollback of motor vehicle efficiency standards hits major bumps in the road

President Obama’s 2012 fuel efficiency standards were described as “an uncontroversial move that, unlike other administration energy policies, was endorsed by industry and environmentalists

alike” [see 2012 (August)]. They are also the “single largest policy enacted by the United States to reduce planet-warming carbon dioxide emissions.”* President Trump’s proposal to freeze fuel efficiency and emissions standards at 2020 levels through 2026 [see 2018 (August)], instead of ratcheting up standards every year as envisioned by Obama, is anything but uncontroversial. In February, the administration announces that it has ended efforts to reach an agreement California, which sought, along with thirteen other states representing more than 1/3 of the U.S. market, to keep the original standards. In June, 17 of the world’s largest auto manufacturers including Ford, General Motors, Toyota and Volvo sign a letter asking President Trump to go back to the negotiating table, saying the relaxed standards threaten to cut their profits and produce “untenable” instability in a crucial manufacturing sector.** Canada formally indicates a willingness to embrace California standards.*** In July, four manufacturers – Ford, Honda, BMW, and Volkswagen – and California sign a deal to continue to improve fuel economy standards, in a “strong rebuke” to President Trump, **** and the Alliance of Automobile Manufacturers follows that up with a policy statement that “Automakers have said repeatedly that they support year-over-year increases in fuel economy standards that align with the marketplace..”*****In August, two additional manufacturers indicate plans to join the California pact; the six companies represent more than 40% of all cars sold in the U.S.. The *New York Times* reports that “three senior political officials working on the rollback... have all left the administration recently. A senior career official with years of experience on vehicle pollution policy was transferred to another office.” The process is now being run by a “29-year-old White House aide with limited experience in climate change policy.”* In September, the Justice Department initiates an anti-trust investigation of the four auto companies who joined in the California pact.***** In October, rumors emerge that the administration is considering discarding the flat-lining approach, and imposing a 1.5% annual increase in fuel efficiency: a proposal that is still far less ambitious than current regulations.***** *The New York Times* quotes William K. Reilly, who headed the E.P.A. in the first George Bush administration: “I don’t think there is any precedent for a major industry to say, ‘We are prepared to have a stronger regulation,’ and to have the White House say, ‘No, we know better.’”* [see 2020 (March)]

* Coral Davenport and Hiroko Tabuchi, “Trump’s Rollback of Auto Pollution Rules Shows Signs of Disarray,” *New York Times*, August 20, 2019, <https://www.nytimes.com/2019/08/20/climate/trump-auto-emissions-rollback-disarray.html>

** Coral Davenport, “Automakers Tell Trump His Pollution Rules Could Mean ‘Untenable’ Instability and Lower Profits,” *New York Times*, June 6, 2019, <https://www.nytimes.com/2019/06/06/climate/trump-auto-emissions-rollback-letter.html>

*** Coral Davenport, “Canada Signals a Willingness to Challenge Trump on His Clean-Car Rollback,” *New York Times*, June 26, 2019, <https://www.nytimes.com/2019/06/26/climate/canada-auto-emissions-california.html>

****Maxine Joselow, “5 questions about the surprise deal,” *Climatewire*, July 26, 2019, <https://www.eenews.net/climatewire/2019/07/26/stories/1060789559>

*****Alliance of Automobile Manufacturers, “A statement responding to news about a framework agreement on fuel economy,” press release, <https://autoalliance.org/2019/07/25/a-statement-responding-to-news-about-a-framework-agreement-on-fuel-economy/>

*****Editorial Board, “A Cruel Parody of Antitrust Enforcement,” *New York Times*, September 6, 2019, <https://www.nytimes.com/2019/09/06/opinion/trump-antitrust-auto-emissions.html>

*****Maxine Joselow, “CO2 would jump under Trump's revised plan,” *Climatewire*, November 5, 2019, <https://www.eenews.net/climatewire/2019/11/05/stories/1061463535>

2019 (June)

Rapid rise in atmospheric methane attributable in part to livestock, and warming tropical wetlands

A review article in *Science* explores possible explanations for a significant rise in atmospheric methane in the last decade: “In 2007, the amount of methane in the atmosphere (CH₄) began to rise after a 7-year period of near-zero growth. Recent research shows that a second step change occurred in 2014. From 2014 to at least the end of 2018, the amount of CH₄ in the atmosphere increased at nearly double the rate observed since 2007.” While this may in part be related to fossil fuel emissions, the authors suggest that about half of the rise is attributable to ruminant emissions from livestock, and offer the further troubling prospect that much of the remainder may be attributable to a climate change feedback mechanism: warming tropical wetlands hasten methane release from decomposition. “If natural wetlands, or changes in atmospheric chemistry, indeed accelerated the CH₄ rise, it may be a climate feedback that humans have little hope of slowing. Although studies have demonstrated the potential for substantial CH₄-climate feedbacks, they were expected to occur gradually, not reaching the magnitude observed by Nisbet *et al.* for decades.” Regardless of the cause, the methane increases bode poorly for achieving goals to limit atmospheric temperatures: “The latest Intergovernmental Panel on Climate Change (IPCC) emission scenarios that limit warming to 1.5°C assume that the amount of CH₄ in the atmosphere will decrease by 35% between 2010 and 2050. Yet, between 2007 and 2014, the amount has risen by an average of 5.7 parts per billion (ppb) per year, and by an average of 9.7 ppb per year since 2014. If this rise continues unabated, cuts to carbon dioxide and other greenhouse gases will need to be even steeper to achieve the Paris goal.”*

*Sara E. Mikaloff Fletcher, Hinrich Schaefer, “Rising methane: A new climate challenge,” *Science* 364, no. 6444 (June 7, 2019): 932-933, <https://science.sciencemag.org/content/364/6444/932>

2019 (June)

President orders wholesale dissolution of scientific advisory committees

Reported in *Science* news: “U.S. President Donald Trump thinks the U.S. government has too many expert committees giving strategic advice to federal research agencies. That's the gist of a 14 June executive order that gives each of those agencies, including NASA, the National Science Foundation, and the Department of Energy's Office of Science, until 30 September to wipe out at least one-third of its top-level advisory panels.”* *Bloomberg Environment* quotes the press statement of Gretchen Goldman, research director with the Union of Concerned Scientists' Center for Science and Democracy: “For the past two years they have been shrinking and restricting the role of federal science advisory committees. Now they're removing the possibility of even making decisions based on robust science advice. It's no longer death by a thousand cuts. It's taking a knife to the jugular.”**

*“News at a glance,” *Science* 364, no. 6446 (June 21, 2019): 1114-1116, <https://science.sciencemag.org/content/364/6446/1114>

**“Trump Orders Agencies to Eliminate One-Third of Advisory Panels,” *Bloomberg Science*, June 14, 2019,

<https://news.bloombergenvironment.com/environment-and-energy/trump-orders-agencies-to-eliminate-one-third-of-advisory-panels/>; President Donald Trump, “Executive Order on Evaluating and Improving the Utility of Federal Advisory Committees,” June 14, 2019, <https://www.whitehouse.gov/presidential-actions/executive-order-evaluating-improving-utility-federal-advisory-committees/>

2019 (June)

Trump administration issues final power plant regulation

The “Affordable Clean Energy” rule, replacing Obama’s 2015 Clean Power Plan, becomes final on June 19 [see 2018 (August)]. As summarized in *The Washington Post*, “Unlike the Obama administration’s 2015 Clean Power Plan, the new rule does not set specific greenhouse gas emissions cuts for each state. Instead, it allows state regulators to determine how utilities can improve efficiency and will not force companies to switch from coal to lower-carbon energy sources.” The *Post* cites recent research indicating that “as many as 28 percent of the plants affected could actually produce higher overall emissions in 2030 than if there was no federal policy in place,” and quoted an anonymous “senior administration official” as conceding that “some plants may end up emitting more pollutants under the rule but these units would be running more efficiently.”* The *Wall Street Journal* notes that if these rules survive a court challenge, it “could set a precedent that could block aggressive efforts at federal regulation. Lawyers and industry leaders expect that would apply not just to power plants, but a host of other heavy industries like oil refineries, cement factories and steel mills.” New York and California have already stated their intent to sue: “That fight and the precedent it sets are likely to be among the biggest developments in modern environmental law for years, and many expect it to be decided by the Supreme Court.”** Calling the final rule a “lily-livered replacement” for Obama’s comprehensive plan, *The New York Times* agrees on the downside risks of a judicial challenge: “Brett Kavanaugh, whose appointment has strengthened the court’s conservative wing, once described the Clean Air Act as a “thin statute,” not designed with greenhouse gases and climate change in mind. The great fear among climate activists is that by upholding Mr. Wheeler’s cramped view of the agency’s authority, the court could effectively foreclose more aggressive action by the E.P.A. in the future.”***In August, 22 states, including Maine, and six cities initiate suit challenging the regulation.****

*Juliet Eilperin and Brady Davis, “Trump EPA finalizes rollback of key Obama climate rule that targeted coal plants,” *Washington Post*, June 19, 2019, https://www.washingtonpost.com/climate-environment/trump-epa-finalizes-rollback-of-key-obama-climate-rule-that-targeted-coal-plants/2019/06/19/b8ff1702-8eeb-11e9-8f69-a2795fca3343_story.html, Amelia T. Keyes *et al.*,

“The Affordable Clean Energy rule and the impact of emissions rebound on carbon dioxide and criteria air pollutant emissions,” *Environmental Research Letters* 14, no. 4 (April 19, 2019), <https://iopscience.iop.org/article/10.1088/1748-9326/aafe25>

**Timothy Puko, “EPA Rule Would Have Impact Beyond Smokestacks,” *Wall Street Journal*, June 25, 2019, <https://www.wsj.com/articles/epa-rule-would-have-impacts-beyond-smokestacks-11561455003>

*** Editorial board, “Abdicating, Again, on Climate,” *The New York Times*, June 22, 2019, <https://www.nytimes.com/2019/06/22/opinion/sunday/trump-climate-clean-power-plan.html>

****Timothy Puko, “States Sue Trump Administration Over Rollback of Power-Plant Regulations,” *Wall Street Journal*, August 13, 2019, <https://www.wsj.com/articles/states-sue-trump-administration-over-rollback-of-power-plant-regulations-11565714532>

2019 (June)

UK enacts binding legal target to be carbon neutral by 2050

The UK becomes the first G7 to establish a legally binding statutory target for emissions reduction. As *YaleEnvironment360* reports: “It will require Britain to add vast amounts of renewable energy, phase out fossil fuel vehicles by 2035, and cut beef and lamb consumption by 20 percent. The country has already cut its greenhouse emissions by 43.5 percent since 1990, largely due to its rapid shift away from coal and other fossil fuel-based electricity to renewable energy sources such as solar and offshore wind.”*

* “UK’s Goal of Net-Zero Carbon by 2050 Becomes Law,” *YaleEnvironment360*, June 27, 2019, <https://e360.yale.edu/digest/uks-goal-of-net-zero-carbon-by-2050-becomes-law>

2019 (June)

US is at odds with G-20 on climate commitment

The US is the sole member of the G-20 at its meeting in Osaka, Japan to refuse to sign a joint communique affirming that the Paris climate accord is irreversible, and reiterating their commitment to its full implementation.*

*Simon Denyer and Brady Dennis, “As G-20 reaffirms fight against climate change, Trump again stands apart,” *Washington Post*, June 29, 2019, https://www.washingtonpost.com/climate-environment/as-g-20-reaffirms-fight-against-climate-change-trump-again-stands-apart/2019/06/29/d3d96f22-9a68-11e9-830a-21b9b36b64ad_story.html

2019 (July)

NASA study describes “precipitous” and “unexpected” decrease in Antarctic sea ice

Unlike the Arctic, Antarctic sea ice had been slowly increasing over the last 40 years, until 2014, when it started a “precipitous” decline, reaching a record low in 2017, well below its extent in 1980. Now, the National Aeronautics and Space Administration reports that Antarctica has lost as much sea ice in four years as the Arctic has lost in 34 years. As Claire Parkinson, author of the study, tells *The Guardian*, “ ‘The Arctic has become a poster child for global warming,’ Parkinson said, but the recent sea ice falls in Antarctica have been far worse. She has tracked Antarctic sea ice for more than 40 years. ‘All of us scientists were thinking eventually global warming is going to catch up in the Antarctic,’ she said.”*

*Damian Carrington, “‘Precipitous’ fall in Antarctic sea ice since 2014 revealed,” *The Guardian*, July 1, 2019, <https://www.theguardian.com/world/2019/jul/01/precipitous-fall-in-antarctic-sea-ice-revealed>; Claire L. Parkinson, “A 40-y record reveals gradual Antarctic sea ice increases followed by decreases at rates far exceeding the rates seen in the Arctic,” *Proceedings of the National Academy of Sciences* 116 (July 16, 2019): 14414-14423, <https://www.pnas.org/content/116/29/14414>

2019 (July)

A report by The Shift Project focuses on the carbon footprint of online video

Describing the “unsustainable and growing impact” of global digital technologies, the report by the French think tank notes that digital technologies now account for 4% of global greenhouse gas emissions, more than civil aviation; that could double by 2025, reaching 8%, more than global car emissions. The report focuses on online video: “10 hours of high definition video comprises more data than all the articles in English on Wikipedia in text format. In 2018, online video viewing generated more than 300 MtCO₂, i.e. as much greenhouse gas as Spain emits: 1% of global emissions.” 27 percent of those viewings were pornographic videos, comprising as much emissions as all of France’s households’ energy consumption. The report urges “digital sobriety,” “making digital transition compatible with climate imperatives.”* Subsequent analyses, however, will argue that these conclusions are overblown.** Comments Scott Fulton in *DataCenter Knowledge*: “The fact that there is a debate on this topic, at this general a level, at this stage of the global climate change crisis, speaks to how little we all know

about the evolving, perhaps metamorphosing, topics of data center power and carbon emissions.”***

*Maxime Efoui-Hess, The Shift Project, *Climate Crisis: The Unsustainable Use of Online Video*, July, 2019, <https://theshiftproject.org/wp-content/uploads/2019/07/2019-02.pdf>

*Jake Pitre, “Binging Less Netflix Isn’t Going to Stop Climate Change,” *Vice*, February 18, 2020, https://www.vice.com/en_ca/article/5dm5pz/binging-less-netflix-isnt-going-to-stop-climate-change

***Scott Fulton, “How Much Is Netflix Really Contributing to Climate Change?” *DataCenter Knowledge*, February 3, 2020, <https://www.datacenterknowledge.com/energy/how-much-netflix-really-contributing-climate-change#menu>

2019 (July)

Washington Post/ABC News poll finds Trump’s worst approval ratings on climate

While the overall approval rating is 44 percent, the best rating of his presidency, Americans disapprove of his action on all issues except the economy. His position on climate is the least popular of all: “His lowest rating was for his handling of climate change. Just 29 percent of respondents say they approve of his position, while 62 percent disapprove, a wider gulf than on any other issue mentioned in the poll—including immigration, “issues of special concern to women,” foreign policy, health care, gun violence, and abortion.”*

*Rebecca Leber, “A New Poll Shows That Trump’s Handling of Climate Change Is Deeply Unpopular,” *Mother Jones*, July 7, 2019, <https://www.motherjones.com/environment/2019/07/poll-trump-climate-change-unpopular/>

2019 (July)

Study assesses potential for carbon capture through vast reforestation efforts

Trees capture and store carbon through photosynthesis, keeping it for the lifetime of the tree. A study published in the journal *Science* uses satellite data to quantify global “tree carrying capacity,” for a potential vast reforestation effort as a strategy against climate change. As summarized in the abstract: “The restoration of trees remains among the most effective strategies for climate change mitigation. We mapped the global potential tree coverage to show that 4.4 billion hectares of canopy cover could exist under the current climate. Excluding existing trees and agricultural and urban areas, we found that there is room for an extra 0.9 billion hectares of canopy cover, which could store 205 gigatonnes of carbon in areas that would naturally support woodlands and forests. This highlights global tree restoration as one of the most effective carbon drawdown solutions to date.” The study cautioned, however, that one risk of this strategy is that climate impacts on tree growth would outrun the restoration efforts: “Our model accurately depicts the regions where tree growth is possible under existing environmental conditions. However, changing climate conditions may alter the area of land that could support forest growth over the rest of the century, a point that needs to be considered when developing long-term restoration projects.”* *Bloomberg* voices skepticism: “The research is noteworthy in the way the North Star is noteworthy—important for knowing which direction to go, yet an unlikely final destination. ‘Even more important are the social and economic feasibility issues that were completely overlooked,’ said Robin Chazdon, a member of the University of Connecticut Department of Ecology and Evolutionary Biology. ‘Their numbers are definitely the maximum possible, I believe, but they’re not going to be very attainable.’”**

*Jean-Francois Bastin et al., “The global tree restoration potential,” *Science* 365, no. 6448 (July 5, 2019): 76-79,

<https://science.sciencemag.org/content/365/6448/76>

**Eric Roston, “This Easy Climate Fix Has More Potential Than Previously Thought,” *Bloomberg News*, July 5, 2019,

<https://www.bloomberg.com/news/articles/2019-07-05/this-easy-climate-fix-has-more-potential-than-previously-thought>; see also

Madeleine Gregory and Sarah Emerson, “Planting ‘Billions of Trees’ Isn’t Going to Stop Climate Change,” *Vice*, July 16, 2019,

https://www.vice.com/en_in/article/7xgymg/planting-billions-of-trees-isnt-going-to-stop-climate-change

2019 (July)

Climate change linked to larger and more destructive wildfires in California

The past decade has seen half of the California’s 10 largest wildfires and seven of its 10 most destructive fires, including 2018’s Camp Fire, the state’s deadliest wildfire ever. A study in the journal *Earth’s Future* concludes that human caused warming is a probable cause of this increasing devastation: “Since the early 1970s, California’s annual wildfire extent increased fivefold, punctuated by extremely large and destructive wildfires in 2017 and 2018. This trend was mainly due to an eightfold increase in summertime forest-fire area and was very likely driven by drying of fuels promoted by human-induced warming. Warming effects were also apparent in the fall by enhancing the odds that fuels are dry when strong fall wind events occur. The ability of dry fuels to promote large fires is nonlinear, which has allowed warming to become increasingly impactful. Human-caused warming has already significantly enhanced wildfire activity in California, particularly in the forests of the Sierra Nevada and North Coast, and will likely continue to do so in the coming decades.” * The costs of California wildfires has been estimated at \$85 billion in 2017, \$400 billion in 2018, and \$80 billion in 2019.**

*A. Park Williams, *et al.*, “Observed Impacts of Anthropogenic Climate Change on Wildfire in California,” *Earth’s Future* 7, no. 8

(July 15, 2019): 892-910, <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2019EF001210>; see also Robinson Meyer,

“California’s Wildfires Are 500 Percent Larger Due to Climate Change,” *The Atlantic*, July 16, 2019,

<https://www.theatlantic.com/science/archive/2019/07/climate-change-500-percent-increase-california-wildfires/594016/>

**John Roach, “California wildfires will cost tens of billions, AccuWeather estimates,” *AccuWeather*, November 1, 2019,

<https://www.accuweather.com/en/weather-news/california-wildfires-will-cost-tens-of-billions-accuweather-estimates/612548>

2019 (August)

Existing fossil fuel infrastructure will take us over 1.5 degrees C., new study concludes

A study published in the Journal *Nature* suggests that it’s time to halt any further development of fossil fuel-consuming infrastructure - powerplants, factories, buildings, cars—if we are to keep global temperatures to 1.5 degrees Celsius over preindustrial levels. In the words of the study authors: “our estimates suggest that little or no new CO₂-emitting infrastructure can be commissioned, and that existing infrastructure may need to be retired early (or be retrofitted with carbon capture and storage technology) in order to meet the Paris Agreement climate goals.”* As summarized in the *Washington Post*, “This fossil fuel infrastructure merely needs to continue operating over the course of its expected lifetime, and the world will emit over 650 billion tons of carbon dioxide,” whereas “the most recent estimate of the so-called carbon budget is that since the beginning of 2018, we can only emit between 420 and 580 billion tons at most if we want to ensure a 50 to 66 percent chance of limiting warming to 1.5 degrees Celsius.” The primary driver of this problem is energy infrastructure in China, as it has developed powerplants and infrastructure to raise the standard of living of its people, and supply the globe with manufactured

products. While China has been a leader in renewable energy, it has also lead in expanded fossil fuel consumption. The *Post* quotes Elmar Kriegler, who heads the Transformation Pathways Department at the Potsdam Institute for Climate Impact Research in Germany, in a statement on the study: “The article shows the huge role that the buildup of coal-fired power plants and heavy industry in China has played over the past 15 years...Not only did it drive global CO2 emissions up until today, it will also be responsible for half of the future emissions from energy infrastructure that we might be committed to. If this buildup of coal infrastructure is going to repeat itself in other rapidly growing economies, notably India and South East Asia, the world will stand no chance to hold warming to well below 2 degrees.”**

*Dan Tong *et al.*, “Committed emissions from existing energy infrastructure jeopardize 1.5 °C climate target,” *Nature* 572 (August 13, 2019): 373, <https://www.nature.com/articles/s41586-019-1364-3>

**Chris Mooney, “Existing fossil fuel plants will push the world across a dangerous climate limit, research finds,” *Washington Post*, July 1, 2019, <https://www.washingtonpost.com/climate-environment/2019/07/01/existing-fossil-fuel-plants-will-push-world-across-dangerous-climate-limit-research-finds/>

2019 (August)

IPCC Special Report highlights land use role in climate dynamics, threats to food security

Agriculture, forestry and other types of land use account for 23% of human greenhouse gas emissions, while land processes absorb carbon dioxide equivalent to almost a third of carbon dioxide emissions from fossil fuels and industry. A new report of the Intergovernmental Panel on Climate Change (IPCC) entitled *Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems*, explores ways land use can be sustainably managed to minimize the impacts of climate change, and sounds an alarm on climate threats to food security. Prepared by more than 100 authors from 52 countries, this is the first IPCC report where a majority, 53%, of participating authors are from developing countries. Coauthor Priyadarshi Shukla notes that “Food security will be increasingly affected by future climate change through yield declines – especially in the tropics – increased prices, reduced nutrient quality, and supply chain disruptions... We will see different effects in different countries, but there will be more drastic impacts on low-income countries in Africa, Asia, Latin America and the Caribbean.”* The report suggests that in drylands, “the dryland population vulnerable to water stress, drought intensity and habitat degradation is projected to reach 178 million people by 2050 at 1.5°C warming, increasing to 220 million people at 2°C warming, and 277 million people at 3°C warming.” This can inevitably lead to mass migrations of environmental refugees: “Changes in climate can amplify environmentally induced migration both within countries and across borders ... Extreme weather and climate or slow-onset events may lead to increased displacement, disrupted food chains, threatened livelihoods ... and contribute to exacerbated stresses for conflict.”** The *New York Times* quotes a lead author Pete Smith: “People’s lives will be affected by a massive pressure for migration... People don’t stay and die where they are. People migrate.” The *Times* notes recent evidence for this in Central America: “Between 2010 and 2015 the number of migrants from El Salvador, Guatemala and Honduras showing up at the United States’ border with Mexico increased fivefold, coinciding with a dry period that left many with not enough food and was so unusual that scientists suggested it bears the signal of climate change.”***

* Intergovernmental Panel on Climate Change, “Land is a critical resource, report says,” news release, August 8, 2019, https://www.ipcc.ch/2019/08/08/land-is-a-critical-resource_srccl/

** Intergovernmental Panel on Climate Change, *Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems*, Summary for Policymakers, August, 2019, <https://www.ipcc.ch/srccl/chapter/summary-for-policymakers/>

*** Christopher Flavelle, “Climate Change Threatens the World’s Food Supply, United Nations Warns,” *New York Times*, August 8, 2019, <https://www.nytimes.com/2019/08/08/climate/climate-change-food-supply.html>; see also Kirk Semple, “Central American Farmers Head to the U.S., Fleeing Climate Change,” *New York Times*, April 13, 2019, <https://www.nytimes.com/2019/04/13/world/americas/coffee-climate-change-migration.html> and Robinson Meyer, “This Land Is the Only Land There Is,” *The Atlantic*, August 8, 2019, <https://www.theatlantic.com/science/archive/2019/08/how-think-about-dire-new-ipcc-climate-report/595705/>

2019 (August)

July was the hottest month on record, with fire and ice impacts in the extreme north

As reported in *Science*: “Fueled by global warming, the hottest month in modern history closed last week with an Arctic heat wave that drove extraordinary melting in Greenland. For several days, nearly 60% of Greenland's ice sheet was melting. Over 2 days, enough ice melted to cover Denmark in a half-meter of water. ..The heat was driven by a weather system that in Europe set record temperatures of more than 40°C. Climate change raised those temperatures by 3°C, according to research from the World Weather Attribution group. Human-induced warming this summer was also blamed for unusually large and long-lasting Arctic wildfires. Through 28 July, they had emitted 125 megatons of carbon dioxide, according to the Copernicus Atmosphere Monitoring Service—the highest year-to-date figure for these fires since such monitoring began in 2003.”*

*“News at a glance: Greenland melts, Arctic burns under record heat,” *Science* 365, no. 6453 (August 9, 2019): 524, <https://science.sciencemag.org/content/365/6453/524.full>

2019 (August)

***Politico* spotlights China’s leadership in renewable technology and climate diplomacy**

A few of the facts that *Politico* assembles in its analysis of China’s role in climate technology and policy: China, the world’s leader in greenhouse gas emissions, roughly 30% of global emissions, is also the leading installer of renewable technology. It has one third of the world’s wind turbines and solar panels; has reduced its dependence on coal for energy from 80 to 60 percent; has almost half of the world’s electric vehicles; half of the charging stations; 99% of the world’s electric buses. The stimulus of China’s market for renewables has dramatically lowered the costs of wind, solar, and electric battery technology. On the diplomatic front, China has joined the Major Economic Forum, a group of ministers of leading countries who seek to maintain momentum in U.N. climate talks. Formerly led by the U.S., which has pulled out, the Forum is now chaired by Canada’s minister of environment and climate, Catherine McKenna. As McKenna tells *Politico*: “I think they certainly believe in climate action and they see the opportunity, and we need them at the table ...I think that's a very positive thing that even without the leadership of the United States—which was extraordinary under the Obama administration—internationally we're all moving forward including working with the E.U. and China.”*

*Luiza Ch. Savage, “The U.S. left a hole in leadership on climate. China is filling it,” *Politico*, August 15, 2019, <https://www.politico.com/story/2019/08/15/climate-china-global-translations-1662345>

2019 (August)

Trump administration encounters industry opposition to rollback on methane regulation

The administration proposes to replace Obama regulations on methane emissions from oil and gas production facilities [see 2016 (May), 2017 (June)], with rules that rescind emissions limits for methane, and remove transmission and storage facilities (potentially significant sources of methane leakage) from regulation altogether. * While the rule is supported by smaller producers that have not yet implemented methane capture technology, large producers, including Exxon, Shell and BP, oppose the rollback. The *Washington Post* quotes BP President Susan Dio in a statement supporting the 2016 regulations: “It’s not only the right thing to do for the environment, there is also a clear business case for doing this... The more gas we keep in our pipes and equipment, the more we can provide to the market — and the faster we can all move toward a lower-carbon future.”** The *Wall Street Journal* quotes Anne Idsal, the acting assistant administrator for the EPA’s Office of Air and Radiation, as saying, “I don’t see that there’s going to be some big climate concern here.” The *Journal* responds that “methane, which accounts for about 10% of U.S. greenhouse-gas emissions, is about 25 times more potent than carbon dioxide in trapping the earth’s heat, according to estimates used by the EPA. Its figures show the oil-and-gas industry has long been the nation’s largest emitter of methane, even before discoveries in shale and fracking led to a wave of new drilling.”*** A recent analysis by the *Wall Street Journal* found that the U.S. oil-and-gas industry’s methane emissions alone were the equivalent to the greenhouse-gas emissions from more than 69 million cars, or about one-fourth of all cars registered in the U.S..****

*Environmental Protection Agency, “Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources Review,” proposed rule, *Federal Register* 84 (September 24, 2019): 50244, <https://www.govinfo.gov/content/pkg/FR-2019-09-24/pdf/2019-19876.pdf>

**Juliet Eilperin and Brady Davis, “Trump administration to relax restrictions on methane, a powerful greenhouse gas,” *Washington Post*, August 29, 2019, <https://www.washingtonpost.com/climate-environment/2019/08/29/trump-administration-reverse-limits-methane-powerful-greenhouse-gas/>

***Timothy Puko, “Energy Companies Set to Get Reprieve on Methane Rules,” *Wall Street Journal*, August 29, 2019, <https://www.wsj.com/articles/energy-companies-set-to-get-reprieve-on-methane-rules-11567051201>

****Rebecca Elliot, “The Leaks That Threaten the Clean Image of Natural Gas,” *Wall Street Journal*, August 8, 2019, <https://www.wsj.com/articles/the-leaks-that-threaten-the-clean-image-of-natural-gas-11565280375>

2019 (September)

The Trump administration revokes California’s longtime exemption from uniform fuel efficiency standards

Faced with the opposition of California, other states which adopt California emissions standards, and some major automakers to the rollback of vehicle emissions standards, the administration announces a “One National Program Rule on Federal Preemption of State Fuel Economy Standards.” “Today’s action meets President Trump’s commitment to establish uniform fuel economy standards for vehicles across the United States, ensuring that no State has the authority to opt out of the Nation’s rules, and no State has the right to impose its policies on the rest of the

country,” says Secretary of Transportation Elaine L. Chao in an agency press release.* Maine Governor Janet Mills decries the action: “With one of the highest asthma rates in the nation, this action will only hurt the health and well-being of Maine people, hinder our efforts to fight climate change, and impede the significant economic, environmental, and health benefits of cleaner vehicles.”** California and 23 other states including Maine file suit in November to challenge the preemption. California Attorney General Xavier Becerra states in his press release: “Over the past 50 years, the EPA has granted more than 100 waivers for California standards. Thanks to those standards, the state has reduced emissions by hundreds of thousands of tons annually, encouraged the development of emission controls technologies, and contributed to stronger federal standards, all as Congress intended.” Adds California Governor Gavin Newsom: “The Trump Administration continues to weaponize federal agencies in his war against public health and clean air. California won’t back down – we, along with major automakers who voluntarily signed onto our framework, know that the future is clean cars. There’s no time to waste and we’ll continue to fight to defend our state’s rights to set our own standards.”***

*Environmental Protection Agency, “Trump Administration Announces One National Program Rule on Federal Preemption of State Fuel Economy Standards,” press release, September 19, 2019, <https://www.epa.gov/newsreleases/trump-administration-announces-one-national-program-rule-federal-preemption-state-fuel>

** Michael Biesecker and Adam Beam, “Janet Mills criticizes Trump move to bar California from setting stricter fuel standards,” September 18, 2019, <https://bangordailynews.com/2019/09/18/national-politics/janet-mills-criticizes-trump-move-to-bar-california-from-setting-stricter-fuel-standards/>

*** Attorney General Xavier Becerra, “Attorney General Becerra Files Lawsuit Against EPA for Attacking California’s Advanced Clean Car Standards,” press release, November 15, 2019, <https://oag.ca.gov/news/press-releases/attorney-general-becerra-files-lawsuit-against-epa-attacking-california%E2%80%99s>

2019 (September)

Poll suggests Americans conflicted on action to address climate change

A Washington Post/Kaiser Family Foundation poll of 2293 adults and 629 teenagers across the country finds a majority concerned about climate change, but reluctant to commit to significant costs to fix it. 64% of adults and 61% of teenagers say climate change is “extremely” or “very” important to them, but it’s ranked behind the economy, health care, immigration and gun policy by adults, and behind the economy, health care and gun policy by teenagers. Fewer than half of those surveyed say they support a two-dollar-a-month surcharge on their electricity bills, and only a third would support a ten-cent-per-gallon increase in the federal gasoline tax.* Commenting in *The New Yorker*, Elizabeth Kolbert queries: “Are the politics of climate change in America changing? There are positive signs. Earlier this month, the top ten candidates for the Democratic Presidential nomination participated in a CNN town hall on the issue; according to the *Times*, this was ‘the first such prime-time event’ in history.” But citing the Post/Kaiser poll: “Still, you’d have to ignore most of the past forty years to conclude that action is imminent.”**

* “Washington Post-Kaiser Family Foundation Climate Change Survey, July 9-Aug. 5, 2019,” *Washington Post*, December 9, 2019, <https://www.washingtonpost.com/context/washington-post-kaiser-family-foundation-climate-change-survey-july-9-aug-5-2019/601ed8ff-a7c6-4839-b57e-3f5eaa8ed09f/>

** Elizabeth Kolbert, “Summits, Strikes, and Climate Change,” *The New Yorker*, September 20, 2019, <https://www.newyorker.com/magazine/2019/09/30/summits-strikes-and-climate-change>

2019 (September)

IPCC releases special report on threats to the oceans and frozen parts of the world

As noted in the Intergovernmental Panel on Climate Change's (IPCC's) press release announcing the *Special Report on the Ocean and Cryosphere in a Changing Climate*, this is an assessment by more than 100 scientists from 36 countries assessing the latest published scientific literature. "The open sea, the Arctic, the Antarctic and the high mountains may seem far away to many people," says Hoesung Lee, Chair of the IPCC. "But we depend on them and are influenced by them directly and indirectly in many ways – for weather and climate, for food and water, for energy, trade, transport, recreation and tourism, for health and wellbeing, for culture and identity." 670 million people in high mountain regions and 680 million people in low-lying coastal zones depend directly on these systems. Four million people live permanently in the Arctic region. Seas are rising: "While sea level has risen globally by around 15 cm during the 20th century, it is currently rising more than twice as fast – 3.6 mm per year – and accelerating, the report showed. Sea level will continue to rise for centuries. It could reach around 30-60 cm by 2100 even if greenhouse gas emissions are sharply reduced and global warming is limited to well below 2°C, but around 60-110 cm if greenhouse gas emissions continue to increase strongly." Warming affects ocean chemistry, and the ability to sustain life: "To date, the ocean has taken up more than 90% of the excess heat in the climate system. By 2100, the ocean will take up 2 to 4 times more heat than between 1970 and the present if global warming is limited to 2°C, and up to 5 to 7 times more at higher emissions. Ocean warming reduces mixing between water layers and, as a consequence, the supply of oxygen and nutrients for marine life." The report rollout concludes with an urgent call for action, directed to the forthcoming U.N. Climate Action Summit, and the UNFCCC 25th Conference of the Parties (COP) in Madrid. In the words of Debra Roberts, Co-Chair of IPCC Working Group II: "We will only be able to keep global warming to well below 2°C above pre-industrial levels if we effect unprecedented transitions in all aspects of society, including energy, land and ecosystems, urban and infrastructure as well as industry. The ambitious climate policies and emissions reductions required to deliver the Paris Agreement will also protect the ocean and cryosphere – and ultimately sustain all life on Earth." *A review of the report in the journal *Science* notes that the projections have worsened since the 2014 Fifth Assessment report [2014 (November)]: "Compared with the last U.N. climate report, in 2014, the new assessment paints a grimmer picture of the future. By 2100... global sea level would likely rise by up to 1.1 meters if greenhouse gas emissions continue unabated; the last IPCC report had set the upper limit at 0.98 meters. Even with steep cuts in fossil fuel burning, the oceans will rise between 0.29 and 0.59 meters, the report adds. 'There's no scenario that stops sea level rise in this century. We've got to deal with this indefinitely,' says Michael Oppenheimer, a report author and climate scientist at Princeton University."**

*Intergovernmental Panel on Climate Change, "Choices made now are critical for the future of our ocean and cryosphere," press release, September 25, 2019, https://www.ipcc.ch/site/assets/uploads/sites/3/2019/09/SROCC_PressRelease_EN.pdf;
Intergovernmental Panel on Climate Change, *Special Report on the Oceans and Cryosphere in a Changing Climate*, September, 2019, <https://www.ipcc.ch/srocc/>

**Paul Voosen, "Warming transforms the oceans and poles," *Science* 365, no. 6460, (September 27, 2019): 1359-1360, <https://science.sciencemag.org/content/365/6460/1359>

2019 (September)

Over the past five years, 8 to 11 percent of the globe has warmed 2 degrees Celsius over the last century, double the global average

A team of *Washington Post* reporters produce an interactive exploration of ten of these “hot spots,” from Uruguay to Siberia, Qatar and the Isles de la Madeleine, Quebec.* The series will win the 2020 Pulitzer Prize for Explanatory Reporting. Lead writer Chris Moody interviewed in *E&E News*: “I think there's one big message of the series: Climate change affects different places in really different ways. Some places get average warming. Other places get way more warming than average. So climate change affects everybody unequally and isn't fair. And if you look at these places that are hit the hardest by temperature change, you learn that they're a harbinger of what everybody will experience in the coming decades. One expert we quoted in the first story, the marine biologist Daniel Pauly, said: ‘These hot spots are chunks of the future in the present.’ So by going to the hot spots and telling what's happening there, we're telling everybody what's coming. And we're also showing that this is a problem now, not for the future.”**

*Chris Mooney and John Muyskens, “2°C: Beyond the limit: Dangerous new hot zones are spreading around the world,” *The Washington Post*, September 11, 2019, <https://www.washingtonpost.com/graphics/2019/national/climate-environment/climate-change-world/>

**Maxine Joselow, “‘Weird things’ on climate beat inspired Pulitzer winner,” *E&E News*, May 8, 2020, <https://www.eenews.net/stories/1063082419>; see also WashPost PR, “The Washington Post’s 2°C: Beyond the Limit series recognized for Outstanding Explanatory Reporting by the Society of Environmental Journalists,” *Washington Post*, August 6, 2020, <https://www.washingtonpost.com/pr/2020/08/06/washington-posts-2c-beyond-limit-series-recognized-outstanding-explanatory-reporting-by-society-environmental-journalists/>

2019 (September)

UN Climate Action Summit largely disappoints, except for the tenacity of Greta Thunberg

The summit, the first since 2014, was intended to showcase steps by countries to ratchet up their commitments for emissions reductions, as contemplated by the Paris Agreement. There are no such commitments by the major emitting countries. The U.S. withdrawal from the agreement clearly casts a pall over the effort. As summarized by the *New York Times*, “despite the protests in the streets, China on Monday made no new promises to take stronger climate action. The United States, having vowed to pull out of the Paris Agreement, the pact among nations to jointly fight climate change, said nothing at all. A host of countries made only incremental promises.” Swedish activist Greta Thunberg, attending the conference via carbon neutral sail and solar power, speaks with barely restrained rage: “The eyes of all future generations are upon you. If you choose to fail us, I say we will never forgive you.” French president Emmanuel Macron delivers an ominous message to the U.S., as it engages in discussions on a free trade pact with the European Union: “I don’t want to see new trade negotiations with countries who are running counter to the Paris Agreement.” * President Trump makes a surprise momentary appearance, with video capturing Thunberg’s reaction.** Thunberg will later dash Trump’s hopes of making *Time Magazine* person of the year.*** A highpoint of the summit from Mainer’s perspectives is the first ever speech before the United Nations by a sitting Maine governor. Governor Janet Mills announces Maine’s plan to dramatically reduce carbon emissions: “What is more precious than water, air, soil, the health and happiness of our children and our children’s children and yours? For all of them, today, by Executive Order, I am pledging that Maine will be carbon neutral by

2045. And if our small state can do it, you can. We've got to unite to preserve our precious common ground, for our common planet, in uncommon ways for this imperative common purpose. Maine won't wait. Will you?"****

* Somini Sengupta and Lisa Friedman, "At U.N. Climate Summit, Few Commitments and U.S. Silence," *New York Times*, September 23, 2019, <https://www.nytimes.com/2019/09/23/climate/climate-summit-global-warming.html>

** <https://twitter.com/elliottwagland/status/1176176291604762624>

*** Charlotte Alter, Suyin Haynes and Justin Worland, "Time 2019 Person of the Year Greta Thunberg," December 11, 2019,

<https://time.com/person-of-the-year-2019-greta-thunberg/>

****Governor Janet T. Mills, "Speaking Before The United Nations, Governor Mills Announces Maine Will Be Carbon Neutral by 2045," press release, September 23, 2019, <https://www.maine.gov/governor/mills/news/speaking-united-nations-governor-mills-announces-maine-will-be-carbon-neutral-2045-2019-09-23>; "An Order to Strengthen Maine's Economy and Achieve Carbon Neutrality by 2045," <https://www.maine.gov/governor/mills/sites/maine.gov/governor.mills/files/inline-files/Executive%20Order%209-23-2019.pdf>

2019 (October)

Study urges a major recalculation of the numbers of cities and people likely to be affected by sea level rise this century

Scientists are in general agreement that under current emissions scenarios sea levels may rise about two meters this century. An understanding of the extent that this will displace populations living along the coasts depends crucially on accurate estimates of the elevation of those coastal cities and settlements. A startling study suggests that those estimates to date have been erroneous, as they were based on satellite images that had trouble recognizing the difference between the tops of trees and buildings, and ground level. Researchers at Climate Central, publishing in the journal *Nature Communications*, use artificial intelligence to identify the error rate and correct for it. The results of the reanalysis triples the numbers of people that would be displaced by rising sea levels by 2050, and predicts the destruction of large areas of the world's major coastal cities, including Mumbai, Bangkok, Ho Chi Minh City, and Shanghai. It warns that 150 million people living along coasts now will be below the high tide mark by midcentury.*

*Scott A. Kulp and Benjamin H. Strauss, "New elevation data triple estimates of global vulnerability to sea-level rise and coastal flooding," *Nature Communications* 10, no. 4844, October 29, 2019, <https://www.nature.com/articles/s41467-019-12808-z#Sec7>;

Denise Lu and Christopher Flavelle, "Rising Seas Will Erase More Cities by 2050, New Research Shows," *New York Times*, October 29, 2019, <https://www.nytimes.com/interactive/2019/10/29/climate/coastal-cities-underwater.html>

2019 (October)

International Monetary Fund calls for \$75/ton carbon tax and dividend

As a strategy to keep warming to under 2 degrees C., the International Monetary Fund (IMF) issues calls for an "immediate" global tax on carbon emissions that will "rise rapidly" to \$75/ton by 2030, with revenues returned to citizens to offset the economic impact.* As summarized by the *Washington Post*, "In the United States, a \$75 tax would cut emissions by nearly 30 percent but would cause on average a 53 percent increase in electricity costs and a 20 percent rise for gasoline at projected 2030 prices, the analysis in the IMF's Fiscal Monitor found. But it would also generate revenue equivalent to 1 percent of gross domestic product, an enormous amount of money that could be redistributed and, if spread equally, would end up being a fiscally progressive policy, rather than one disproportionately targeting the poor."**

*International Monetary Fund, *Fiscal Monitor: How to Mitigate Climate Change*, October 2019, <https://www.imf.org/en/Publications/FM/Issues/2019/09/12/fiscal-monitor-october-2019>

**Chris Mooney and Andrew Freedman, “The world needs a massive carbon tax in just 10 years to limit climate change, IMF says,” *The Washington Post*, October 10, 2019, <https://www.washingtonpost.com/climate-environment/2019/10/10/world-needs-massive-carbon-tax-just-years-limit-climate-change-imf-says/>

2019 (November)

More than 11,000 scientists publish a declaration of “climate emergency”

The declaration by scientists from around the world is published in the journal *BioScience* on precisely the 40th anniversary of the First World Climate Conference in 1979, where 350 scientists declared that it was “now urgently necessary” to “foresee and prevent potential man-made changes in climate that might be adverse to the well-being of humanity.” [see 1979 (November)]. The present declaration states: “Scientists have a moral obligation to clearly warn humanity of any catastrophic threat and to ‘tell it like it is.’ On the basis of this obligation and the graphical indicators presented below, we declare, with more than 11,000 scientist signatories from around the world, clearly and unequivocally that planet Earth is facing a climate emergency.” The declaration is supported by a “suite of graphical vital signs of climate change over the last 40 years for human activities that can affect GHG emissions and change the climate, as well as actual climatic impacts. We use only relevant data sets that are clear, understandable, systematically collected for at least the last 5 years, and updated at least annually.”* Comments Bill McKibben, writing in *YaleEnvironment360*: “Eleven thousand, by the way, is another way of saying essentially all scientists who study this field — the tiny cadre of deniers shrinks annually, and is not being replenished by young climatologists.”**

*William J. Ripple, et al., “World Scientists’ Warning of a Climate Emergency,” *BioScience*, biz088, November 5, 2019, <https://academic.oup.com/bioscience/advance-article/doi/10.1093/biosci/biz088/5610806>

**Bill McKibben, “The New Climate Math: The Numbers Keep Getting More Frightening,” *YaleEnvironment360*, November 25, 2019, <https://e360.yale.edu/features/the-new-climate-math-the-numbers-keep-getting-more-frightening>

2019 (November)

Amazon suffers devastating fires, accelerated deforestation

As the *Guardian* put it, “The assault on the planet’s biggest terrestrial carbon sink by land-grabbers, agribusiness, miners and loggers is accelerating. In the year until 30 July 2019, 9,762 sq kms were lost, an increase of 29.5% over the previous 12 months, the Brazilian space agency INPE said. The clearance rate – equivalent to about two football fields a minute – is the fastest since 2008, pushing Brazil far off course from reaching its Paris agreement goals to cut carbon emissions.”* An article in *Science* confirms that the fires are the result of government policies, not, as President Jair Bolsonaro alleges, started by NGOs eager to discredit him: “Thousands of fires occur in the Amazon annually, but the numbers have risen since Bolsonaro became president on 1 January and began to encourage development. In satellite images, Brazil’s National Institute for Space Research (INPE) counted more than 41,000 ‘fire spots’ between 1 January and 24 August, compared with 22,000 in the same period last year.”**

*Jonathan Watts, “Amazon deforestation 'at highest level in a decade',” *The Guardian*, November 18, 2019, <https://www.theguardian.com/environment/2019/nov/18/amazon-deforestation-at-highest-level-in-a-decade>

**Herton Escobar, “Amazon fires clearly linked to deforestation, scientists say,” *Science* 365, no. 6456 (August 30, 2019): 856, <https://science.sciencemag.org/content/365/6456/853>

2019 (November)

U.S. Department of Defense greenhouse gas emissions are larger than some entire nations

The U.S. spends more on its military than any other nation, much more than the combined spending of its major rivals Russia and China. As such, it is a major consumer of fossil fuels. A study by the Costs of War Project at Brown University and Boston University concludes that the the Department of Defense “is the world’s largest institutional user of petroleum and correspondingly, the single largest institutional producer of greenhouse gases (GHG) in the world. From FY1975 to FY 2018, total DOD greenhouse gas emissions were more than 3,685 Million Metric Tons of CO₂ equivalent. While only a portion of US total emissions, US military emissions are, in any one year, larger than the emissions of many countries. In 2017, for example, the Pentagon’s total greenhouse gas emissions...were greater than the greenhouse gas emissions of entire industrialized countries such as Sweden, Denmark and Portugal and also greater than all CO₂ emissions from US production of iron and steel.”* A follow up article in *The War Horse* in 2022 will underscore the major obstacles to calculating military contributions to greenhouse gas emissions in the US and around the world: “In 1997, the Kyoto Protocol—the world’s first legally binding, international climate treaty—created a reporting loophole for militaries, exempting many of the greenhouse gases emitted during military operations from counting against a country’s emissions totals. While the 2015 Paris Accords did away with this exemption, they didn’t replace it with an obligation. Rather, the decision of whether to report military emissions—and how to calculate them—was left up to individual countries.”**

*Neta Crawford, “Pentagon Fuel Use, Climate Change, and the Costs of War,” Costs of War, Watson Institute, Brown University, November 13, 2019, <https://watson.brown.edu/costsofwar/papers/ClimateChangeandCostofWar>; in 2022 Crawford will publish a book, *The Pentagon, Climate Change, and War: Charting the Rise and Fall of US Military Emissions* (Boston, MIT Press, October 4, 2022) ; see also Ruqaiyah Zarook, “Why the Pentagon Is the World’s Biggest Single Greenhouse Gas Emitter,” *Mother Jones*, October 7, 2022, <https://www.motherjones.com/environment/2022/10/pentagon-climate-change-neta-crawford-book/>

**Sonner Kehrt, “‘We Must Do Our Part to Mitigate Climate Change’—The Military’s Pollution Problem,” *The War Horse*, January 6, 2022, <https://thewarhorse.org/us-military-has-a-pollution-problem-but-no-accountability/>

2019 (November)

Two reports of the United Nations Environment Programme highlight the distance between climate goals and reality

The 2019 United Nations Environment Program (UNEP) *Emissions Gap Report* warns that “we are on the brink of missing the opportunity to limit warming to 1.5° C.” Current commitments under the Paris Agreement will lead to 3.5° C. by the end of the century. To get on track to hold warming to 1.5° C, emissions must drop rapidly to 25 Gt by 2030. Under Paris commitments, emissions are on track to reach 56 Gt CO₂e by 2030, over twice what they should be. “Collectively, if commitments, policies and action can deliver a 7.6% emissions reduction every year between 2020 and 2030, we CAN limit global warming to 1.5° C.” * The UNEP introduces this year, in collaboration with five other research and academic institutions, a *Production Gap*

Report. As stated in the Forward to the report by UNEP Executive Director Inger Andersen, “In the decade since [the first *Emissions Gap Report*], countries have made new rounds of commitments through the Paris Agreement. However, carbon emissions have remained exactly at the levels projected a decade ago, under the business-as-usual scenarios used in Emissions Gap Reports. This calls for a sharpened, and long overdue, focus on fossil fuels. The world’s energy supply remains dominated by coal, oil and gas, driving emission levels that are inconsistent with climate goals. To that end, this report introduces the fossil fuel production gap, a new metric that clearly shows the gap between increasing fossil fuel production and the decline needed to limit global warming.” The key finding: “Governments are planning to produce about 50% more fossil fuels by 2030 than would be consistent with a 2°C pathway and 120% more than would be consistent with a 1.5°C pathway.” Alternatively, Belize, Costa Rica, France, Denmark, and New Zealand have enacted partial or total bans or moratoria on oil and gas exploration and extraction, while Germany and Spain are phasing out coal extraction. The report highlights as well actions individual investors and institutions can play: “individuals and institutions have already pledged to divest over USD 11 trillion from fossil fuel holdings.”**

*United Nations Environment Programme, *Emissions Gap Report 2019*, <https://www.unenvironment.org/interactive/emissions-gap-report/2019/>

**SEI, IISD, ODI, Climate Analytics, CICERO, and UNEP, *The Production Gap: The discrepancy between countries’ planned fossil fuel production and global production levels consistent with limiting warming to 1.5°C or 2°C.*, November, 2019, <http://productiongap.org/>

2019 (December)

Global carbon dioxide emissions will increase by .6% in 2019, with a total of 37.2 GtCO₂ emitted to the atmosphere, a new high

As indicated by the Global Carbon Project report, the projected increase in emissions from fossil fuel burning and cement production reflects slower growth than in the past two years. Emissions from India are predicted to grow by 1.8% and from China by 2.6%; emissions from the U.S. are expected to decline by 1.7%, and from the E.U. to decline by 1.7%. The final figures for 2018 are reported as follows: “In 2018, global CO₂ emissions were dominated by emissions from China (28%), the USA (15%), the EU (28-member states; 9%) and India (7%). Growth rates of these countries from 2017 to 2018 were +2.3% for China, +2.8% for the USA, -2.1% for the EU28, and +8.0% for India. The per-capita CO₂ emissions in 2018 were 4.8 tCO₂ tonnes of carbon person⁻¹yr⁻¹ for the globe, 16.6 tCO₂ for the USA, 7.0 tCO₂ for China, 6.9 tCO₂ for the EU28, and 2.0 tCO₂ for India.”* Commentary in *The New York Times* notes that “The new data shows that natural gas, which is less polluting than coal but still a fossil fuel, has become the biggest driver of emissions growth globally in recent years. Japan, for instance, has relied on imported natural gas to replace many of the carbon-free nuclear plants that were closed down after the 2011 accident at the Fukushima Daiichi power station. And a boom in hydraulic fracturing has recently made natural gas the largest source of electricity in the United States, where it helps fill the gaps during lulls in wind and solar production.” The *Times* quotes Glen Peters, research director at the Center for International Climate Research in Norway, who helped compile the data: “Natural gas may produce fewer carbon emissions than coal, but that just means you cook the planet a bit more slowly. And that’s before even getting into the worries about

methane leaks” from gas infrastructure.** Reflecting on the failure of COP25 [see below], Elizabeth Kolbert in *The New Yorker* notes: “If in the past year (or the past decade) the world began to understand how dangerous climate change is, it certainly didn’t act like it. In the past ten years, more CO₂ was emitted than in all of human history up to the election of J.F.K.”***

*Global Carbon Project, *Carbon Budget 2019*, December 4, 2019,

<https://www.globalcarbonproject.org/carbonbudget/19/highlights.htm>

**Brad Plumer, “Carbon Dioxide Emissions Hit a Record in 2019, Even as Coal Fades,” *New York Times*, December 3, 2019,

<https://www.nytimes.com/2019/12/03/climate/carbon-dioxide-emissions.html>

*** Elizabeth Kolbert, “Don’t Wait,” *The New Yorker*, January 13, 2020, <https://www.newyorker.com/magazine/2020/01/13/what-will-another-decade-of-climate-crisis-bring>

2019 (December)

Climate Action Tracker ranks U.S. progress toward climate goals “critically insufficient”

The Climate Action Tracker, a collaboration of Climate Analytics and New Climate Institute, annually ranks a country’s emissions reduction pledges, long-term targets and current policies against whether they are consistent with a country’s fair share effort to achieve the Paris Agreement 1.5°C temperature goal. It tracks 32 countries representing about 80% of global emissions. The 2019 report ranks the U.S., along with the Russian Federation, Saudi Arabia, Turkey, Ukraine and Vietnam as “critically insufficient,” meaning that their commitments “fall well outside the fair range and are not at all consistent with holding warming below 2°C let alone with the Paris Agreement’s stronger 1.5°C limit. If all government targets were in this range, warming would exceed 4 °C.” Bhutan, Costa Rica, Ethiopia, India, Kenya, and the Philippines are ranked “2°C Compatible,” and only Morocco and The Gambia are ranked 1.5°C Compatible.”*

*Climate Action Tracker, <https://climateactiontracker.org>; the analysis justifying the U.S. ranking is at <https://climateactiontracker.org/countries/usa/>

2019 (December)

Exxon Mobil cleared of claims of investor fraud regarding climate risk

A New York judge rejects, after a trial including testimony by former CEO Rex Tillerson, the suit by the New York Attorney General for allegedly misleading investors about climate risk [see 2015 (November), 2016 (October) and 2018 (October)]. As summarized by *InsideClimate News*, the decision “hand[s] the oil giant a major victory in the first trial of a fossil fuel company involving climate change. ... While [Justice Barry Ostrager] praised Exxon's executives for ‘rigorously discharging their duties in the most comprehensive and meticulous manner possible,’ the judge excoriated the attorney general's case, saying it failed to establish that any investor was misled. Ostrager also made clear, however, that ‘nothing in this opinion is intended to absolve ExxonMobil from responsibility for contributing to climate change,’ adding that the company's emission of greenhouse gases was not on trial. ‘ExxonMobil is in the business of producing energy, and this is a securities fraud case, not a climate change case,’ he wrote.”* The *Wall Street Journal* Editorial Board chimes in: “Well, that was embarrassing. After spending nearly four years trying to nail Exxon Mobil for myriad climate-change deceptions, New York’s attorney

general was excoriated Tuesday by a state judge for making “hyperbolic” claims and essentially trying to deceive the court.”**

*Nicholas Kusnetz and David Hasemyer, “Judge Clears Exxon in Investor Fraud Case Over Climate Risk Disclosure,” *InsideClimate News*, December 10, 2019, <https://insideclimatenews.org/news/10122019/exxon-ruling-climate-investor-fraud-new-york-case-impact>

**Editorial Board, “New York’s Stranded Exxon Case,” *Wall Street Journal*, December 10, 2019, <https://www.wsj.com/articles/new-yorks-stranded-exxon-case-11576022767>

2019 (December)

Nuclear Regulatory Commission gives unprecedented operating extension to Florida nuclear plant

The Editorial Board of the *Wall Street Journal* praises a NRC decision that for the first time extended a nuclear plant’s license so it can operate for 80 years: “You probably haven’t heard about a recent regulatory decision that will reduce carbon emissions because it doesn’t follow the green template of controlling private industry and suppressing economic growth.” The editorial invites climate activists to celebrate the milestone: “Because of the steep regulatory obstacles to building new nuclear plants, continued operation of existing plants is the best bet for keeping nuclear from declining below its current 19% share of U.S. electric power. Environmentalists who say the climate is an existential crisis should be the most pleased at this indication that nuclear energy will stay on the grid.”*

*Editorial Board, “A Nuclear Milestone for Climate,” *Wall Street Journal*, December 12, 2019, <https://www.wsj.com/articles/a-nuclear-milestone-for-climate-11576196316>

2019 (December)

NOAA annual Arctic report card: the Arctic may already substantially contribute to climate change

Scientists have long considered the possibility of a tipping point where warming permafrost accelerates climate change through carbon emissions. For the first time, the National Oceanic and Atmospheric Administration (NOAA) provides a measured estimate of this. Through a three-year study using aircraft measurements of atmospheric gases over the Arctic, the report concludes: “Thawing permafrost throughout the Arctic could be releasing an estimated 300-600 million tons of net carbon per year to the atmosphere.” The report explains, “Northern permafrost region soils contain 1,460-1,600 billion metric tons of organic carbon, about twice as much as currently contained in the atmosphere. This pool of organic carbon is climate-sensitive. Warming conditions promote microbial conversion of permafrost carbon into the greenhouse gases carbon dioxide and methane that are released to the atmosphere in an accelerating feedback to climate warming... These observations signify that the feedback to accelerating climate change may already be underway.”* As an article in *Vox* notes, the new estimate of emissions from permafrost thawing is roughly equivalent to the annual fossil-fuel emissions of Japan. Ted Schuur, the author of the report’s section on permafrost, tells *Vox*: “We think that should be two to three times bigger by the end of the century based on the kind of forecasting we’ve done.”**

*National Oceanic and Atmospheric Administration, Arctic Program, *2019 Arctic Report Card*, December, 2019, <https://www.arctic.noaa.gov/Report-Card/Report-Card-2019>

**Brian Resnick, “Scientists feared unstoppable emissions from melting permafrost. They may have already started,” *Vox*, December 12, 2019, <https://www.vox.com/energy-and-environment/2019/12/12/21011445/permafrost-melting-arctic-report-card-noaa>

2019 (October - December)

Fueled by unprecedented drought and record high temperatures, Australia burns

Bush fires destroy 84,000 square kilometers by year-end, an area bigger than Ireland.* As Elizabeth Kolbert reports in *The New Yorker*, “On December 17th, maximum temperatures across the entire country, which is roughly the size of the continental United States, averaged 105.6 degrees. Then, on December 18th, they climbed to 107.4 degrees. The ‘feeling when you open the oven door’ is how one Australian described the heat to the BBC. ‘It’s like that, but just the whole time.’”** Writes Stephen Wright in the *Wall Street Journal*: “Scientists say at least six species are in jeopardy [of extinction]... The fires may have killed more than a billion animals, according to a rough estimate by Chris Dickman, an ecology professor at the University of Sydney, who based his calculation on animal-density data from 2007 that involved more than 100 species of mammals, birds and reptiles. That data didn’t include bats, frogs, insects and other invertebrates.”*** Paul Krugman, on the intransigence of the Australian “anti-environmentalist government” and the Murdoch empire’s “disinformation” campaign: “But if a nation in flames isn’t enough to produce a consensus for action — if it isn’t even enough to produce some moderation in the anti-environmentalist position — what will? The Australia experience suggests that climate denial will persist come hell or high water — that is, through devastating heat waves and catastrophic storm surges alike.”****

*Jeffrey Brainard, “News in Brief,” *Science* 367, no. 6474 (January 10, 2020): 127,

<https://science.sciencemag.org/content/367/6474/126>; see also John Pickrell, “Massive Australian blazes will ‘reframe our understanding of bushfire’”, *Science*, November 20, 2019, <https://www.sciencemag.org/news/2019/11/massive-australian-blazes-will-reframe-our-understanding-bushfire>

** Elizabeth Kolbert, “Don’t Wait,” *The New Yorker*, January 13, 2020, <https://www.newyorker.com/magazine/2020/01/13/what-will-another-decade-of-climate-crisis-bring>

***Stephen Wright, “Fires Raise Extinction Threat in Australia,” *Wall Street Journal*, January 15, 2020,

<https://www.wsj.com/articles/australia-fires-imperil-populations-of-green-bees-honeyeaters-and-potoroos-11578997803>

****Paul Krugman, “Australia Shows Us the Road to Hell,” *New York Times*, January 9, 2020,

<https://www.nytimes.com/2020/01/09/opinion/australia-fires.html>

2019 (December)

Impending U.S. exit from Paris accord exacerbates challenges to COP25

At the 25th UNFCCC Conference of the Parties in Madrid, delegates from 200 nations fail to strengthen targets to cut emissions or to create a global carbon-trading system, two main goals of the 2015 Paris accord. As the *Wall Street Journal* reports, “China, the top emitter globally, is adding more coal-fired plants than the rest of the world combined, while also building them internationally. The U.S., the world’s second-largest emitter, is rolling back emissions-reducing rules on energy and transport enacted by the Obama administration.” A focus of debate is the need for developed countries, as the top historical producers of greenhouse gases, to provide funds to developing nations under the Paris accord. “Wealthy countries promised to make available \$100 billion annually starting in 2020 to help poorer nations meet climate goals Development... [C]oncerns that developed countries may not deliver on their funding pledge ... are fueling

backlash against Paris accord commitments. Some African countries said they will resist the climate agenda altogether, citing their reliance on fossil fuel resources for future economic growth. ‘Anybody out of the continent saying we should not develop [oil and gas] fields, that is criminal. It is very unfair,’ Equatorial Guinea’s Mines, Industry and Energy Minister Gabriel Obiang Lima said recently.” * These concerns are aggravated by President Trump’s 2017 reneging on \$2 billion due to the Green Climate Fund from the U.S.** [see 2017 (June)] The *Washington Post* reports: “The painstaking pace of ... COP25 stood in contrast to the mass demonstrations and vehement pleas from young activists, some of whom staged protests inside the conference hall and accused world leaders of neglecting the most significant challenge facing humanity. ‘This is the biggest disconnect between this process and what’s going on in the real world that I’ve seen,’ said Alden Meyer, director of strategy and policy for the Union of Concerned Scientists, who has been attending climate talks since the early 1990s.”*** Elizabeth Kolbert comments in *The New Yorker*: “in Madrid, the creaky machinery of climate diplomacy came very close to breaking down altogether. The Trump Administration....and the [Australian Prime Minister Scott] Morrison government, which wanted to use an accounting trick to fulfill its Paris commitments, were explicitly blamed for the stalemate. Many commentators noted the irony of the situation. A headline in the *Guardian* put it this way: ‘Australia Took a Match to UN Climate Talks While Back Home the Country Burned.’”****

*Emre Peker, “U.N. Climate Talks End Without Meeting Goals,” *Wall Street Journal*, December 15, 2019,

<https://www.wsj.com/articles/u-n-climate-talks-end-without-accord-on-carbon-markets-11576424025>

**Nurith Azenman, “A Little-Known Climate Fund Is Suddenly In The Spotlight,” *NPR*, June 9, 2017,

<https://www.npr.org/sections/goatsandsoda/2017/06/09/532106567/a-little-known-climate-fund-is-suddenly-in-the-spotlight>

***Brady Dennis and Chico Harlan, “U.N. climate talks end with hard feelings, few results and new doubts about global unity,”

Washington Post, December 15, 2019, https://www.washingtonpost.com/climate-environment/un-climate-talks-end-with-hard-feelings-few-results-and-new-doubts-about-global-unity/2019/12/15/38918278-1ec7-11ea-b4c1-fd0d91b60d9e_story.html

****Elizabeth Kolbert, “Don’t Wait,” *The New Yorker*, January 13, 2020, <https://www.newyorker.com/magazine/2020/01/13/what-will-another-decade-of-climate-crisis-bring>

2019 (December)

Dutch Supreme Court rules that government has a legal duty to protect citizens from climate change

The highest court in the Netherlands holds that, under the European Commission on Human Rights and Fundamental Freedoms (ECHR), the Dutch government has a legal duty to implement policies to reduce the threats of climate change. The court also cites the Netherlands’ obligations under the United Nations Framework Convention on Climate Change, to which the U.S. has also committed. Under the ruling, the government will have to cut emissions by 25% of 1990 levels by the end of 2020. The lawsuit was brought six years ago by the Dutch organization Urgenda, which has brought similar suits in other countries around the world. The Dutch government, in defending the lawsuit, had agreed that climate change posed a risk to human life and welfare under the ECHR, but argued for a slower ratcheting down of national emissions. The court finds that it had failed to meet its burden of proof: “There is a broad consensus in climate science and within the international community that as reduction measures are taken later, they must become more drastic and costly to achieve the intended end goal. There is also a greater risk of abrupt climate change because a tipping point is reached. In the light of that generally endorsed insight,

it was up to the State to explain that the intended acceleration of the reduction after 2020 will be practically feasible and sufficiently effective to achieve the 2030 and 2050 targets, and thus the 2°C- and keeping the 1.5°C goal within reach. However, the State did not do that. The Court of Appeal has therefore been able to judge that the State must in any case adhere to the internationally deemed objective of a minimum 25% reduction by 2020.” In response to the government’s argument that it is not the proper role of the courts to direct climate policy, the court rules: “In the Dutch state system, decision-making on the reduction of greenhouse gas emissions belongs to the government and parliament. They have a great deal of freedom to make the necessary political decisions. It is up to the judge to judge whether the government and parliament have kept their decisions within the limits of the law to which they are bound. These limits stem, among other things, from the ECHR. The Constitution requires the Dutch court to apply the provisions of this treaty. The court must do this in accordance with the interpretation thereof by the ECtHR. This task for the judge to offer legal protection, also against the government, is an essential part of the democratic constitutional state.”* *The Independent* quotes Dr. David Boyd, the UN’s special rapporteur on human rights and the environment: “This is the most important climate change court decision in the world so far, confirming that human rights are jeopardised by the climate emergency and that wealthy nations are legally obligated to achieve rapid and substantial emission reductions.” The UN’s high commissioner for human rights, Michelle Bachelet states: “This landmark ruling provides a clear path forward for concerned individuals in Europe — and around the world — to undertake climate litigation in order to protect human rights, and I pay tribute to the civil society groups which initiated this action.” ** *The New York Times* cites Michael Gerrard, director of the Sabin Center for Climate Change Law at Columbia University: “There have been 1,442 climate lawsuits around the world...This is the strongest decision ever. The Dutch Supreme Court upheld the first court order anywhere directing a country to slash its greenhouse gas emissions.”***

**The State of the Netherlands v. Stichting Urgenda*, ECLI: NL: PHR: 2019: 887, December 20, 2019, <https://uitspraken.rechtspraak.nl/inziendocument?id=ECLI:NL:HR:2019:2006>

**Andy Gregory, “Landmark ruling that Holland must cut emissions to protect citizens from climate change upheld by supreme court,” *Independent*, December 21, 2019, <https://www.independent.co.uk/environment/holland-emissions-climate-change-supreme-court-urgenda-dutch-co2-a9256346.html>

***John Schwartz, “In ‘Strongest’ Climate Ruling Yet, Dutch Court Orders Leaders to Take Action,” *New York Times*, December 20, 2019, <https://www.nytimes.com/2019/12/20/climate/netherlands-climate-lawsuit.html>

2019 (December)

Year-end count: Trump administration rolling back 95 major environmental rules

Based on research from Harvard and Columbia law schools, the *New York Times* counts 16 rollbacks completed and 9 in process on air pollution and emissions; 10 rollbacks completed and 9 in process on drilling and extraction.* Many of those “completed” rollbacks are subject to court challenges, which are tracked in the Harvard Law School Regulatory Rollback Tracker.**

*Nadja Popovich, Livia Albeck-Ripka and Kendra Pierre-Louis, “95 Environmental Rules Being Rolled Back Under Trump,” *New York Times*, December 21, 2019, <https://www.nytimes.com/interactive/2019/climate/trump-environment-rollbacks.html>

**Harvard Law School, Environmental & Energy Law Program, <https://eelp.law.harvard.edu/regulatory-rollback-tracker/>

2019 (December)

EPA's Scientific Advisory Board criticizes regulatory rollback justifications, including proposed fuel efficiency rule

The *Washington Post* reveals that the Environmental Protection Agency (EPA) Scientific Advisory Board, now purged of some distinguished scientists and composed of two-thirds Trump administration appointees [see 2017 (October)], still delivers sharp criticism of major EPA proposed regulations, in draft reviews posted by the EPA online.* One of these draft reviews relates to the justifications for the 2018 “Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule”, rolling back Obama era vehicle fuel efficiency standards. [see 2018 (August) and 2019 (June – November)] The draft cover letter from the Scientific Advisory Board to EPA chief Andrew Wheeler states: “there appear to be significant weaknesses in the analysis supporting the 2018 notice of proposed rulemaking.” These weaknesses particularly relate to estimates of size of vehicle fleets. “Together with other smaller problems and inconsistencies, the issues are of sufficient magnitude that the estimated net benefits of the proposed revision may be substantially overstated. In fact, the weaknesses are sufficiently important that they could reverse the rankings of the policies being considered. In other words, the original [original, Obama] standards might provide a better outcome for society than the proposed revision.”**

*Juliet Eilperin, “EPA’s scientific advisers warn its regulatory rollbacks clash with established science,” *The Washington Post*, December 31, 2019, https://www.washingtonpost.com/climate-solutions/epas-scientific-advisers-warn-its-regulatory-rollbacks-clash-with-established-science/2019/12/31/a1994f5a-227b-11ea-a153-dce4b94e4249_story.html; see also H. Holden Thorp, “Stick to science,” *Science* 367, no. 6474 (January 10, 2020): 125, <https://science.sciencemag.org/content/367/6474/125>

**Environmental Protection Agency, Science Advisory Board, Draft Report (10/16/19), [https://yosemite.epa.gov/sab/sabproduct.nsf/ea5d9a9b55cc319285256cbd005a472e/3bd8a1aea4943223852584e1005463de/\\$FILE/SAFE%20SAB%20Draft%20Review_10_16_19_.pdf](https://yosemite.epa.gov/sab/sabproduct.nsf/ea5d9a9b55cc319285256cbd005a472e/3bd8a1aea4943223852584e1005463de/$FILE/SAFE%20SAB%20Draft%20Review_10_16_19_.pdf)

2020 (January)

2019 is the second hottest year on record

Reports by the National Oceanic and Atmospheric Administration (NOAA) and the National Aeronautics and Space Administration (NASA) find 2019 to be just shy of the record-setting year 2016, and the previous decade to be the hottest ever. As summarized in the *New York Times*, “Since the 1960s, each decade has been warmer than the previous one, by significant amounts. While the 2010s continued this trend, the second half of the decade was especially warm. The five hottest years ever have occurred during that time span.” Global average surface temperatures in 2019 were nearly 1 degree Celsius (1.8 degrees Fahrenheit) higher than the average from the middle of last century. *

* Henry Fountain and Nadja Popovich, “2019 Was the Second-Hottest Year Ever, Closing Out the Warmest Decade,” *New York Times*, January 15, 2020, <https://www.nytimes.com/interactive/2020/01/15/climate/hottest-year-2019.html>

2020 (January)

Ninth Circuit Court of Appeals dismisses Juliana v. U.S. lawsuit; plaintiffs will move to amend

In a split 2-1 decision, the court reversed the decision of Federal District Judge Ann Aiken [2016 (April)] and concluded that the plaintiffs lacked standing because the request for injunctive relief was too complex for the courts to oversee. The majority decision written by Judge Andrew Hurwitz begins by acknowledging the compelling factual case plaintiffs had made: “In the mid-1960s, a popular song warned that we were ‘on the eve of destruction.’ The plaintiffs in this case have presented compelling evidence that climate change has brought that eve nearer. A substantial evidentiary record documents that the federal government has long promoted fossil fuel use despite knowing that it can cause catastrophic climate change, and that failure to change existing policy may hasten an environmental apocalypse. The plaintiffs claim that the government has violated their constitutional rights, including a claimed right under the Due Process Clause of the Fifth Amendment to a ‘climate system capable of sustaining human life.’” But the decision concluded that the courts lacked power to solve this problem: “The central issue before us is whether, even assuming such a broad constitutional right exists, an Article III court can provide the plaintiffs the redress they seek—an order requiring the government to develop a plan to ‘phase out fossil fuel emissions and draw down excess atmospheric CO₂.’ Reluctantly, we conclude that such relief is beyond our constitutional power. Rather, the plaintiffs’ impressive case for redress must be presented to the political branches of government.” Judge Josephine Staton dissented, offering a rebuttal to Judge Hurwitz’ reasoning: “In these proceedings, the government accepts as fact that the United States has reached a tipping point crying out for a concerted response—yet presses ahead toward calamity. It is as if an asteroid were barreling toward Earth and the government decided to shut down our only defenses. Seeking to quash this suit, the government bluntly insists that it has the absolute and unreviewable power to destroy the Nation. My colleagues throw up their hands, concluding that this case presents nothing fit for the Judiciary. On a fundamental point, we agree: No case can singlehandedly prevent the catastrophic effects of climate change predicted by the government and scientists. But a federal court need not manage all of the delicate foreign relations and regulatory minutiae implicated by climate change to offer real relief, and the mere fact that this suit cannot alone halt climate change does not mean that it presents no claim suitable for judicial resolution.”* The plaintiffs will return to the trial court in 2021 to request permission to amend their complaint to seek only declaratory relief, and drop the claim for injunctive relief that was the focus of the 9th Circuit panel’s concerns. That motion was still pending in 2023.** [see 2023 (June)]

* *Juliana v. United States*, 947 F.3rd 1159 (9th Cir. 2020), <https://cdn.ca9.uscourts.gov/datastore/opinions/2020/01/17/18-36082.pdf>; for an analysis concluding that “*Juliana* may come to stand for broad and significant limitations on the powers of federal district courts sitting in equity,” see “*Juliana v. United States* Ninth Circuit Holds that Developing and Supervising Plan to Mitigate Anthropogenic Climate Change Would Exceed Remedial Powers of Article III Court,” 134 *Harvard Law Review* 1929 (March 10, 2021), <https://harvardlawreview.org/2021/03/juliana-v-united-states/>

** Our Children’s Trust, newsletter, <https://mailchi.mp/ourchildrenstrust/julianabigdevelopments?e=c872088a50>; summary of major court orders and filings, <https://www.ourchildrenstrust.org/court-orders-and-pleadings>

2020 (January)

Greta Thunberg calls out world leaders at Davos; deniers float “anti-Greta”

At the World Economic Forum, Thunberg [see 2019 (September)] bluntly rejects moderation in climate goals. “Let’s be clear. We don’t need a ‘low carbon economy.’ We don’t need to ‘lower emissions,’” she said. “Our emissions have to stop.” Her remarks come barely an hour after

President Trump’s remarks, which, as reported by the *New York Times*, “barely mentioned climate change, except to implicitly describe climate activists as ‘heirs of yesterday’s foolish fortune tellers.’”^{*} Meanwhile, the Heartland Institute promotes an “anti-Greta,” German Naomi Siebt, who denounces “climate alarmism,” and calls climate consciousness “a despicably anti-human ideology.” Observes the *Washington Post*: “If imitation is the highest form of flattery, Heartland’s tactics amount to an acknowledgment that Greta has touched a nerve, especially among teens and young adults. Since launching her protest two years ago outside the Swedish parliament at age 15, Greta has sparked youth protests across the globe and in 2019 was named Time magazine’s “Person of the Year,” the youngest to ever win the honor.”^{**} Heartland uses Siebt to market a “proposed anti-climate spin campaign [that] would focus on rolling back ‘prohibitive climate laws’ in Germany.”^{***} A troubled Heartland downsizes more than half of its staff and ousts its president. Siebt is criticized for ties to Germany’s far-right and for comments that some challenged as anti-Semitic.^{****} Michael Mann comments in his book *The New Climate War*, “The climate-denying Heartland Institute is increasingly ignored and unable to garner mainstream coverage. Their 2019 ‘conference,’ held at the Trump International Hotel in Washington, DC, was reduced from the sprawling three days of its earlier incarnations to just a single-day affair. While it had attracted more than fifty sponsors in past years, it drew just sixteen in 2019—fifteen if you account for the fact that one was fake.”^{*****}

^{*} Somini Sengupta, “Greta Thunberg’s Message at Davos Forum: ‘Our House Is Still on Fire,’” *New York Times*, January 21, 2020, <https://www.nytimes.com/2020/01/21/climate/greta-thunberg-davos.html>

^{**} Desmond Butler and Juliet Eilperin, “The anti-Greta: A conservative think tank takes on the global phenomenon,” February 23, 2020, <https://www.washingtonpost.com/climate-environment/2020/02/23/meet-anti-greta-young-youtuber-campaigning-against-climate-alarmism/>

^{***} Stuart Braun, “In denial: The spin machine upending the climate consensus,” *DW*, September 3, 2020,

<https://www.dw.com/en/trump-climate-change-denial-emissions-environment-germany-fake-heartland-seibt/a-52688933>

^{****} Nicholas Kusnetz, “Heartland Launches Website of Contrarian Climate Science Amid Struggles With Funding and Controversy,” *InsideClimate News*, March 13, 2020, <https://insideclimatenews.org/news/13032020/heartland-institute-climate-change-skeptic/>; Scott Waldman, “President of reeling anti-climate science group forced out,” *E&E News*, March 17, 2020, <https://www.eenews.net/stories/1062624167>

^{*****} Michael Mann, *The New Climate War* (New York: PublicAffairs, 2021), 227.

2020 (January)

Climate Leadership Council urges GOP to adopt carbon pricing as climate strategy

Former Reagan administration Secretary of State George Schulz and executive director of the Climate Leadership Council (CLC) Ted Halstead release a report outlining “the top 12 reasons carbon pricing outperforms regulations and subsidies on all counts and should become the cornerstone of U.S. climate policy. Chief among these are that carbon pricing offers the most cost-effective and fiscally conservative solution and would unlock all facets of clean-energy innovation.” Schulz and Halstead argue in a *Washington Post* opinion that “The winning Republican climate answer is the third option: carbon pricing. Just as a market-based solution is the Republican policy of choice on most issues, so should it be on climate change. A well-designed carbon fee checks every box of conservative policy orthodoxy. Not surprisingly, this is the favored option of corporate America and economists — including all former Republican chairs of the president’s Council of Economic Advisers.”^{*} In December, CLC will release a study on the economic impacts of its “Carbon Dividend” plan, concluding that it “generates an extra

\$190 billion in economic output per year, on average, while achieving the same emissions reductions as a regulatory approach,” and that “by 2036, GDP is \$420 billion higher each year under the carbon dividends approach.”** The Editorial Board of the *Washington Post* urges Democrats and Republicans to unite with this plan, which it argues “is more ambitious and effective in carbon reduction than Mr. Obama’s energy plan or the Paris accord; doesn’t increase the deficit by so much as a dime; leaves most Americans financially better off; encourages innovation; and provides an incentive for other emitters, including China and India, to act.”***

*George P. Schulz and Ted Halstead, “The Winning Conservative Climate Solution,” *Washington Post*, January 16, 2020, https://www.washingtonpost.com/opinions/the-winning-republican-climate-solution-carbon-pricing/2020/01/16/d6921dc0-387b-11ea-bf30-ad313e4ec754_story.html

**NERA Economics Consulting, *Economic Impacts of the Climate Leadership Council’s Carbon Dividends Plan Compared to Regulations Achieving Equivalent Emissions Reductions*, December, 2020, <https://clcouncil.org/>

***Editorial Board, “ Democrats and Republicans should both embrace this common-sense, planet-saving reform,” February 13, 2020, https://www.washingtonpost.com/opinions/democrats-and-republicans-should-both-embrace-this-common-sense-planet-saving-reform/2020/02/12/c28ab042-4dcc-11ea-9b5c-eac5b16dafaaf_story.html

2020 (February)

University of Maine Climate Change Institute: Maine is getting wetter, stormier, and warmer

In the five-year update to the Climate Change Institute report *Maine’s Climate Future* [see 2009 (February), 2015 (February)], the overriding takeaway is more variability, less predictability: “More and more, we seem to be experiencing ‘winter weather whiplash,’ with rapid shifts from freezing to thawing conditions, heat waves and rain in the depths of winter, and cold or snow in spring and fall when the leaves are still on the trees. Arctic blasts cause cold snaps and can contribute to major snowstorms during otherwise mild winters.” Some other key findings of the report: “the Northeast is warming faster than any other region in the U.S., and is projected to warm 5.4 °F (3 °C) when the rest of the world reaches 3.6 °F (2 °C).” “The whole state has warmed, and temperature increases have been greatest in the coastal division.” “The growing season (the period between the last frost and first frost) is more than two weeks longer than it was in 1950, mostly due to later frosts in the fall.” “Average annual precipitation has increased 15 percent (5.8 inches) since 1895, and the increase has come in the form of more rain, and less snow. Since 1895, depth of annual snowfall has decreased 20 percent (2.3 inches). As with temperature, the rate of increase has accelerated in recent decades.” “Increased precipitation means increased volume of runoff to local streams, rivers, and ultimately the Gulf of Maine ... These higher flows and floods can impact drinking water ... and damage roads, bridges, and properties. Storms often include strong winds, such as the October 2017 event that was the worst wind storm in Maine’s history ...” The report emphasizes the costs to the entire nation of this changing climate: “While in the past we may have underestimated the rate and severity of climate change, today there is little doubt of the price of unchecked climate change, with the National Climate Assessment estimating a potential cost equal to nearly 10 percent of the U.S. gross domestic product by the end of the century ... Since 1980, the U.S. has sustained 241 weather and climate disasters that exceeded \$1 billion in damages, with a total cost for these events of \$1.6 trillion ... In 2018 alone, there were 14 of these climate disasters with 247 deaths and costs exceeding \$1 billion in the U.S. These costs do not include the chronic consequences of a changing climate that we experience every day.”*

*Ivan Fernandez *et al.*, *Maine's Climate Future: 2020 Update* (Orono, Me: University of Maine 2020): 2, 3, 4, 6, 9.

<https://climatechange.umaine.edu/wp-content/uploads/sites/439/2020/02/Maines-Climate-Future-2020-Update-web.pdf>;

Bill Trotter, "Maine is getting wetter, stormier and warmer, with coast warming fastest, researchers say," *Bangor Daily News*, February 13, 2020, <https://bangordailynews.com/2020/02/13/news/hancock/maine-is-getting-wetter-stormier-and-warmer-with-coast-warming-fastest-researchers-say/>

2020 (February)

Ice core study suggests oil and gas industry contributes substantially more to climate change than previously thought, through methane emissions

It has long been understood that methane is a substantial contributor to climate change. Atmospheric concentrations of methane have more than doubled since preindustrial times, and methane as a greenhouse gas is 80 times more potent than carbon dioxide over a 20-year period. But how much of that methane is naturally occurring and how much a direct result of oil and gas drilling, production, distribution, and burning has been debated. In order to get a more precise estimate of how much of current emissions are naturally occurring, researchers from the University of Rochester, publishing in the journal *Nature*, analyze ice core data from 300 years ago from a Greenland glacier, data from Antarctica ice dating back to 1750, and compare isotopes indicating fossil fuel origins of the gas versus other biologic origins. The conclusions: we have significantly over estimated naturally occurring methane emissions, and hence under estimated emissions from human fossil fuel activities: "Here we use preindustrial-era ice core CH₄ [methane] measurements to show that natural geological CH₄ emissions to the atmosphere were about 1.6 teragrams CH₄ per year, with a maximum of 5.4 teragrams CH₄ per year (95 per cent confidence limit)—an order of magnitude lower than the currently used estimates. This result indicates that anthropogenic fossil CH₄ emissions are underestimated by about 38 to 58 teragrams CH₄ per year, or about 25 to 40 per cent of recent estimates."* The *New York Times* quotes lead author Benjamin Hmiel: "We've identified a gigantic discrepancy that shows the industry needs to, at the very least, improve their monitoring. If these emissions are truly coming from oil, gas extraction, production use, the industry isn't even reporting or seeing that right now."** [see also 2018 (June)]

*Benjamin Hmiel, *et al.*, "Preindustrial ¹⁴CH₄ indicates greater anthropogenic fossil CH₄ emissions," *Nature* 578, 409–412 (2020).

<https://doi.org/10.1038/s41586-020-1991-8>

**Hiroko Tabuchi, "Oil and Gas May Be a Far Bigger Climate Threat Than We Knew," *New York Times*, February 19, 2020,

<https://www.nytimes.com/2020/02/19/climate/methane-flaring-oil-emissions.html>; see also Jonah M. Kessel and Hiroko Tabuchi, "It's a Vast, Invisible Climate Menace. We Made It Visible," *New York Times*, November 8, 2019,

<https://www.nytimes.com/interactive/2019/12/12/climate/texas-methane-super-emitters.html>

2020 (February)

Idaho federal judge voids nearly one million acres of oil and gas leases, finding Trump Administration's limits on public input "arbitrary and capricious"

In one piece of a larger effort to protect sage-grouse habitat from oil and gas drilling across 11 Western states*, environmentalists score a victory against the Bureau of Land Management (BLM). In a drive to speed up drilling on federal lands, the BLM issued an "instructional memorandum" in 2018 reducing the amount of time the public could comment on and protest

drilling leases. The Judge Magistrate notes that the memorandum was issued without soliciting public comment and was “more edict in nature” than advisory: “Faster and easier lease sales, at the expense of public participation, is not enough.” The *Washington Post* cites the statement of Talasi Brooks, a staff attorney with the plaintiff Western Watersheds Project: “The court wasn’t fooled by the agency’s efforts to disguise its intention to provide greater influence to extractive energies, and the sage grouse and 350 other sagebrush-dependent species will benefit from today’s win.”**

*For an analysis of earlier proceedings in this case and background on the sage-grouse litigation, see post by Peter Daniels, “Defending Science and Collaborative Conservation: Sage-Grouse and Western Watersheds Project v. Schneider (D. Idaho 2019),” Harvard Environmental and Energy Law Program, April 30, 2020, <https://eelp.law.harvard.edu/2020/04/defending-science-and-collaborative-conservation-sage-grouse-and-western-watersheds-project-v-schneider-d-idaho-2019/>

** Juliet Eilperin and Darryl Fears, “Judge voids nearly 1 million acres of oil and gas leases, saying Trump policy undercut public input,” *Washington Post*, February 20, 2020, <https://www.washingtonpost.com/climate-environment/2020/02/27/judge-voids-nearly-1-million-acres-oil-gas-leases-saying-trump-policy-undercut-public-input/>

2020 (March)

Interior Department official promoted under Trump Administration injects climate denial language into scientific reports

A *New York Times* review of Interior Department records from 2017 to 2019 obtained under public-records laws by the watchdog group Energy and Policy Institute finds that Indur M. Goklany injected “misleading language... in environmental studies and impact statements affecting major watersheds including the Klamath and Upper Deschutes river basins in California and Oregon, which provide critical habitat for spawning salmon and other wildlife.” Goklany instructed Department scientists to write that rising carbon dioxide is beneficial because it “may increase plant water use efficiency” and “lengthen the agricultural growing season,” and urged language that inaccurately suggests lack of consensus on global warming. As described by the *New York Times*, “The final language states inaccurately that some studies have found the earth to be warming, while others have not.” Internally these changes came to be known as “Gok’s uncertainty language.” Marlon Duke, the Bureau of Reclamation’s acting public affairs chief, responds to inquiries concerning the language changes by stating, “Uncertainty is a part of climate modeling, as it is with all scientific modeling.”*

*Hiroki Tabuchi, “A Trump Insider Embeds Climate Denial in Scientific Research,” *New York Times*, March 2, 2020, <https://www.nytimes.com/2020/03/02/climate/goks-uncertainty-language-interior.html>

2020 (March)

Study finds diminishing ability of Amazon tropical forest to sequester carbon; predicts similar trends in Africa.

Scientists publishing in the journal *Nature* begin their report by highlighting the critical role that tropical forests play in capturing carbon from the atmosphere and sequestering it in biomass: “Tropical forests account for approximately one-third of Earth’s terrestrial gross primary productivity and one-half of Earth’s carbon stored in terrestrial vegetation. Thus, small biome-wide changes in tree growth and mortality can have global impacts, either buffering or exacerbating the increase in atmospheric CO₂.” The good news is that globally the amount of

carbon sequestered in forest growth is growing: “Globally, the terrestrial carbon sink is increasing. Between 1990 and 2017 the land surface sequestered about 30% of all anthropogenic carbon dioxide emissions. Rising CO₂ concentrations are thought to have boosted photosynthesis more than rising air temperatures have enhanced respiration, resulting in an increasing global terrestrial carbon sink.” In the Amazon, however, the carbon sink has been diminishing: “recent results from repeated censuses of intact forest inventory plots show a progressive two-decade decline in sink strength primarily due to an increase in carbon losses from tree mortality.” By comparing data from African tropical forests with those of the Amazon, the researchers attempted to determine the environmental drivers of this increased mortality. The analysis found the tropical biomass loss resulted from a combination of direct human impacts – deforestation and degradation [see 2019 (November), 2020 (June),] – and indirect impacts from climate change – atmospheric chemistry and climatic changes. “Given that the intact tropical forest carbon sink is set to end sooner than even the most pessimistic climate driven vegetation models predictor analyses suggest that climate change impacts in the tropics may become more severe than predicted. Furthermore, the carbon balance of intact tropical forests will only stabilize once CO₂ concentrations and the climate stabilizes.”* Senior author Simon Lewis of Leeds University, quoted in *The Guardian*, observes: “We’ve found that one of the most worrying impacts of climate change has already begun. This is decades ahead of even the most pessimistic climate models.”**

*Wannes Hubau, *et al.*, “Asynchronous carbon sink saturation in African and Amazonian tropical forests,” *Nature* 579, 80-87 (2020), <https://www.nature.com/articles/s41586-020-2035-0>

**Fiona Harvey, “Tropical forests losing their ability to absorb carbon, study finds,” *The Guardian*, March 4, 2020, <https://www.theguardian.com/environment/2020/mar/04/tropical-forests-losing-their-ability-to-absorb-carbon-study-finds>; see also, Fred Pearce, “Why ‘Carbon-Cycle Feedbacks’ Could Drive Temperatures Even Higher,” *Yale Environment* 360, April 28, 2020, <https://e360.yale.edu/features/why-carbon-cycle-feedbacks-could-drive-temperatures-even-higher>

2020 (March)

Study finds Greenland lost 600 billion tons of ice in two summer months in 2019

2019 was the hottest year on record for the Arctic. An analysis of satellite data concludes that the ice over land mass lost in two months in 2019 was more than double the estimated 268 billion tons total losses in Greenland from 2002 to 2019. Unlike sea ice, this ice melt contributes directly to sea level rise, enough to raise global ocean levels 2.2 mm.* To put the loss of 600 billion tons in perspective, the *Guardian* notes that “Los Angeles county, which has more than 10 million residents, consumes 1bn tons of water a year.”**

*Isabella Velicogna *et al.*, “Continuity of Ice Sheet Mass Loss in Greenland and Antarctica from the GRACE and GRACE Follow-On Missions,” *Geophysical Research Letters*, Volume 47, Issue 8 (April 28, 2020),

<https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2020GL087291>

**Oliver Milman, “Greenland’s melting ice raised global sea level by 2.2mm in two months,” *The Guardian*, March 19, 2020, <https://www.theguardian.com/science/2020/mar/19/greenland-ice-melt-sea-level-rise-climate-crisis>; see also Damian Carrington, “Polar ice caps melting six times faster than in 1990s,” *The Guardian*, March 11, 2020, <https://www.theguardian.com/environment/2020/mar/11/polar-ice-caps-melting-six-times-faster-than-in-1990s>

2020 (March)

Climate denial morphs into downplaying COVID-19 risks

An analysis by DeSmogBlog reveals a natural connect between climate science denial and COVID science denial. Fossil fuel funded organizations like the American Council on Science and Health (ACSH), the American Enterprise Institute, and the Cato Institute, readily seized the opportunity to raise doubts about the seriousness of COVID-19. On January 29, an American Enterprise Institute scholar claimed “The media is driving the overreaction to the coronavirus.” In February, a writer for the ACSH claimed COVID-19 is “not even close” to as bad as the flu. In March, the Cato Institute labeled estimates of deaths in reported cases by the director general of the World Health Organization “sensationalistic nonsense.” A day later, President Trump called the estimate “really a false number.” DeSmogBlog concludes: “prominent organizations ... fanned the flames of conspiracy theories or confidently promoted complacency when circumstances required rapid action. To be clear: No one should be faulted for failing to foresee precisely how severe of a problem COVID-19 would prove to be. None of us has a crystal ball and few, if any, expected this situation to unfold in this particular way. But these organizations published positions that not only wound up being laden with false reassurances, but they did so based on claims that they made confidently at the time that now appear to have been false or misleading.”

*Sharon Kelly, “Meet the Climate Science Deniers Who Downplayed COVID-19 Risks,” *DeSmogBlog*, March 16, 2020, <https://www.desmogblog.com/2020/03/16/climate-science-deniers-downplayed-covid-19-cato-acsh-aei>; see also, Kaitlyn Weisbrod, “6 Ways Trump’s Denial of Science Has Delayed the Response to COVID-19 (and Climate Change),” *Inside Climate News*, March 19, 2020, <https://insideclimatenews.org/news/19032020/denial-climate-change-coronavirus-donald-trump/>

March (2020)

Three days after a request from the American Petroleum Institute, the Trump Administration EPA suspends enforcement of environmental regulations

The unprecedented policy is a blanket suspension of enforcement and civil penalties for any regulated entity that can show COVID-19 was the cause of a failure to comply with the law. *Inside Climate News* notes that “it is clear that a primary beneficiary will be the oil industry, which sought suspension of its obligations under consent decrees over past air and water pollution violations at its refineries, deferral of requirements on handling of fracking wastewater and a pause in reporting its greenhouse gas emissions and other pollution.” Obama administration EPA chief Gina McCarthy, now president of the Natural Resources Defense Council, characterizes the move as “an open license to pollute.” “The administration should be giving its all toward making our country healthier right now. Instead it is taking advantage of an unprecedented public health crisis to do favors for polluters that threaten public health.”*

*David Hasemyer *et al.*, “Trump’s Move to Suspend Enforcement of Environmental Laws is a Lifeline to the Oil Industry,” *Inside Climate News*, March 27, 2020, <https://insideclimatenews.org/news/27032020/coronavirus-covid-19-EPA-API-environmental-enforcement/>

March (2020)

Trump Administration finalizes reduced motor vehicle fuel economy standards

In what concludes the most controversial and potentially impactful of President Trump’s rollbacks of Obama Administration environmental rulemaking [see 2018 (August), 2019 (June-November)], the March 31 news release announces that “U.S. DOT and EPA Put Safety and

American Families First with Final Rule on Fuel Economy Standards.” Transportation Secretary Elaine Chao asserts that “By making newer, safer, and cleaner vehicles more accessible for American families, more lives will be saved and more jobs will be created... Today, President Trump is keeping his promise to autoworkers made three years ago that he would reinvigorate American auto manufacturing by updating costly, increasingly unachievable fuel economy and vehicle CO2 emissions standards.” President Obama’s rule enacted in 2012 would require carbon dioxide emissions to be ratcheted down by 5% every year until 2026; President Trump’s original proposal in August 2018 would have frozen 2020 emissions until 2026. The final rule, in a concession to environmentalists as well as auto manufacturers which supported lowering emissions, would ratchet down emissions by 1.5% every year until 2026.* Internal government analyses obtained by Senator Thomas Carper indicate that while the average consumer would save between \$977 to \$1,083 on the purchase price of a vehicle under the new rules, they would spend more than \$1,400 on fuel over the lifetime of the car. A Consumer Reports analysis concluded that the added lifetime fuel costs would be \$3200, costing U.S. consumers collectively about \$300 billion.* The internal analyses also concluded that the rule “would lead to the loss of roughly 13,000 jobs in the auto industry in a single year, model year 2029.” The *New York Times* quotes Michael Greenstone, an economist at the University of Chicago who served on President Obama’s Council of Economic Advisers, on the administration’s cost/benefit analysis: “They are monkeying around with the numbers and the benefits, undermining a four-decade commitment to on-the-level cost-benefit analysis that has been in place since the Reagan administration.” *** The state of California and nearly two dozen other states, including Maine, sue to overturn the new standards.**** In 2021, an EPA inspector general’s report will find that while “on paper, the lower emissions standards were signed jointly by the EPA and the Transportation Department’s National Highway Traffic Safety Administration... EPA Administrator Scott Pruitt decided that the NHTSA, and not his own experts, would complete ‘all modeling and analysis on behalf of both agencies.’...The result was that many EPA staffers felt shut out of the process of making one of the agency’s most important rules.”*****

*U.S. Environmental Protection Agency, “U.S. DOT and EPA Put Safety and American Families First with Final Rule on Fuel Economy Standards,” news release, March 31, 2020, <https://www.epa.gov/newsreleases/us-dot-and-epa-put-safety-and-american-families-first-final-rule-fuel-economy-standards>

**Jeff Plungis, “Fuel Economy Rollback Plan Would Cost Consumers, Analysis Says,” *Consumer Reports*, January 23, 2020, <https://www.consumerreports.org/fuel-economy-efficiency/fuel-economy-rollback-plan-would-cost-consumers-analysis-says/>

***Coral Davenport, “Trump Calls New Fuel Economy Rule a Boon. Some Experts See Steep Costs,” *New York Times*, March 31, 2020, <https://www.nytimes.com/2020/03/31/climate/trump-pollution-rollback.html>

****State of California Department of Justice, “Attorney General Becerra Files Lawsuit Challenging Trump Administration’s Reckless Rollback of America’s Clean Car Standards,” press release, May 27, 2020, <https://oag.ca.gov/news/press-releases/attorney-general-becerra-files-lawsuit-challenging-trump-administration>

*****Dino Grandoni, “Trump administration sidelined experts in writing car pollution rules, EPA watchdog finds,” *Washington Post*, April 21, 2021, <https://www.washingtonpost.com/climate-environment/2021/04/21/trump-administration-sidelined-experts-writing-car-pollution-rules-epa-watchdog-finds>

2020 (April)

Federal appeals court restores Obama administration regulation of HFCs

The U.S. Court of Appeals for the District of Columbia Circuit holds that the Trump Administration failed to follow proper procedures for public notice and comment in its decision to remove restrictions on use of hydrofluorocarbons (HFCs), greenhouse gases used to replace

ozone-depleting chlorofluorocarbons (CFCs) in refrigeration and air conditioning. [see 2013 (June) and 2018 (October)]. HFCs are 10,000 times more potent as a greenhouse gas than carbon dioxide. *Inside Climate News* observes: “This week’s ruling ensures that as supermarkets and other users of older, highly potent CFC refrigerants update their cooling and air conditioning systems, they switch to newer, climate friendly alternatives rather than highly potent HFCs. The ruling comes on the heels of a recent study that found continued CFC use is far larger than previously thought, suggesting there are still large numbers of supermarkets and other commercial buildings that could leapfrog from older CFC chemicals to the latest generation of more benign refrigerants.”* In the year-end omnibus legislation, Congress agrees to phase down production and consumption of HFCs 85% by 2036.**

*Phil McKenna, “U.S. Appeals Court in D.C. Restores Limitations on Super-Polluting HFCs,” *Inside Climate News*, April 9, 2020, <https://insideclimatenews.org/news/09042020/us-appeals-court-dc-restores-limitations-super-polluting-hfcs/>

**Harvard Environmental and Energy Law Program, “Hydrofluorocarbons and Kigali Amendment to Montreal Protocol,” December, 2020 update, <https://eelp.law.harvard.edu/2017/09/hydrofluorocarbons-and-kigali-amendment-to-montreal-protocol/>

2020 (April)

Federal appeals court questions 2017 Trump rule barring federal grant recipients from serving on scientific advisory panels, sends to lower court for review

A three judge panel of the U.S. Court of Appeals for the District of Columbia Circuit unanimously agrees that the highly controversial policy instituted by EPA Commissioner Scott Pruitt [see 2017 (October)] is reviewable, and likely legally insupportable. Judge David Tatel observes: “Even the Directive itself agrees that ‘it is in the public interest to select the most qualified, knowledgeable, and experienced candidates’, yet the Directive nowhere confronts the possibility that excluding grant recipients — that is, individuals who EPA has independently deemed qualified enough to receive competitive funding — from advisory committees might exclude those very candidates.” “Of course,” the decision concludes, “nothing prevents EPA from developing an appointment policy that excludes individuals it previously allowed to serve. To do so, however, EPA must explain the basis for its decision. Because the Directive contains no discussion of ... EPA’s prior conclusion at all, the Directive ‘cross[ed] the line from the tolerably terse to the intolerably mute.’”*

*Pamela King, “D.C. Circuit hands down ‘resounding win for science’” *E&E News*, April 21, 2020,

<https://www.eenews.net/stories/1062934583>, *Physicians for Social Responsibility v. Wheeler* (D.C. Cir. 2020),

<https://www.psr.org/wp-content/uploads/2020/04/science-advisory-board-opinion.pdf>; for background see Joe Goffman and Laura Bloomer, “DC Circuit Weighs in on EPA’s Science Mandates,” Harvard Environmental and Energy Law Program, May 7, 2020, <https://eelp.law.harvard.edu/2020/05/dc-circuit-weighs-in-on-epas-science-mandates/>

2020 (May)

Scientist survey suggests sea level rise by 2100 of 1 meter or more under high emissions scenario

In a survey published in the journal *npj Climate and Atmospheric Science*, 100 climate scientists around the world specializing in sea level rise conclude that the rise is happening faster than suggested in the Fifth Assessment of the Intergovernmental Panel on Climate Change. Without substantial reductions in greenhouse gas emissions, this survey suggests that sea levels could

reach 1 meter (0.63–1.32 m) by 2100, and possibly over 5 meters (1.67–5.61 m) by 2300.* Co-author Stefan Rahmstorf, from the Potsdam Institute for Climate Impact Research in Germany, notes the impact on major coastal cities: “A global sea-level rise by several metres would be detrimental for many coastal cities such as Miami, New York, Alexandria, Venice, Bangkok, just to name a few well-known examples. Some may have to be abandoned altogether as they cannot be defended.” **

*Benjamin P. Horton, *et al.*, “Estimating global mean sea-level rise and its uncertainties by 2100 and 2300 from an expert survey,” *npj Climate and Atmospheric Science*, v. 3, no. 18 (2020), <https://www.nature.com/articles/s41612-020-0121-5>

**Jonathan Watts, “Sea levels could rise more than a metre by 2100, experts say,” *The Guardian*, May 8, 2020, <https://www.theguardian.com/environment/2020/may/08/sea-levels-could-rise-more-than-a-metre-by-2100-experts-say>

2020 (May)

Study confirms longstanding suspicion: stronger, more frequent storms are the result of human-caused global warming

A study by researchers at the National Oceanic and Atmospheric Administration and the University of Wisconsin at Madison is the first to find a statistically significant global trend linking severity of tropical storms to warming surface air temperatures. The study finds that the likelihood that a given tropical cyclone will become a Category 3 or greater storm has increased by about 8 percent per decade, as the atmosphere warms.* As summarized in the *Washington Post*, “The findings are consistent with what scientists expect to happen as the world warms, given that hurricanes get their energy from warm ocean waters and water vapor in the air, among other factors. Importantly, the observed, statistically significant trends match projections seen in computer model simulations of a warming world.”**[see 2020 December]

*James P. Kossin, *et al.*, “Global increase in major tropical cyclone exceedance probability over the past four decades,” *Proceedings of the National Academy of Sciences*, v. 117, no. 22 (2020), 11975-11980, <https://doi.org/10.1073/pnas.1920849117>

**Andrew Freedman and James Samenow, “The strongest, most dangerous hurricanes are now far more likely because of climate change, study shows,” *Washington Post*, May 18, 2020, <https://www.washingtonpost.com/weather/2020/05/18/hurricanes-stronger-climate-change/>

2020 (May)

Renewables eclipse coal in U.S. electricity production

President Trump’s promise to bring back “beautiful, clean coal” was just hot air. Coal fares worse under President Trump than under President Obama, as the *Wall Street Journal* summarizes: “The use of coal to generate electricity in the U.S. is expected to fall more than a third during Mr. Trump’s first term, data from the U.S. Energy Information Administration show, as a glut of cheap natural gas unlocked due to fracking and increasingly competitive wind and solar sources gained market share. More than half of that drop happened before the new coronavirus outbreak. That compares with a decline of about 35% in coal consumed for power generation during Mr. Obama’s eight years in office... In the power sector, the EIA expects coal will generate just 20% of U.S. electricity this year, down from 31% in 2016. Another 20% is forecast to come from renewables, up from around 15% four years ago.” The *Journal* quotes Karla Kimrey, previously a vice president at Wyoming-based coal producer Cloud Peak Energy Inc., which filed for bankruptcy protection last year: “Coal isn’t coming back. You can’t legislate it.”* The *New York*

Times summarizes the impact for climate change: “Coal is the dirtiest of all fossil fuels, and its decline has already helped drive down United States carbon dioxide emissions 15 percent since 2005. This year, the agency expects America’s emissions to fall by another 11 percent, the largest drop in at least 70 years. While the pandemic has made these projections uncertain, the decline is expected to come partly because Americans aren’t driving as much, but mainly because coal plants are running less often.”**

*Rebecca Elliott and Jonathan Randles, “Trump’s Promise to Revive Coal Thwarted by Falling Demand, Cheaper Alternatives,” September 16, 2020, <https://www.wsj.com/articles/trumps-promise-to-revive-coal-thwarted-by-falling-demand-cheaper-alternatives-11600269350>

**Brad Plumer, “In a First, Renewable Energy Is Poised to Eclipse Coal in U.S.,” *New York Times*, May 13, 2020, <https://www.nytimes.com/2020/05/13/climate/coronavirus-coal-electricity-renewables.html>

2020 (May)

Carbon dioxide levels measured at record high monthly average of 417.2 ppm

When these measurements from the Mauna Loa Observatory in Hawaii were first started by Charles D. Keeling in 1958, carbon dioxide was at 313 parts per million. [see 1976] The “Keeling Curve” continues to climb, the pandemic notwithstanding. *Inside Climate News* quotes the son of Charles Keeling, Ralph Keeling, who now runs the Scripps Oceanography CO2 program: “This is a measure of humanity overwhelming nature.” “The short-term throttling of emissions during the coronavirus pandemic didn’t even show up as a blip, scientists said, adding that the readings are important because they help explain that fossil fuel pollution is changing the climate dangerously, and faster than expected.”*

*Bob Berwyn, “Fossil Fuel Emissions Push Greenhouse Gas Indicators to Record High in May,” *Inside Climate News*, June 5, 2020, <https://insideclimatenews.org/news/05062020/fossil-fuel-emissions-mauna-loa-keeling-curve-coronavirus-hawaii/>

2020 (June)

Siberia burns, breaks temperature records

On June 20, the northeastern Siberian town of Verkhoyansk set a likely record for the highest temperature documented in the Arctic Circle, with a reading of 100.4 degrees (38 Celsius); records had been kept in Verkhoyansky since 1885.* As Brian Kahn writes for *Earther*, “Siberia has been the most abnormally hot place on Earth all year, and continued pulses of heat are expected to ripple across the region through at least mid-July. Remote fires have been nearly impossible to control and monitor. The coronavirus has made matters worse, with people escaping from cities and starting fires and firefighters struggling to socially distance while battling blazes.” An estimated 59 million tons of carbon dioxide were released from fires in Siberia in June, roughly equivalent to the entire annual emissions of Portugal.** By September the count for the first six months of 2020 was 244 million tons emitted across the Arctic Circle, compared to 181 million tons for the whole of 2019. Most of these fires were in Siberia, with fires in Alaskan and Canadian territories less than last year.*** The NOAA 2020 Arctic Report Card recounts “the numerous ways that climate change continues to disrupt the polar region, with second-highest air temperatures and second-lowest summer sea ice driving a cascade of impacts, including the loss of snow and extraordinary wildfires in northern Russia.”****

*Andrew Freedman, “Hottest Arctic temperature record probably set with 100-degree reading in Siberia,” *Washington Post*, June 23, 2020, <https://www.washingtonpost.com/weather/2020/06/21/arctic-temperature-record-siberia/>

**Brian Kahn, “Siberian Fires Have Released a Record Amount of Carbon This Year,” *Earther*, July 2, 2020, <https://earther.gizmodo.com/siberian-fires-have-released-a-record-amount-of-carbon-1844245153>

***Laura M. Lombrana, “Worst-Ever Arctic Fires Released Record Amount of CO₂,” *Bloomberg Green*, September 3, 2020, <https://www.bloomberg.com/news/articles/2020-09-03/climate-change-arctic-fires-in-2020-released-record-carbon>

****National Oceanic and Atmospheric Administration, *Arctic Report Card: Update for 2020*, December, 2020, <https://arctic.noaa.gov/Report-Card/Report-Card-2020>, press release at <https://www.noaa.gov/media-release/sea-ice-loss-and-extreme-wildfires-mark-another-year-of-arctic-change>,

2020 (June)

Fossil fuel producers and polluters reap benefits from U.S. and global pandemic relief

In the United States, oil and gas interests have obtained billions of dollars in the form of tax breaks, loans, and waivers of the fees normally charged for extracting resources on public lands. As reported in *Yale Environment 360*, “Industries such as oil and gas, coal, aviation, and auto-manufacturing describe the giveaways as necessary to ease the pandemic’s economic pain, but experts say the changes often align with companies’ long-standing agendas of weakening existing environmental rules and taxes, and opposing new ones. And, collectively, the moves threaten to create a dirty, high-carbon legacy that long outlasts the current crisis — one that stands in sharp contrast to the widely noted, but short-lived, dips in greenhouse gas emissions and air pollution that resulted from lockdowns.” Nonprofits Friends of the Earth in the U.S. and InfluenceMap in the U.K. have taken the lead in documenting these efforts. “With decisions being made at warp speed and many meetings held remotely, transparency has been an early casualty. ‘There’s less opportunity for oversight, and less opportunity for public input than you’d see in normal times,’ [InfluenceMap’s Edward] Collins said. ‘Considering the amounts of money and the amounts of regulatory intervention on the table,’ he said, that is deeply worrying.”*

*Beth Gardiner, “In Pandemic Recovery Efforts, Polluting Industries Are Winning Big,” *Yale Environment 360*, June 23, 2020, <https://e360.yale.edu/features/in-pandemic-recovery-efforts-polluting-industries-are-winning-big>

2020 (June)

Amazon deforestation escalates under the pandemic

In 2019, Brazil President Jair Bolsonaro oversaw the highest rate of deforestation in the Amazon since 2008 [see 2019 (November)]. With Brazil facing the rages of a pandemic in 2020, the destruction of the tropical forest soars even more. As reported in the *New York Times*, “An estimated 464 square miles of Amazon tree cover was slashed from January to April, a 55 percent increase from the same period last year and an area roughly 20 times the size of Manhattan, according to Brazil’s National Institute for Space Research, a government agency that tracks deforestation with satellite images....Government officials and environmental activists say the rise in deforestation is being driven by a prevailing sense among illegal loggers and miners that tearing down the rainforest carries minimal risk of punishment and yields significant payoff.”

*Ernesto Londoño, Manuela Andreoni and Leticia Casado, “Amazon Deforestation Soars as Pandemic Hobbles Enforcement,” *New York Times*, June 6, 2020, <https://www.nytimes.com/2020/06/06/world/americas/amazon-deforestation-brazil.html>, see also Sue Branford and Thais Borges, “Brazil guts agencies, ‘sabotaging environmental protection’ in Amazon: Report,” *Mongabay*, February 1, 2021, <https://news.mongabay.com/2021/02/brazil-guts-agencies-sabotaging-environmental-protection-in-amazon-report/>

2020 (July)

Presidential candidate Joe Biden unveils \$2 trillion climate plan

Biden's "Plan to Build a Modern, Sustainable Infrastructure and an Equitable Clean Energy Future" is an infrastructure, jobs creation, and climate plan all rolled into one, with a consistent aim to restore union jobs, and remedy social and environmental disparities. Pledging to see that the U.S "Builds Back Better," his plan is described as "the most ambitious and aggressive environmental agenda in US history if it were enacted."* In unveiling the plan Biden makes it clear that climate concerns will be integral to a multifaceted plan to restore the economy after the pandemic: " 'Here we are now with the economy in crisis, but with an incredible opportunity not just to build back to where we were before, but better, stronger, more resilient, and more prepared for the challenges that lie ahead. And there is no more consequential challenge that we must meet in this next decade than the onrushing climate crisis.' " ** The plan aims to put the U.S on "an irreversible path to achieve net-zero emissions, economy-wide, by no later than 2050" and draws a stark comparison with Donald Trump's "devastating pattern of denying science and leaving our country unprepared and vulnerable." Biden calls for zero carbon pollution in the electricity sector by 2035, a million new jobs building electric vehicles and charging stations, retrofitting existing buildings and constructing new ones to make the housing sector energy efficient, zero emissions public transit vehicles and infrastructure for pedestrian and bicycle travel, and ensuring that 40 percent of the benefits of spending on green initiatives goes to disadvantaged communities.*** Biden's plan is substantially more specific than the Green New Deal [2019 (February)], but more conservative in its goals; Biden stops well short of the Green New Deal's aim to eliminate the U.S. contribution to climate change in ten years.**** Holman Jenkins' opinion in the *Wall Street Journal* contends, "Mr. Biden offered no real thoughts on climate science or policy. His speech was a triangulation of hot buttons, an invitation to spend money, lots of it. That's why greens climbed aboard despite its defense of nuclear, its call for carbon capture (which would keep oil, gas and coal in business), its refusal to denounce fracking. Mr. Biden promises to spend \$2 trillion over four years. That's all they needed to hear."*****

*Umair Irfan, "We asked Joe Biden's campaign 6 key questions about his climate change plans," *Vox*, October 22, 2020,

<https://www.vox.com/21516594/joe-biden-climate-change-covid-19-president>

**Dan Gearino *et al.*, "Biden's \$2 Trillion Climate Plan Promotes Union Jobs, Electric Cars and Carbon-Free Power," *Inside Climate News*, July 15, 2020, <https://insideclimatenews.org/news/15072020/joe-biden-climate-plan-coronavirus-build-back-better/>

***Biden/Harris campaign, "The Biden Plan to Build a Modern, Sustainable Infrastructure and an Equitable Clean Energy Future," <https://joebiden.com/clean-energy>

****Dino Grandoni, "The Energy 202: This is how Biden's climate plan stacks up to the Green New Deal," *Washington Post*,

October 9, 2020, <https://www.washingtonpost.com/politics/2020/10/09/energy-202-this-is-how-biden-climate-plan-stacks-up-green-new-deal/>

*****Holman Jenkins, "Biden's Climate Plan Is Serious—About Green Pork," *Wall Street Journal*, July 17, 2020,

<https://www.wsj.com/articles/bidens-climate-plan-is-seriousabout-green-pork-11595024735>

2020 (July)

Facebook called out on spreading climate disinformation, squelching scientists

E&E News reports that Facebook "appears to be weakening a firewall it has built to fact-check ... climate denialism," and estimates that "in recent weeks, tens of thousands of people have been

exposed to misleading and false claims about rising temperatures.” Particularly concerning is its treatment of Katharine Hayhoe, of Texas Tech University and a lead author of the Fourth National Climate Assessment, described as “one of the country’s most visible climate scientists.” “She has been blocked from promoting videos related to climate research, a move that has limited her efforts to refute false claims. Facebook has previously identified Hayhoe’s educational climate videos as “political.” As a result, they are categorized by the platform as a social issue that requires Hayhoe to register them by in part providing personal information that she fears could expose her to personal attacks.” In speaking with *E&E News* Hayhoe says that Facebook has been a way “to share science with [people who might be skeptical of climate change] that doesn’t feel like a political attack... Placing her work on the same level as groups that seek to confuse the public about climate science gives climate denial organizations equal footing that’s unwarranted, she said.” Examples of efforts to confuse the public identified by *E&E News* include: “our Oceans, all of them, are benefitting enormously by the increase in carbon dioxide which man’s industrialization has produced. The global warming scaremongers have falsely preached that additional carbon dioxide could lower the pH of the oceans to where they become acidic, killing off ocean life” (Committee for a Constructive Tomorrow); “If you believe that sea level rise is a massive problem, you’ve bought into the corporate media’s alarmist narrative” (The Heartland Institute); “Had the Green New Deal been enacted 20 years ago, we might have been looking at a million dead from COVID due to mass transit use” (Texas Public Policy Foundation).^{*} Facebook holds firm on its policy to exempt climate denial, classified as “opinion,” from its external fact-checking system, saying that it “prioritizes handling of misinformation that poses an immediate threat of harm, like bogus coronavirus cures or hate speech that could incite violence” over climate misinformation. In September, Facebook launches a “climate science information center to elevate credible sources on climate change, as critics question its role in the spread of misinformation on the issue. Facebook said the project is modeled on its COVID-19 Information Center, and launched a similar feature last month on voting in preparation for U.S. elections in November.”^{**} The nonprofit InfluenceMap determines that “Climate denial groups have used Facebook to spread disinformation to millions of people in the lead-up to the 2020 elections...on the cheap.” Fifty-one climate disinformation ads from nine organizations targeted to older men in rural areas were viewed an estimated 8 million times. “All for the cost of \$42,000.”^{***}

^{*}Scott Waldman, “Denial expands on Facebook as scientists face restrictions,” *E&E News*, July 6, 2020,

<https://www.eenews.net/stories/1063511857>; see also, Veronica Penney, “How Facebook Handles Climate Disinformation,” *New York Times*, July 14, 2020, <https://www.nytimes.com/2020/07/14/climate/climate-facebook-fact-checking.html>

^{**} Foo Yun Chee and Katie Paul, “Facebook launches climate science info center amid fake news criticism,” *Reuters*, September 15, 2020, <https://www.reuters.com/article/facebook-climatechange-int/facebook-launches-climate-science-info-center-amid-fake-news-criticism-idUSKBN2660M5>

^{***}Scott Waldman, “Climate falsehoods reached millions on Facebook,” *E&E News*, October 8, 2020, <https://www.eenews.net/stories/1063715769>

2020 (July)

Trump Administration revision of NEPA rules bars consideration and disclosure of climate impacts from major federal actions

The Council on Environmental Quality (CEQ) rightly claims a “comprehensive update...for the first time in over 40 years” to regulations under the landmark National Environmental Policy Act.

[see 1970]* Buried on page 72 of the 73 page *Federal Register* notice is a redefinition of the causal connection that would require federal agencies to review and disclose the environmental impacts of “major federal actions:” “Effects or impacts means changes to the human environment from the proposed action or alternatives that are reasonably foreseeable and have a reasonably close causal relationship to the proposed action ... A “but for” causal relationship is insufficient to make an agency responsible for a particular effect under NEPA. Effects should generally not be considered if they are remote in time, geographically remote, or the product of a lengthy causal chain. Effects do not include those effects that the agency has no ability to prevent due to its limited statutory authority or would occur regardless of the proposed action.”** Gone, then, is the mandate, or even the discretion, to consider long term cumulative effects of a highway project that will contribute to greenhouse gas emissions, or a newly licensed refinery adding to cumulative pollutant load on a low-income neighborhood. The *New York Times* quotes Brett Hartl of the Center for Biological Diversity: “This may be the single biggest giveaway to polluters in the past 40 years.”***

*U.S. Council on Environmental Quality, NEPA Regulations, <https://ceq.doe.gov/laws-regulations/regulations.html>

**U.S. Council on Environmental Quality, “Update to the Regulations Implementing the Procedural Provisions of the National Environmental Policy Act,” *Federal Register* 85 (July 16, 2020): 43304-43376, <https://www.govinfo.gov/content/pkg/FR-2020-07-16/pdf/2020-15179.pdf>

***Lisa Friedman, “Trump Weakens Major Conservation Law to Speed Construction Permits,” July 15, 2020, <https://www.nytimes.com/2020/07/15/climate/trump-environment-nepa.html>

2020 (July)

Federal court strikes down Trump Administration repeal of Obama Methane Waste Prevention rule

U.S. District Judge Yvonne Gonzalez Rogers, in the District of California, holds that the Trump Administration’s rulemaking process in rolling back the Obama Administration’s effort to reduce fugitive methane emissions from drilling on federal lands [see 2018 (September)] was “wholly inadequate:” “In its haste, BLM [Bureau of Land Management] ignored its statutory mandate under the Mineral Leasing Act, repeatedly failed to justify numerous reversals in policy positions previously taken, and failed to consider scientific findings and institutions relied upon by both prior Republican and Democratic administrations.” The court concludes: BLM “was required to provide its reasoned explanation for its abrupt reversal as to the findings in the Waste Prevention Rule and to comply with its obligations under NEPA [National Environmental Policy Act] by considering the impacts of its rulemaking on the environment both thoroughly and thoughtfully. Instead, in its zeal, BLM simply engineered a process to ensure a preordained conclusion. ... Where a court has found such widespread violations, the court must fulfill its duties in striking the defectively promulgated rule.”*

*State of California v. David Bernhardt, Case No. 4:18-cv-05712-YGR (N.D. Cal. 2020), <http://blogs.edf.org/climate411/files/2020/07/BLM-WPR-Opinion.pdf>

2020 (July)

Good and bad news on projected warming when carbon dioxide levels double

In a study characterized as "the most important climate science paper that's come out in several years," scientists reassess predictions of "climate sensitivity."* That is the estimate of how much the earth will warm when carbon dioxide levels reach twice the preindustrial level of 280 ppm, or about 560 ppm. In the landmark 1979 Charney Report, the estimate was a range between 1.5 to 4.5 degrees Celsius, or 2.7 to 8.1 degrees Fahrenheit. [see 1979 (July)]. The 2014 Fifth Assessment by the Intergovernmental Panel on Climate Change concluded that the "likely" result was precisely the same range that the Charney Report estimated in 1979. [see 2014 (November)] The summary of the study published in the journal *Reviews of Geophysics* by a team of 25 scientists with the World Climate Research Programme notes that "In the 40 years since [the Charney Report], it has appeared difficult to reduce this uncertainty range. In this report we thoroughly assess all lines of evidence including some new developments. We find that a large volume of consistent evidence now points to a more confident view of a climate sensitivity near the middle or upper part of this range. In particular, it now appears extremely unlikely that the climate sensitivity could be low enough to avoid substantial climate change (well in excess of 2°C warming) under a high-emission future scenario. We remain unable to rule out that the sensitivity could be above 4.5°C per doubling of carbon dioxide levels, although this is not likely."** The scientists now predict that the earth will warm between 4.9 to 7 degrees Fahrenheit with a doubling of carbon dioxide. As *E&E News* reporter Chelsea Harvey sums up the significance of the new estimate: "On the one hand, the study strikes a blow to a favorite argument used by climate deniers: The uncertainty about climate sensitivity suggests future warming might not actually be that severe. The new report strongly suggests that the best-case sensitivity scenarios — those at the lower end of the old ranges — are probably not in the cards. Still, the revised range doesn't change much when it comes to the international climate goals outlined by the Paris Agreement. Nations worldwide are striving to keep global temperatures within 2 C of their preindustrial levels. To reach that target, world leaders would have to ensure global CO2 concentrations never double at all."*

*Chelsea Harvey, "Groundbreaking study: Earth will warm 4.9 to 7 degrees F," *E&E News*, July 23, 2020, <https://www.eenews.net/stories/1063611707>; see also, Bill McKibben, "How Hot Will the Future Feel?" *The New Yorker*, July 29, 2020, <https://www.newyorker.com/news/annals-of-a-warming-planet/how-hot-will-the-future-feel>

**S.C. Sherwood, et al. "An Assessment of Earth's Climate Sensitivity Using Multiple Lines of Evidence" *Reviews of Geophysics*, v. 58, no. 4 (July 22, 2020), <https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2019RG000678>

2020 (July)

Study suggests the "social costs of carbon" are more than double that set by the Obama Administration, and about 100 times that of the Trump Administration

The "social cost of carbon" is a dollar amount that federal agencies put on the long term economic impact of a ton of carbon pollution. They use this in calculating costs and benefits of executive actions that increase or reduce that pollution [see 2013 (May), 2017 (March), 2018 (September)]. President Obama set that cost at \$45 per ton; President Trump quickly disbanded the task force that determines this estimate, and in rolling back Obama era regulations estimated the cost at between \$1 and \$6 per ton. A new study by an independent team of scientists concludes that the social cost of carbon should actually start at about \$100 to \$200 per ton of carbon dioxide pollution in 2020, increasing to nearly \$600 by 2100. The study reached this conclusion by

updating the models of how carbon pollution impacts temperature, and how, in turn, higher temperatures lead to global economic damages.*[see 2021 (February)]

*Martin C. Hansel, et al., “Climate economics support for the UN climate targets,” *Nature Climate Change*, v. 10, pages781–789 (2020), <https://www.nature.com/articles/s41558-020-0833-x>; Dana Nuccitelli, “The Trump EPA is vastly underestimating the cost of carbon dioxide pollution to society, new research finds,” *Yale Climate Connections*, July 30, 2020, <https://yaleclimateconnections.org/2020/07/trump-epa-vastly-underestimating-the-cost-of-carbon-dioxide-pollution-to-society-new-research-finds/>

2020 (August)

Trump Administration revokes requirement that oil and gas industry monitor and limit methane emissions

Undeterred by judicial rebuke on its effort to deregulate methane emissions on oil and gas leases on federal lands [2020 (July)], the Trump Administration finalizes its rule rescinding Obama Administration requirements that all U.S. oil and gas producers, pipelines and storage units monitor and fix methane leaks. Oil and gas production and distribution is the largest source of methane emissions, a much more potent greenhouse gas than carbon dioxide, though shorter lived. Proceeding with relaxing these standards was controversial, even within the industry. As Timothy Puko reports in the *Wall Street Journal*, “As the drilling boom sent natural-gas production surging, the EPA responded in 2016 with requirements for companies to make plans for reducing emissions at new wells and the pipelines they feed. That included regular checks to close leaky valves, pipelines and tanks in the sprawling network covering millions of miles that supplies home furnaces, power plants, industrial sites and other consumers. Rescinding these requirements was a priority for small-and mid-sized oil-and-gas producers, which say the requirements were so costly to meet that it would be unprofitable to drill in some places. But larger producers, including international giants Exxon Mobil Corp., Royal Dutch Shell PLC and BP PLC, favored retaining the rules, saying a lack of climate regulation undermines their promise that the U.S. natural gas they sell is a cleaner source of energy.”*The Editorial Board of the *Washington Post* points out that “unlike with some environmental regulations that require massive plant retrofits or expensive monitoring, the methane rules’ compliance costs were low, in part because captured methane can be sold...It is a measure of the Trump administration’s allergy to reason that even these modest rules were deemed too burdensome. Rolling back this latest rollback should be top on Democrats’ list if they prevail in November.”**

*Timothy Puko, “EPA to Rescind Methane Regulations for Oil and Gas,” *Wall Street Journal*, August 10, 2020, <https://www.wsj.com/articles/epa-to-rescind-methane-regulations-for-oil-and-gas-11597051802>, see also Timothy Puko, “New EPA Rules Could Raise Bar for Climate-Change Regulations,” *Wall Street Journal*, August 13, 2020, <https://www.wsj.com/articles/new-epa-rules-could-raise-bar-for-climate-change-regulations-11597323600>

**Editorial Board, “The Trump administration’s disastrous policy shift on methane emissions,” *Washington Post*, August 14, 2020, https://www.washingtonpost.com/opinions/methane-emissions-trump-policy/2020/08/14/3728e7de-ddc9-11ea-8051-d5f887d73381_story.html

2020 (August)

Trump Administration announces oil leasing in the Alaskan National Wildlife Refuge

Congress mandated opening part of the Alaskan National Wildlife Refuge (ANWR) to oil drilling within ten years in 2017 legislation, and the Trump Administration plans to sell leases before the end of the year. Oil and gas interests had unsuccessfully lobbied for 30 years to open up the refuge. The Editorial Board of the *Wall Street Journal* commends the development: “Some 92% of ANWR will remain untouched under the Interior plan, and the rest should be protected with extensive drilling protocols. Accidents can happen, but the leases and drilling could provide thousands of new jobs and revenue for Alaska and the federal government.”* Significant doubts remain, however: “Investors question its value, however, as a source of oil, especially in an era of lower crude prices and tepid demand. The industry is glutted with supply world-wide, pushing companies of all sizes to plan deep spending cuts. The reserves in ANWR are uncertain and drilling there appears unpopular with the public. Combined with the sheer expense of entering Arctic wilderness for the first time, it might all chase away several of the major companies that could afford such a capital outlay.”** In a last minute change in December, the Interior Department will cut the area proposed for leases from 1.56 million acres to 457,000 acres, in response to concerns about the impact on a caribou herd.*** Four lawsuits will be filed to block the auction; in January the U.S. District Judge will deny an application for a preliminary injunction.**** The *New York Times* will report that only half of the tracts offered for lease were sold, and all but two of those purchased by the State of Alaska: “Once billed as a potential windfall that, over time, could bring in close to a billion dollars for the federal Treasury, in all the sale netted less than \$15 million, with half of that going to the state.”***** Emily Atkin, MSNBC Opinion Columnist, will describe the Trump Administration’s failure to “sell off one of America's last untouched swaths of wilderness to fossil fuel companies” as “one of the most significant failures of his administration's entire anti-climate agenda — and the first significant win of 2021 for the global climate movement.” Atkins attributes the lack of interest in the sale in large part to the success of the global movement to divest in fossil fuel companies in 2020, including the fact that, under pressure from the divestment movement, all six major U.S. banks pledged not to finance ANWR drilling.*****

*Editorial Board, “An Alaska Oil Opening, at Last,” *Wall Street Journal*, August 17, 2020, <https://www.wsj.com/articles/an-alaska-oil-opening-at-last-11597707908>

**Timothy Puko, “Interior Secretary Approves Oil Drilling in Alaska’s Arctic Refuge,” August 17, 2020, <https://www.wsj.com/articles/interior-secretary-to-approve-oil-drilling-in-alaska-s-arctic-refuge-11597667400>

***Yereth Rosen, “Trump administration cuts size of Arctic land offered for oil auction,” *Reuters*, December 21, 2020, <https://www.reuters.com/article/us-usa-alaska-auction-idUSKBN28V1KF>

****Jessica Corbett, “Biden Is Urged to Ban ANWR Drilling After Court Approves Auction of Fossil Fuel Leases,” *EcoWatch*, January 7, 2021, <https://www.ecowatch.com/anwr-trump-drilling-lease-auction-2649779271.html>

*****Henry Fountain, “Sale of Drilling Leases in Arctic Refuge Fails to Yield a Windfall,” *New York Times*, January 6, 2021, <https://www.nytimes.com/2021/01/06/climate/arctic-refuge-drilling-lease-sales.html>

*****Emily Atkin, “One of Trump's most significant failures is a massive win for the climate movement,” *MSNBC*, January 11, 2021, <https://www.msnbc.com/opinion/one-trump-s-most-significant-failures-massive-win-climate-moment-n1253724>

2020 (August)

Report assesses growing costs of climate-related natural disasters

A report commissioned by the Environmental Defense Fund focuses on the evidence that climate change is increasing the impacts of natural disasters like tropical storms, hurricanes, droughts and floods, and causing costs of those disasters to escalate dramatically. As summarized by *Inside Climate News*, “In the 1980s, the annual average cost of climate and extreme weather disasters in

the United States was about \$18 billion per year. By the 2010s, the total annual cost more than quadrupled, to \$80 billion per year.”* As the Environmental Defense Fund notes on releasing the report, “We are learning the hard way that climate change is a "threat multiplier" making the pandemic, a recession and other challenges to our nation that much harder to fight.”**

*Bob Berwyn, “Paying for Extreme Weather: Wildfire, Hurricanes, Floods and Droughts Quadrupled in Cost Since 1980,” *Inside Climate News*, August 25, 2020, <https://insideclimatenews.org/news/25082020/extreme-weather-costs-wildfire-climate-change/>

**Marcy Lowe and Rebecca Marx, *Climate Change-Fueled Weather Disasters: Costs to State and Local Economics*, Datu Research, August 12, 2020, <https://www.edf.org/sites/default/files/content/report-ClimateChange-FueledWeatherDisasters.pdf>; Environmental Defense Fund, “The rising cost of climate change-fueled extreme weather,” press release, August 12, 2020, <https://www.edf.org/climate/rising-cost-climate-change-fueled-extreme-weather>

2020 (September)

Exxon Mobil removed from the Dow Jones Industrial Average

In a stark indicator of problems in the oil and gas industry, Exxon Mobil suffers what the *Wall Street Journal* calls a “stunning fall from grace,” after nearly 100 years on the Dow Jones index: “Analysts estimate Exxon will lose more than \$1 billion this year, compared with profits of \$46 billion in 2008, then a record by an American corporation. ... At the heart of the problem: Exxon doubled down on oil and gas at what now looks to be the worst possible time. While rivals have begun to pivot to renewable energy, it is standing pat. Investors are fleeing and workers are grumbling about the direction of a company some see as out of touch and stubborn.”*

*Christopher Matthews, “Exxon Used to Be America’s Most Valuable Company. What Happened?” *Wall Street Journal*, September 30, 2020, <https://www.wsj.com/articles/exxon-used-to-be-americas-most-valuable-company-what-happened-oil-gas-11600037243>

2020 (September)

Trump Administration reverses course on East Coast offshore oil and gas drilling

As the *Washington Post* characterizes it, “President Trump, who barely two years ago proposed a vast expansion of oil and gas drilling in U.S. continental waters, on Tuesday made clear there is at least part of the nation’s coastline he is eager to protect: the crucial electoral battleground of Florida.” The administration extends a moratorium on offshore drilling to the eastern Gulf of Mexico, an area that includes Florida’s west coast, as well as expanding it to include the Atlantic coasts of Florida, Georgia and South Carolina.* Days later, the administration acknowledges that permits to allow seismic blasting in the Atlantic ocean, preliminary to drilling operations, will expire next month and not be renewed. The permits had been stayed by a federal lawsuit by nine states and several conservation groups arguing that the seismic blasting would be harmful to endangered whales and other marine mammals.**

*Brady Dennis and Dino Grandoni, “In reversal, Trump to ban oil drilling off coasts of Florida, Georgia and South Carolina,” *Washington Post*, September 8, 2020, <https://www.washingtonpost.com/climate-environment/2020/09/08/reversal-trump-ban-oil-drilling-off-coasts-florida-georgia-south-carolina/>

**Darryl Fears and Dino Grandoni, “Trump plan to allow seismic blasts in Atlantic search for oil appears dead,” October 1, 2020, <https://www.washingtonpost.com/climate-environment/2020/10/01/offshore-drilling-atlantic/>

2020 (September)

Commodities Futures Trading Commission releases first ever government report on impacts of climate change on U.S. financial markets

In the press release announcing the release of the report, CFTC Commissioner Rostin Behnam states, “As we’ve seen in the past few weeks alone, extreme weather events continue to sweep the nation from the severe wildfires of the West to the devastating Midwest derecho and damaging Gulf Coast hurricanes. This trend—which is increasingly becoming our new normal—will likely continue to worsen in frequency and intensity as a result of a changing climate.” Findings of the 196 page report include: “Climate change poses a major risk to the stability of the U.S. financial system and to its ability to sustain the American economy,” and “U.S. financial regulators must recognize that climate change poses serious emerging risks to the U.S. financial system, and they should move urgently and decisively to measure, understand, and address these risks.” Among the report’s recommendations: “Material climate risks must be disclosed under existing law, and climate risk disclosure should cover material risks for various time horizons. To address investor concerns around ambiguity on when climate change rises to the threshold of materiality, financial regulators should clarify the definition of materiality for disclosing medium- and long term climate risks... * There is also some ambiguity about whether this is an “official” report of the Trump Administration. As the *Washington Post* reports: “A senior White House official, who spoke on condition of anonymity, said that while the full commission had voted to produce the report, it has not yet voted to endorse its findings. “It doesn’t represent the position of the C.F.T.C. and is not an official government report,” the official said. The C.F.T.C. subcommittee that authored the report did vote unanimously to endorse it, and it is published on the commission’s website.”**

*Commodities Futures Trading Commission, “CFTC’s Climate-Related Market Risk Subcommittee Releases Report,” press release, September 9, 2020, <https://www.cftc.gov/PressRoom/PressReleases/8234-20>; Bob Litterman et al., *Managing Climate Risk in the U.S. Financial System: Report of the Climate-Related Market Risk Subcommittee, Market Risk Advisory Committee of the U.S. Commodities Futures Trading Commission*, September, 2020,

https://www.researchgate.net/publication/344192525_Managing_Climate_Risk_in_the_US_Financial_System

**Coral Davenport and Jeanna Smialek, “Federal Report Warns of Financial Havoc From Climate Change,” September 8, 2020, <https://www.nytimes.com/2020/09/08/climate/climate-change-financial-markets.html>

2020 (September)

Climate deniers hired to top NOAA posts

David Legates, a University of Delaware professor of climatology, has been hired as the National Oceanic and Atmospheric Administration’s deputy assistant secretary of commerce for observation and prediction, reporting directly to NOAA acting director Neil Jacobs. As National Public Radio reports, “In 2007, Legates was one of the authors of a paper that questioned previous findings about the role of climate change in destroying the habitat of polar bears. That research was partially funded by grants from Koch Industries, the American Petroleum Institute lobbying group and ExxonMobil, according to InsideClimate News. The same year, Delaware Gov. Ruth Ann Minner sent a letter to Legates expressing concern about his opinions on climate change, given that he was the state climatologist at the time. Minner asked him to refrain from casting doubt on climate science when he was acting in his official role. Legates stepped down in 2011. Legates also appeared in a video pushing the discredited theory that the sun is the cause of global warming. In testimony before the U.S. Senate in 2014, Legates argued that a climate science

report by the U.N. Intergovernmental Panel on Climate Change erroneously stated that humans are causing global warming.”* In the same month, vocal critic of climate scientists and journalists Ryan Maue is appointed as NOAA’s chief scientist. For a collection of Maue’s previous tweets, now deleted, including, “Items that many activist scientists don’t need or use: a comb, toothbrush, socks, dandruff shampoo or a mirror” (12/23/17), see *Heated*.** [see 2021 (January)]

*Rebecca Hersher and Joe Palca, “Longtime Climate Science Denier Hired At NOAA,” *NPR*, September 12, 2020, <https://www.npr.org/2020/09/12/912301325/longtime-climate-science-denier-hired-at-noaa>; Sabrina Shankman, “U. of Delaware Refuses to Disclose Funding Sources of Its Climate Contrarian,” *Inside Climate News*, March 19, 2015, <https://insideclimatenews.org/news/19032015/u-delaware-refuses-disclose-funding-sources-its-climate-contrarian>
**Emily Atkin, “NOAA’s new top scientist deletes evidence of his climate views,” *Heated*, November 2, 2020, <https://heated.world/p/noaas-new-top-scientist-deletes-evidence>

2020 (September)

“United in Science” report describes 20% likelihood of reaching 1.5 degrees Celsius above preindustrial times in four years

Described as a “multi-organization high-level compilation of the latest climate science information,” the annual update is organized by the United Nations and includes contributions from six major climate science organizations including the World Meteorological Organization (WMO) and the Intergovernmental Panel on Climate Change. In his introduction to the report, U.S. Secretary Antonio Guterres writes: “The solution to slowing down the rate of global temperature rise and keeping it below 1.5°C is for nations to dramatically cut emissions, with the aim of achieving carbon neutrality by 2050. While emissions fell during the peak of S pandemic confinement measures, they have already mostly recovered to within 5 per cent of the same period in 2019 and are likely to increase further. This report stresses that short-term lockdowns are no substitute for the sustained climate action that is needed to enable us to meet the goals of the Paris Agreement on Climate Change.” Among the report’s predictions, in the WMO chapter: “There is a growing chance of annual global mean near surface temperature temporarily exceeding 1.5 °C above the 1850–1900 pre-industrial level, being ~20% in the 5-year period ending in 2024... Within the next 5 years, the Arctic is predicted to continue to warm at more than twice the overall global rate.”*

*World Meteorological Organization, *United in Science 2020*, September, 2020, https://public.wmo.int/en/resources/united_in_science; Seth Borenstein, “UN report: Increased warming closing in on agreed upon limit,” *AP News*, September 9, 2020, <https://apnews.com/article/climate-climate-change-archive-united-nations-c8c510423f9c5eae18bd5e58f89a9d2a>

2020 (September)

Report shines spotlight on global inequality in greenhouse gas emissions

The report, *Confronting Carbon Inequality*, by Oxfam in conjunction with the Stockholm Environment Institute assesses the consumption emissions of different income groups between 1990 and 2015, 25 years when humanity doubled the amount of carbon dioxide in the atmosphere. Its findings include: “The richest one percent of the world’s population [63 million people] are responsible for more than twice as much carbon pollution as the 3.1 billion people who made up the poorest half of humanity during a critical 25-year period of unprecedented emissions growth.”* Transport is a major component of this inequality: “Governments can tackle

both extreme inequality and the climate crisis if they target the excessive emissions of the richest and invest in poor and vulnerable communities. For example, a recent study found that the richest 10 percent of households use almost half (45 percent) of all the energy linked to land transport and three quarters of all energy linked to aviation. Transportation accounts for around a quarter of global emissions today, while SUVs were the second biggest driver of global carbon emissions growth between 2010 and 2018.”**

*Tim Gore, *Confronting Carbon Inequality* (Oxfam: September 21, 2020), <https://www.oxfam.org/en/research/confronting-carbon-inequality>

**Oxfam, “Carbon emissions of richest 1 percent more than double the emissions of the poorest half of humanity,” press release, September 21, 2020, <https://www.oxfam.org/en/press-releases/carbon-emissions-richest-1-percent-more-double-emissions-poorest-half-humanity>

2020 (September)

Study estimates impact of Trump Administration rollbacks could add 1.8 billion metric tons of carbon dioxide to the atmosphere by 2035

President Trump has repealed or rolled back more than 100 environmental regulations and standards. This study by the Rhodium Group looked at just a subset of these: regulation of methane emissions from oil and gas production and landfills, motor vehicle fuel efficiency rules, and regulation of hydrofluorocarbons in refrigeration and air conditioning. The total potential climate price tag for these rollbacks exceeds the annual greenhouse gas emissions of Germany, Britain and Canada in one year.*

*Hannah Pitt, Kate Larsen, and Maggie Young, *The Undoing of US Climate Policy: The Emissions Impact of Trump-Era Rollbacks* (Rhodium Group, September 17, 2020), <https://rhg.com/research/the-rollback-of-us-climate-policy/>; Nadja Popovich and Brad Plumer, “What Trump’s Environmental Rollbacks Mean for Global Warming,” *New York Times*, September 17, 2020, <https://www.nytimes.com/interactive/2020/09/17/climate/emissions-trump-rollbacks-deregulation.html>

2020 (September)

China pledges to achieve carbon neutrality before 2060

In his speech to the annual meeting of the United Nations General Assembly, President Xi Jinping calls on countries to “achieve a green recovery of the world economy in the post-Covid era...Humankind can no longer afford to ignore the repeated warnings of nature and go down the beaten path of extracting resources without investing in conservation, pursuing development at the expense of protection, and exploiting resources without restoration.” The *New York Times* quotes Todd Stern, the chief United States negotiator at talks for the 2015 Paris Agreement, as calling this “big and important news,” given that China is the world’s number one producer of greenhouse gas emissions.* Reports DW: “Given that global emissions are still rising — despite the pandemic-related slowdown — and in view of the inadequacy of the Paris climate pledges, China’s announcement was widely welcomed as the most important commitment since the 2015 Paris agreement in the push to carbon neutrality by mid-century. ‘It’s like steroids in the move to decarbonization,’ said Niklas Hagelberg, coordinator of the Climate Change Program at the United Nations Environment Program, of the pledge from the world’s largest carbon emitter.” However, China’s five-year economic plan announced in March, 2021, will make “only tepid commitments” toward achieving this goal.** As the *New York Times* will report, “unusually sharp

debate has risen in China over how aggressively it should cut the use of coal, which has fueled its industrial takeoff yet made it the world's top-polluting nation in recent decades.”***

*Somini Sengupta, “China, in Pointed Message to U.S., Tightens Its Climate Targets,” *New York Times*, September 22, 2020, <https://www.nytimes.com/2020/09/22/climate/china-emissions.html>

**Stuart Braun, “Is China's 5-year plan a decarbonization blueprint?” *DW*, March 5, 2021, <https://www.dw.com/en/china-coal-emissions-climate-change/a-56644449>

***Chris Buckley, “The Rock Standing in the Way of China’s Climate Ambitions: Coal,” *New York Times*, March 16, 2021, <https://www.nytimes.com/2021/03/16/world/asia/china-coal-politics.html>; see also, Michael Standaert, “Despite Pledges to Cut Emissions, China Goes on a Coal Spree,” *YaleEnvironment360*, March 24, 2021, <https://e360.yale.edu/features/despite-pledges-to-cut-emissions-china-goes-on-a-coal-spreec>

2020 (October)

U.S. Geological Survey delays, but finally releases, report on threats to polar bears in U.S. Arctic from oil and gas drilling

The *Washington Post* reports that the U.S. Fish and Wildlife Service had been seeking the report for at least three months, after it had been approved by top agency scientists. “The analysis ... finds that 34 percent of the western U.S. Arctic’s maternal [polar bear] dens are on the coastal plain of the Arctic National Wildlife Refuge, which has implications for the Trump administration’s plans to auction oil and gas leases on the refuge. That is the same area the Interior Department approved for leasing in August, which has been off limits to drilling for four decades.” In an email to USGS employees, director James Reilly admitted that he had held up release of the report, but “said it was wrong to suggest he did it ‘solely to benefit the oil and gas industry.’”*

*Juliet Eilperin, “Long-delayed Trump administration study finds that climate change threatens polar bears,” *Washington Post*, October 2, 2020, <https://www.washingtonpost.com/climate-environment/2020/10/02/drilling-polar-bears/>

2020 (October)

Appointment of Amy Coney Barrett to the U.S. Supreme Court threatens a “tectonic court shift on the environment”

An analysis by *YaleEnvironment360* concludes that “the decisive conservative majority that [Judge Barrett’s] confirmation would cement will ... have serious repercussions for the environment and public health, with polluting industries almost certain to get freer rein than they have enjoyed for decades.”* When Senator John Kennedy, of Louisiana, asks Judge Barrett in confirmation hearings if she has an opinion on climate change, she responds: “I’ve read things about climate change. I would not say I have firm views on it.” Responds Bill McKibben, in *The New Yorker*: “It’s hard to imagine that an intelligent and highly educated person, such as Barrett, would not have reached a conclusion on the key questions facing the future of life on earth: Is global warming dangerous, and is it caused by humans? Neither of these positions is controversial among the scientific community, nor, for that matter, in the Catholic community where Barrett makes her spiritual home. Pope Francis’s lengthiest and most important encyclical, ‘Laudato Si,’ [see 2015 (May)] takes on the climate crisis with a philosophical and sociological depth that few others have even attempted. The Pope’s newest encyclical, ‘Fratelli Tutti,’ released this

month, covers much the same ground, and he has helpfully produced a ted talk that makes the point in much sharper terms. ‘We must act now,’ he said, which is what every scientist studying the crisis has said, too.”** More than 70 science and climate journalists join in an opinion in *RollingStone* decrying Barrett’s multiple claims of climate ignorance in the confirmation hearings: “It is frightening that a Supreme Court nominee — a position that is in essence one of the highest fact-checkers in the land — has bought into the same propaganda we have worked so hard to dispel.”***

*Beth Gardiner, “With Justice Barrett, a Tectonic Court Shift on the Environment,” *YaleEnvironment360*, October 26, 2020, <https://e360.yale.edu/features/with-justice-barrett-a-tectonic-court-shift-on-the-environment>

**Bill McKibben, “There’s Nothing Sacred about Nine Justices; a Livable Planet, on the Other Hand . . .,” *The New Yorker*, October 21, 2020, <https://www.newyorker.com/news/annals-of-a-warming-planet/theres-nothing-sacred-about-nine-justices-a-livable-planet-on-the-other-hand>

***Justin Noble and Antonia Juhasz, “More Than 70 Science and Climate Journalists Challenge Supreme Court Nomination of Amy Coney Barrett,” *RollingStone*, October 25, 2020, <https://www.rollingstone.com/politics/political-commentary/amy-coney-barrett-climate-journalists-challenge-supreme-court-nomination-1080453/>

2020 (November)

Joe Biden and Kamala Harris win the U.S. presidential election

Biden wins 306 electoral college votes to Trump’s 232, with Biden’s popular vote count trumping Trump by 7 million. The election promises “a 180-degree turn on climate change and conservation policy.”* Biden “embed[s] climate-minded officials throughout his sprawling transition team.”** John Kerry, Secretary of State under the Obama administration who brokered the Paris Climate Accord, will be Biden’s global climate envoy, with a first ever “climate seat” on the National Security Council. Gina McCarthy, EPA chief under the Obama administration, who spearheaded Obama’s greenhouse gas regulations, will lead a new White House office on domestic climate policy.*** In making cabinet picks, Biden signals “that low-carbon energy and climate policy will be a priority across all major federal agencies.”**** On a cautionary note, Coral Davenport writing for the *New York Times* observes that “President-elect Joseph R. Biden Jr. will use the next four years to try to restore the environmental policies that his predecessor has methodically blown up, but the damage done by the greenhouse gas pollution unleashed by President Trump’s rollbacks may prove to be one of the most profound legacies of his single term.” Davenport quotes Michael Wara, a climate and energy expert at Stanford University: “Because global emissions in 2020 are so much higher than they were 10 or 20 or 30 years ago, that means that a year wasted in the Trump administration on not acting on climate has much bigger consequences than a year wasted in Ronald Reagan or George W. Bush or Bill Clinton’s administration.”*****

*Juliet Eilperin, Dino Grandoni, and Darryl Fears, “A Biden victory positions America for a 180-degree turn on climate change,” *Washington Post*, November 7, 2020, <https://www.washingtonpost.com/climate-environment/2020/11/07/biden-climate-change-monuments/>

**Adam Aton and Jean Chemnick, “Biden stocks landing teams with climate experts,” *E&E News*, November 12, 2020, <https://www.eenews.net/stories/1063718319>

***Coral Davenport and Lisa Friedman, “Biden’s Twin Climate Chiefs, McCarthy and Kerry, Face a Monumental Task,” *New York Times*, December 16, 2020, <https://www.nytimes.com/2020/12/16/climate/gina-mccarthy-john-kerry-climate-adviser.html>

*****E&E News* staff, “Biden’s Cabinet picks could transform energy world,” *E&E News*, November 24, 2020, <https://www.eenews.net/stories/1063719227>

*****Coral Davenport, “What Will Trump’s Most Profound Legacy Be? Possibly Climate Damage,” *New York Times*, November 9, 2020, <https://www.nytimes.com/2020/11/09/climate/trump-legacy-climate-change.html>

2020 (November)

The Federal Reserve warns for the first time of climate risks

The warning comes in its biannual Financial Stability Report. In her statement introducing the report, Federal Reserve Governor Lael Brainard writes: “I welcome the introduction of climate into the FSR [Financial Stability Report]. Climate change poses important risks to financial stability. A lack of clarity about true exposures to specific climate risks for real and financial assets, coupled with differing assessments about the sizes and timing of these risks, can create vulnerabilities to abrupt repricing events. Acute hazards, such as storms, floods, or wildfires, may cause investors to update their perceptions of the value of real or financial assets suddenly. Chronic hazards, such as slow increases in mean temperatures or sea levels, or a gradual change in investor sentiment about those risks, introduce the possibility of abrupt tipping points or significant swings in sentiment. Supervisors expect banks to have systems in place that appropriately identify, measure, control, and monitor their material risks, which for many banks is likely to extend to climate risks.”*

*U.S. Federal Reserve, *Financial Stability Report*, November 9, 2020, Statement of Governor Lael Brainard, <https://www.federalreserve.gov/publications/brainard-comment-20201109.htm>; see also, Ariel Cohen, “Federal Reserve Warns Of Climate Risks, In Historic First,” *Forbes*, November 11, 2020, <https://www.forbes.com/sites/arielcohen/2020/11/11/us-fed-report-acknowledges-climate-change-risks-in-historic-first/>

2020 (November)

Study assesses role of global food system in meeting climate goals

Global greenhouse gas emissions from food production are the equivalent of about 16 billion metric tons of carbon dioxide a year, or 30 percent of total global emissions. These emissions, of methane, carbon dioxide and other gases, come from land clearing and deforestation, digestion by cattle and other livestock, production and use of fertilizers and the cultivation of rice in flooded paddies. A study in the journal *Science* looks at trends in emissions from food production, and concludes that “To have any hope of meeting the central goal of the Paris Agreement, which is to limit global warming to 2°C or less, our carbon emissions must be reduced considerably, including those coming from agriculture. ...[E]ven if fossil fuel emissions were eliminated immediately, emissions from the global food system alone would make it impossible to limit warming to 1.5°C and difficult even to realize the 2°C target. Thus, major changes in how food is produced are needed if we want to meet the goals of the Paris Agreement.”* The study identifies and explores five strategies for reducing greenhouse gas emissions from agriculture: “(i) globally adopting a plant-rich diet ... ; (ii) adjusting global per capita caloric consumption to healthy levels; (iii) achieving high yields by closing yield gaps and improving crop genetics and agronomic practices; (iv) reducing food loss and waste by 50%; and (v) reducing the GHG intensity of foods by increasing the efficiency of production, such as by altering management regimes (e.g., precise use of nitrogen fertilizer and other inputs) or technological implementation (e.g., additives to ruminant feed).” The authors suggest that “Full adoption of all five strategies could result in a food system with marginally negative net cumulative emissions because of lowered emissions and net carbon sequestration on abandoned croplands.”**

*H. Jesse Smith, “Thought for Food,” *Science*, v. 370, no. 6517, November 6, 2020, p. 677,

<https://science.sciencemag.org/content/370/6517/677.3?intcmp=trendmd-sci>

**Michael Clark, et al., “Global food system emissions could preclude achieving the 1.5° and 2°C climate change targets,” *Science*, v. 370, no. 6517, November 6, 2020, pp. 705-708, <https://science.sciencemag.org/content/370/6517/705>; see also, Henry Fountain, “Cutting Greenhouse Gases From Food Production Is Urgent, Scientists Say,” *New York Times*, November 5, 2020,

<https://www.nytimes.com/2020/11/05/climate/climate-change-food-production.html>

2020 (November)

Maine’s Climate Council unveils its Climate Action Plan

In 2019 the Maine legislature under the leadership of Governor Janet Mills enacted a statute setting greenhouse gas emissions goals for the State: to become carbon neutral by 2045, and to reduce annual greenhouse gas emissions to 80% below 1990 levels by 2050.* The plan, *Maine Won’t Wait: A Four-Year Plan for Climate Action*,** focuses on transportation and housing in order to achieve these goals. As summarized by Caitlin Andrews in the *Bangor Daily News*, the plan “recommends increasing the share of electric vehicles in new passenger car sales to 28 percent in 2025 and 100 percent by 2050. It also suggests reducing driving by hitting the state’s goal to connect 95 percent of the state to high-speed internet by 2025, allowing more people to work from home. It recommends doubling the pace of weatherization programs to households to cover 17,500 additional homes and businesses within the next five years, with an end goal of 105,000 by 2050. Over 60,000 upgraded heat pumps have been installed in Maine over the last several years, according to the report, and it recommends the state install another 100,000 by 2025.”*** As noted by Marina Schaufler, reporting in the *Maine Monitor*, “Maine’s status as the nation’s most rural state might strike some people as grounds for a free pass, leaving climate action to settings that generate more carbon pollution. But the state needs to act precisely because its economy is so grounded in natural systems. The rising fossil fuel emissions that disrupt climate will cause disproportionate harm to our farming, fishing and forestry communities.” Schaufler notes that the plan’s “renewed commitment to reduce emissions offers new growth opportunities in natural resource sectors.” Amanda Beal, commissioner of the Maine Department of Agriculture, Conservation and Forestry, describes “the potential of forests, farms and coastal estuaries to absorb and store carbon, making them a ‘part of the solution.’ The state intends to help farmers and foresters adopt practices to better store carbon and increase their land’s capacity to withstand climate disruptions. The plan also advocates a marked increase in local food production, which could help the growing ranks of Maine residents struggling to put food on the table.”****

*38 MRSA sec. 576-A

**Maine Climate Council, *Maine Won’t Wait, A Four-Year Plan for Climate Action*, November, 2020,

<https://climatecouncil.maine.gov/>

***Caitlin Andrews, “Long-awaited Maine climate plan leans on existing initiatives, ducks some funding questions,” *Bangor Daily News*, November 13, 2020, <https://bangordailynews.com/2020/11/13/politics/long-awaited-maine-climate-plan-leans-on-existing-initiatives-ducks-some-funding-questions/>

****Marina Schaufler, “Much to gain – or lose,” *The Maine Monitor*, December 6, 2020, <https://www.themainemonitor.org/sea-change-much-to-gain-or-lose/>

2020 (December)

U.K.-organized virtual Climate Ambition Summit marks fifth anniversary of the Paris Climate Agreement

Prime Minister Boris Johnson's opening remarks for the one day event sound a strong note of "scientific optimism:" "Good afternoon from London, where we are coming to the end of an extraordinary and difficult year, I think with a sudden surge of scientific optimism. Because after barely 12 months of the pandemic, we're seeing the vaccine going into the arms of the elderly and vulnerable, vaccines that have been products each and every one of them of vast international efforts in laboratories around the world. And so my message to you all, is that together we can use scientific advances to protect our entire planet, our biosphere against a challenge far worse, far more destructive even than coronavirus. By the promethean power of our invention we can begin to defend the earth against the disaster of global warming. And by that I mean that together we can reduce our emissions, we can radically cut our dependence on fossil fuels, we can change our agricultural practices, and in short we can reverse the process by which for centuries, humanity has been quilting our planet in a toxic tea-cosy of greenhouse gases. And at the same, we can create hundreds of thousands of jobs, millions of jobs across the planet as we collectively recover from coronavirus. If you doubt our ability to do that, let me tell you that when I was a child of six, this country depended on coal for 70% of our energy needs. That coal dependency is now down to 3% or less and since 1990, the UK has cut our CO2 emissions by 43% - more than any other G20 nation – and yet our economy has grown by 75%."* The fifth anniversary of the Paris Accord inspired the European Union and the United Kingdom to set ambitious new 2030 emission-cutting targets, by 55 percent and 68 percent respectively (both compared to 1990). But Greta Thunberg, in a speech marking the anniversary, remains unimpressed: "We are still speeding in the wrong direction. Distant hypothetical targets are being set. Big speeches are being given. Yet when it comes to the immediate action we need, we are still in a state of complete denial, as we waste our time creating new loopholes with empty words and creative accounting."**

*Prime Minister Boris Johnson, "PM Climate Ambition Summit opening remarks," December 12, 2020,

<https://www.gov.uk/government/speeches/pm-climate-ambition-summit-opening-remarks-12-december-2020>

**Bob Berwyn, "Five Years After Paris, Where Are We Now? Facing Urgent Choices," *Inside Climate News*, December 23, 2020,

<https://insideclimatenews.org/news/23122020/paris-agreement-five-year-anniversary-biden/>; Greta Thunberg, "Paris Agreement Anniversary Speech," December 10, 2020, <https://www.facebook.com/gretathunbergsweden/posts/1299523393748811>

2020 (December)

2020 hurricane season smashes "a trail of broken records"

As summarized in *The Daily Climate*, "This season had the most named storms, with 30, taking the record from the calamitous 2005 season that brought Hurricane Katrina to New Orleans. It was only the second time the list of storm names was exhausted since naming began in the 1950s. Ten storms underwent rapid intensification, a number not seen since 1995. Twelve made landfall in the U.S., also setting a new record. Six of those landfalling storms were hurricane strength, tying yet another record." The likely explanation is a combination of extremely warm surface water temperatures in the Atlantic, Caribbean and Gulf of Mexico, and a *La Niña* pattern of cool surface waters in the Pacific, which weakened the vertical wind shear over the tropical Atlantic. *The Daily Climate* explains the connection to climate change: "A growing proportion of high-intensity storms, Category 3, 4 and 5, is being observed around the world, including in the

Atlantic. Since ocean temperature controls the potential intensity of tropical cyclones, climate change is likely behind this trend, which is expected to continue.”*[see 2020 (May)]

*Allison Wing and James Ruppert, “The 2020 Atlantic hurricane season was a record-breaker, and it’s raising more concerns about climate change,” *The Daily Climate*, December 1, 2020, <https://www.dailyclimate.org/climate-change-hurricanes-2020-2649091972/particle-1>

2020 (December)

Report assesses the United States’ “Fair Share” of emissions reductions, given historical contributions and capacity to pay

An analysis released by the U.S. Climate Action Network, based on the work of nonprofits EcoEquity and the Climate Equity Reference Project, attempts to calculate how much of the burden of emissions reductions by 2030, to limit warming to 1.5 degrees Celsius, each country should bear. Its calculation considers historic contribution to greenhouse gases, and ability to bear the costs of reductions. Its conclusion is that the United States has the highest obligation, as it is historically the largest contributor to greenhouse gases, currently second highest to China in annual emissions, and as it is the world’s wealthiest country, “with much of that wealth concentrated in a small elite.” The price tag: “the US fair share of the global mitigation effort in 2030 is equivalent to a reduction of 195% below its 2005 emissions levels, reflecting a fair share range of 173-229%.” 70% of those emissions reductions, the report proposes, should be accomplished by domestic emissions cutbacks, and the remaining 125% through economic and technical assistance to poorer nations to facilitate their reduced emissions.* Bill McKibben, in *The New Yorker*, quotes Tom Athanasiou, of EcoEquity, noting that though many leading countries have committed to reducing their own greenhouse gas emissions, “Not one of these countries has made anything like an adequate move to support ambitious decarbonization and adaptation plans in the developing world. Or even, despite lots of talk, to significantly cut fossil subsidies. In fact, as I’m sure you know, a lot of the covid recovery money has gone to the fossils.”**

*U.S. Climate Action Network, *US Climate Fair Share*, December 2, 2020, <https://usfairshare.org/>

**Bill McKibben, “The Climate Debt the US Owes the World,” *The New Yorker*, December 3, 2020, <https://www.newyorker.com/news/annals-of-a-warming-planet/the-climate-debt-the-us-owes-the-world>

2020 (December)

Danish parliament shuts down new oil and gas licensing in the North Sea, with goal to end fossil fuel production by 2050, and to cut emissions by 70% by 2030

Denmark drilled its first exploratory wells in the North Sea 80 years ago, and is now the largest producer of fossil fuels in the European Union. As reported in *The Guardian*, “Denmark’s 55 existing oil and gas platforms, scattered across 20 oil and gas fields, will be allowed to continue extracting fossil fuels but the milestone decision to end the hunt for new reserves in the ageing basin will guarantee an end to Denmark’s fossil fuel production.” Denmark’s climate minister Dan Jørgensen states: “We’re the European Union’s biggest oil producer and this decision will therefore resonate around the world. We are now putting a final end to the fossil era.” It’s estimated that the decision to phase out oil and gas production will cost the country 1.8 billion

pounds (\$2.48 billion) in lost revenue. * The deal to stop new drilling, which is binding on future administrations, enjoyed support across the political spectrum. Jørgensen tells *The Guardian* that “the centre-right opposition Liberal party also deserved credit for backing the cancellation of the current exploration licensing round, something it had long opposed. ‘This is an example of what has changed in Danish politics, that we now really do have a broad support for the green transformation,’ he said. ‘Political parties that a decade ago would have never even have thought about this are now on board.’”**

*Jillian Ambrose, “Denmark to end new oil and gas exploration in North Sea,” *The Guardian*, December 4, 2020, <https://www.theguardian.com/business/2020/dec/04/denmark-to-end-new-oil-and-gas-exploration-in-north-sea>

**Richard Orange, “The Danish climate minister closing down the oil industry for good,” *The Guardian*, December 5, 2020, <https://www.theguardian.com/world/2020/dec/05/the-danish-climate-minister-closing-down-the-oil-industry-for-good>

2020 (December)

Study finds that human-created material surpasses all global living biomass this year for the first time

As summarized in the study published in *Nature* by a team led by Emily Elhacham at the Weizmann Institute of Science in Israel, “Earth is exactly at the crossover point; in the year 2020 (± 6), the anthropogenic mass, which has recently doubled roughly every 20 years, will surpass all global living biomass. On average, for each person on the globe, anthropogenic mass equal to more than his or her bodyweight is produced every week. This quantification of the human enterprise gives a mass-based quantitative and symbolic characterization of the human-induced epoch of the Anthropocene.”* Bill McKibben, writing in *The New Yorker*, notes that this is “a study so remarkable that we should just pause and absorb it...[O]ur built environment now weighs more than all the living things, including humans, on the globe. Buildings, roads, and other infrastructure, for instance, weigh about eleven hundred gigatons, while every tree and shrub, set on a scale, would weigh about nine hundred gigatons. We have nine gigatons of plastic on the planet, compared with four gigatons of animals—every whale and elephant and bee added together. The weight of living things remains relatively static, year to year, but the weight of man-made objects is doubling every twenty years. This means that most of us likely have in our minds a very different and very wrong picture of the relative size of nature and civilization. In 1900, the weight of human-made mass was three per cent of the weight of the natural world; we were a small part of the big picture. No longer. We live on Planet Stuff.”**

*Emily Elhacham, “Global human-made mass exceeds all living biomass,” *Nature*, v. 588, 442-444 (December 17, 2020), <https://doi.org/10.1038/s41586-020-3010-5>

**Bill McKibben, “Our Stuff Weighs More Than All Living Things on the Planet,” *The New Yorker*, December 16, 2020, <https://www.newyorker.com/news/annals-of-a-warming-planet/our-stuff-weighs-more-than-all-living-things-on-the-planet>

2020-2021 (December-January)

Trump administration rushes to complete environmental rollbacks before inauguration day, but moves meet with open staff resistance

Actions include: new cost-benefit rules, applying to all future Clean Air Act regulations, requiring consideration of all the economic costs of curbing an air pollutant, but instructing the

EPA to disregard many of the incidental “co-benefits” that arise, such as illnesses and deaths avoided by a potential regulation;* rules allowing dishwashers, showerheads, and washing machines to use copious amounts of water** and rejecting a recommendation by EPA scientists to set lower standards for fine particulate pollution, or soot, “despite mounting evidence linking air pollution to lethal outcomes in respiratory illnesses, including covid-19, the disease caused by the coronavirus.”*** On January 13, 2021, the Trump EPA issued a surprise final rule on regulating greenhouse gases from stationary sources, in effect a stealth landmine designed to prevent any future greenhouse gas regulation from industrial facilities other than power plants. The rule deviated dramatically from its original published draft, and there was no opportunity for public input on it.**** A *New York Times* investigation details, however, how the Trump administration tried, but failed, to derail the National Climate Assessment, now due out in 2023. As Christopher Flavelle writes, “How the Trump White House attempted to put its mark on the report, and why those efforts stumbled, demonstrates the resilience of federal climate science despite the administration’s haphazard efforts to impede it.”*****The Trump administration’s final regulatory push meets with career staff resistance.*****

*Juliet Eilperin and Brady Davis, “Trump EPA finalizes rollback making it harder to enact new public health rules,” *Washington Post*, December 9, 2020, <https://www.washingtonpost.com/climate-environment/2020/12/09/trump-air-pollution/>; see also EELP Staff, “New Cost-Benefit Rule Hampers EPA’s Ability to Regulate Harmful Air Pollutants,” Harvard Environment and Energy Law Program, January 12, 2021, <https://eelp.law.harvard.edu/2021/01/new-cost-benefit-rule-hampers-epas-ability-to-regulate-harmful-air-pollutants/>; this rule was rescinded by the Biden EPA effective June 14, 2021, as “inadvisable, untethered to the CAA, and not necessary to effectuate the purposes of the Act,” <https://www.federalregister.gov/documents/2021/05/14/2021-10216/rescinding-the-rule-on-increasing-consistency-and-transparency-in-considering-benefits-and-costs-in>. Hannah Perls, writing in the *Vermont Law Review*, provides an excellent summary of the Trump Administration’s environmental regulatory legacy. Hannah Perls, “Deconstructing Environmental Regulation Under the Trump Administration,” *Vermont Law Review* 45 (July, 2021): 591, https://lawreview.vermontlaw.edu/wp-content/uploads/2021/07/05_Perls_Final.pdf

**Todd Frankel, “Trump’s big policy win: Stronger showers, faster dishwashers. It’s something almost no one asked for,” *Washington Post*, December 30, 2020, [Trump’s curious and successful push to roll back rules limiting water use for shower heads, dishwashers and toilets - The Washington Post](https://www.washingtonpost.com/climate-environment/2020/12/30/trump-curios-and-successful-push-to-roll-back-rules-limiting-water-use-for-shower-heads-dishwashers-and-toilets-the-washington-post/); the Biden Administration would ultimately reverse these regulatory actions. See Juliet Eilperin, Brady Dennis and John Muyskens, “Tracking Biden’s environmental actions,” *Washington Post*, January 3, 2023, <https://www.washingtonpost.com/graphics/2021/climate-environment/biden-climate-environment-actions/>

***Juliet Eilperin and Brady Davis, “Trump administration rejects tougher standards on soot, a deadly air pollutant,” *Washington Post*, <https://www.washingtonpost.com/climate-environment/2020/12/07/trump-air-pollution/>; the Biden Administration would still be working on these standards in 2023: Maxine Joselow, “Biden administration to miss deadlines on major environmental rules,” *Washington Post*, January 5, 2023, <https://www.washingtonpost.com/politics/2023/01/05/biden-administration-miss-deadlines-major-environmental-rules/>

****Alex Guillen, “Trump’s EPA launches surprise attack on Biden’s climate rules,” *Politico*, January 13, 2021, <https://www.politico.com/news/2021/01/12/trump-epa-biden-climate-rules-458280>

This is one of the many rules that will be reassessed under Biden’s January 20, 2021 Executive Order, and on April 5, 2021 the D.C.Circuit Court of Appeals will vacate the rule and remand it to the EPA. See Harvard Environmental and Energy Law Program, Power Plant Regulation, Regulatory Tracker, <https://eelp.law.harvard.edu/2017/09/ghg-new-source-performance-standards-for-power-plants/> for a summary of the significance of this rule and subsequent developments.

*****Christopher Flavelle, “How Trump Tried, but Largely Failed, to Derail America’s Top Climate Report,” *New York Times*, January 1, 2021, <https://www.nytimes.com/2021/01/01/climate/trump-national-climate-assessment.html>

***** Lisa Friedman, “E.P.A.’s Final Deregulatory Rush Runs Into Open Staff Resistance,” *New York Times*, November 27, 2020, <https://www.nytimes.com/2020/11/27/climate/epa-trump-biden.html>; see also, Marianne Lavelle, “The Resistance: In the President’s Relentless War on Climate Science, They Fought Back,” *Inside Climate News*, December 27, 2020, <https://insideclimatenews.org/news/27122020/trump-climate-science-epa-wheeler-biden/>

2021 (January)

U.S. greenhouse gas emissions down more than 10% in 2020, largely due to Covid restrictions’ impact on travel

Emissions reached the lowest level in more than three decades, according to an estimate by the Rhodium Group. As summarized in the *New York Times*, “Transportation, the nation’s largest source of greenhouse gases, saw a 14.7 percent decline in emissions in 2020 as millions of people stopped driving to work and airlines canceled flights. While travel started picking up again in the latter half of the year as states relaxed their lockdowns, Americans drove 15 percent fewer miles over all last year than they did in 2019 and the demand for jet fuel fell by more than one-third.”*

*Kate Larsen, Hannah Pitt, and Alfredo Rivera, “Preliminary US Greenhouse Gas Emissions Estimates for 2020,” *Rhodium Group*, January 12, 2021, <https://rhg.com/research/preliminary-us-emissions-2020/>; Brad Plummer, “Covid-19 Took a Bite From U.S. Greenhouse Gas Emissions in 2020,” *New York Times*, January 12, 2021, <https://www.nytimes.com/2021/01/12/climate/2020-greenhouse-gas-emissions.html>

2021 (January)

2020 global temperatures tie the record high of 2016, despite 7% drop in emissions

Jointly released assessments of NASA, Berkeley Earth, the U.K. Met Office, and the National Oceanic and Atmospheric Administration report that the annual average global surface temperature in 2020 tied the modern record at about 1°C above the 1951-80 average, or 1.25°C above the preindustrial level. As reported by Paul Voosen in the journal *Science*, “Although the global economic slowdown of the COVID-19 pandemic cut carbon dioxide (CO₂) emissions by some 7%, atmospheric CO₂ is long-lived, and warming from previous emissions was preordained. In any case, the drop in emissions is unlikely to last. Later this year, in May, before photosynthesis in the Northern Hemisphere draws down CO₂, the U.K. Met Office predicts that levels of atmospheric CO₂ will pass 417 parts per million for several weeks, 50% higher than preindustrial levels.” It is particularly concerning that 2020 hit record warmth without a powerful El Niño to propel it: “The annual update of global surface temperatures—an average of readings from thousands of weather stations and ocean probes—shows 2020 essentially tied records set in 2016. But the years were nothing alike. Temperatures in 2016 were boosted by a strong El Niño, a weather pattern that warms the globe by blocking the rise of cold deep waters in the eastern Pacific Ocean.” In late 2020 however, the Pacific shifted to the opposite phase from an El Niño, called La Niña, which has a cooling effect. The fact that global temperatures warmed despite the cooling influence from the La Niña “is an unwelcome surprise, says Nerilie Abram, a climate scientist at Australian National University. ‘It makes me worried about how quickly the global warming trend is growing.’” * James Hansen at Columbia University’s Earth Institute and colleagues express similar concerns: “Global surface temperature in 2020 was in a virtual dead-heat with 2016 for warmest year in the period of instrumental data in the Goddard Institute for Space Studies (GISS) analysis. The rate of global warming has accelerated in the past several years. ...The six warmest years in the GISS record all occur in the past six years, and the 10 warmest years are all in the 21st century. Growth rates of the greenhouse gases driving global warming are increasing, not declining.” ** An overview of 2020 global temperatures and climate impacts in the *Washington Post* notes that “another year as hot as 2016 coming so soon suggests a swift step up the climate escalator. And it implies that a momentous new temperature record — breaching the critical 1.5 degrees Celsius (2.7 degrees Fahrenheit) warming threshold for the first time — could occur as soon as later this decade.” ***

*Paul Voosen, “Global temperatures in 2020 tied record highs,” *Science*, January 14, 2021,

<https://www.sciencemag.org/news/2021/01/global-temperatures-2020-tied-record-highs>

**James Hansen, et al., “Global Temperature in 2020,” *Climate Science, Awareness and Solutions (CSAS)*, Columbia University Earth Institute, January 14, 2021,

http://www.columbia.edu/~jeh1/mailings/2021/20210114_Temperature2020.pdf

***Chris Mooney, Andrew Freedman and John Muyskens, “2020 rivals hottest year on record, pushing Earth closer to a critical climate threshold,” *Washington Post*, January 14, 2021, <https://www.washingtonpost.com/climate-environment/interactive/2021/2020-tied-for-hottest-year-on-record>

2021 (January)

Annual U.S. disaster costs doubled in 2020

Disaster costs estimated by Munich Re for the United States were the third-highest losses since 2010, causing \$95 billion in damage, almost double the amount in 2019. Almost half of the damage was from hurricanes, followed by convective storms such as thunderstorms and tornados, and by wildfires. As Christopher Flavelle reports in the *New York Times*, “Those losses occurred during a year that was one of the warmest on record, a trend that makes extreme rainfall, wildfires, droughts and other environmental catastrophes more frequent and intense. ‘Climate change plays a role in this upward trend of losses,’ Ernst Rauch, the chief climate scientist at Munich Re, said in an interview. He said continued building in high-risk areas had also contributed to the growing losses.”*

*Christopher Flavelle, “U.S. Disaster Costs Doubled in 2020, Reflecting Costs of Climate Change,” *New York Times*, January 7, 2021, <https://www.nytimes.com/2021/01/07/climate/2020-disaster-costs.html>

2021 (January)

Two Trump Administration appointees to NOAA reassigned after publishing unauthorized articles on climate science

Climate deniers David Legates and Ryan Maue, controversial Trump appointments to the National Oceanic and Atmospheric Administration [see 2020 (September)] were moved by the Trump Administration to the White House Office of Science and Technology Policy (OSTP). Legates was then appointed to head the OSTP’s U.S. Global Change Research Program, in charge of leading the next National Climate Assessment, slated for publication in 2023. Legates and Maue are subsequently dismissed from the OSTP and reassigned to NOAA, after publishing papers on nongovernment websites which falsely bore the imprint of the Executive Office of the President and stated that they were copyrighted by the OSTP. As reported in the *Washington Post*, the papers include the claim that subscribing to the idea of human-caused global warming “involves a large measure of faith” and that computer models are “too small and slow” to produce meaningful climate simulations. The *Washington Post* reports that John Holdren, head of the OSTP during Barack Obama’s presidency, “characterized the fliers as ‘misguided and thoroughly erroneous screeds’ and said they ‘would not have been issued by anybody with a shred of scientific integrity.’” *

*Andrew Freedman and Jason Samenow, “Trump officials reassigned by White House after publishing controversial climate papers without approval,” *Washington Post*, January 13, 2021, <https://www.washingtonpost.com/weather/2021/01/11/controversial-climate-skeptics-release-papers/>

2021 (January)

Biden puts climate action front and center

President elect Joe Biden acknowledges in his inaugural address that “Few periods in our nation’s history have been more challenging or difficult than the one we’re in now,” and that among the keenest challenges that the nation and the world faces is climate change: “A cry for survival comes from the planet itself. A cry that can’t be any more desperate or any more clear.”* Biden signs the Paris Climate Agreement within hours after his inauguration**, and issues an Executive Order on Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis, which directs all agencies to “immediately review and, as appropriate and consistent with applicable law, take action to address the promulgation of Federal regulations and other actions during the last 4 years that conflict with these important national objectives, and to immediately commence work to confront the climate crisis.” The order imposes a temporary moratorium on all oil and gas leasing activities in the Arctic National Wildlife Refuge, creates an Interagency Working Group on the Social Costs of Greenhouse Gases in order to ensure that agencies “capture the full costs of greenhouse gas emissions as accurately as possible, including by taking global damages into account,” and revokes numerous related Trump executive orders.*** One week later, Biden issues an Executive Order on Tackling the Climate Crisis at Home and Abroad, which affirms that “climate considerations shall be an essential element of United States foreign policy and national security;” pauses new oil and natural gas leases on public lands or in offshore waters pending completion of a review of climate impacts, creates a Special Presidential Envoy for Climate (who will be John Kerry); creates the White House Office of Domestic Climate Policy, headed by the National Climate Advisor (who will be Ali Zaidi); creates a Civilian Climate Corps, and commits to spurring “environmental and economic justice” by “investing and building a clean energy economy that creates well-paying union jobs, turning disadvantaged communities — historically marginalized and overburdened — into healthy, thriving communities...”**** *Inside Climate News* quotes Jill Tauber of Earthjustice: “The last four years have been an unrelenting assault on our public health and environmental protections on an unprecedented scale...But while we’ve lost a lot of time, and while certainly there is much damage to undo, [Biden’s order to review the agency rules] is a commitment to do just that—to as swiftly as possible reverse the destructive policies of the Trump administration and also recognizing that that’s not enough.”***** Writing in the *Wall Street Journal*, Walter Russell Mead argues that a stronger U.S. climate initiative will meet resistance from abroad: “Climate change is now back on the national agenda...Climate skeptics and fossil-fuel interests should brace themselves. The fight to reduce global greenhouse-gas emissions and to shift the world’s energy systems toward much lower emissions isn’t going away. Key positions up and down the government bureaucracy will be filled by committed greens who have thought long and hard about how to use the powers of the regulatory state to achieve green goals. A host of new policies—and new regulations—are sure to come...But if skeptics underestimate the effect the climate movement will have on the world’s economy, greens are in danger of overestimating how much their efforts will help the polar bears. Paradoxically, as climate change assumes a more prominent place on the international agenda, climate activists will lose influence over climate

policy. Geopolitics and greed will get in the way. Greens see climate change as an existential threat to all humanity against which every country should unite. That is not how the world works. Countries inevitably see even the most urgent global problems through the lens of their own interests.”*****

*The White House, Inaugural Address by President Joseph R. Biden, Jr., January 20, 2021, <https://www.whitehouse.gov/briefing-room/speeches-remarks/2021/01/20/inaugural-address-by-president-joseph-r-biden-jr/>

**The White House, Paris Climate Agreement, January 20, 2021, <https://www.whitehouse.gov/briefing-room/statements-releases/2021/01/20/paris-climate-agreement/>

***The White House, Executive Order on Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis, January 20, 2021, <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/20/executive-order-protecting-public-health-and-environment-and-restoring-science-to-tackle-climate-crisis/>

****The White House, Executive Order on Tackling the Climate Crisis at Home and Abroad,” January 27, 2021, <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/executive-order-on-tackling-the-climate-crisis-at-home-and-abroad/>

*****Sabrina Shankman, et al., “Biden Signs Sweeping Orders to Tackle Climate Change and Rollback Trump’s Anti-Environment Legacy,” January 21, 2021, *Inside Climate News*, <https://insideclimatenews.org/news/21012021/biden-executive-orders-climate-change/>

*****Walter Russell Mead, “The Polar Bear Paradox,” *Wall Street Journal*, February 22, 2021, <https://www.wsj.com/articles/the-polar-bear-paradox-11614035542>

2021 (January)

The world’s ice has decreased dramatically over the past three decades

In the first study of its kind using satellite data, a team lead by researchers at the University of Leeds undertook to estimate the total amount of ice, both on land and on sea, lost over recent decades across the planet. As summarized in the abstract: “We combine satellite observations and numerical models to show that Earth lost 28 trillion tonnes of ice between 1994 and 2017. Arctic sea ice (7.6 trillion tonnes), Antarctic ice shelves (6.5 trillion tonnes), mountain glaciers (6.1 trillion tonnes), the Greenland ice sheet (3.8 trillion tonnes), the Antarctic ice sheet (2.5 trillion tonnes), and Southern Ocean sea ice (0.9 trillion tonnes) have all decreased in mass. ... The rate of ice loss has risen by 57 % since the 1990s – from 0.8 to 1.2 trillion tonnes per year – owing to increased losses from mountain glaciers, Antarctica, Greenland and from Antarctic ice shelves.” In addition to causing global rise in sea levels by 34.6 mm [1.3 inches] through loss of grounded ice, “the loss of floating ice has caused reductions in the planetary albedo [the cooling effect of reflecting sunlight]..., reductions in the buttressing of grounded ice ..., ocean freshening..., and ocean cooling....” The study concludes that “Although a small fraction of mountain glacier losses are associated with retreat since the little ice age ..., there can be little doubt that the vast majority of Earth’s ice loss is a direct consequence of climate warming.” *Phys.org News* quotes lead author Dr. Thomas Slater: “Although every region we studied lost ice, losses from the Antarctic and Greenland ice sheets have accelerated the most. The ice sheets are now following the worst-case climate warming scenarios set out by the Intergovernmental Panel on Climate Change. Sea-level rise on this scale will have very serious impacts on coastal communities this century.”*

*Thomas Slater et al. “Earth’s ice imbalance,” *The Cryosphere*, v. 15, January 25, 2021, p. 233, <https://doi.org/10.5194/tc-15-233-2021>; University of Leeds, “Global ice loss increases at record rate,” *phys.org news*, January 25, 2021, <https://phys.org/news/2021-01-global-ice-loss.html>

2021 (January)

Federal Reserve commits to assessing the impact of climate change on the financial system

Following a growing number of international financial regulators, the Federal Reserve System begins to pay attention to the financial impacts of climate change. It creates a Supervision Climate Committee (SCC), to bring together senior staff across the Federal Reserve Board and Reserve Banks to “build the Federal Reserve’s capacity to understand the potential implications of climate change for financial institutions, infrastructure, and markets.”* *E&E News Climatewire* quotes Sarah Dougherty, a former researcher at the Federal Reserve Bank of Atlanta who is now with the Natural Resources Defense Council, as saying the Fed's new climate committee is a sign the central bank "actually wants to do something instead of just talk about it." The head of the new SCC, Kevin Stiroh, served as co-chair of a climate risk task force within the Basel Committee on Banking Supervision, an international group of central banks that promotes financial stability, and said in a recent presentation at the Harvard Business School that climate impacts and the transition to a low-carbon economy "will be felt across business sectors and asset classes, on strategies and operations, and through the balance sheets and income statements of financial firms."** In March, Lael Brainard, a member of the Federal Reserve Board of Governors, speaking in Boston with the caveat that “these are my own views and do not necessarily reflect those of the Federal Reserve Board” will acknowledge that “Climate change is already imposing substantial economic costs and is projected to have a profound effect on the economy at home and abroad. Future financial and economic effects will depend on the severity of the physical effects of climate change and the nature and speed of the transition to a sustainable economy. Financial market participants that do not put in place frameworks to assess and address climate-related risks could face significant losses on climate-sensitive assets caused by environmental shifts, by a disorderly transition, or both.” *** Brainard will be appointed Vice Chair of the Federal Reserve in May, 2022. Writing later this year in the *New York Times*, Neil Irwin will observe that while climate activists “want the Fed to use its regulatory powers to throttle the flow of bank lending to carbon-producing industries,” “[a]t the same time, some Republicans are assailing the Fed for mere research efforts involving climate.”**** When Jerome Powell appears in a January 2022 Congressional hearing on confirmation for his second four-year term as Federal Reserve Chair, some Congressional democrats will express serious concern about his commitment to engaging the Federal Reserve in steps to mitigate climate change.*****

*Federal Reserve Bank of New York Press Release, “Kevin Stiroh to Step Down as Head of New York Fed Supervision to Assume New System Leadership Role at Board of Governors on Climate,” January 25, 2021,

<https://www.newyorkfed.org/newsevents/news/aboutthefed/2021/20210125>

**Avery Ellfeldt, “'Enormously big deal': Fed creates climate committee,” *E&E News Climatewire* January 25, 2021,

<https://subscriber.politicopro.com/article/eenews/1063723523>

***Lael Brainard, “Financial Stability Implications of Climate Change,” Board of Governors of the Federal Reserve System, March 21, 2021, <https://www.federalreserve.gov/newsevents/speech/brainard20210323a.htm>

****Neil Irwin, “How Should the Fed Deal With Climate Change?” *New York Times*, August 26, 2021,

<https://www.nytimes.com/2021/08/26/upshot/fed-climate-change-analysis.html>

*****Marianne Lavelle, “Heading for a Second Term, Fed Chair Jerome Powell Bucks a Global Trend on Climate Change,” *Inside Climate News*, January 16, 2022, <https://insideclimatenews.org/news/16012022/heading-for-a-second-term-fed-chair-jerome-powell-bucks-a-global-trend-on-climate-change/>

2021 (February)

Paris court finds France guilty of “non-respect of its engagements” aimed at combating global warming

This legal case was brought by four French environmental groups after a petition signed by 2.3 million people. The Paris administrative court holds that compensation should be made “in kind,” with damages awarded “only if the reparation measures were impossible or insufficient.” For now, the court orders the French state to pay 1 euro (\$1.20) each to the environmental groups, in compensation for the “moral damage” resulting from its failure “to meet its commitments in the fight against climate change.” The *Guardian* quotes Jean-François Julliard, the executive director of Greenpeace France, one of the plaintiffs: “This is an historic win for climate justice. The decision not only takes into consideration what scientists say and what people want from French public policies, but it should also inspire people all over the world to hold their governments accountable for climate change in their courts.”* The *New York Times* reports that “an environment ministry statement said that the government ‘took note’ of the court ruling and was ‘aware that the initial objectives’ to reduce its emissions ‘had not been achieved.’ It added that a set of new climate-related laws would help France meet its commitments and that the government was ‘aware of the legitimate expectations and is listening to the questions from civil society on these issues.’”** In a further ruling in October, *Reuters* reports that the court “ordered the French government to take all necessary measures to repair ecological damage and to prevent a further increase of carbon emissions by end-December 2022 at the latest.” No fines or penalties had been assessed as of that date.***

*Kim Willsher, “Court convicts French state for failure to address climate crisis,” *Guardian*, February 3, 2021, <https://www.theguardian.com/environment/2021/feb/03/court-convicts-french-state-for-failure-to-address-climate-crisis>

**Constant Méheut, “Court Faults France Over ‘Ecological Damage’ From Its Emissions Levels,” *New York Times*, February 3, 2021, <https://www.nytimes.com/2021/02/03/world/europe/france-emissions-court.html>

***Geert DeClercq, “French court orders state to honour its climate commitments,” *Reuters*, October 14, 2021, <https://www.reuters.com/world/europe/french-court-orders-state-honour-its-climate-commitments-oxfam-2021-10-14/>

2021 (February)

Study finds Atlantic ocean convection currents are in their “weakest state in over a millennium”

A study suggests that the metaphorical “conveyor belt” of ocean currents in the Atlantic bringing colder water southward in the deep Atlantic and circulating warmer water to the north near the surface to warm Europe and North America, has slowed down significantly, likely caused by climate change [see 2018 (March)]. This conveyor belt is referred to as the “Atlantic Meridional Overturning Circulation” (AMOC) and is described by the authors of this study from three European research institutions as “a major mechanism for heat redistribution on our planet and an important factor in climate variability and change.” The authors summarize their findings: “using several different and largely independent proxy indicators of the AMOC evolution over the past 100 to nearly 2,000 years, we provide strong evidence that the AMOC decline in the twentieth century is unprecedented and that over the past decades, the AMOC is in its weakest state in over a millennium.”* A report on this study in the *Washington Post* notes that the AMOC “can be weakened by making northern water more fresh and less salty, and therefore less dense.

That’s what climate change — through a combination of more rain and snow, more melting of Arctic sea ice, and huge freshwater pulses from Greenland — is thought to be doing.” And while scientists do not anticipate flipping warming periods to intense cold in the Northern Hemisphere, as was hypothesized in the 1990’s, “even the modest slowing of 15 percent has been accompanied by odd temperature patterns in the ocean and the significant upending of certain key fisheries, such as lobster and cod off the coast of New England.” Slowing of the currents may be related to the fact that “warm water has lingered instead off the coast of the northeastern United States, where the Gulf of Maine is showing some of the fastest-warming ocean water anywhere in the world.”** The *New York Times* provides a stunning interactive presentation, in graphics and text, of the AMOC, the science attempting to understand its evolution, and the potential consequences of that evolution.*** In August, a further analysis will conclude that “human-caused warming has led to an ‘almost complete loss of stability’ in the system that drives Atlantic Ocean currents.”**** [see 2023 July]

*Levke Caesar et al., “Current Atlantic Meridional Overturning Circulation weakest in last millennium,” *Nature Geoscience*, v. 14, p. 118, February 25, 2021, <https://www.nature.com/articles/s41561-021-00699-z>

**Chris Mooney and Andrew Freedman, “Scientists see stronger evidence of slowing Atlantic Ocean circulation, an ‘Achilles’ heel’ of the climate,” *Washington Post*, February 25, 2021, <https://www.washingtonpost.com/climate-environment/2021/02/25/atlantic-ocean-currents-weakening-amoc-gulf-stream/>

*** Moises Velasquez-Manoff and Jeremy White, “In the Atlantic Ocean, Subtle Shifts Hint at Dramatic Dangers,” *New York Times*, March 2, 2021, <https://www.nytimes.com/interactive/2021/03/02/climate/atlantic-ocean-climate-change.html>

**** Sarah Kaplan, “A critical ocean system may be heading for collapse due to climate change, study finds,” *Washington Post*, August 5, 2021, <https://www.washingtonpost.com/climate-environment/2021/08/05/change-ocean-collapse-atlantic-meridional/>; Niklas Boers, “Observation-based early-warning signals for a collapse of the Atlantic Meridional Overturning Circulation,” *Nature Climate Change*, v.11, 680–688, August 5, 2021, <https://www.nature.com/articles/s41558-021-01097-4>

2021 (February)

Biden Administration’s interim cost of carbon announcement lower than expected

The “social cost of carbon” is a dollar amount that federal agencies put on the long-term economic impact of a ton of carbon pollution. They use this in calculating costs and benefits of executive and legislative actions that increase or reduce that pollution [see 2013 (May), 2017 (March), 2018 (September), 2020 (July)]. President Obama set that cost at \$45 per ton initially; President Trump quickly disbanded the task force that determines this estimate, and in rolling back Obama era regulations estimated the cost at between \$1 and \$6 per ton. Reevaluating that cost was one of the priorities of the Biden Administration announced on day one [see 2021 (January)]. The Interagency Working Group announces “it is replacing the previous Administration’s estimates with the estimates developed prior to 2017, adjusted for inflation. This interim step will enable Federal agencies to immediately and more appropriately account for climate impacts in their decision-making while we continue the process of bringing the best, most up-to-date science and economics to the estimation of the social costs of greenhouse gases.” The IWG’s figure is \$51 in 2020 dollars at a 3% discount rate.* The figure is less than half a figure anticipated in a recent article in *Science*: “Carbon pollution is about to get a lot more expensive...Many economists believe the cost, set as low as \$1 during the Trump administration, will rise as high as \$125 in the next month—and higher still come January 2022, when the IWG is due to provide a final number.”** Writes *Inside Climate News*: “That [IWG’s interim] figure, applied during the Obama administration, will serve as a baseline while the Biden administration works on

developing its own metric amid calls by climate-focused economists for a value that is at least twice as high. Michael Greenstone, a University of Chicago economist who served as chief economist for Obama's Council of Economic Advisers, was a co-author of a working paper last month that put the social cost of carbon at \$125 per ton or more. And Nobel laureate Joseph Stiglitz and Lord Nicholas Stern, author of a groundbreaking 2006 U.K. study on the economic cost of climate change, published a paper released Monday that warned a return to the Obama-era number would be a fundamentally flawed approach. 'It is clear that climate change involves the management of risks of enormous magnitude and multiple dimensions, which could destroy lives and livelihoods across the world, displace billions, and lead to widespread, prolonged, and severe conflict,' they wrote.'*** In May, 2022, the Supreme Court will reject an appeal from Republican-led states seeking to prevent the Biden Administration's use of the interim cost of carbon metric in rulemaking.****

*The White House, "A Return to Science: Evidence-Based Estimates of the Benefits of Reducing Climate Pollution," February 26, 2021, <https://www.whitehouse.gov/cea/written-materials/2021/02/26/a-return-to-science-evidence-based-estimates-of-the-benefits-of-reducing-climate-pollution/>; Interagency Working Group on Social Cost of Greenhouse Gases, "Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990," February 2021, https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf

**Paul Voosen, "Trump downplayed the cost of carbon. That's about to change," *Science*, January 29, 2021, v. 371, no. 6528, <https://www.science.org/doi/10.1126/science.371.6528.447>

***Marianne Lavelle, "How Much Does Climate Change Cost? Biden Raises Carbon's Dollar Value, but Not by Nearly Enough, Some Say," *Inside Climate News*, February 26, 2021, <https://insideclimatenews.org/news/26022021/carbon-cost-biden-climate-change/>

**** Ariane de Vogue and Ella Nilsen, "Supreme Court allows Biden administration to continue counting the costs of planet-warming emissions, for now," *CNN*, May 26, 2022, <https://www.cnn.com/2022/05/26/politics/supreme-court-social-cost-of-carbon-ruling-climate/index.html>; see also Sigal Samuel, "The Supreme Court just okayed Biden's 'social cost of carbon.' It's still way too low," *Vox*, May 27, 2022, <https://www.vox.com/future-perfect/22643358/social-cost-of-carbon-mortality-biden-discounting>; for reporting on the legal ruling against the social cost of carbon that the Supreme Court declined to affirm, see Maxine Joselow, "Court ruling on social cost of carbon upends Biden's climate plans," *Washington Post*, February 21, 2022, <https://www.washingtonpost.com/climate-environment/2022/02/21/social-cost-of-carbon-biden/>; For assistance navigating the development of these and other rules through the Obama, Trump and Biden administrations, and links to Federal Register notices, see the Environmental and Energy Law Project (EELP), Harvard Law School, Regulatory Tracker, The Social Cost of Greenhouse Gases (Carbon Dioxide, Methane, Nitrous Oxide), <https://eelp.law.harvard.edu/2017/09/the-social-cost-of-carbon/>

2021 (March)

The Amazon rainforest is most likely now a net contributor to warming of the planet

The Amazon has long been recognized as the most significant carbon sink on the planet, sequestering carbon that would otherwise contribute to global warming. [see 2019 (November), 2020 (March), 2020 (June)] A new study supported by *National Geographic* reaches the alarming conclusion that when all effects of recent changes to the rainforest from human activity and natural processes are considered, the Amazon may be now a net contributor to the planet's warming. As the *National Geographic* summarizes: "the inhaling and exhaling of CO₂ is just one way this damp jungle, the most species-rich on Earth, influences the global climate. Activities in the Amazon, both natural and human-caused, can shift the rainforest's contribution in significant ways, warming the air directly or releasing other greenhouse gases that do. Drying wetlands and soil compaction from logging, for example, can increase emissions of the greenhouse gas nitrous oxide. Land-clearing fires release black carbon, small particles of soot that absorb sunlight and increase warmth. Deforestation can alter rainfall patterns, further drying and heating the forest. Regular flooding and dam-building releases the potent gas methane, as

does cattle ranching, one chief reason forests are destroyed. And roughly 3.5 percent of all methane released globally comes naturally from the Amazon's trees.”* The study concludes: “Following a decade of hope for a transition to a sustainable development pattern ..., rapid deforestation and land-use change have returned to the Amazon. This resurgent change refocused popular attention on the fate of the Basin's vast [carbon] stocks. Our current understanding of the biogeochemistry of climate in the Amazon, however, suggests that positive forcing from non-CO2 factors plays a large role in the regional and global climate system, now likely dominating the net radiative balance of the Amazon.”** As described in a report by *Inside Climate News*, “Every day, thousands of miners, loggers, farmers and ranchers burn or cut roughly 10,000 acres of forest, working to satisfy a growing demand for the resources it contains. They are tiny cogs in a sprawling global machine that has destroyed nearly one-fifth of the Brazilian rainforest—an area about the size of California—over the last 35 years, driving more than 10,000 plant and animal species toward extinction.” Since President Jair Bolsonaro was elected in 2019, “the annual rate of deforestation has risen sharply, increasing nearly 60 percent from 2020, according to a Brazilian research institute. Bolsonaro has called government data on deforestation a ‘lie.’”***

*Craig Welch, “First study of all Amazon greenhouse gases suggests the damaged forest is now worsening climate change,” *National Geographic*, March 11, 2021, <https://www.nationalgeographic.com/environment/article/amazon-rainforest-now-appears-to-be-contributing-to-climate-change>

**Kristofer Covey et al., “Carbon and Beyond: The Biogeochemistry of Climate in a Rapidly Changing Amazon,” *Frontiers in Forests and Global Change*, March 11, 2021, <https://doi.org/10.3389/ffgc.2021.618401>

***Georgina Gustin, “The Amazon is the Planet’s Counterweight to Global Warming, a Place of Stupefying Richness Under Relentless Assault,” *Inside Climate News*, December 19, 2021, <https://insideclimatenews.org/news/19122021/amazon-rainforest-brazil-jair-bolsonaro-climate-change/>

2021 (March)

Study finds food systems responsible for about one third of greenhouse gas emissions

The study, published in *Nature Food*, estimates that food production and distribution contributed 34% of greenhouse gases in 2015.* This is consistent with earlier figures in a report by the Intergovernmental Panel on Climate Change, which estimated that the total contribution of food systems was between 21% and 37% of global emissions.** This is the first study, however, to break down emissions from each stage of the food chain for every year from 1990 to 2015. Among the findings, summarized by *CarbonBrief*: “71% of food emissions in 2015 came from agriculture and ‘associated land use and land-use change activities’ ...The rest stemmed from retail, transport, consumption, fuel production, waste management, industrial processes and packaging...CO2 accounts for roughly half of food-related emissions, while methane (CH4) makes up 35% – mainly from livestock production, farming and waste treatment... ‘food miles’ contribute less to food emissions than packaging.”***

*Monica Crippa et al., “Food systems are responsible for a third of global anthropogenic GHG emissions,” *Nature Food*, March 8, 2021, <https://www.nature.com/articles/s43016-021-00225-9>

**Intergovernmental Panel on Climate Change, “Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems,” 2019, <https://www.ipcc.ch/srccl/chapter/summary-for-policymakers/>

***CarbonBrief, “Food systems responsible for ‘one third’ of human-caused emissions,” March 8, 2021, <https://www.carbonbrief.org/food-systems-responsible-for-one-third-of-human-caused-emissions/>

2021 (March)

American Petroleum Institute comes out in favor of carbon pricing

The *Wall Street Journal* describes the API as “a giant among Washington business groups, with \$200 million in annual revenue, derived primarily from member dues and its standard-setting and security certification business.” The powerful lobbyist for the oil and gas industry “spent decades leveraging its financial muscle to fight almost every green initiative in its path. Then in March, the group signaled an about-face. It released its ‘Climate Action Framework,’ a set of new policy prescriptions to lower emissions and support cleaner fuels. The core of the plan called for two policies API had opposed for years: more regulation on methane, a potent greenhouse gas that leaks from oil-and-gas operations, and a price on carbon, a financial penalty levied on all carbon-dioxide emissions.”* E&E News will report in August: “In the five months since API released its Climate Action Framework and, for the first time, endorsed the idea of putting a price on carbon dioxide emissions as the main way to fight climate change, the national conversation on carbon pricing has barely nudged. No carbon pricing legislation has moved in Congress. No lawmaker has announced a change in their position on the matter, with Republicans still overwhelmingly opposed to the idea and many Democrats supportive, but only in combination with other policies like regulations or subsidies. ‘The climate debate is dominated by entrenched politics. And they are slow to change,’ said Alex Flint, executive director of the Alliance for Market Solutions, which pushes the case that carbon taxes can align with conservative, pro-business principles.” **

*Timothy Puko and Ted Mann, “Washington’s Oil Lobby Pivoted on Climate Change—and Made No One Happy,” *Wall Street Journal*, July 28, 2021, <https://www.wsj.com/articles/api-oil-gas-lobby-reckoning-climate-change-11627484072>, American Petroleum Institute, Climate Action Framework, March 2021, <https://www.api.org/climate>

**Timothy Cama, “API supports carbon pricing but its allies remain skeptical,” *E&E Daily*, August 12, 2021, <https://www.eenews.net/articles/api-supports-carbon-pricing-but-its-allies-remain-skeptical/>

2021 (March)

President Biden unveils the American Jobs Plan, the largest presidential proposal for climate action in U.S. history

The American Jobs Plan for infrastructure and climate proposes spending \$2 trillion over ten years, with approximately \$650 billion allocated to facilitating a clean energy transition, all funded by increases in corporate taxes.* As Marianne Lavelle notes in *Inside Climate News*, “The \$2 trillion proposal holds out the promise of federal dollars for every Congressional district that has roads, bridges, water pipes, housing, transit systems, leaking oil wells or other infrastructure in need of upgrade and repair—in other words, most of the country. The only catch is that the money is meant for transformation, not restoration.” The \$650 billion for clean energy “would be about seven times the largest previous injection of federal money into clean energy, the \$90 billion included in the economic stimulus package approved in the first year of President Barack Obama’s administration.” Some key provisions of the climate action include: \$213 billion to build, modernize and weatherize affordable housing; \$174 billion to accelerate a transition to electric vehicles; \$100 billion for power grid modernization and resilience, including aims to upgrade the system to better handle and transport wind and solar energy; an \$85 billion

investment in modernizing public transit; eliminating fossil fuel subsidies, which are estimated to add up to at least \$20 billion a year (but not building in a carbon tax); creation of a federal Energy Efficiency and Clean Electricity Standard requiring utilities to deliver a certain percentage of electricity from renewable or other clean energy sources; \$10 billion for a new Civilian Climate Corps.** Elizabeth Kolbert comments: “From a political standpoint, it makes sense to link jobs and justice and decarbonization. Union wages and electric school buses are a lot easier to sell than a hike in the gasoline tax.” *** The Wall Street Journal’s take on the proposal: “Mr. Biden says his plan will ‘create millions of good jobs,’ but his anti-carbon policies will destroy many more in fossil fuels and carbon-intensive industries. That’s why he’s proposing a \$40 billion Dislocated Workers Program and \$10 billion Civilian Climate Corps. No wonder Ms. Ocasio-Cortez is elated. Her climate dreams are coming true, and all under the false front of ‘infrastructure.’” **** And Bill McKibben’s: “The U.S. federal government is proposing to spend a sum of money that starts with a “T” on an infrastructure bill, and much of that money (two trillion dollars) is aimed at fighting the climate crisis. That is remarkable, and not just when you consider that we’re only seventy-five days out from an Administration that didn’t believe climate change was real. In my lifetime, we’ve spent sums like that mainly on highly dangerous infrastructure—aircraft carriers, fighter jets, nuclear weapons—and the wars in which they were used. To see a proposal to spend it on solar panels and trains is moving, and also just the slightest bit annoying: Why weren’t we doing this all along? Why weren’t we doing it in the nineteen-eighties, when scientists first told us that we were in a crisis?”***** By October, the President’s plan will assume the shape of two separate bills, a \$3.5 trillion “Build Back Better” budget package proposed by House democrats, and a \$1 trillion infrastructure bill with bipartisan support.***** Some significantly reduced commitments to infrastructure projects in the Biden plan will be enacted in the Infrastructure Investment and Jobs Act of 2021 [see 2021 (November)]. More climate and energy provisions, substantially modified from the original plan, will be enacted in the Inflation Reduction Act of 2022 [see 2022 (August)]. 2021 year-end commentary on the failure of Build Back Better will focus on the role of West Virginia democratic Senator Joe Manchin and the failure’s dire consequences for meeting emissions goals.*****

* The White House, FACT SHEET: The American Jobs Plan, March 31, 2021, <https://www.whitehouse.gov/briefing-room/statements-releases/2021/03/31/fact-sheet-the-american-jobs-plan/>

**Marianne Lavelle, “Nine Ways Biden’s \$2 Trillion Plan Will Tackle Climate Change,” *Inside Climate News*, March 31, 2021, [Nine Ways Biden’s \\$2 Trillion Plan Will Tackle Climate Change - Inside Climate News](https://www.insideclimatenews.org/article/nine-ways-biden-s-2-trillion-plan-will-tackle-climate-change)

***Elizabeth Kolbert, “Biden’s Jobs Plan Is Also a Climate Plan. Will It Make a Difference?” *The New Yorker*, April 4, 2021, <https://www.newyorker.com/magazine/2021/04/12/bidens-jobs-plan-is-also-a-climate-plan-will-it-make-a-difference>

****The Editorial Board, “The Green New Deal, in Disguise,” *Wall Street Journal*, April 12, 2021, <https://www.wsj.com/articles/the-green-new-deal-in-disguise-11618267156>

*****Bill McKibben, “The Climate Crisis,” *The New Yorker* newsletter, April 7, 2021,

<https://mail.google.com/mail/u/0/#label/climate/FMfcgxwLtQPwrgBHzJjDsCsPhqqpKWxs>

***** Brad Plumer and Winston Choi-Schagrin, “Major Climate Action at Stake in Fight Over Twin Bills Pending in Congress,” *New York Times*, October 10, 2021, <https://www.nytimes.com/2021/10/10/climate/climate-action-congress.html>

*****Bill McKibben, “Joe Manchin Has Wrecked the Biden Presidency—Perhaps He’ll Also Liberate It,” *The New Yorker*, December 20, 2021, <https://www.newyorker.com/news/daily-comment/joe-manchin-has-wrecked-the-biden-presidency-perhaps-hell-also-liberate-it>; Brad Plumer and Nadja Popovich, “What the Stalled Build Back Better Bill Means for Climate, in One Chart,” *New York Times*, December 21, 2021, <https://www.nytimes.com/interactive/2021/12/21/climate/manchin-climate-change-build-back-better.html>

2021 (April)

Carbon dioxide levels are now 50% higher than before the industrial revolution

Researchers Richard Betts from the UK Met Office Hadley Centre and Ralph Keeling of Scripps Institution of Oceanography, UC San Diego, issue a statement regarding new record levels of CO₂ in the atmosphere: “The average for March 2021 was 417.14 parts per million (ppm), which is 50% higher than the average for 1750-1800. Independent measurements by NOAA also show record CO₂ levels. The Met Office predicts monthly CO₂ concentrations in 2021 to peak at 419.5 ± 0.6 ppm in May. This is despite a temporary reduction in global emissions last year due to the Covid-19 pandemic....The build-up of CO₂ in the atmosphere has also been accelerating. It took over 200 years for levels to increase by 25%, but now just over 30 years later, levels are at a 50% increase. If the current trend continues, doubled-CO₂ will be reached in approximately 55 years. Reversing this trend and slowing the atmospheric CO₂ rise and global warming will need global emissions to reduce. Projections by the IPCC suggest that to halt global warming at 1.5°C, global emissions will need to reach net zero by approximately 2050, possibly much sooner.”*

*Rob Monroe, “Statement from Scripps Oceanography, UK Met Office on Record High CO₂ Buildup,” *The Keeling Curve Blog*, April 7, 2021, <https://keelingcurve.ucsd.edu/2021/04/07/statement-from-scripps-oceanography-uk-met-office-on-record-high-co2-buildup/>

2021 (April)

Google Earth’s Timelapse feature shows the effect of climate change over 40 years

Reports CNN Business: “Google’s latest feature, Timelapse, is an eye opening, technical feat that provides visual evidence of how the Earth has changed due to climate change and human behavior. The tool takes the platform’s static imagery and turns it into a dynamic 4D experience, allowing users to click through timelapses that highlight melting ice caps, receding glaciers, massive urban growth and wildfires’ impact on agriculture. Timelapse compiles 24 million satellite photos taken from 1984 to 2020, an effort Google (GOOG) said took two million processing hours across thousands of machines in Google (GOOG) Cloud. For the project, the company worked with NASA, the United States Geological Survey’s Landsat program — the world’s longest-running Earth observation program — the European Union’s Copernicus program and its Sentinel satellites, and Carnegie Mellon University’s CREATE Lab, which helped develop the technology behind Timelapse.” A video introduction to the feature created by CNN Business quotes Rebecca Moore, a director of Google Earth: “Visual evidence can cut to the core of the debate in a way that words cannot and communicate complex issues to everyone.”

* Examples of the experiences on Timelapse are the Columbia Glacial Retreat in Alaska; Urban Growth in Dalian, Liaoning, China and Las Vegas, Nevada; and the Drying of the Aral Sea in Kazakhstan and Uzbekistan.**

*Samantha Kelly, “Google Earth’s new Timelapse feature shows chilling effect of climate change,” *CNN Business*, April 15, 2021, <https://www.cnn.com/2021/04/15/tech/google-earth-timelapse/index.html>

**Google Earth Engine, Google Earth Timelapse, <https://earthengine.google.com/timelapse/>

2021 (April)

President Biden announces new U.S. emissions pledge at virtual Earth Day summit

More than three dozen heads of state join virtually in a summit intended to spotlight the United States' renewed commitment to climate action. President Biden announces a new pledge under the Paris Climate Agreement: to reduce U.S. emissions between 50 and 52 percent by 2030 compared with 2005 levels. This is significantly more ambitious than the pledge made by President Obama in 2015, to reduce emissions by 26 to 28% from 2005 levels by 2025. This new goal tracks with limiting temperatures to 2% over pre-industrial levels, but not with the more ambitious 1.5% goal urged by the Intergovernmental Panel on Climate Change. Biden also promises by 2024 to double the amount of annual financing that Obama had made available for climate-related projects in developing countries. Notes the *Washington Post*: "He faces an uphill battle in delivering on some of these climate promises, given that they will need congressional support." China is the first nation invited to speak at the summit, consistent with its position as largest greenhouse gas emitter. Xi Jinping reiterates the nation's pledge to "strive to peak carbon dioxide emissions before 2030 and achieve carbon neutrality before 2060." On coal consumption, Xi said China might "phase it down" during its 15th Five Year Plan, which runs from 2025 through 2030. * The *Wall Street Journal* comments that the president is "committing the U.S. to a far-fetched CO2 emissions goal without a vote of Congress." "The Biden goal will require the electric grid to be totally rebuilt in 10 years. According to the Natural Resources Defense Council, the U.S. will also have to double its share of carbon-free power to 80% from 40% today—half of which is now provided by nuclear—to have any hope of achieving Mr. Biden's pledge...Mr. Biden is essentially doing an end-run around the Constitution, which requires approval by two-thirds of the Senate for the President to enter a treaty. The emissions reductions that foreign leaders pledged on Thursday aren't legally binding, but Mr. Biden intends to use regulation to bind Americans. Businesses will be conscripted as foot soldiers in the progressive war on fossil fuels."** In a response to the *Wall Street Journal* editorial, representatives of the Environmental Defense Fund and the Natural Resources Defense Council write: "you get one thing right. Cleaning up the power grid and electrifying transportation and buildings are needed to meet the president's target of cutting U.S. climate pollution in half by 2030 and reaching net-zero emissions by 2050. You neglect to mention, however, that both steps will improve Americans' lives and livelihoods. Replacing coal-fired power plants, electrifying cars and deploying wind and solar can create more than three million jobs in 2030 and avoid more than 40,000 premature deaths this decade, studies by Energy Innovation and Princeton show. We can, and must, protect all communities, including those overburdened by decades of pollution. And we can, and must, help coal communities reach the clean economy of the future."***

*Brady Dennis, Juliet Eilperin and Steven Mufson, "Biden spells out U.S. climate goal, urges other world leaders to go big," *Washington Post*, April 22, 2021, <https://www.washingtonpost.com/climate-environment/2021/04/22/biden-climate-summit/>

**Editorial Board, "Biden's 10-Year Climate Plan," *Wall Street Journal*, April 22, 2021, <https://www.wsj.com/articles/bidens-10-year-climate-plan-11619132440>

***Nathaniel Keohane and David Doniger, "Biden's Climate Plan Is Wise and Necessary," Letters, *Wall Street Journal*, April 28, 2021, <https://www.wsj.com/articles/bidens-climate-plan-is-wise-and-necessary-11619643244>

2021 (May)

China's greenhouse gas emissions surpass the U.S. and all developed countries combined, and China plays the major role in financing overseas development of coal power

An analysis by the Rhodium group covering the year 2019 reports that China's share of global emissions rose to 27 percent of the world's total, while the United States remained the second-largest emitter at 11 percent. India's share came third at 6.6 percent, edging out the 27 nations in the European Union, which accounted for 6.4 percent. China's emissions have grown dramatically: 14.1 gigatons of carbon dioxide equivalents in 2019, more than triple 1990 levels and a 25 percent increase over the past decade according to the Rhodium report. Per capita emissions for China's 1.4 billion people have also skyrocketed: 10.1 tons annually in 2019, nearly tripling over the last twenty years. The report reminds us, however, that China is far from the greatest historical greenhouse gas producer. The 37 developed nations that make up the Organization for Economic Cooperation and Development have emitted four times more carbon dioxide than China on a cumulative basis since 1750. Much of that remains in the upper atmosphere contributing to global warming. The *Washington Post* comments: "The Biden administration has made a concerted push to work with China on combating climate change, despite diplomatic clashes between the two countries on numerous other issues, including trade disagreements and a crackdown on pro-democracy activists in Hong Kong. White House climate envoy John F. Kerry traveled to China last month to meet with his counterparts and encourage the kind of partnership that helped make the Paris agreement a reality in 2015. After Kerry's visit, the United States and China released a statement vowing to work together on climate change 'with the seriousness and urgency that it demands.'" * A key issue these talks need to address: China "has spent tens of billions of dollars to build coal power facilities in 152 countries over the past decade through its Belt and Road Initiative. Roughly 70% of the coal plants built globally now rely on Chinese funding. That's a problem for the climate. The International Energy Agency warns in a new analysis that if the world hopes to reach net zero emissions by 2050, widely seen as necessary to meet the Paris climate agreement goals, there should be no investment in new fossil fuel supply projects or in new coal-fired power plants that don't capture their carbon emissions. Shortly after that report comes out, the G7 group of leading industrialized democracies calls for an end to international financing of unabated coal projects on May 21, 2021."** In September, 2021, Chinese President Xi Jinping, in a video address at the annual UN general assembly, will pledge: "China will step up support for other developing countries in developing green and low-carbon energy, and will not build new coal-fired power projects abroad."***

*Kate Larsen et al., "China's Greenhouse Gas Emissions Exceeded the Developed World for the First Time in 2019," *Rhodium Group*, May 6, 2021, <https://rhg.com/research/chinas-emissions-surpass-developed-countries/>; Steven Mufson and Brady Dennis, "Chinese greenhouse gas emissions now larger than those of developed countries combined," *Washington Post*, May 6, 2021, <https://www.washingtonpost.com/climate-environment/2021/05/06/china-greenhouse-emissions/>

**Jeff Nesbit, "China finances most coal plants built today – it's a climate problem and why US-China talks are essential," *The Conversation*, May 24, 2021, <https://theconversation.com/china-finances-most-coal-plants-built-today-its-a-climate-problem-and-why-us-china-talks-are-essential-161332>; International Energy Agency, "Net Zero by 2050 A Roadmap for the Global Energy Sector," May, 2021, <https://iea.blob.core.windows.net/assets/4719e321-6d3d-41a2-bd6b-461ad2f850a8/NetZeroBy2050-ARoadmapfortheGlobalEnergySector.pdf>; Editorial Board, "A new study shows getting to net-zero emissions is doable. Here's how," *Washington Post*, May 23, 2021, https://www.washingtonpost.com/opinions/a-new-study-shows-getting-to-net-zero-emissions-is-doable-heres-how/2021/05/23/3768b354-b9b6-11eb-a6b1-81296da0339b_story.html

***Vincent Ni, "'Betting on a low-carbon future': why China is ending foreign coal investment," *The Guardian*, September 22, 2021, <https://www.theguardian.com/world/2021/sep/22/betting-on-a-low-carbon-future-why-china-is-ending-foreign-coal-investment>

2021 (May)

Major U.N. study demonstrates the urgency of rapid reductions in methane emissions, while U.S. Senate reinstates Obama era methane capture regulations

The assessment, a collaboration of the Climate & Clean Air Coalition and the United Nations Environment Programme, highlights the critical role that cutting methane emissions plays in slowing the rate of global warming. It concludes that a reduction of 45% of global methane emissions in the next decade is feasible and would have multiple environmental benefits. While methane pollution has several different natural and human-caused sources, the report concludes that the fossil fuel industry has the greatest potential to cut its methane emissions at little to no cost: “The greatest potential for negative cost abatement [net savings from emissions reductions] is in the oil and gas subsector where captured methane adds to revenue instead of being released to the atmosphere.” It also concludes that unless there is a significant deployment of as of yet unproven carbon capture technology, expanding the use of natural gas would likely result in exceeding the goal of keeping warming to under 1.5 degrees Celsius. The *New York Times* summarizes why a focus on methane emissions would be particularly effective in meeting mid-century climate goals: “While methane is an extremely potent greenhouse gas, it is also relatively short-lived, lasting just a decade or so in the atmosphere before breaking down. That means cutting new methane emissions today, and starting to reduce methane concentrations in the atmosphere, could more quickly help the world meet its midcentury targets for fighting global warming.” * Meanwhile, just eight days earlier, the U.S. Senate takes what Maine Senator Angus King argues is “the most important climate vote that the Senate has had, maybe ever”: to reinstate an Obama-era regulation designed to clamp down on U.S. methane emissions by requiring oil and gas operations to monitor and capture leaks. Senate Democrats, joined by three Republicans including Maine Senator Susan Collins, used the Congressional Review Act to rescind President Trump’s repeal of the Obama methane regulation.** The House will affirm the reinstatement of Obama rules in June,*** while a new study led by Penn State will report that that the EPA has severely underestimated methane emissions from U.S. oil and gas development.**** [see 2016 (May, October, November), 2017 (March, May, June), 2018 (June, September), 2019 (August), 2020 (February, July, August) 2021 (September, November)]

*United Nations Environment Programme and Climate and Clean Air Coalition , “Global Methane Assessment: Benefits and Costs of Mitigating Methane Emissions,” May 6, 2021, <https://www.unep.org/resources/report/global-methane-assessment-benefits-and-costs-mitigating-methane-emissions>; Summary for Decision Makers at https://wedocs.unep.org/bitstream/handle/20.500.11822/35917/GMA_ES.pdf;

Hiroko Tabuchi, “Halting the Vast Release of Methane Is Critical for Climate, U.N. Says,” *New York Times*, April 24, 2021, <https://www.nytimes.com/2021/04/24/climate/methane-leaks-united-nations.html>

**Editorial Board, “This might be the Senate’s most important climate vote ever,” *Washington Post*, April 27, 2021, https://www.washingtonpost.com/opinions/this-might-be-the-senates-most-important-climate-vote-ever/2021/04/27/067a77a0-a796-11eb-bca5-048b2759a489_story.html; Coral Davenport, “Senate Reinstates Obama-Era Controls on Climate-Warming Methane,” *New York Times*, April 27, 2021, <https://www.nytimes.com/2021/04/28/climate/climate-change-methane.html>

***Juliet Eilperin and Brady Dennis, “As Democrats spar over advancing Biden’s climate agenda, they move to cut methane,” *Washington Post*, June 25, 2021, <https://www.washingtonpost.com/climate-environment/2021/06/25/methane-climate-change/>

****Zachary Barkley et al., “Analysis of Oil and Gas Ethane and Methane Emissions in the Southcentral and Eastern United States Using Four Seasons of Continuous Aircraft Ethane Measurements,” *Journal of Geophysical Research: Atmospheres*, June 24, 2021; v. 126 (10), <https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2020JD034194>; E360 Digest, “Methane Emissions from Oil and Gas Exceed EPA Estimates, Study Finds” *Yale Environment* 360, June 29, 2021, <https://e360.yale.edu/digest/methane-emissions-from-oil-and-gas-exceed-epa-estimates-study-finds>

2021 (May)

First of its kind ruling by Dutch court orders Shell to reduce its carbon emissions, while Exxon gets two climate activist directors

The court in The Hague finds Royal Dutch Shell partially responsible for climate change, and rules that Shell must cut its carbon emissions by 45% by 2030, compared with 2019 levels. This is in line with United Nations guidance for member states aimed at preventing global temperatures rising more than 1.5 degrees Celsius above preindustrial levels. The civil suit was brought by the Dutch arm of the nonprofit Friends of the Earth. As reported in the *Wall Street Journal*, “Rather than seek damages, the nonprofit asked the court to force Shell to reduce its carbon emissions. Shell’s current emissions-reduction targets are based on intensity—the amount of carbon in any unit of energy—that could see its overall emissions still rise. The court said that Shell wasn’t in breach of its obligation to reduce carbon emissions, but that there was an “imminent breach” and therefore set the reduction requirement. It said its ruling covered the emissions of the company’s own operations and also those of its suppliers and customers. The court didn’t stipulate how the ordered reductions should be met, or how it might monitor or enforce its ruling.”* *Inside Climate News* quotes Roger Cox, an attorney for Friends of the Earth Netherlands: “ ‘This is a turning point in history... This case is unique because it is the first time a judge has ordered a large polluting company to comply with the Paris climate agreement.’”** Shell’s chief executive Ben van Beurden says that the company will appeal the decision, but “We will seek ways to reduce emissions even further in a way that remains purposeful and profitable.”*** A related article in the *Wall Street Journal* reports that “an activist investor won at least two seats on Exxon’s board, a historic defeat for the oil giant that will likely require it to alter its fossil-fuel focused strategy...The back-to-back, watershed decisions demonstrated how dramatically the landscape is shifting for oil-and-gas companies as they face increasing pressure from environmentalists, investors, lenders, politicians and regulators to transition to cleaner forms of energy. ‘The events of today show definitively that many leaders in the oil-and-gas industry have a tin ear and do not understand that society’s views and the legal and political environment in which they operate are changing radically,’ said Amy Myers Jaffe, a professor at Tufts University’s Fletcher School who has advised energy companies.”**** A year from now, however, nearly two-thirds of investors in ExxonMobil and Chevron will reject stockholder proposals for the companies to align their climate strategies with the Paris Agreement.*****

*Sarah McFarlane, “Shell Ordered by Dutch Court to Cut Carbon Emissions,” *Wall Street Journal*, May 26, 2021,

<https://www.wsj.com/articles/shell-ordered-by-dutch-court-to-cut-carbon-emissions-11622038961>

**Kristoffer Tigue and Dan Gearino, “Dutch Court Gives Shell Nine Years to Cut Its Carbon Emissions by 45 Percent from 2019 Levels,” *Inside Climate News*, May 26, 2021, <https://insideclimatenews.org/news/26052021/dutch-court-gives-shell-nine-years-to-cut-its-carbon-emissions-by-45-percent-from-2019-levels/>

***Stanley Reed, “Shell says a court ruling on greenhouse gases will speed up its plans to cut emissions,” *New York Times*, June 9 2021, <https://www.nytimes.com/2021/06/09/business/shell-climate-change.html>

****Sarah McFarlane and Christopher Matthews, “Oil Giants Are Dealt Major Defeats on Climate Change as Pressures Intensify,” *Wall Street Journal*, May 26, 2021, <https://www.wsj.com/articles/oil-giants-are-dealt-devastating-blows-on-climate-change-as-pressures-intensify-11622065455>

*****Maxine Joselow, “Investors reject climate proposals targeting ExxonMobil, Chevron,” *Washington Post*, May 26, 2022, <https://www.washingtonpost.com/politics/2022/05/26/investors-reject-climate-proposals-targeting-exxonmobil-chevron/>

2021 (June)

Biden Administration suspends drilling leases in Arctic National Wildlife Reserve pending environmental review, but supports another massive Alaska drilling project

Following up on President Biden's January 20 executive order that identified "alleged legal deficiencies" in the original ANWR leasing program and put in place a temporary moratorium on leasing activities in the refuge, Interior Secretary Deb Haaland announces a suspension of the ANWR leases pending a new environmental review under the National Environmental Policy Act. Environmentalists would have preferred an outright voiding of the leases.* Just a week previously, the Administration controversially lends its support to developing ConocoPhillips' Willow project in the National Petroleum Reserve-Alaska, the area that lies to the west of ANWR, set to produce more than 100,000 barrels of oil each day for 30 years, evidently unmindful of the IEA warning that there should be no new investment in fossil fuel supply projects in order to achieve net zero emissions by 2050 [see 2021 (May)]. ** In August, 2021, Judge Sharon L. Gleason of the United States District Court for Alaska will issue a ruling blocking the Willow project, writing that the Trump administration's approval of the project was "arbitrary and capricious" because it failed to account for the full scope of greenhouse gas emissions or for dangers to wildlife, including polar bears.*** The Biden Administration will undertake a new environmental review of the project.

*Adam Federman, "Biden freezes oil leases in Alaska refuge pending new environmental review," *Politico*, June 1, 2021, <https://www.politico.com/news/2021/06/01/biden-anwr-alaska-oil-491498>

**Lisa Friedman, "Biden Administration Defends Huge Alaska Oil Drilling Project," *New York Times*, May 26, 2021, <https://www.nytimes.com/2021/05/26/climate/biden-alaska-drilling.html>

***Georgina Gustin, "A Federal Judge's Rejection of a Huge Alaska Oil Drilling Project is the Latest Reversal of Trump Policy," *Inside Climate News*, August 20, 2021, <https://insideclimatenews.org/news/20082021/alaska-willow-oil-project-biden-trump/>

2021 (June)

Wild blueberry fields in Maine warming faster than Maine as a whole

As reported in the *Washington Post*, "Maine's beloved wild blueberry fields are home to one of the most important fruit crops in New England, and scientists have found that they are warming at a faster rate than the rest of the state...The wild blueberry industry in Maine has struggled somewhat in recent years as a result of factors such as last year's drought and volatile markets. Farmers produced 47.4 million pounds of Maine wild blueberries last year, and that was the lowest number since 2004. The study authors found that wild blueberry growers might need to change the way they farm to prepare for more warming. That could include changes to strategies such as irrigation and fertilizer use."* As earlier reported in *UMaine News*: "Rafa Tasnim, a Ph.D. student of ecology and environmental sciences, led the study that explored changes in climate change patterns, particularly in temperature and precipitation, at Down East wild blueberry fields in the past 40 years of growing seasons from 1980–2019, then compared them to aggregate changes in climate measured for the entire state. Yongjiang Zhang, an assistant professor of applied plant physiology, and Francis Drummond, professor emeritus of insect ecology and pest management, collaborated on the study, the first to assess climate change patterns for a fruit spanning different fields in a single production region." The study also reveals that "rising temperatures at Down East wild blueberry fields fueled increased potential evapotranspiration, or water loss, over four decades, the continuation of which could threaten the

water supply for crops and the low-water holding capacity of the soil in which the crops reside. The coupling effects of warming and increased potential evapotranspiration could hurt wild blueberry health and yield, according to researchers.”**

*Patrick Whittle, “Maine’s beloved blueberry fields warming faster than rest of state, study finds,” *Washington Post*, June 6, 2021, https://www.washingtonpost.com/national/maines-beloved-blueberry-fields-warming-faster-than-rest-of-state-study-finds/2021/06/06/e6c3ac56-c711-11eb-81b1-34796c7393af_story.html

**Marcus Wolf, “New study reveals Down East wild blueberry fields warming faster than Maine as a whole,” April 26, 2021, <https://zach.lv-o-wpc-test.its.maine.edu/news/blog/2021/04/26/new-study-reveals-down-east-wild-blueberry-fields-warming-faster-than-maine-as-a-whole/>; Rafa Tasnim, Francis Drummond and Yong-Jiang Zhang, “Climate Change Patterns of Wild Blueberry Fields in Downeast, Maine over the Past 40 Years,” *Water* 2021, 13(5), 594, February 25, 2021; <https://doi.org/10.3390/w13050594>

2021 (June)

NASA and NOAA report “alarming” increase in the Earth’s energy imbalance

A study by the National Oceanic and Atmospheric Administration and the National Aeronautic and Space Administration determines that the Earth’s “energy imbalance,” “how much of the Sun’s ‘radiative energy’ is absorbed by Earth’s atmosphere and surface, compared to how much ‘thermal infrared radiation’ bounces back into space,” approximately doubled from 2005 to 2019. As described in the NASA release on the study, “Increases in emissions of greenhouse gases such as carbon dioxide and methane due to human activity trap heat in the atmosphere, capturing outgoing radiation that would otherwise escape into space. The warming drives other changes, such as snow and ice melt, and increased water vapor and cloud changes that can further enhance the warming. Earth’s energy imbalance is the net effect of all these factors. In order to determine the primary factors driving the imbalance, the investigators used a method that looked at changes in clouds, water vapor, combined contributions from trace gases and the output of light from the Sun, surface albedo (the amount of light reflected by the Earth’s surface), tiny atmospheric particles called aerosols, and changes in surface and atmospheric temperature distributions.” Norman Loeb, lead author of the study, explains the cause of the increasing energy imbalance: “It’s likely a mix of anthropogenic forcing and internal variability... And over this period they’re both causing warming, which leads to a fairly large change in Earth’s energy imbalance. The magnitude of the increase is unprecedented.”*

*NASA, “Joint NASA, NOAA Study Finds Earth’s Energy Imbalance Has Doubled,” June 15, 2021, <https://www.nasa.gov/feature/langley/joint-nasa-noaa-study-finds-earths-energy-imbalance-has-doubled>; Norman Loeb, et al., “Satellite and Ocean Data Reveal Marked Increase in Earth’s Heating Rate,” *Geophysical Research Letters*, June 15, 2021, <https://doi.org/10.1029/2021GL093047>; Victoria Bekiempus, “Earth is trapping ‘unprecedented’ amount of heat, Nasa says,” *The Guardian*, June 17, 2021, <https://www.theguardian.com/science/2021/jun/17/earth-trapping-heat-study-nasa-noaa>

2021 (July)

Planet endures a catastrophic summer of heat, drought, fire, floods

“‘We are all in the same boat,’ says one diplomat from the developing world. ‘That is what this summer is telling us.’” As captured in the *Washington Post*, “The panicked commuters of Zhengzhou, China, could only stand on seats and cling to poles in a desperate attempt to keep their heads above the muddy torrent this past week, as floodwaters from record-breaking rains inundated the subway system. On the other side of the planet, in Gresham, Ore., a 61-year-old

maker of handcrafted ukuleles slowly died in June as searing temperatures made an oven out of his lifelong home — one of at least 800 victims of what one scientist called ‘the most anomalous heat event ever observed on Earth.’ Massive floods deluged Central Europe, Nigeria, Uganda and India in recent days, killing hundreds. June’s scorching temperatures, followed by a fast-moving wildfire, erased a Canadian town. More than a million people are close to starvation amid Madagascar’s worst drought in decades. In Siberia, tens of thousands of square miles of forest are ablaze, potentially unleashing carbon stored in the frozen ground below.”* The Canadian town that was “erased” was Lytton, British Columbia, which broke three heat records in three consecutive days, topping out at 121 degrees Fahrenheit, burning to the ground, parched dry, on the next day in a wildfire. Bill McKibben quotes Jeff Masters and Bob Henson, meteorologists who blog for a Yale climate website: “Never in the century-plus history of world weather observation have so many all-time heat records fallen by such a large margin.” And climate scientist James Hansen tells McKibben: “We’ve been expecting extreme events. But what happened in Canada was unusually extreme.”** An estimated one billion small sea creatures — including mussels, clams and snails — die during the heat wave off the coast of the Pacific Northwest and Canada.*** As for extreme conditions in the U.S., *The Guardian* quotes University of California Irvine paleoclimatologist Kathleen Johnson: “the current drought potentially on track to become the worst that we’ve seen in at least 1,200 years. And the reason is linked directly to human caused climate change.” Katherine Hayhoe, climate scientist and chief scientist at The Nature Conservancy comments: “The extreme heat and the wildfires aren’t surprising. But it is just surreal to see what you only ever saw before in your research studies and models, actually happening in real life. And you’re almost dumbfounded by the speed at which your projections have become reality.”**** As of mid-July, Lake Mead, the U.S.’s largest reservoir formed by construction of the Hoover Dam in the 1930’s to provide water for seven Western states, “is now barely a third full, the dark basalt rock of its canyon walls blanched by a distinctive white calcium ring where the water level once was. This level has plunged by about 130ft in the past 20 years and is currently receding by about a foot a week as farms hit their peak irrigation period.”***** The *Wall Street Journal* reports: “In a sign that the West’s drought is getting worse, the U.S. Bureau of Reclamation said Friday it was taking the unprecedented action of releasing more water from reservoirs upstream to Lake Powell to help keep its level high enough for power generation...’We hoped we would never have to go down this road, but now we have to,’ Wayne Pullan, the bureau’s regional director in Salt Lake City, said in a video briefing with the media Friday.”*****

*Sarah Kaplan and Brady Dennis, “Amid summer of fire and floods, a moment of truth for climate action,” *Washington Post*, July 24, 2021, <https://www.washingtonpost.com/climate-environment/2021/07/24/amid-summer-fire-floods-moment-truth-climate-action/>

**Bill McKibben, “The Year in Climate: A summer that really scared scientists,” *The New Yorker*, December 16, 2021, <https://www.newyorker.com/news/2021-in-review/the-year-in-climate>

*** Sammy Westfall and Amanda Coletta, “Crushing heat wave in Pacific Northwest and Canada cooked shellfish alive by the millions,” *Washington Post*, July 8, 2021, <https://www.washingtonpost.com/world/2021/07/08/canada-sea-creatures-boiling-to-death/>

****Maanvi Singh, “ ‘Potentially the worst drought in 1,200 years’: scientists on the scorching US heatwave,” *The Guardian*, June 18, 2021, <https://www.theguardian.com/us-news/2021/jun/18/us-heatwave-west-climate-crisis-drought>

*****Oliver Milman, “Severe drought threatens Hoover dam reservoir – and water for US west,” *The Guardian*, July 13, 2021, <https://www.theguardian.com/us-news/2021/jul/13/hoover-dam-lake-mead-severe-drought-us-west>

*****Jennifer Levitz and Ian Lovett, “Heat Waves, Wildfires Intensify in the West,” *Wall Street Journal*, July 18, 2021, <https://www.wsj.com/articles/western-states-bake-in-another-weekend-of-intense-heat-as-wildfires-spread-11626560700>

2021 (July)

France passes wide-ranging legislation to reduce greenhouse gas emissions

Spurred by a court ruling [February, 2021], activist pressure and a summer of extreme weather, France passes a law intended to mitigate climate change. Left-wing politicians and environmental activists respond that the steps are not enough. The *New York Times* summarizes provisions of the law: “Landlords are no longer allowed to rent poorly insulated properties; single-use food packaging made of polystyrene will be banned starting in 2025; advertising for fossil fuel energy, like gasoline, is set to be phased out; and weekly vegetarian menus will become the norm in state-funded school cafeterias. Domestic flights for journeys that can be made by train in less than 2.5 hours are banned, unless they connect to an international flight. Subsidies for drivers who trade in a polluting car for a cleaner one have been extended to electric bicycle purchases. The law will also create low-emission zones in urban areas with over 150,000 inhabitants by 2025, limiting the circulation of certain polluting vehicles.” Taxing polluting activities plays a small, contingent role in the legislative scheme: “The law gives regions the ability, but does not require them, to tax the polluting activities of freight merchandise transportation starting in 2024. And a tax on polluting nitrogen fertilizers used in farming will only be ‘considered’ if reduction targets are not met.”*

* Aurelien Breeden, “France Passes Climate Law, but Critics Say It Falls Short,” *New York Times*, July 20, 2021, <https://www.nytimes.com/2021/07/20/world/europe/france-climate-law.html>

2021 (July)

European Union adopts ambitious Climate Law together with proposals for implementation

On July 9, the EU publishes Regulation (EU) 2021/1119 (the “European Climate Law”), which enshrines in law the EU’s objective of becoming climate neutral by 2050, and the intermediate target of reducing net greenhouse gas (GHG) emissions by at least 55% by 2030. The new law is a central element of the European Green Deal, and its adoption sets the stage for a wave of “green” regulatory initiatives in the EU aimed at achieving the EU’s climate objectives. João Pedro Matos Fernandes, EU Minister of Environment and Climate Action, states in a press release: “I warmly welcome this final step of the adoption of the EU’s very first climate law which enshrines into legislation the 2050 climate neutrality objective.” In addition to the goal of climate neutrality and an aspirational goal for the Union to strive to achieve negative emissions after 2050, the law sets a binding EU climate target of a reduction of net greenhouse gas emissions (emissions after deduction of removals) by at least 55% by 2030 compared to 1990.* The package of proposed legislation to achieve this goal, unveiled a week later by the European Commission, the executive branch of the EU, is described by the *Wall Street Journal* “as a broad economic overhaul that would sharply cut the bloc’s reliance on fossil fuels and place first-of-its kind levies on imports from high-emitting countries...rank[ing] among the most ambitious plans yet by a major economic power to cut emissions of carbon dioxide and other gases such as methane that the majority of scientists say are causing the earth to warm. It calls for a massive shift by companies

and households to cleaner technologies such as wind turbines, solar power and electric vehicles—including a requirement for the share of renewable sources in Europe’s energy mix to rise to 40% in 2030 from 20% currently. The plan aims to limit pollution across the European economy, including electricity generation, automobiles, housing, shipping and agriculture.” ** These proposals must be negotiated with the EU countries and the European Parliament, a process that could take two years.***

*Press Release, Council of the European Union, “Council adopts European climate law,” June 28, 2021,

<https://www.consilium.europa.eu/en/press/press-releases/2021/06/28/council-adopts-european-climate-law/>

** Matthew Dalton and Sha Hua, “EU, China Unveil Sweeping Plans to Cut Greenhouse-Gas Emissions,” *Wall Street Journal*, July 15, 2021, <https://www.wsj.com/articles/eu-to-propose-sweeping-economic-plan-to-combat-climate-change-11626251377>

***Kate Abnett, “EU bets on energy savings, greener buildings to meet climate target -draft,” *Reuters*, July 6, 2021,

<https://www.reuters.com/business/environment/eu-bets-energy-savings-greener-buildings-meet-climate-target-draft-2021-07-06/>

2021 (July)

China begins long promised emissions trading system for electric generation

In a step forward for emissions trading as a strategy for greenhouse gas reduction, China begins trading for carbon credits among its electric power plants on July 16. The project had been in the works for more than ten years and was formally announced in 2017 [2017 (December)]. An emissions trading system (“ETS”) puts a price on greenhouse gases generated by industry and allows more efficient facilities to sell credits to less efficient industries, increasing the economic costs of pollution and promoting efficiency. Although the system in China is limited to electric generation, the *Wall Street Journal* reports that China’s ETS is now the world’s largest carbon market and doubles the share of global emissions covered under such programs.* In a detailed analysis of the Chinese ETS and what it means for climate change, *CarbonBrief* reports that the Chinese program covers 12% of global carbon dioxide emissions. China overall accounts for more than a quarter of global emissions, and 40% of China’s emissions come from the electricity sector which is covered by the ETS. *Xinwen Lianbo*, a prime-time news program that is a major mouthpiece of the Communist Party of China, reports that “It is the first time that China has pressed the responsibility of controlling greenhouse gas emissions onto enterprises from the national level and promoted the upgrading of industrial technology through a market-pushing mechanism.” The opening price per tonne of CO₂ is 48 yuan (\$7.4) with a prospective “steady rise” forward, up to 167 yuan (\$26) in 2050. Unlike other ETS’s [see Regional Greenhouse Gas Initiative (2005 December)] China’s program does not use a declining “cap” to ensure CO₂ emissions fall each year. Much of the hope for success of this program for significantly reduced emissions depends on the potential for later modifications: “In the first implementation cycle, permits will be given for free, based on the output of each site and ‘benchmarks’ of emissions per unit of output, as well as other adjustments. ... In general, the current design means a regulated power plant will receive more permits if it generates more electricity. As a result, the ETS should – in theory, at least – encourage more efficient operations, but it is not guaranteed to reduce emissions overall. The scheme could be tightened in the future by adjusting the benchmarks over time, or by introducing an absolute cap on the emissions that can be released under the ETS. The regulatory and legislative structure underpinning the ETS is relatively weak and fines for breaches are low, but these too could be strengthened over time.”**

*Matthew Dalton and Sha Hua, “EU, China Unveil Sweeping Plans to Cut Greenhouse-Gas Emissions,” *Wall Street Journal*, July 15, 2021, <https://www.wsj.com/articles/eu-to-propose-sweeping-economic-plan-to-combat-climate-change-11626251377>

**Hongqiao Liu, “China Policy: In-depth Q&A: Will China’s emissions trading scheme help tackle climate change?” *CarbonBrief*, June 24, 2021, <https://www.carbonbrief.org/in-depth-qa-will-chinas-emissions-trading-scheme-help-tackle-climate-change/>

2021 (July)

Study assesses impact of warming Gulf of Maine on zooplankton and fishery stocks

A study led by Andrew Pershing of the Gulf of Maine Research Institute, and including scientists from NOAA, the University of Maine Darling Center, Bigelow Laboratory of Ocean Sciences, and several Canadian research institutes, analyses correlations between warming waters in the Gulf of Maine and diminished populations of various iconic species and goes on to assess the likelihood of further changes by the year 2050. The Gulf of Maine has experienced its warmest 5-year period (2015–2020) in the instrumental record, making it one of the fastest rates of warming of any ocean ecosystem. During the same period, northeast U.S. fishery stocks, including northern shrimp, Atlantic cod, American lobster, and herring are moving northward and to deeper depths with long-term temperature changes across the region. The study suggests that a key to the dynamic changes in Gulf of Maine ecosystems is in understanding the role of a microscopic crustacean, the zooplankton *Calanus finmarchicus*.* As described in an article on the study by Derrick Jackson in *The Daily Climate*, Calanus is “the keystone of the sub-polar food web that makes the Gulf of Maine one of Earth’s richest marine ecosystems. By munching on phytoplankton and microzooplankton invisible to the naked eye, Calanus pack themselves so densely with fatty acids that researchers call them ‘butterballs’ of the sea. Species that directly eat Calanus at some point in their lives include herring, mackerel, cod, basking sharks, haddock, redfish, sand lance, shrimp, lobster and right whales. ... The Gulf of Maine already marks the southern end of the range for *Calanus finmarchicus* on this side of the Atlantic. With record warmth in recent years, the species is in a decline that correlates with right whales bypassing the gulf in search of food hundreds of miles to the north in the Gulf of St. Lawrence. There are also early correlations with a decline in baby lobsters. While scientists are often careful to say that correlations do not necessarily mean causation, the decline of Calanus populations coincides with current and projected declines for many fish populations in the gulf.”** Under a greenhouse gas emissions scenario that reflects few if any future emissions controls, the study predicts significant further loss of Calanus zooplankton, as well as of the cod, lobster, and herring that “human communities and economies around the Gulf of Maine depend on for food, livelihoods, recreation, heritage, and culture.”*

*Andrew Pershing et al., “Climate impacts on the Gulf of Maine ecosystem: A review of observed and expected changes in 2050 from rising temperatures,” *Elementa: Science of the Anthropocene* (2021) 9 (1): 00076, <https://doi.org/10.1525/elementa.2020.00076>

**Derrick Jackson, “A big climate warning from one of the Gulf of Maine’s smallest marine creatures,” *The Daily Climate*, February 17, 2022, <https://www.dailyclimate.org/a-big-climate-warning-from-one-of-the-gulf-of-maines-smallest-marine-creatures-2656689407/dramatic-declines>

2021 (August)

IPCC delivers “unequivocal” warning on climate change in Sixth Assessment Report

Reflecting the work of over 750 scientists from around the world, and 14,000 scientific studies, the Intergovernmental Panel on Climate Change delivers what has been described as the “clearest and most comprehensive summary yet” of how humans are driving dramatic and long-lasting changes to our climate. This is the first of three parts of the Sixth Assessment, written by Working Group I, which provides the latest assessment of scientific knowledge about the warming of the planet and projections for future warming and its impacts on the climate system. As summarized by *New York Times* journalist Henry Fountain, humans “have poured so much of these gases into the atmosphere over the last century-plus that no matter what happens now, the world will keep warming until at least until 2050, reaching 1.5 degrees Celsius (2.7 degrees Fahrenheit) of warming, the ambitious limit that was a goal of the 2015 Paris Agreement, well before that, perhaps even by the end of this decade.” Deadly heatwaves, parching droughts, and devastating floods will continue for the next thirty years.* The IPCC press release states: “Many of the changes observed in the climate are unprecedented in thousands, if not hundreds of thousands of years, and some of the changes already set in motion—such as continued sea level rise—are irreversible over hundreds to thousands of years. However, strong and sustained reductions in emissions of carbon dioxide (CO₂) and other greenhouse gases would limit climate change. While benefits for air quality would come quickly, it could take 20-30 years to see global temperatures stabilize...[U]nless there are immediate, rapid and large-scale reductions in greenhouse gas emissions, limiting warming to close to 1.5°C or even 2°C will be beyond reach.” A new feature in the assessment reflects growing concerns about the disproportional impacts of climate on poorer nations, and the need for effective policy responses: “For the first time, the Sixth Assessment Report provides a more detailed regional assessment of climate change, including a focus on useful information that can inform risk assessment, adaptation, and other decision-making, and a new framework that helps translate physical changes in the climate – heat, cold, rain, drought, snow, wind, coastal flooding and more – into what they mean for society and ecosystems.” And as opposed to previous assessments [see 2013 (September)], the IPCC Summary for Policymakers makes it clear that there is no longer a shred of doubt that the climate change we have been seeing and will see is the result of what humans have done: “It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred.” ** The *Wall Street Journal* predicts that the report “is likely to be a major force in both geopolitics and business. It sets scientific baselines and offers guidance to negotiators regularly convened by the U.N. under the Paris Climate Agreement, which has become a benchmark for corporate as well as governmental efforts to curb emissions,” and quotes climate scientist Michael Mann on its resonance with a summer of extreme weather: “[t]he report ‘connects the dots in a way we really haven’t seen before,’ said climate scientist Michael Mann, director of the Earth System Science Center at Pennsylvania State University, who wasn’t involved with the report. ‘The message eerily resonates with what we’re seeing this summer in Canada, the U.S. and Europe as extreme weather events play havoc on us and our infrastructure.’”*** Michael Mann and coauthors will also point out that buried in this report is a “paradigm-shifting” analysis of our climate future that is reason for optimism: achieving a zero-carbon global economy may stop temperatures rising “in as little as three to five years.”**** In the interim, while we move too slowly toward zero-carbon, Elizabeth Kolbert concludes her *New Yorker* comment: “What will summer be like as temperatures continue to rise? In the carefully vetted formulation of the I.P.C.C., ‘many changes

in the climate system become larger in direct relation to increasing global warming.’ In other words, we really don’t want to find out. But, unfortunately, we are going to.”*****

*Henry Fountain, “A future with dangerous warming locked in,” *New York Times Climate Forward* newsletter, August 11, 2021, <https://www.nytimes.com/2021/08/11/climate/a-future-with-dangerous-warming-locked-in.html>

**Intergovernmental Panel on Climate Change, *Climate Change 2021: The Physical Science Basis Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, August 9, 2021,

<https://www.ipcc.ch/report/ar6/wg1/>; IPCC Press Release, “Climate Change widespread, rapid, and intensifying,” August 9, 2021,

https://www.ipcc.ch/site/assets/uploads/2021/08/IPCC_WGI-AR6-Press-Release_en.pdf; an interactive presentation of impacts on different regions is at <https://interactive-atlas.ipcc.ch/>; Summary for Policymakers at

<https://www.ipcc.ch/report/ar6/wg1/chapter/summary-for-policymakers/>

***Robert Lee Hotz and Timothy Puko, “Some Climate Change Effects May Be Irreversible, U.N. Panel Says,” August 9, 2021,

<https://www.wsj.com/articles/some-climate-change-effects-may-be-irreversible-u-n-panel-report-says-11628496000>

****Mark Hertsgaard, Saleemul Huq and Michael E. Mann, “How a little-discussed revision of climate science could help avert doom,” *Washington Post*, February 23, 2022, <https://www.washingtonpost.com/outlook/2022/02/23/warming-timeline-carbon-budget-climate-science/>; see also, with additional text and graphic, Mark Hertsgaard, Saleemul Huq and Michael E. Mann, “The Best Climate Science You’ve Never Heard Of,” February 26, 2022, <https://michaelmann.net/content/best-climate-science-you%E2%80%99ve-never-heard>

*****Elizabeth Kolbert, “The U.N.’s Terrifying Climate Report,” *The New Yorker*, August 15, 2021, <https://www.newyorker.com/magazine/2021/08/23/the-uns-terrifying-climate-report>

2021 (August)

Report tracks fossil fuel sector’s use of Facebook to delay climate action

InfluenceMap releases a report on over 25,000 ads on Facebook sponsored by 25 fossil fuel oil and gas sector organizations, led by Exxon, that were viewed 431 million times in 2020 alone. The report states, “The ads promoted either the climate-friendliness of the industry, including voluntary targets, investments into renewables, and promoting fossil gas as green, or promoted an ongoing role for oil and gas in the energy mix. Many of these ads either contained misleading content or present information that was misaligned with the science of climate change according to both the Intergovernmental Panel on Climate Change’s and the International Energy Agency’s reports on reaching net zero by 2050.”* Comments Bill McKibben, in the context of the IPCC Sixth Assessment and delays in Congress on climate legislation [see 2021(March)]: “In time, historians will conclude that the concerted effort to slow our reaction to the threat of climate change underlay much of the damage that the social world has suffered in past decades... [O]ur social world has been as thoroughly polluted as our physical one, and a great deal of the divisiveness that now clouds every issue can be traced to this battle for the energy future. In that light, the climate movement has essentially been fighting for one thing: to build a conscious consensus among people that the world is in danger, and, in the process, to weaken the hand of the carbon industry. ... The I.P.C.C. has gotten better at its job over the years, and so have movements: the message that we face implacable deadlines is clearly getting through, and public opinion is shifting. But, again, delay is victory for the oil industry. ...The I.P.C.C. has documented—with terrifying precision, employing all the tools that human cleverness can conjure up—the predicament of our physical world. But, at this point, that’s not where the fight really lies.”

*InfluenceMap, “Climate Change and Digital Advertising: The Oil and Gas Industry’s Digital Advertising Strategy,” August 2021, <https://influencemap.org/report/Climate-Change-and-Digital-Advertising-a40c8116160668aa2d865da2f5abe91b#1>

**Bill McKibben, “The Climate Crisis,” *The New Yorker* newsletter, August, 2021, <https://link.newyorker.com/view/5bea0cf62ddf9c72dc8d8224epi34.lg3/31d51279>

2021 (August)

Biden Administration proposes tighter US vehicle emissions standards, while at the same time urging OPEC to increase fuel production

As reported in *Inside Climate News*, President Biden’s proposed vehicle emission rules, to go into effect in 2023, would be more stringent than they were before Trump loosened them [see 2020 (March)]. Biden would require average fuel economy of 52 miles per gallon by 2026, compared to the Obama administration’s standards, which would have brought the average to 50.1 mpg by 2025. “But because of the years of lost progress, the greenhouse gas savings will be less: some 2 billion metric tons of carbon pollution through 2026, compared to the Obama plan, which was designed to cut 6 billion metric tons through 2025.”* Six days later, and two days after release of the August 9 IPCC Sixth Assessment report, President Biden issues a statement on the “Need for Reliable and Stable Global Energy Markets,” urging the oil cartel OPEC, to increase production in hopes of lowering the price of gasoline at the pump. In an essay titled “Biden’s Welcome Hypocrisy on Climate Policy” in the *Wall Street Journal*, Ted Nordhaus and Morgan Bazilian argue: “The awkward juxtaposition of these events offers a good window into why climate action has proved to be so difficult, even as the risks associated with continuing climate change have become clearer. While the Biden administration attempts with one hand to wrangle China and India to commit to deeper emissions cuts and to raise the ambition of federal climate policy, it tries with the other to keep energy prices from rising. ... In the U.S., strong majorities of the public say that they support action to address climate change, but that support generally collapses when pollsters place a price tag on those actions. Voters appear to mean it. Many observers believe that Democratic efforts to raise energy prices—via a federal BTU tax in 1994 and a cap-and-trade program in 2010—contributed to their loss of congressional majorities in the elections that followed. Little wonder that earlier this month Mr. Biden was eager to boast that he had resisted efforts to pay for his infrastructure and climate investments with a gas tax.”**

*EPA Press Release, “EPA to Overhaul Pollution Standards for Passenger Vehicles and Heavy-Duty Trucks, Paving Way for Zero-Emission Future,” August 5, 2021, <https://www.epa.gov/newsreleases/epa-overhaul-pollution-standards-passenger-vehicles-and-heavy-duty-trucks-paving-way>; Dan Gearino, Marianne Lavelle, Nicholas Kusnetz, “Biden Tightens Auto Emissions Standards, Reversing Trump, and Aims for a Quantum Leap on Electric Vehicles by 2030,” *Inside Climate News*, August 5, 2021, <https://insideclimatenews.org/news/05082021/biden-tightens-auto-emissions-standards-reversing-trump-and-aims-for-a-quantum-leap-on-electric-vehicles-by-2030/>; For assistance navigating the development of these and other rules through the Obama, Trump and Biden administrations, and links to Federal Register notices, see the Environmental and Energy Law Project (EELP), Harvard Law School, Regulatory Tracker, Clean Car Rules—Corporate Average Fuel Economy Standards/Greenhouse Gas Standards, <https://eelplaw.harvard.edu/2019/09/corporate-average-fuel-economy-standards-greenhouse-gas-standards/>

**Ted Nordhaus and Morgan Bazilian, “Biden’s Welcome Hypocrisy on Climate Policy,” *Wall Street Journal*, August 26, 2021, <https://www.wsj.com/articles/bidens-welcome-hypocrisy-on-climate-policy-11629993737>

2021 (August)

NOAA annual climate report: unprecedented global sea levels and the highest annual increase in concentrations of methane gas

The planet’s health showed dramatic decline in 2020, according to the “State of the Climate in 2020” report from the National Oceanic and Atmospheric Administration. As summarized in the

abstract, “In 2020, the dominant greenhouse gases stored in Earth’s atmosphere continued to increase. The annual global average carbon dioxide (CO₂) concentration at Earth’s surface was 412.5± 0.1 ppm, an increase of 2.5 ± 0.1 ppm over 2019, and the highest in the modern instrumental record and in ice core records dating back 800,000 years. While anthropogenic CO₂ emissions were estimated to decrease around 6%–7% globally during the year due to reduced human activities during the COVID-19 pandemic, the reduction did not materially affect atmospheric CO₂ accumulation as it is a relatively small change, less even than interannual variability driven by the terrestrial biosphere. The net global uptake of ~3.0 petagrams of anthropogenic carbon by oceans in 2020 was the highest in the 39-year record and almost 30% higher than the 1999–2019 average.” * The *Washington Post* captures the frustration of NOAA climate scientist Jessica Blunden, who has co-led the report for eleven years: “‘It’s a record that keeps playing over and over again ... Things are getting more and more intense every year because emissions are happening every year.’ Sometimes Blunden feels like a doctor whose patient won’t listen to health advice, watching a mild illness morph into a chronic disease. By this point, the patient practically has multiple organ failure, ‘and still they keep eating those Cheeto puffs,’ she said.”**

*Jessica Blunden and Tim Boyer, Eds., “State of the Climate in 2020”. *Bull. Amer. Meteor. Soc.*, v.102 (8), August 1, 2021,

<https://journals.ametsoc.org/view/journals/bams/102/8/2021BAMSStateoftheClimate.1.xml>

**Sarah Kaplan, “Many measures of Earth’s health are at worst levels on record, NOAA finds,” *Washington Post*, August 26, 2021,

<https://www.washingtonpost.com/climate-environment/2021/08/26/many-measures-earths-health-are-worst-levels-record-noaa-finds/>

2021 (August)

For the first time since observations have been made, rain falls on the highest point of the Greenland ice sheet

The Greenland ice sheet is about 656,000 square miles of glacial land ice, covering most of the country. It is located in the Arctic region, which is warming twice as fast as other regions of the world – by almost 2 degrees Celsius since pre-industrial times, compared with the global average of about 1 degree Celsius. As reported by National Public Radio, “According to the U.S. National Snow & Ice Data Center, rain fell for several hours on an area 10,551 feet in elevation on Aug. 14, an unprecedented occurrence for a location that rarely sees temperatures above freezing.”* Writes Kim Heacox in *The Guardian*: “If the people of Miami, Shanghai, Tokyo, Mumbai, Lagos, Bangkok and New York are not concerned, they should be. The great Greenland ice melt is a climate crisis sword of Damocles for all coastal, low-lying, densely populated areas. No other single factor will probably contribute more to sea level rise over the next few decades.”**

*Joe Hernandez, “Rain Fell On The Peak Of Greenland's Ice Sheet For The First Time In Recorded History,” *NPR*, August 20, 2021,

<https://www.npr.org/2021/08/20/1029633740/rain-fall-peak-of-greenland-ice-sheet-first-climate-change>

**Kim Heacox, “Rain fell on Greenland’s ice sheet for the first time ever known. Alarms should ring,” *The Guardian*, September 13,

2021, <https://www.theguardian.com/commentisfree/2021/sep/13/greenland-ice-sheet-melting-fridtfjof-nansen>

2021 (August)

Climate scientists warn that rate of global warming could double in the next 25 years, partially as a result of reductions in cooling industrial aerosol emissions

While carbon dioxide, methane, and other greenhouse gases in the highest reaches of Earth's atmosphere have been trapping solar energy and raising global temperatures, another product of industrialization has had a countereffect of cooling the planet: sulfate aerosols which make clouds more reflective of the sun's energy. Pollution controls have been reducing those aerosols, hence accelerating warming beyond amounts predicted based on greenhouse gas emissions alone. As former NASA climate scientist James Hansen and colleague Makiko Sato write in their monthly temperature analysis published by the Climate Science, Awareness and Solutions center at Columbia University's Earth Institute, "July global temperature (+1.16°C relative to 1880-1920 mean) was within a hair (0.02°C) of being the warmest July in the era of instrumental measurements. That's remarkable because we are still under the influence of a fairly strong La Nina. Global cooling associated with La Ninas peaks five months after the La Nina peak, on average. Something is going on in addition to greenhouse warming." After concluding that changes in greenhouse gas concentrations in the atmosphere can't fully account for the increases in temperature, they write: "It follows that the global warming acceleration is due to the one huge climate forcing that we have chosen not to measure: the forcing caused by imposed changes of atmospheric aerosols. Leon Simons – Director of Club of Rome Netherlands – sent a message to [Hansen] several months ago describing regulations being imposed by the International Maritime Organization on sulfur emissions from ships. Some reductions were required by 2015 and stiffer restrictions were imposed globally in 2020. The reductions are imposed for the sake of human health; the World Health Organization reports that 3-4 million people per year die from outdoor air pollution. It's a shame that we are not measuring the aerosol climate forcing to take advantage of this vast geophysical experiment to improve our understanding. The human-made aerosol forcing is almost as large as the CO2 forcing, but it is of the opposite sign, i.e., aerosols cause cooling." Because the cooling global aerosol production "is expected to decline substantially in the next several decades as we phase down fossil fuel emissions," Hansen and Sato estimate that "We should expect the global warming rate for the quarter of a century 2015-2040 to be about double the 0.18°C/decade rate during 1970-2015 unless appropriate countermeasures are taken."* As Bob Berwyn notes in *Inside Climate News*, "While Hansen was with NASA—where he worked when he testified to Congress [see 1988 (June)] that human emissions of greenhouse gases were warming the climate—he pushed for the deployment of satellites with instruments specifically designed to measure the effects of aerosols on the climate. And it 'almost happened against the wishes of NASA headquarters,' he said. But NASA's Glory satellite mission exploded before reaching orbit. That left a gap in observations of the particles' effects on the climate during a critical time period when greenhouse gas emissions accelerated, while aerosol emissions slowed. The loss of the satellite left researchers especially blind to geographic nuances, like how reductions of aerosols from shipping affect clouds over the oceans."**

*James Hansen and Makiko Sato, "July Temperature Update: Faustian Payment Comes Due," Columbia University Climate Science, Awareness, and Solutions, August 13, 2021, <http://www.columbia.edu/~mhs119/Temperature/Emails/July2021.pdf>

**Bob Berwyn, "The Rate of Global Warming During Next 25 Years Could Be Double What it Was in the Previous 50, a Renowned Climate Scientist Warns," *Inside Climate News*, September 15, 2021, <https://insideclimatenews.org/news/15092021/global-warming-james-hansen-aerosols/>

2021 (September)

Department of Energy releases plan to grow solar to 40% of U.S. electricity by 2035

DOE Secretary Jennifer Granholm states that solar “could produce enough electricity to power all of the homes in the U.S. by 2035 and employ as many as 1.5 million people in the process... Achieving this bright future requires a massive and equitable deployment of renewable energy and strong decarbonization policies – exactly what is laid out in the bipartisan Infrastructure Investment and Jobs Act and President Biden’s Build Back Better agenda.”* Notes Bill McKibben: “By itself, of course, converting one country’s electricity system to run nearly half on solar is not going to curtail global warming. But an effort at this scale will move us fast along the learning curve: the cost of solar has regularly fallen about thirty per cent with each doubling of capacity—so increasing its scale from less than four per cent, which it is at present, to forty-five per cent should make what is already the cheapest energy on Earth far cheaper still.” Reminding us of President Jimmy Carter installing solar panels on the White House roof and proposing a goal to produce twenty per cent of the country’s energy from renewable resources by 2000 [1979 (June)], McKibben comments: “Had Carter been reelected, and had we pursued steadily his vision through the nineteen-eighties and nineties, we may have gone down the learning curve decades earlier. We might not have solved climate change by now, but we’d probably be in an infinitely better place. That we didn’t is an unspeakable tragedy.” **

*U.S. Department of Energy, “DOE Releases Solar Futures Study Providing the Blueprint for a Zero-Carbon Grid,” September 8, 2021, <https://www.energy.gov/articles/doe-releases-solar-futures-study-providing-blueprint-zero-carbon-grid>; Timothy Puko and Jennifer Hiller, “U.S. Puts \$562 Billion Price Tag on Ramping Up Solar Power,” *Wall Street Journal*, September 8, 2021, <https://www.wsj.com/articles/u-s-could-get-44-of-its-electricity-from-solar-power-by-2050-report-says-11631114263>

**Bill McKibben, “Joe Biden’s Solar Plan and the Prescience of Jimmy Carter,” *The New Yorker*, September 8, 2021, <https://www.newyorker.com/news/daily-comment/joe-bidens-solar-plan-and-the-prescience-of-jimmy-carter>

2021 (September)

Harvard University will divest its \$42 billion endowment from all fossil fuels

Harvard’s decision follows nearly a decade of student, faculty, and alumni activism [see 2012 (November), 2014 (April)], including filing a complaint earlier this year with the Massachusetts attorney general’s office alleging that Harvard’s investments in oil, gas, and coal violate the Uniform Prudent Management of Institutional Funds Act, a state law that regulates how nonprofit institutions can spend their endowment funds.* Bill McKibben, whose 350.org launched the divestment movement in 2012, notes that one of the founders of Fossil Fuel Divest Harvard, Chloe Maxmin, has since graduated, been elected to the Maine House of Representatives, and then to the Maine State Senate.** As reported in *The Guardian*, Harvard president Laurence Bacow concedes that some indirect fossil fuel investments will continue for some time: “The university has legacy investments in a number of private equity funds with holdings in the fossil fuel industry. Those indirect investments constitute less than 2% of the endowment.” The school has not made any new commitments to these limited partnerships since 2019 and has no intention to do so and they will end as these partnerships are liquidated. Fossil Fuel Divest Harvard’s comment on this “massive victory:” “It took conversations and protests, meetings with administration, faculty/alumni votes, mass sit-ins and arrests, historic legal strategies, and storming football fields. But today, we can see proof that activism works, plain and simple.”***

Although some institutional investors with a climate agenda express concern that divestment ends the ability to influence oil and gas company agendas from within,**** in October the Ford Foundation, 72 faith institutions, and five additional colleges and universities will commit to divesting from fossil fuels. *The Revelator* quotes McKibben as saying divestment has “turned into what’s probably the biggest anti-corporate campaign in history. It’s not only badly tarnished the social license of these companies but dented their access to capital so badly that Peabody Coal called it one cause of their bankruptcy and Shell Oil said it was having a ‘material adverse effect’ on their business. Since their business is having a material adverse effect on the prospects for life on earth, turnabout is fair play.”*****

*Emily Pontecorvo, “Students find obscure law that could make university fossil fuel investments illegal,” *Grist*, March 22, 2021, <https://grist.org/climate-energy/harvard-boston-college-students-find-obscure-law-that-could-make-university-fossil-fuel-investments-illegal>

**Bill McKibben, “The Climate Crisis” newsletter, *The New Yorker*, April 7, 2021, <https://mail.google.com/mail/u/0/#label/climate/FMfcgxwLtOPwrgBHzJjDsCsPhqqpKWXs>

***Arwa Mahdawi, “Harvard University will divest its \$42bn endowment from all fossil fuels,” *The Guardian*, September 10, 2021, <https://www.theguardian.com/environment/2021/sep/10/harvard-university-divest-endowment-fossil-fuels>

****Chris McGreal, “The climate advocates who say Harvard’s oil divestment is a mistake,” *The Guardian*, September 14, 2021, <https://www.theguardian.com/environment/2021/sep/14/fossil-fuel-divestment-harvard-oil-exxon-shell>

*****John Platt, “The Divestment Movement’s Big Month,” *The Revelator*, October 29, 2021, <https://therevelator.org/divestment-big-month/>

2021 (September)

US and EU spearhead global pledge on methane emissions, US follows through with strict proposed regulations for methane emissions from oil and gas wells

Bolstered by the landmark UN report on the urgency of reducing methane emissions [2021 (May)], and in preparation for the UN Conference of the Parties (COP26) in Glasgow in November, the United States and the European Union pledge to take steps to reduce their respective nation’s methane emissions by at least 30 percent below 2020 levels by 2030.* By COP26 in November [2021 (November)], more than 100 nations will have signed the pledge, and the US will have announced a far reaching proposed regulation on methane emissions from oil and gas wells. For the first time, the Environmental Protection Agency would regulate methane at existing wells nationwide, putting roughly a million new and existing wells under EPA methane regulation, with stricter requirements for new wells in addition to the first-time regulations for old ones. Venting methane at wells would be prohibited; companies would be required to collect the methane and sell it and develop comprehensive monitoring systems to find and fix leaks. By COP27 in November 2022 [2022 November], the EPA will release a Supplemental Proposal to regulate methane with a more comprehensive regulatory framework that encourages use of advanced technologies to reduce emissions. **

*Phil McKenna, “Global Methane Pledge Offers Hope on Climate in Lead Up to Glasgow,” *Inside Climate News*, September 20, 2021, <https://insideclimatenews.org/news/20092021/global-methane-pledge-glasgow-cop-26/>

**Timothy Puko and Katy Ferek, “World Leaders Vow to Cut Methane Emissions,” *Wall Street Journal*, November 2, 2021, <https://www.wsj.com/articles/epa-moves-to-limit-methane-emissions-from-oil-and-gas-production-11635829202>; Environmental Protection Agency, “Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review,” *Federal Register* 86 (November 15, 2021): 63110-63263, <https://www.federalregister.gov/documents/2021/11/15/2021-24202/standards-of-performance-for-new-reconstructed-and-modified-sources-and-emissions-guidelines-for>; Environmental Protection Agency, “Standards of Performance for New, Reconstructed, and

Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review,” *Federal Register* 87 (December 6, 2022): 74702-74847, <https://www.federalregister.gov/documents/2022/12/06/2022-24675/standards-of-performance-for-new-reconstructed-and-modified-sources-and-emissions-guidelines-for>; For assistance navigating the development of these and other rules through the Obama, Trump and Biden administrations, and links to Federal Register notices, see the Environmental and Energy Law Project (EELP), Harvard Law School, Regulatory Tracker, EPA VOC and Methane Standards for Oil and Gas Facilities, <https://eelplaw.harvard.edu/2019/09/epa-voc-and-methane-standards-for-oil-and-gas-facilities/>

2021 (September)

China and the US move to regulate climate super pollutant hydrofluorocarbons

Hydrofluorocarbons (HFCs) are chemicals used in air conditioning, refrigeration, and manufacturing that replaced chlorofluorocarbons, which were dangerously depleting the ozone layer [2013 (June), 2018 (October)] The Kigali Amendment to the Montreal Protocol for protection of the ozone layer addressed the unanticipated problem that HFCs are extremely potent greenhouse gases. One HFC, HFC-23, is now estimated to be 14,600 times more powerful than carbon dioxide in warming the atmosphere. As reported by *Inside Climate News*, “an estimated 15,900 tons of HFC-23 are still being released into the atmosphere each year, equal to the annual greenhouse gas emissions of 50 million automobiles. Eliminating emissions of HFC-23 and other HFCs could prevent half a degree of additional warming by the end of the century.” Hence it is good news that China, the largest producer of HFC-23, has joined the Kigali Amendment and is beginning to enforce restrictions on HFCs. However a detailed history of China’s efforts to address the HFC problem reveals numerous challenges. * In the same month, the Biden Administration finalizes regulations in compliance with the Kigali Amendment: “This final rule will phase down the U.S. production and consumption of HFCs by 85% over the next 15 years, as mandated by the American Innovation and Manufacturing (AIM) Act that was enacted in December 2020. In addition to implementing this landmark phasedown, the Biden-Harris Administration is marshalling a whole-of-government approach to prevent the illegal trade, production, use or sale of HFCs; support the transition to HFC alternatives through research and purchasing; and encourage the reclamation and recycling of HFCs from retired equipment, thus reducing further HFC production.”** [see 2022 (September)]

*Phil McKenna and Lili Pike, “China Just Entered a Major International Climate Agreement. Now Comes the Hard Part,” *Inside Climate News*, September 22, 2021, <https://insideclimatenews.org/news/22092021/china-super-pollutants-kigali-amendment-montreal-protocol/>

**EPA Press Office, “U.S. Will Dramatically Cut Climate-Damaging Greenhouse Gases with New Program Aimed at Chemicals Used in Air Conditioning, Refrigeration,” September 23, 2021, <https://www.epa.gov/newsreleases/us-will-dramatically-cut-climate-damaging-greenhouse-gases-new-program-aimed-chemicals>; Phil McKenna, “EPA Targets Potent Greenhouse Gases, Bringing US Into Compliance With the Kigali Amendment,” *Inside Climate News*, September 27, 2021, <https://insideclimatenews.org/news/27092021/epa-hfcs-greenhouse-gas-emissions-super-pollutants-kigali-amendment/> (covering environmental justice concerns of the Louisville, Kentucky community where HFC-23 will be incinerated); For assistance navigating the development of these and other rules through the Obama, Trump and Biden administrations, and links to Federal Register notices, see the Environmental and Energy Law Project (EELP), Harvard Law School, Regulatory Tracker, Hydrofluorocarbons and the Kigali Amendment, <https://eelplaw.harvard.edu/2017/09/hydrofluorocarbons-and-kigali-amendment-to-montreal-protocol/>

2021 (October)

International Monetary Fund urges eliminating fossil fuel subsidies to put world on track for Paris Agreement goal

The IMF calculates subsidies by considering both “explicit subsidies” which reduce fuel costs below production costs, such as tax breaks, and “implicit subsidies” which are externalities including “contributions to climate change through greenhouse gas emissions, local health damages (primarily pre-mature deaths) through the release of harmful local pollutants like particulates, and traffic congestion and accident externalities associated with the use of road fuels.” When all are tallied together, the IMF puts a figure of \$5.9 trillion or 6.8 percent of global GDP in 2020, with 92% reflecting implicit subsidies.* As *The Guardian* characterizes the number, “the fossil fuel industry benefits from subsidies of \$11m every minute.”** The IMF concludes that “Raising fuel prices to their fully efficient levels reduces projected global fossil fuel CO2 emissions 36 percent below baseline levels in 2025... This reduction is in line with ... levels needed by 2030 to be on track with containing global warming to the Paris goal of 1.5-2C.”**

*International Monetary Fund, Fossil Fuel Subsidies, 2022 <https://www.imf.org/en/Topics/climate-change/energy-subsidies>

**Damian Carrington, “Fossil fuel industry gets subsidies of \$11m a minute, IMF finds,” *The Guardian*, October 6, 2021, <https://www.theguardian.com/environment/2021/oct/06/fossil-fuel-industry-subsidies-of-11m-dollars-a-minute-imf-finds>

2021 (October)

Global energy prices soar on the way to COP26

Without any reduction in fossil fuel subsidies, fuel costs around the world are rising dramatically, in what *The Economist* calls “the first big energy shock of the green era:” “Next month world leaders will gather at the cop26 summit, saying they mean to set a course for net global carbon emissions to reach zero by 2050. As they prepare to pledge their part in this 30-year endeavour, the first big energy scare of the green era is unfolding before their eyes. Since May the price of a basket of oil, coal and gas has soared by 95%. Britain, the host of the summit, has turned its coal-fired power stations back on, American petrol prices have hit \$3 a gallon, blackouts have engulfed China and India, and Vladimir Putin has just reminded Europe that its supply of fuel relies on Russian goodwill. The panic is a reminder that modern life needs abundant energy: without it, bills become unaffordable, homes freeze and businesses stall... Without rapid reforms there will be more energy crises and, perhaps, a popular revolt against climate policies.” The analysis suggests causes of the price rise include surging demand after the Covid-related slump of 2020, too little investment in renewables, too little wind in Europe and droughts in Latin American impacting hydropower, and geopolitics: “as rich democracies quit fossil-fuel production and supply shifts to autocracies with fewer scruples and lower costs, including the one run by Mr Putin... [t]he share of oil output from OPEC plus Russia may rise from 46% today to 50% or more by 2030.”* Queries Holman Jenkins in the *Wall Street Journal*: “Was it ever plausible that human beings might dramatically reduce their use of fossil fuels? Doesn’t it seem especially unlikely in a month when leaders have been throwing their climate promises to the wind in pursuit of lower energy prices for their consumers and voters?”**

*Leaders, “The first big energy shock of the green era,” *The Economist*, October 16, 2021, <https://www.economist.com/leaders/2021/10/16/the-first-big-energy-shock-of-the-green-era>

**Holman Jenkins, “Wait, We Still Want Fossil Fuels?” *Wall Street Journal*, October 12, 2021, <https://www.wsj.com/articles/we-still-want-fossil-fuels-oil-pipelines-cheap-energy-11634074127>

2021 (October)

The Biden Administration releases four reports on the national security impacts of climate change

As summarized in a White House press release, the reports include a first-ever National Intelligence Estimate on Climate Change, a Department of Defense Climate Risk Analysis—the first Pentagon report focused on the strategic risks of climate change, a Department of Homeland Security Strategic Framework for Addressing Climate Change, and a Report on the Impact of Climate Change on Migration, the first time the U.S. Government is officially recognizing and reporting on this linkage.* The *Washington Post* quotes Erin Sikorsky, director of the Center for Climate and Security and a former senior U.S. intelligence official focused on climate issues: “The release of the U.S. assessments ‘sends a warning message ahead of next month’s U.N. summit of the grave risks that we’re facing and why it’s so critical. These reports are overdue.’”** The *Wall Street Journal* notes that the new National Intelligence Estimate “projects that nations will fail to meet their pledges to limit global temperature increases to 1.5 degrees Celsius, with that mark being passed around 2030. Instead, the report portrays climate change as a new geopolitical battleground. Poor nations disproportionately affected will demand help from wealthier ones, it said. China, the largest emitter of greenhouse gasses, and India, the fourth-largest, will struggle to wean themselves from burning coal. Some countries could unilaterally deploy geoengineering technologies to cool their climates, sparking conflict.”***

*The White House, “Fact Sheet: Prioritizing Climate in Foreign Policy and National Security,” October 21, 2021, <https://www.whitehouse.gov/briefing-room/statements-releases/2021/10/21/fact-sheet-prioritizing-climate-in-foreign-policy-and-national-security/>

** Shane Harris and Michael Birnbaum, “White House, intelligence agencies, Pentagon issue reports warning that climate change threatens global security,” October 21, 2021, https://www.washingtonpost.com/national-security/intelligence-pentagon-climate-change-warnings/2021/10/21/ea3a2c84-31d3-11ec-a1e5-07223c50280a_story.html

***Warren P. Strobel and Vivian Salama, “U.S. Intelligence Report Sounds New Climate Warning,” *Wall Street Journal*, October 21, 2021, <https://www.wsj.com/articles/u-s-intelligence-report-sounds-new-climate-warning-11634829769>

2021 (October)

Two UN reports reveal big gaps between national emissions reduction pledges and projected fossil fuel production, and what’s needed to achieve Paris Agreement goal

As summarized in *Science*, “As world leaders converge on Glasgow, U.K., for a climate summit beginning 31 October, a series of reports show the world is far from meeting a promise to try to hold global temperature increases below the 1.5°C target that could avert the worst impacts of climate change. To meet the temperature target, set in the 2015 Paris climate agreement, nations need to cut greenhouse gas emissions by 55% by 2030, but current pledges would trim emissions by only 7.5%, the United Nations Environment Programme (UNEP) warned this week. Meanwhile, countries’ detailed plans show they expect to increase fossil fuel production until at least 2040, despite commitments to reduce emissions to net-zero by 2050, a coalition of research institutes and UNEP reported on 20 October.”* The UNEP Emissions Gap Report 2021 concludes: “new national climate pledges combined with other mitigation measures put the world on track for a global temperature rise of 2.7°C by the end of the century. That is well above the goals of the Paris climate agreement and would lead to catastrophic changes in the

Earth's climate. To keep global warming below 1.5°C this century, the aspirational goal of the Paris Agreement, the world needs to halve annual greenhouse gas emissions in the next eight years.”** The UNEP Production Gap Report 2021 concludes: “The world's governments plan to produce around 110% more fossil fuels in 2030 than would be consistent with limiting warming to 1.5°C, and 45% more than consistent with 2°C. The size of the production gap has remained largely unchanged compared to our prior assessments. Governments' production plans and projections would lead to about 240% more coal, 57% more oil, and 71% more gas in 2030 than would be consistent with limiting global warming to 1.5°C.”***

*Science News Staff, “News at a glance: Climate promises, a predatory ‘Hydra’ publisher, and tracking the birth of elements,” *Science*, October 28, 2021, <https://www.science.org/content/article/news-glance-climate-promises-predatory-hydra-publisher-and-tracking-birth-elements>

**UNEP, UNEP Copenhagen Climate Centre, Emissions Gap Report 2021, October 26, 2021, <https://www.unep.org/resources/emissions-gap-report-2021>

***UNEP Press Release, “Governments' fossil fuel production plans dangerously out of sync with Paris limits,” October 20, 2021, <https://www.unep.org/news-and-stories/press-release/governments-fossil-fuel-production-plans-dangerously-out-sync-paris>; UNEP, Production Gap Report 2021, October 20, 2021, <https://www.unep.org/resources/report/production-gap-report-2021>

2021 (November)

Washington Post investigation finds substantial undercounting of global greenhouse gas emissions

The key strategy of the Paris Climate Agreement framework is that nations commit to “Nationally Determined Contributions,” or pledges to reduce their greenhouse gas emissions through nationally implemented policies, and to revise those pledges over time as necessary to achieve the aspirational goal of keeping warming below 1.5°C this century.* The United Nations Environment Programme's Emissions Gap Report [2021 (October)] concludes that pledges to date are insufficient to achieve that goal. A more fundamental question is the accuracy of national estimates of current and past emissions as a basis for evaluating the effectiveness of pledges to reduce those emissions and achieve the Paris goal. The *Washington Post* targets this question in a major investigation and comes up with a disturbing conclusion. The first in the series of reports from the investigation analyzes reports on emissions from 196 countries, concluding that there is “a giant gap between what nations declare their emissions to be vs. the greenhouse gases they are sending into the atmosphere. The gap ranges from at least 8.5 billion to as high as 13.3 billion tons a year of underreported emissions — big enough to move the needle on how much the Earth will warm.” The low end of this estimate is approximately the equivalent of the annual emissions of the United States, and the high end the emissions of China, or “23 percent of humanity's total contribution to the planet's warming.” The primary reason for the undercounting is over estimation of the offsets from emissions from absorption of carbon dioxide from land, particularly forests; Malaysia, for example, claims in its UN report that its trees are absorbing carbon four times faster than reported for similar forests in neighboring Indonesia. The next most significant cause is underestimation of methane emissions, from oil and gas production and distribution, agriculture, and human waste. The third major factor is underreporting emissions of human-made fluorinated gases used in air conditioning, refrigeration and manufacturing [see 2021 (September)]. “The Post found that dozens of countries don't report these emissions at all — a major shortcoming since some of these potent greenhouse gases are a growing part of the world's

climate problem.” This first report warns: “The plan to save the world from the worst of climate change is built on data. But the data the world is relying on is inaccurate. ‘If we don’t know the state of emissions today, we don’t know whether we’re cutting emissions meaningfully and substantially,’ said Rob Jackson, a professor at Stanford University and chair of the Global Carbon Project, a collaboration of hundreds of researchers. ‘The atmosphere ultimately is the truth. The atmosphere is what we care about. The concentration of methane and other greenhouse gases in the atmosphere is what’s affecting climate.’”** Subsequent reports from the investigation will explore how Russia dramatically underreports its methane emissions, how draining and development of vast peatlands in the Democratic Republic of Congo would threaten massive carbon dioxide release, underestimation of release of nitrous oxide from Mexican agriculture, threats to billions of tons of carbon dioxide stored in the trees of Alaska’s Tongass National Forest, and how Canada stopped counting its emissions from uncontrollable megafires.***

*UNFCCC, Nationally Determined Contributions (NDCs), <https://unfccc.int/ndc-information/nationally-determined-contributions-ndcs>

**Chris Mooney, et al., “Countries’ climate pledges built on flawed data, Post investigation finds,” *Washington Post*, November 7, 2021, <https://www.washingtonpost.com/climate-environment/interactive/2021/greenhouse-gas-emissions-pledges-data/>

***Trish Wilson, “6 takeaways from our investigation into greenhouse gas emissions,” *Washington Post*, April 20, 2022, <https://www.washingtonpost.com/climate-environment/2022/04/20/greenhouse-gas-emissions-investigation/> [includes links to articles]; regarding emissions from human conversion of peatlands, see also Chris Mooney, “An enormous missing contribution to global warming may have been right under our feet,” *Washington Post*, June 4, 2021, <https://www.washingtonpost.com/climate-environment/2021/06/04/an-enormous-missing-contribution-global-warming-may-have-been-right-under-our-feet/>

2021 (November)

COP26 makes small steps forward, much depending on effective follow through

UNFCCC 26th Conference of the Parties (COP26), the annual meeting to advance global climate policy, can claim, at least, better outcomes than COP25 [2019 (December)] or the U.K.-organized virtual Climate Ambition Summit [2020 (December)]. In no small part, progress stems from the return of the United States to the world climate stage [Biden, 2021 (January)], and the ever increasing recognition of urgency [IPCC, 2021(August)]. As reported in *Science*, “When nations gathered in Glasgow, U.K., earlier this month for the major U.N. climate summit, ‘Keep 1.5 alive’ was a ubiquitous mantra, repeated on protest banners and in speeches by politicians. By the end of the meeting last week, however, it was clear that the international effort to limit global warming to 1.5°C above preindustrial levels—the stretch goal set by the 2015 Paris agreement—is on life support. Current commitments to curb greenhouse gas emissions—including new national pledges finalized at the summit—are more ambitious than ever, but still not enough to keep warming below 1.5°C, researchers say. Many are vague and promise results only decades from now, and the pact includes no enforcement mechanisms. Nor does it guarantee that rich nations will provide the financial help that poorer countries will need to control their emissions and cope with climate impacts. The outcomes were disappointing, although not unexpected, for many developing and island nations that fear warming greater than 1.5°C will bring devastating harm. Still, many attendees were encouraged by signs of progress. More than 100 nations made new pledges to curb emissions that, if realized, could for the first time keep warming below 2°C. And 197 countries agreed to a host of new measures—including standards for reporting national

emissions and ground rules for trading credits for carbon removal—that could promote more ambitious pledges and reveal whether countries are actually following through. Nations also agreed to return to next year’s summit, to be held in Egypt, with even stronger commitments, aimed at meeting the 1.5°C goal.”* The Paris Agreement contemplated revisiting commitments every five years; the agreement to do so by the 2022 COP27 meeting is a significant acknowledgment of the urgency to act. COP26 is the first COP to give prominent attention to returning land tenure and land rights over tropical forests to Indigenous peoples and local communities (IPLCs).** [see separate entry] “The Glasgow Climate Pact is the first U.N. climate deal to explicitly mention the need to move away from coal power and subsidies for fossil fuels. But in the face of lobbying from top fossil-fuel-producing countries, the language was watered down several times during the negotiations.”*** According to the advocacy group Global Witness, “The prize for largest delegation went to the fossil fuel industry, which, as a whole, sent more delegates than any single country.” Greta Thunberg’s Tweet: “I don’t know about you, but I sure am not comfortable with having some of the world’s biggest villains influencing & dictating the fate of the world.”**** When 40 countries sign a pledge to phase out coal, the U.S. is “conspicuously absent.” Comments *E&E News*: “The Biden administration’s decision not to sign the coal phaseout pledge comes as Democrats haggle over a budget bill in Congress that would direct billions of dollars in subsidies to clean energy. Finalizing that deal requires securing the vote of Sen. Joe Manchin, the Democrat from coal-dependent West Virginia who holds the swing vote in the Senate.”***** The U.S. does sign on to a pledge with other countries to stop financing new fossil fuel projects abroad by the end of 2023, in a “seismic shift that could stem the construction of natural gas and oil facilities in lower-income nations.” The agreement does not include Liquefied Natural Gas (LNG), and major energy financiers including Japan, South Korea and China do not join the pledge.***** Bill McKibben finds that “trust is hard to find” at the Glasgow summit, noting the striking inconsistency between Barack Obama’s speech to youth activists at the summit, and his speech in Houston three years ago lauding growth in fossil fuel production during his presidency.***** In response to COP26 President Alok Sharma’s assertion that “We can say with credibility that we have kept 1.5 degrees within reach, but its pulse is weak,” climate scientist James Hansen and colleagues query: “Where did Sharma derive his claim of credibility? From climate models? Who was informing Sharma?... The United Nations struggles to come up with a \$100 billion climate fund for innocent nations suffering climate change. It’s inconceivable that trillions of dollars per year will be found for CO2 extraction [“carbon capture and storage”]. We conclude that the 1.5°C target certainly will be exceeded, and the world will almost certainly blow through the 2°C ceiling. Of course, one can devise a scenario that stays under 2°C via a miraculous transition to zero emissions within a few decades, but the real world pays no attention to imaginary scenarios.”***** U.S. Climate Envoy John Kerry’s summary of the summit’s accomplishments is a bit more optimistic: “I often think of Benjamin Franklin’s comment to a young citizen after the delegates finished drafting the Constitution in Philadelphia, promising that they had created “a republic, if you can keep it.” After COP26, something similar could be said for climate diplomacy: It was an important breakthrough, if we can follow through on it.”*****

*Cathleen O’Grady, “The new climate pact is more ambitious. But hopes dim for limiting warming to 1.5°C,” *Science*, v. 374, i. 6570, November 16, 2021, <https://www.science.org/content/article/new-climate-pact-more-ambitious-hopes-dim-limiting-warming-1-5c>

**Justin Catanoso, “Hope old and new: COP26 focused on two largely unsung climate solutions,” *Mongabay*, November 18, 2021, <https://news.mongabay.com/2021/11/hope-old-and-new-cop26-focused-on-two-largely-unsung-climate-solutions/>

***Maxine Joselow, “Five big takeaways from COP26,” *Washington Post*, November 15, 2021, <https://www.washingtonpost.com/politics/2021/11/15/five-big-takeaways-cop26/>

****Karla Adam and Harry Stevens, “Who has the most delegates at the COP26 summit? The fossil fuel industry,” *Washington Post*, November 8, 2021, <https://www.washingtonpost.com/world/2021/11/08/cop26-glasgow-climate-summit-fossil-fuel/>

*****Benjamin Storrow, “Why the U.S. Didn’t Join 40 Other Countries in Pledge to End Coal,” *E&E News*, November 8, 2021, reprinted in *Scientific American*, <https://www.scientificamerican.com/article/why-the-u-s-didnt-join-40-other-countries-in-pledge-to-end-coal/>

*****Sara Schonhardt, “U.S. Agrees to End Fossil Fuel Financing Abroad,” *E&E News*, November 4, 2021, reprinted in *Scientific American*, <https://www.scientificamerican.com/article/u-s-agrees-to-end-fossil-fuel-financing-abroad/>

*****Bill McKibben, “Trust Is Hard to Find at the U.N. Climate Summit in Glasgow,” *The New Yorker*, November 9, 2021, <https://www.newyorker.com/news/daily-comment/trust-is-hard-to-find-at-the-un-climate-summit-in-glasgow>

*****James Hansen, Makiko Sato and Pushker Kharecha, “November Temperature Update and the Big Climate Short,” Columbia University Climate Science, Awareness, and Solutions, December 23, 2021,

<http://www.columbia.edu/~jeh1/mailings/2021/NovemberTUpdate+BigClimateShort.23December2021.pdf>

*****John Kerry, “COP26 Prepared the World to Beat Climate Change,” *Wall Street Journal*, November 21, 2021,

<https://www.wsj.com/articles/cop26-prepared-the-world-to-beat-climate-change-global-warming-emissions-glasgow-11637526170>

2021 (November)

Policy Brief helps focus COP26 on legal protections for Indigenous lands

The Woodwell Climate Research Center and Rainforest US submit a policy paper to COP26 arguing that protection of the planet’s rainforests can best be supported by formalizing the legal rights of Indigenous peoples and local communities (IPLCs): “Our findings indicate that Indigenous Peoples, Afro-Descendant Peoples, and local communities customarily hold and use at least 958 million hectares (mha) of land in the 24 reviewed countries but have legally recognized rights to less than half of this area (447 mha). Their lands are estimated to store at least 253.5 Gigatons of Carbon (GtC), playing a vital role in the maintenance of globally significant greenhouse gas sinks and reservoirs. However, the majority of this carbon (52 percent, or 130.6 GtC) is stored in community-held lands and territories that have yet to be legally recognized.”**Mongabay* quotes COP26 delegate Joseph Itongwa, executive director of the Anapac National Alliance for Supporting and Promoting Indigenous and Community Conservation in the Democratic Republic of the Congo (DRC): “When our land is not secured, it is open to a series of threats — logging, mining, agriculture at an industry scale...Many people see the forests as an economic asset. But we connect forests with our personality and culture. We bring something important, and in addition to, the economic elements of the forest.” ** The United States, United Kingdom, Norway, Netherlands and Germany along with 17 private funders including the Ford Foundation pledge \$1.7 billion to support “Indigenous Peoples’ and Local Communities’ Tenure Rights and Forest Guardianship.” This is historically the largest public-private commitment to support IPLCs. *** 100 countries representing 85% of the globe’s forested land sign the COP26 Glasgow Declaration on Forests and Land Use, pledging to end or reduce deforestation by 2030, supported by pledges of \$19.2 billion. This agreement is highly controversial, however, as plantations producing palm oil, paper, or wood pellets under current U.N. rules are counted as “forests,” and industrial logging of natural forests for wood pellets may as well be a loophole permitted under the Declaration. *Mongabay* quotes Peg Put, with the Environmental Paper Network, a worldwide network of 140 civil society organizations headquartered in Australia: “This rapacious fake renewable is scouring the planet for forests to burn, subsidized and expanding the reach and intensity of logging natural forests, while also

encouraging land grabbing for huge swathes of plantations. [In the process] it emits as much CO₂ as does burning coal and is making climate change worse.”****

*Woodwell Climate Research Center, “Significance of community-held territories in 24 countries to global climate,” November 6, 2021, <https://www.woodwellclimate.org/significance-of-community-held-territories-in-24-countries-to-global-climate/>

** Justin Catanoso, “Hope old and new: COP26 focused on two largely unsung climate solutions,” *Mongabay*, November 18, 2021, <https://news.mongabay.com/2021/11/hope-old-and-new-cop26-focused-on-two-largely-unsung-climate-solutions/>

***Laurel Sutherland, “\$1.7 billion pledged in support of Indigenous and local communities’ land tenure,” *Mongabay*, November 2, 2021, <https://news.mongabay.com/2021/11/1-7-billion-pledged-in-support-of-indigenous-and-local-communities-land-tenure/>

****Justin Catanoso, “COP26 Glasgow Declaration: Salvation or threat to Earth’s forests?” *Mongabay*, November 3, 2021, <https://news.mongabay.com/2021/11/cop26-glasgow-declaration-salvation-or-threat-to-earths-forests/> For more on the biomass/wood pellet loophole in carbon emissions counting, see Sarah Miller, “The Millions of Tons of Carbon Emissions That Don’t Officially Exist,” *The New Yorker*, December 8, 2021, <https://www.newyorker.com/news/annals-of-a-warming-planet/the-millions-of-tons-of-carbon-emissions-that-dont-officially-exist>

2021 (November)

Congress enacts the Infrastructure Investment and Jobs Act

Reflecting the more easily negotiated provisions of President Biden’s American Jobs Plan [2021 (March)], this law authorizes \$1.2 trillion in spending, with \$550 billion being newly authorized spending on top of what Congress was planning. It includes the following climate-related allocations: \$66 billion to upgrade and maintain passenger and freight rail systems, \$65 billion to update power lines, prevent hacking of the power grid, and provide clean energy, \$39 billion to upgrade public transit, create new bus routes, and increase accessibility for seniors and the disabled, \$8 billion for Western water infrastructure, including mitigating drought conditions, \$7.5 billion for a nationwide network of electric vehicle charging stations, and \$5 billion for electric school buses, primarily in low-income, rural, and tribal communities.* The White House Fact Sheet notes that it provides the largest investment in public transit in U.S. history, and the largest investment in passenger rail since the creation of Amtrak.** The *New York Times* heralds the law’s commitment to building a response to climate’s very real consequences: “The \$47 billion in the bill designated for climate resilience is intended to help communities prepare for the new age of extreme fires, floods, storms and droughts that scientists say are worsened by human-caused climate change. The money is the most explicit signal yet from the federal government that the economic damages of a warming planet have already arrived. Its approval by Congress with bipartisan support reflects an implicit acknowledgment of that fact by at least some Republicans, even though many of the party’s leaders still question or deny the established science of human-caused climate change.”*** The *Wall Street Journal* disparages the legislation’s shift toward centralized energy planning: “The bill is a major down payment on President Biden’s Green New Deal. The Senate bill is a great leap forward for progressive ambitions to use central planning to re-engineer the electrical grid and banish carbon from the U.S. economy. The bill helps this political medicine go down by offering large subsidies that have co-opted the business lobbies.”**** Controversially, the law allocates \$12 billion of new investment to supporting carbon capture, utilization, and storage technology.***** Comments Bill McKibben: “energy companies and their lobbyists are filling the infrastructure bill with billions of dollars for carbon-sequestration projects—essentially, getting taxpayers to fund equipment to capture the climate-destroying gases that Big Oil’s products emit. That’s absurd: it

would be much cheaper to simply shut down those power plants and build out solar and wind power instead.”*****[see 2022 (February)]

*Jim Probasco, “Infrastructure Investment and Jobs Act: Definition and Summary,” *Investopedia*, November 29, 2022,

<https://www.investopedia.com/infrastructure-investment-jobs-act-5209581>

**The White House, “Fact Sheet: The Bipartisan Infrastructure Deal,” November 6, 2021, <https://www.whitehouse.gov/briefing-room/statements-releases/2021/11/06/fact-sheet-the-bipartisan-infrastructure-deal/>

*** Coral Davenport and Christopher Flavelle,, “Infrastructure Bill Makes First Major U.S. Investment in Climate Resilience,”

November 6, 2021, <https://www.nytimes.com/2021/11/06/climate/infrastructure-bill-climate.html>

****Editorial Board, “Green New Deal, Part I,” *Wall Street Journal*, August 4, 2021, <https://www.wsj.com/articles/green-new-deal-part-i-senate-infrastructure-bill-joe-biden-jennifer-granholm-11628106419>

*****IEA, “Infrastructure and Jobs act: Carbon capture, utilization and storage investment,” April 18, 2022,

<https://www.iea.org/policies/14982-infrastructure-and-jobs-act-carbon-capture-utilization-and-storage-investment>

*****Bill McKibben, “The Climate Crisis,” *The New Yorker* newsletter,

<https://link.newyorker.com/view/5bea0cf62ddf9c72dc8d8224esq1y.j4x/17fada47> ;see also: Nicholas Kusnetz, “Fossil Fuel Companies Are Quietly Scoring Big Money for Their Preferred Climate Solution: Carbon Capture and Storage,” *Inside Climate News*, August 17, 2021, <https://insideclimatenews.org/news/17082021/carbon-capture-storage-fossil-fuel-companies-climate/>

2021 (December)

Report finds that Biden Administration has issued more oil and gas leases on public lands than in the first three years of the Trump Administration

President Biden’s January 27, 2021 Executive Order paused new oil and natural gas leases on public lands or in offshore waters pending completion of a review of climate impacts [2021 (January)]. In June, a Trump-appointed federal judge in Louisiana blocked the pause on leasing. While appealing the decision, the Biden Administration proceeded to issue leases at a higher rate than the first three years of the Trump Administration, as well as to offer leases on more than 80 million acres in the Gulf of Mexico, according to a report by Public Citizen.* [see 2022 (January)] And the Interior Department’s November report on oil and gas leasing and permitting practices in response to the Executive Order does not recommend a ban on new drilling.** As reported in the *Washington Post*, the Public Citizen analysis appears to refute Republican claims that high fossil fuel prices stem from Biden’s policies: “The analysis also comes as Republicans have sought to blame high gas prices on Biden's restrictions on domestic oil and gas production. The GOP is seeking to weaponize the energy price crunch to bash Democrats up for reelection next year...House Minority Leader Kevin McCarthy (R-Calif.) tweeted last week that high gas prices are ‘what happens when the government is controlled by Democrats who cancel pipelines and keep American energy buried in the ground.’”*** An *Inside Climate News* report notes: “some observers argue that from a climate perspective, the administration had little to gain and a lot to lose politically by going forward with a ban on new federal leasing at this time. Oil and gas from federal lands and offshore has become a smaller portion of U.S. production over the last 18 years, while drilling on private land has soared. A ban on new leasing would not make a significant dent in U.S. greenhouse gas emissions, they say, but it would stir up a political firestorm that would hurt Biden and other Democrats, especially in two swing states with substantial federal oil and gas leasing, New Mexico and Colorado.”**** The need for any new leasing in the U.S. and elsewhere, however, is called into question by the International Energy Agency’s May, 2021 analysis of the pathway to Net Zero: “There is no need for investment in new fossil fuel supply in our net zero pathway. Beyond projects already committed as of 2021, there are no new oil and

gas fields approved for development in our pathway, and no new coal mines or mine extensions are required. The unwavering policy focus on climate change in the net zero pathway results in a sharp decline in fossil fuel demand, meaning that the focus for oil and gas producers switches entirely to output – and emissions reductions – from the operation of existing assets.” ***** [see January (2022)]

*Alan Zibel, “Biden’s Oil Letdown: Despite pledge to stop drilling on public lands, Trump-era drilling boom continues under Biden,” Public Citizen, December 6, 2021, <https://www.citizen.org/article/bidens-oil-letdown/>

**Department of the Interior press release, “Interior Department Report Finds Significant Shortcomings in Oil and Gas Leasing Programs,” November 26, 2021, <https://www.doi.gov/pressreleases/interior-department-report-finds-significant-shortcomings-oil-and-gas-leasing-programs>

***Maxine Joselow, “Biden is approving more oil and gas drilling permits on public lands than Trump, analysis finds,” *Washington Post*, December 6, 2021, <https://www.washingtonpost.com/politics/2021/12/06/biden-is-approving-more-oil-gas-drilling-permits-public-lands-than-trump-analysis-finds/>

****Marianne Lavelle, “Biden Promised to Stop Oil Drilling on Public Lands. Is His Failure to Do So a Betrayal or a Smart Political Move?” *Inside Climate News*, December 6, 2021, <https://insideclimatenews.org/news/06122021/biden-promised-to-stop-oil-drilling-on-public-lands-is-his-failure-to-do-so-a-betrayal-or-a-smart-political-move/>

*****IEA, Net Zero by 2050 - A Roadmap for the Global Energy Sector, Summary for Policymakers, May, 2021, <https://www.iea.org/reports/net-zero-by-2050>

2021 (December)

Biden Administration EPA issues final motor vehicle fuel efficiency standards

Characterized as “President Biden’s biggest step yet to tackle climate change” the standards are even tighter than those proposed in August [2021(August)] for model years 2025 to 2026. Cars, SUVs and pickup trucks may release no more than an average of 161 grams of carbon dioxide per mile by 2026, which is equivalent to 55 miles per gallon by 2026 in laboratory testing. EPA estimates that the new rule will prevent 3.1 billion tons of carbon dioxide emissions through 2050, equal to shutting down more than 700 coal plants for a year. The announcement is somewhat overshadowed by news that Senator Joe Manchin will not support Biden’s Build Back Better bill, which would have provided federal support for electric charging stations and incentives for buying electric vehicles.* [see 2021 (March), 2022 (August)] In March, 2022, the EPA will rescind the Trump Administration’s California waiver withdrawal, thus ensuring that in the future California and other states that follow it including Maine can implement higher fuel efficiency standards.**In April, 2022 the Department of Transportation will release its companion fuel efficiency standards. As reported in the *Washington Post*, the EPA estimates that the tightened emissions rules “would achieve roughly 40 miles per gallon in real-world conditions, up from about 32 miles per gallon under the Trump administration. With gas prices soaring, oil markets beset by events in Ukraine and Biden’s climate agenda stalled in Congress, administration officials have emphasized the savings Americans will see at the pump in the coming years because of [the DOT] rule. Americans buying new vehicles purchased through 2030 will spend about \$192 billion less on gas because of the rule, according to the administration.” ***

*Environmental Protection Agency, “Final Rule to Revise Existing National GHG Emissions Standards for Passenger Cars and Light Trucks Through Model Year 2026,” December 31, 2021, <https://www.epa.gov/regulations-emissions-vehicles-and-engines/final-rule-revise-existing-national-ghg-emissions>; Dino Grandoni, Faiz Siddiqui and Anna Phillips, “New Biden rule reducing climate emissions from cars and SUVs reverses major Trump rollback,” *Washington Post*, December 20, 2021, <https://www.washingtonpost.com/climate-environment/2021/12/20/auto-mileage-rule-biden-climate/>

**For assistance navigating the development of these and other rules through the Obama, Trump and Biden administrations, and links to Federal Register notices, see the Environmental and Energy Law Project (EELP), Harvard Law School, *Regulatory Tracker*, <https://eelp.law.harvard.edu/2019/09/corporate-average-fuel-economy-standards-greenhouse-gas-standards/>; these materials include an interview with Harvard Law School professor Jody Freeman, founding director of EELP, and former EPA senior executive Chet France about the development of the clean car rules across three administrations. “Jody and Chet discuss how we are at a potentially transformational moment in the history of the Clean Air Act, the auto industry, and climate change.”

<https://eelp.law.harvard.edu/2022/01/cleanlaw-jody-freeman-and-chet-france-discuss-the-clean-car-rules/>

***Michael Laris, “Administration finalizes rule to raise fuel standards for new cars, light trucks by 2026,” *Washington Post*, April 1, 2022, <https://www.washingtonpost.com/transportation/2022/04/01/tailpipe-pollution-fuel-efficiency/>

2021 (December)

2021 will be a record year for global renewable energy, but also for coal-fired generation

Global new renewable power capacity is forecast to rise to 290 gigawatts (GW) in 2021, surpassing the previous all-time high set last year, according to International Energy Agency’s Renewables Market Report: “By 2026, global renewable electricity capacity is forecast to rise more than 60% from 2020 levels to over 4 800 GW – equivalent to the current total global power capacity of fossil fuels and nuclear combined. Renewables are set to account for almost 95% of the increase in global power capacity through 2026, with solar PV alone providing more than half. The amount of renewable capacity added over the period of 2021 to 2026 is expected to be 50% higher than from 2015 to 2020. This is driven by stronger support from government policies and more ambitious clean energy goals announced before and during the COP26 Climate Change Conference.” * However, this level of growth is only half of what is required to achieve net zero carbon emissions by 2050. *The Guardian* quotes Heymi Bahar, lead author of the Renewables report: “We need a gear change to meet net zero... We have already seen a very important gear change in recent years but we need to move up another gear now. It is possible, we have the tools. Governments need to show more ambition, not just on targets but on policy measures and plans.” China installed the most new renewable energy capacity this year, and is now expected to reach 1,200GW of wind and solar capacity in 2026, four years earlier than its target of 2030.** On the downside, coal-fired generation will also reach a record high in 2021: “With electricity demand outpacing low-carbon supply, and with steeply rising natural gas prices, global coal power generation is on course to increase by 9% in 2021 to 10 350 terawatt-hours (TWh) – a new all-time high. However, coal’s share of the global power mix in 2021 is expected to be 36% – 5 percentage points below its 2007 peak. In the United States and the European Union, coal power generation is forecast to increase by almost 20% in 2021 but will not reach 2019 levels. By contrast, estimated growth of 12% in India and 9% in China will push coal power generation to record levels in both countries.” The report adds: “China’s influence on coal markets is difficult to overstate. China’s power generation, including district heating, accounts for one-third of global coal consumption. China’s overall coal use is more than half of the global total.” ***

*IEA Press Release, “Renewable electricity growth is accelerating faster than ever worldwide, supporting the emergence of the new global energy economy,” December 21, 2021, <https://www.iea.org/news/renewable-electricity-growth-is-accelerating-faster-than-ever-worldwide-supporting-the-emergence-of-the-new-global-energy-economy>

**Fiona Harvey, “Renewable energy has ‘another record year of growth’ says IEA,” *The Guardian*, December 1, 2021, <https://www.theguardian.com/environment/2021/dec/01/renewable-energy-has-another-record-year-of-growth-says-iea>

***IEA, Coal2021, Executive Summary, December, 2021, <https://www.iea.org/reports/coal-2021/executive-summary>

2021 (December)

The Arctic is, in fact, warming *four times* faster than the rest of the world

As the article in *Science* opens: “It’s almost a mantra in climate science: The Arctic is warming twice as fast as the rest of the world. But that figure, found in scientific studies, advocacy reports, the popular press, and even the 2021 U.N. climate assessment, is incorrect, obscuring the true toll of global warming on the north, a team of climate scientists reports this week. In fact, the researchers say, the Arctic is warming four times faster than the global average.” * The dramatically different calculation is largely the result of correcting the latitude at which measurements are taken, and focusing on the previous three decades, instead of a longer period. As summarized in a presentation abstract from the December meeting of the American Geophysical Union: “Using spatially-complete instrumental temperature records, we re-examine the rate of Arctic warming under multiple definitions. We demonstrate the Arctic is likely warming over 4 times faster than the rest of the world, some 3-4 times the global average, with higher rates found both for more recent intervals as well as more accurate latitudinal boundaries. These results stand in contrast to the widely-held conventional wisdom — prevalent across scientific and lay publications alike — that the Arctic is ‘only’ warming around twice as fast as the global mean. Our findings update and re-emphasize the significance of Arctic warming in the context of extreme anthropogenic environmental disruption. Current and future changes in the Arctic have profound implications for the physical climate system, human populations and ecosystems, as well as geopolitical decision-making for commerce and global security. It is essential that the scientific community not only accurately understand but also convey the scale of Arctic warming, which is occurring nearly twice as rapidly as commonly described.” ** More colloquially, presenter Peter Jacobs, a climate scientist at NASA’s Goddard Space Flight Center, comments to *Science*, “Everybody knows [the Arctic] is a canary when it comes to climate change. Yet we’re misreporting it by a factor of two. Which is just bananas.” * A report with similar conclusions from a separate study will be published in *Communications Earth & Environment* in August, 2022. *** Meanwhile, NOAA’s Arctic Report Card 2021 notes that sea ice is “thinning at an alarming rate as the Arctic’s oldest and thickest multi-year ice disappears. This loss of sea ice diminishes the Arctic’s ability to cool the global climate. It can also alter lower latitude weather systems to an extent that makes previously rare and impactful weather events, like droughts, heat waves and extreme winter storms, more likely,” and that more shipping activity in the Arctic leads to “shipping noise increasingly infiltrating the Arctic’s underwater marine soundscape, to the detriment of marine mammals.” ****

*Paul Voosen, “The Arctic is warming four times faster than the rest of the world,” *Science*, December 14, 2021,

<https://www.science.org/content/article/arctic-warming-four-times-faster-rest-world>

**Peter Jacobs, “The Arctic Is Now Warming Four Times As Fast As the Rest of the Globe,” presentation, American Geophysical Union, December 13, 2021, <https://agu.confex.com/agu/fm21/meetingapp.cgi/Paper/898204>

***Mika Rantanen et al., “The Arctic has warmed nearly four times faster than the globe since 1979,” *Communications Earth & Environment* 3, 168, August 11, 2022, <https://www.nature.com/articles/s43247-022-00498-3>

**** Matthew Druckenmiller et al., “2021 Arctic Report Card reveals a (human) story of cascading disruptions, extreme events and global connections,” *The Conversation*, December 14, 2021, <https://theconversation.com/2021-arctic-report-card-reveals-a-human-story-of-cascading-disruptions-extreme-events-and-global-connections-172136>; National Oceanic and Atmospheric Administration, Arctic Report Card: Update for 2021, December 14, 2021, <https://arctic.noaa.gov/Report-Card/Report-Card-2021/ArtMID/8022/ArticleID/934/2021-Headlines>

2021 (December)

Global weather disasters top \$101 billion in insured losses in 2021, and 2021 is the fifth hottest in recorded history

For only the third time since 1970, insured losses from extreme weather events worldwide exceeded \$100 billion, according to a report by Swiss Re, the global reinsurance company.* NOAA reports that the U.S. had 20 separate weather and climate disasters of over \$1 billion in damages (insured and uninsured) in 2021, with total damages estimated at \$155 billion.** The past seven years were the hottest years ever recorded, and the U.S. and Europe had their hottest summer on record.*** In a year in the United States punctuated by record breaking heat, extreme drought in the West, extreme precipitation in the East, and unprecedented fires, it's estimated by the *Washington Post* that more than 40 percent of Americans live in counties hit by climate disasters, and more than 80 percent of Americans experienced a heatwave: "In the country that has generated more greenhouse gases than any other nation in history, global warming is expanding its reach and exacting an escalating toll."**** Comments Katharine Hayhoe, climate scientist in Texas and chief scientist for the Nature Conservancy: "These supersized disasters just keep coming and coming. According to a recent analysis, there was about an average of three months in between fires, heatwaves, and flooding – I would say you have good reason to be anxious, your fears are valid, your concerns are real. Now, how can we use our voices to encourage action at every level? It's not about saving the planet. The planet will be orbiting the sun long after we're gone. It is about saving us – our civilization, and many of the other living things that share this planet with us."***** For a graphic exploration of the impacts of climate change around the world, see the *New York Times* feature "Postcards from a World on Fire."***** [see 2023 (March), boreal fires in 2021]

*Thomas Frank, "Global Weather Disasters Cost \$101 Billion in 2021," *E&E News*, December 15, 2021, reprinted in *Scientific American*, <https://www.scientificamerican.com/article/global-weather-disasters-cost-101-billion-in-2021/>

**Nina Lakhani, "US hit by 20 separate billion-dollar climate disasters in 2021, NOAA report says," *The Guardian*, January 10, 2022, <https://www.theguardian.com/environment/2022/jan/11/us-hit-by-20-separate-billion-dollar-climate-disasters-in-2021-noaa-report-says>; NOAA, Billion Dollar Weather and Climate Time Series, <https://www.ncei.noaa.gov/access/billions/time-series>

***Raymond Zhong, "2021 Was Earth's Fifth-Hottest Year, Scientists Say," *New York Times*, January 10, 2022, <https://www.nytimes.com/2022/01/10/climate/2021-hottest-year.html>

**** Sarah Kaplan and Andrew Ba Tran, "More than 40 percent of Americans live in counties hit by climate disasters in 2021," *Washington Post*, January 5, 2022, <https://www.washingtonpost.com/climate-environment/2022/01/05/climate-disasters-2021-fires/>

*****Maanvi Singh, "'Extraordinary is no longer extraordinary': US scientists on a year of climate disasters," *The Guardian*, December 30, 2021, <https://www.theguardian.com/us-news/2021/dec/30/climate-crisis-emergency-climate-disaster>

*****Editorial Board, "Postcards from a World on Fire," *New York Times*, December 13, 2021, <https://www.nytimes.com/interactive/2021/12/13/opinion/climate-change-effects-countries.html>

2021 (December)

Global carbon dioxide emissions will increase by 4.9% in 2021, with a total of 36.4 GtCO₂ emitted to the atmosphere

As estimated by the Global Carbon Project report, the projected increase in emissions from fossil fuel burning and cement production reflects a substantial comeback from the 2020 pandemic slump. Emissions from India are predicted to grow by 12.6% and from China by 4%; emissions

from both the U.S. and the E.U. are expected to grow by 7.6%. The final figures for 2020 are reported as follows: total emissions 34.8 GtCO₂, with emissions from India declining by 7.3%, from the EU by 10.9%, and from the U.S. by 10.9%; emissions from China increased by 1.4%. Global decline in 2020 was 5.4%. The per-capita CO₂ emissions in 2020 were 4.5 tCO₂ tonnes of carbon person-1yr-1 for the globe, 14.2 tCO₂ for the U.S., 7.4 tCO₂ for China, 5.8 tCO₂ for the E.U., and 1.8 tCO₂ for India.” *

*Global Carbon Project, *Carbon Brief 2021*, November 4, 2021,

https://www.globalcarbonproject.org/carbonbudget/archive/2021/GCP_CarbonBudget_2021.pdf; Josie Garthwaite,

“Stanford-led research shows carbon emissions have rebounded to near pre-pandemic levels,” *Stanford News*, November 3, 2021,

<https://news.stanford.edu/2021/11/03/carbon-emissions-rebound-near-pre-pandemic-levels/>; see also, Ariel Gans, “US Emissions Surged in 2021: Here’s Why in Six Charts,” *Inside Climate News*, January 10, 2022, <https://insideclimatenews.org/news/10012022/us-emissions-surged-in-2021-heres-why-in-six-charts/> (report by the Rhodium Group).

2022 (January)

Record ocean warming noted from the Great Barrier Reef to the Gulf of Maine

The National Oceanic and Atmospheric Administration’s Coral Reef Watch finds that from mid-November to mid-December 2021, *minimum* temperatures over more than 80% of the Great Barrier Reef were higher for that period than previous *maximums*. The *Guardian* quotes William Skirving who led the analysis: “his team ‘were surprised, shocked and concerned’ when the analysis, covering each year from 1985, was completed. ‘There’s never been heat stress like that in our records. It’s completely out of character and speaks to the fact that the minimum temperatures were higher than the previous maximums. This is almost certainly a climate change signal. Being a scientist in this field in this day and age is sometimes a bit nightmarish. Sometimes I wish I knew a little bit less.’” * Meanwhile the Gulf of Maine Research Institute reports that “The average [Sea Surface Temperature] for the Gulf of Maine during Fall 2021 (Sept 1 – Nov 30) was 59.9°F, more than 4°F above the long-term average. That makes this fall the hottest on record, and this follows what was the second-warmest summer in the Gulf of Maine of all time.” ** A study in *PLOS Climate* finds a dramatic increase in extreme marine heat waves from the Industrial Revolution to the present: “For the year 2019, our index reports that 57% of the global ocean surface recorded extreme heat, which was comparatively rare (approximately 2%) during the period of the second industrial revolution.” *** A study by the Woods Hole Oceanographic Institute in collaboration with the University of Maine estimates changes in Gulf of Maine ocean temperature going back 1,000 years, by using ocean quahog shell growth as a proxy for direct temperature measurements: “The results suggest that the Gulf of Maine underwent a long-term cooling over the last 1,000 years driven mainly by volcanic forcing. However, this trend was significantly reversed by warming that began in the late 1800s, around the time of the Industrial Revolution began adding greenhouse gasses to the atmosphere while the behavior and position of the Gulf Stream shifted. The simulations suggest that the warming in the most recent century has been more rapid than any other 100-year period in the region’s last 1,000 years.” **** The consequences of this warming for marine species cannot be understated: a study in *Science* will conclude, as summarized in *Inside Climate News*, that “[i]f greenhouse gas pollution remains unchecked, global warming could trigger the most catastrophic extinction of ocean species since the end of the Permian age, about 250 million years ago.” *****

*Graham Readfearn, “Great Barrier Reef on verge of another mass bleaching after highest temperatures on record,” *The Guardian*, January 28, 2022, <https://www.theguardian.com/environment/2022/jan/29/great-barrier-reef-on-verge-of-another-mass-bleaching-after-highest-temperatures-on-record>

**Gulf of Maine Research Institute, “Seasonal Warming Update, 2021,” <https://www.gmri.org/stories/fall-2021-warming-update/>; Kasha Patel, “Gulf of Maine waters spiked to record warm levels in fall 2021,” *Washington Post*, January 12, 2022, <https://www.washingtonpost.com/weather/2022/01/12/gulf-maine-record-warm-2021/>

***Kisei Tanaka and Kyle Van Houtan, “The recent normalization of historical marine heat extremes,” *PLOS Climate*, February 1, 2022, <https://journals.plos.org/climate/article?id=10.1371/journal.pclm.0000007>; Chelsea Harvey, “Extreme Heat Becomes New Normal for Oceans,” *E&E News*, February 3, 2022, republished in *Scientific American*, <https://www.scientificamerican.com/article/extreme-heat-becomes-new-normal-for-oceans/>

****Samantha Schipani, “Past century of climate warming reverses 900 years of cooling in the Gulf of Maine, study shows,” *UMaine News*, August 10, 2022, <https://umaine.edu/news/blog/2022/08/10/past-century-of-climate-warming-reverses-900-years-of-cooling-in-the-gulf-of-maine-study-shows/>; Nina Whitney et al., “Rapid 20th century warming reverses 900-year cooling in the Gulf of Maine,” *Communications Earth & Environment*, v. 3, no. 179, August 8, 2022, <https://www.nature.com/articles/s43247-022-00504-8>

*****Bob Berwyn, “The Current Rate of Ocean Warming Could Bring the Greatest Extinction of Sealife in 250 Million Years,”

Inside Climate News, April 28, 2022, <https://insideclimatenews.org/news/28042022/ocean-extinction-climate-change/>;

Justin Penn and Curtis Deutsch, “Avoiding ocean mass extinction from climate warming,” *Science*, v. 376, no. 6592, April 28, 2022, <https://www.science.org/doi/10.1126/science.abe9039>

2022 (January)

Study reveals gas stoves release substantial methane as well as toxic nitrogen dioxide

More than 40 million Americans cook with gas stoves. A study at Stanford University measured releases of methane in 53 homes with gas stoves, including emissions when the stove was on, when it was off, and during the ignition phase. From these measurements, the study concludes that total annual methane emissions from gas stoves in the U.S. are 28 gigagrams methane, and that “annual methane emissions from all gas stoves in U.S. homes have a climate impact comparable to the annual carbon dioxide emissions of 500, 000 cars.” Remarkably, “More than three-quarters of methane emissions we measured originated during steady-state-off [appliance not in use],” coming from slow leaks in stove piping and fittings. Additionally, “co-emitted health-damaging air pollutants such as nitrogen oxides (NO_x) are released into home air and can trigger respiratory diseases.... Our data suggest that families who don’t use their range hoods or who have poor ventilation can surpass the 1-h national standard of NO₂ (100 ppb) [the EPA standard toxicity level for outside air] within a few minutes of stove usage, particularly in smaller kitchens.” The greatest climate impact from gas stoves remains the carbon dioxide produced when the gas is burned, but this study concludes that methane leaks add one third more climate impact to the carbon dioxide emissions. The study concludes that EPA has substantially underestimated methane emissions from gas cook stoves: “From stoves alone, we estimated total methane emissions to be about 28 Gg CH₄ year⁻¹, more than the emissions currently reported by the USEPA from stationary combustion from all appliances, suggesting that the USEPA substantially underestimated emissions from residential natural gas combustion.” *Inside Climate News* quotes an EPA response to this study: “ ‘While post-meter leak emissions (including leak emissions from stoves) are not currently included in the [Greenhouse Gas] Inventory, EPA plans to incorporate an estimate for these post-meter emissions in the upcoming 2022 GHG Inventory,’ EPA spokeswoman Enesta Jones said.”**

*Eric Lebel, et al., “Methane and NO_x Emissions from Natural Gas Stoves, Cooktops, and Ovens in Residential Homes,” *Environmental Science & Technology*, v. 56, no. 4, January 27, 2022, <https://pubs.acs.org/doi/10.1021/acs.est.1c04707>

**Phil McKenna, “Gas Stoves in the US Emit Methane Equivalent to the Greenhouse Gas Emissions of Half a Million Cars,” *Inside Climate News*, January 27, 2022, <https://insideclimatenews.org/news/27012022/gas-stoves-methane-emissions/>

2022 (January)

Atmospheric methane levels reach 1,900 ppb, triple pre-industrial levels, and Stanford study suggests EPA underestimates climate impact

According to a preliminary report released by National Oceanic and Atmospheric Administration in January, * finalized in April,** for the second year in a row methane increases in the atmosphere in 2021 topped the previous year's record increase. Potential explanations for the increases include expanding oil and natural gas production, rising emissions from landfills and livestock herds, and increasing activity by microbes in wetlands, triggered as a feedback from warming temperatures. * Methane does far more, on a ton for ton basis, to warm the atmosphere, but stays in the atmosphere for only about 12 years, as opposed to carbon dioxide which remains for hundreds of years. A study at Stanford published in *Environmental Research Letters* suggests that the EPA is substantially undercounting the impact of methane on global temperature in comparison to carbon dioxide, in following guidance by the United Nations Framework Convention on Climate Change (UNFCCC) which bases the estimate on a 100-year period. As explained in *Inside Climate News*: “Based on climate models using scenarios where global warming is limited to 1.5 degrees, [the researchers] determined the planet would reach 1.5 degrees of warming above pre-industrial levels in approximately 24 years. ‘If that’s the case, and you’re using a 100-year frame for methane, then you’re not going to put enough value on reducing methane emissions compared to other greenhouse gasses,’ [coauthor Rob Jackson] said. Over a 24 year time period methane is 75 times more potent than carbon dioxide as a greenhouse gas. This is three times higher than 25, the current value that the EPA uses for methane.” ***

*Jeff Tollefson, “Scientists raise alarm over ‘dangerously fast’ growth in atmospheric methane,” *Nature*, February 8, 2022, <https://www.nature.com/articles/d41586-022-00312-2>

**NOAA, “Increase in atmospheric methane set another record during 2021,” April 7, 2021, <https://www.noaa.gov/news-release/increase-in-atmospheric-methane-set-another-record-during-2021>; Raymond Zong, “Methane Emissions Soared to a Record in 2021, Scientists Say,” April 7, 2021, <https://www.nytimes.com/2022/04/07/climate/methane-emissions-record.html>

***Phil McKenna, “To Counter Global Warming, Focus Far More on Methane, a New Study Recommends,” *Inside Climate News*, February 9, 2022, <https://insideclimatenews.org/news/09022022/methane-global-warming-study/>; Sam Abernethy and Robert Jackson, “Global temperature goals should determine the time horizons for greenhouse gas emission metrics,” *Environmental Research Letters*, February 9, 2022, <https://iopscience.iop.org/article/10.1088/1748-9326/ac4940>; see also, Fred Pearce, “Why Methane Is a Large and Underestimated Threat to Climate Goals,” *YaleEnvironment360*, February 24, 2021, <https://e360.yale.edu/features/why-methane-is-a-large-and-underestimated-threat-to-climate-goals>

2022 (January)

Federal court invalidates Biden Administration oil and gas leases for 30 million acres in Gulf of Mexico

The District Court for the District of Columbia agrees with the argument of environmental plaintiffs in finding that the Department of the Interior relied on inadequate assessments by the Trump Administration of the climate costs of what would have been the largest lease sale in U.S. history. The Administration had gone ahead with the sale after a Louisiana District Court held that President Biden's Executive Order suspending lease offerings was invalid and that the Administration must proceed with the scheduled Gulf of Mexico sale. [see 2021 (January,

December)] The Administration will now have to prepare a revised environmental assessment under the National Environmental Policy Act, and then make a decision as to whether to proceed with the leases. The *New York Times* quotes Brett Hardy, a senior attorney for Earthjustice, one of several environmental groups that brought the lawsuit: “This requires the bureau to go back to the drawing board and actually consider the climate costs before it offers these leases for sale, and that’s really significant...Once these leases are issued, there’s development that’s potentially locked in for decades to come that is going to hurt our global climate.” The *Times* comments: “Emissions from burning fossil fuels produced on federal lands and waters account for about 25 percent of the nation’s greenhouse gas emissions. But despite its bold promises, the Biden administration has moved cautiously over the past year on whether to restrict drilling. With gas prices rising and Republicans eager to blame the administration, environmental activists have accused the administration of sacrificing aggressive action for political expediency.” * In February, the Administration announces that it will not appeal the court’s decision invalidating the leases, but “they left open the possibility that the leases could still be issued if the decision to throw out the sale’s results is ultimately overturned. The American Petroleum Institute, the oil and gas industry’s largest trade group, has challenged the ruling.” **[see 2021 (December)]

*Lisa Friedman, “Court Revokes Oil and Gas Leases, Citing Climate Change,” *New York Times*, January 22, 2022,

<https://www.nytimes.com/2022/01/27/climate/federal-court-drilling-gulf.html>

**Anna Phillips, “Biden administration won’t appeal judge’s ruling revoking Gulf of Mexico drilling leases,” *Washington Post*,

February 28, 2022, <https://www.washingtonpost.com/climate-environment/2022/02/28/biden-administration-wont-appeal-judges-ruling-revoking-gulf-mexico-drilling-leases/>

2022 (February)

UMaine study documents first major assessment of climate impacts on the roof of the world

Glaciers are fast shrinking around the world. 250 million people live near mountain glaciers, which play a critical role in storing water for agriculture, hydropower, and sustaining human and ecosystem survival. Eventually, more than 1.6 billion people receive water from mountain regions and 50% of Earth’s biodiversity centers are in mountain regions. * Relatively little has been studied regarding the most highly situated glaciers, over 5000 meters in elevation, for obvious reasons of logistical challenges. In a study published in *Nature Portfolio Journal Climate and Atmospheric Science*, an international team of scientists led by the University of Maine Climate Change Institute reports on a first in depth analysis of the impact of climate change on the South Col Glacier, the highest glacier on Mt. Everest (alternately named Sagarmatha (Nepali) and Qomolangma (Tibetan)), at an elevation of 8020 meters. Data was gathered for this study during the National Geographic and Rolex’s Perpetual Planet Everest Expedition mounted in April/May 2019, “the most comprehensive scientific investigation of the Nepalese side of Mt. Everest thus far undertaken, including studies in biology, geology, glaciology, meteorology, and mapping.”** Glaciers lose mass from both melting, and sublimation, when ice can change to water vapor directly. For thousands of years, snowpack has served to insulate glaciers from both kinds of mass loss. With climate change, exposed ice much more rapidly diminishes. The study’s findings: “Climate predictions for the Himalaya all suggest continued warming and continued glacier mass loss. We find the transition from snow covered to exposed ice can change the state

of the glacier from one of equilibrium to one of extremely rapid mass loss. At an estimated thinning rate approaching 2000 mm a^{-1} even glaciers such as SCG [South Col Glacier] that are above 8000 m may disappear by mid-century. Our study points to the critical balance afforded by snow-covered surfaces and the potential for loss throughout high mountain glacier systems as snow cover is depleted by changes in sublimation and surface melt driven by climate trends. Everest's highest glacier has served as a sentinel for this delicate balance and has demonstrated that even the roof of the Earth is impacted by anthropogenic source warming." The expedition team installed the two highest weather stations in the world (at 8,430 meters and 7,945 meters) and collected the highest-ever ice core (at 8,020 meters), garnering two Guinness World Records. As summarized in *UMaine News*, data from the weather stations and ice core as well as satellite and photogrammetric imagery led to the finding of "contemporary thinning rates approaching approximately 2 meters of water per year now that the glacier has turned from snowpack to ice, losing its ability to reflect solar radiation, resulting in rapid melting and increased sublimation. Once South Col Glacier ice was regularly exposed, approximately 55 meters of glacier thinning is estimated to have occurred in a quarter-century — thinning over 80 times faster than the nearly 2,000 years it took to form the ice at the surface." *UMaine News* quotes Paul Mayewski, glaciologist and director of UMaine's Climate Change Institute, who was the expedition leader and lead scientist: "It answers one of the big questions posed by our 2019 NGS/Rolex Mount Everest Expedition — whether the highest glaciers on the planet are impacted by human-source climate change. The answer is a resounding yes, and very significantly since the late 1990s." ***

*Walter Immerzeel et al., "Importance and vulnerability of the world's water towers," *Nature*, v. 577, 364–369, December 9, 2019, <https://doi.org/10.1038/s41586-019-1822-y>

**Mariusz Potocki et al., "Mt. Everest's highest glacier is a sentinel for accelerating ice loss," *Nature Portfolio Journal Climate and Atmospheric Science*, v. 5, no. 7, February 3, 2022, <https://doi.org/10.1038/s41612-022-00230-0>; for information on the alternative names of the mountain, see Everest Education Expedition, "The Naming of Mount Everest," Montana State University, <https://www.montana.edu/everest/facts/naming.html>

*** Kirsten Weymouth and Margaret Nagle, "Human-induced climate change impacts the highest reaches of the planet — Mount Everest," *UMaine News*, February 3, 2022, <https://umaine.edu/news/blog/2022/02/03/human-induced-climate-change-impacts-the-highest-reaches-of-the-planet-mount-everest/>

2022 (February)

NOAA predicts U.S. sea level rise in the next 30 years equivalent to rise experienced in the last 100 years

The key takeaways from the report: "Sea level along the U.S. coastline is projected to rise, on average, 10 - 12 inches in the next 30 years (2020 - 2050), which will be as much as the rise measured over the last 100 years (1920 - 2020); Sea level rise will create a profound shift in coastal flooding over the next 30 years by causing tide and storm surge heights to increase and reach further inland. By 2050, "moderate" (typically damaging) flooding is expected to occur, on average, more than 10 times as often as it does today, and can be intensified by local factors; Current and future emissions matter. About 2 feet of sea level rise along the U.S. coastline is increasingly likely between 2020 and 2100 because of emissions to date. Failing to curb future emissions could cause an additional 1.5 - 5 feet of rise for a total of 3.5 - 7 feet by the end of this century." *

*National Oceanic and Atmospheric Administration, "2022 Sea Level Rise Technical Report," February, 2022, <https://oceanservice.noaa.gov/hazards/sealevelrise/sealevelrise-tech-report.html>

2022 (February)

Controversy erupts over federal guidance discouraging use of federal funds to construct new highway lanes

The Infrastructure Investment and Jobs Act (IIJA) [2021 (November)] made \$110 billion available to states for infrastructure improvements. Whether that should be spent on repairing existing roads and bridges, or expanding the capacity of the nation's highways to carry more vehicles, becomes a point of strong contention. On December 16, 2021, the Federal Highway Administration (FHWA) circulated a memo to state offices on how to spend those funds. As reported in *E&E News Daily*: “The Transportation Department arm encouraged states to prioritize repairing existing roads and bridges rather than expanding or building new ones. FHWA also asked states to make existing roads accessible to all modes of transportation, not just driving, while ensuring climate resiliency and equity. President Biden's original infrastructure proposal included this fix-it-first approach, but that language did not survive Senate negotiations and the final bill does not require states to repair existing infrastructure conditions before expanding highways or building new ones. For many transportation policy advocates, that's a huge problem. ‘We want to see states focus on repairing what they have before they build new things, and as they build new things have a plan to maintain it,’ said Beth Osborne, who worked at the Transportation Department under President Obama and now serves as director of Transportation for America.’ ‘It's more important to replace dangerous bridges than to build something new.’”

* Also on December 16, 2021, a study released by the Georgetown Climate Center compared the greenhouse gas emissions consequences of using the IIJA funds to build new highway lanes, as opposed to repairing aged infrastructure: “If transportation investment decisions prioritize a ‘fix it first’ approach and emphasize maintenance of existing roadways, along with investments in transit, electric vehicles and charging infrastructure, and other low-carbon transportation options, this historic infusion of federal funding has the potential to accelerate reductions in GHG emissions from surface transportation relative to business as usual. But if investments instead flow mostly to adding more lanes and building more roads, the IIJA funding could result in an increase in emissions over what we'd expect without this additional investment. That's because building more roads consistently results in more traffic — an ‘if you build it, they will come’ effect known as ‘induced demand.’ In short, traffic expands to fill the new lanes within a few short years, bringing with it more pollution.” ** Senators Mitch McConnell and Shelley Moore Capito send a letter to the nation's governors urging them to ignore the FHWA guidance memo. As reported in *E&E News Daily*: “The senators accused the Federal Highway Administration (FHWA) of attempting to enact a ‘wish list of policies’ not outlined in the \$1.2 trillion Infrastructure Investment and Jobs Act, which Congress passed last year with bipartisan support. Both McConnell and Capito voted in favor of the measure. ‘These policies, such as discouraging projects that increase highway capacity and prioritizing projects that advance non-motorized transportation options, differ from the provisions negotiated and agreed to in the law,’ they wrote in their letter. ‘The FHWA memorandum is an internal document, has no effect of law, and states should treat it as such.’” *

*Arianna Skibell, “Republicans urge states to ignore infrastructure guidance,” *E&E News Daily*, February 10, 2022, <https://www.eenews.net/articles/republicans-urge-states-to-ignore-infrastructure-guidance/>; The FHWA memo is at https://www.fhwa.dot.gov/bipartisan-infrastructure-law/building_a_better_america-policy_framework.cfm; for further background see Brad Plummer, “How Billions in Infrastructure Funding Could Worsen Global Warming,” *New York Times*, February 10, 2022, <https://www.nytimes.com/2022/02/10/climate/highways-climate-change-traffic.html>
** Georgetown Climate Center, “Issue Brief: Estimating the Greenhouse Gas Impact of Federal Infrastructure Investments in the IJA,” December 16, 2021, <https://www.georgetownclimate.org/articles/federal-infrastructure-investment-analysis.html>

2022 (February)

Russia invades Ukraine

The invasion lays bare the risks of the “fossil-fueled codependency among the economies of Russia, Europe, and (somewhat less directly) the United States.”* Observes Bill McKibben: “This is not a ‘war for oil and gas’ in the sense that too many of America’s Middle East misadventures might plausibly be described. But it is a war underwritten by oil and gas, a war whose most crucial weapon may be oil and gas, a war we can’t fully engage because we remain dependent on oil and gas. If you want to stand with the brave people of Ukraine, you need to find a way to stand against oil and gas.”** The *Wall Street Journal* will report in April that the war is leading many countries to race in the short term to lock up enough supply of fossil fuels from non-Russian sources, including more coal, over the next few years, while at the same time accelerating plans to switch to green energy in the longer term.*** In October, the International Energy Agency will forecast, as reported in the *New York Times*, that “the energy crisis sparked by Russia’s invasion of Ukraine is likely to speed up rather than slow down the global transition away from fossil fuels and toward cleaner technologies like wind, solar and electric vehicles.”**** In a historic first in the history of warfare, eight months into the invasion, the Ministry of Environmental Protection and Natural Resources of Ukraine and the Ukraine School of Economics, in collaboration with other organizations, will release an interim estimate of greenhouse gases generated as a result of Vladimir Putin’s war. The report covers five discrete areas in the first seven months of the war, measured in tons CO₂ equivalent: internal displacements and international refugees – 1.397 million tons; fuel consumption and emissions from the use and manufacture of munitions by both Russia and Ukraine - 8.855 million tons; fires caused by shelling, bombing, and mine-laying operations – 23.764 million tons; costs of reconstruction of destroyed or damaged civilian infrastructure – 48.670 million tons; and gas leakage from the Nord Stream 1 & 2 pipelines – 14.6 million tons. The total, 97.286 million tons: “This is the equivalent of the total GHG emissions over the same period in a country like The Netherlands. As a number of impacts of this war have not yet been taken into consideration, these figures are likely to underestimate the true level of emissions. The longer Russia’s war continues, the higher final figures will be.” ***** Ukraine will bring a shrapnel-covered log to its COP27 pavilion, and President Volodymyr Zelensky will advise the delegates in a video address that the war has destroyed 5 million acres of forest in Ukraine in six months. He will go on to say: “There are still many for whom climate change is just rhetoric or marketing or political ritual...They are the ones who start wars of aggression when the planet cannot afford a single gunshot because it needs global joint actions.”

*Sueellen Campbell, “Climate change and Russia’s invasion of Ukraine: A nexus?” *Yale Climate Connections*, February 28, 2022.

**Bill McKibben, “This is how we defeat Putin and other petrostate autocrats.” *The Guardian*, February 25, 2022.

***Jenny Strasburg and Phreb Dvorak, [“Ukraine War Drives Countries to Embrace Renewable Energy—but Not Yet.”](#) *Wall Street Journal*, April 4, 2022.

****Brad Plumer, [“War in Ukraine Likely to Speed, Not Slow, Shift to Clean Energy, I.E.A. Says.”](#) *New York Times*, October 27, 2022.

*****Initiative on GHG accounting of war, [“Climate Damage Caused By Russia’s War in Ukraine.”](#) November 1, 2022; see also, Sebastian Malo, [“There’s a Battle Over Carbon Emerging from the War in Ukraine.”](#) *Politico*, September 3, 2023.

*****Fiona Harvey et al., [“Cop27: ending war in Ukraine necessary to tackle climate crisis, Zelenskiy says.”](#) *The Guardian*, November 8, 2022; see also Sharon Udasin, [“Zelensky: Russia’s war is destroying the climate.”](#) *The Hill*, November 8, 2022.

2022 (February)

IPCC Sixth Assessment report on climate impacts warns of “unavoidable hazards” even under ambitious scenario of limiting climate warming to 1.5 degrees Celsius

The second part of the Intergovernmental Panel on Climate Change report [see 2021 (August) for the first] describes current and predicted impacts of climate change on ecosystems and human society. Limiting average warming to 1.5 degrees Celsius (2.7 degrees Fahrenheit), the stretch goal set under the Paris Agreement, would still “cause unavoidable increases in multiple climate hazards and present multiple risks to ecosystems and humans.” As for the current impacts of human-induced climate change that are baked into the planet’s new normal, the damage is more certain and more profound than described in the Fifth Assessment [2014 (November)]: “Widespread, pervasive impacts to ecosystems, people, settlements, and infrastructure have resulted from observed increases in the frequency and intensity of climate and weather extremes, including hot extremes on land and in the ocean, heavy precipitation events, drought and fire weather (high confidence). Increasingly since [the Fifth Assessment], these observed impacts have been attributed to human-induced climate change particularly through increased frequency and severity of extreme events. These include increased heat-related human mortality (medium confidence), warm-water coral bleaching and mortality (high confidence) and increased drought-related tree mortality (high confidence) [B.1.1]... Some losses are already irreversible, such as the first species extinctions driven by climate change (medium confidence). Other impacts are approaching irreversibility such as the impacts of hydrological changes resulting from the retreat of glaciers, or the changes in some mountain (medium confidence) and Arctic ecosystems driven by permafrost thaw (medium confidence). [B.1.2]... Ocean warming and ocean acidification have adversely affected food production from shellfish aquaculture and fisheries in some oceanic regions (high confidence). Increasing weather and climate extreme events have exposed millions of people to acute food insecurity and reduced water security, with the largest impacts observed in many locations and/or communities in Africa, Asia, Central and South America, Small Islands and the Arctic (high confidence) [B.1.3].” For the first time, the report highlights the role of Indigenous Peoples in developing effective adaptations to climate change, and the importance of environmental justice: “Climate resilient development is facilitated by ... governments at all levels ... developing partnerships with traditionally marginalised groups, including women, youth, Indigenous Peoples, local communities and ethnic minorities (high confidence). These partnerships are most effective when supported by enabling political leadership, institutions, resources, including finance, as well as climate services, information and decision support tools.” [D.2]* *Inside Climate News* plumbs the implications of Russian’s invasion of Ukraine for this report: “Today’s report ... was finalized just as Russia invaded Ukraine. Russian scientists at the online approval session Sunday apologized for their country’s invasion, while the war drew

Ukrainian scientists away from the meeting. It might be hard to concentrate on the new science assessment as a war erupts in Europe, but it's important to focus on both subjects at the same time because they are deeply related, said Rod Schoonover, a climate security expert with the Council on Strategic Risks' Center for Climate and Security, and a former United States intelligence officer. 'You shouldn't shut one or the other off. Humanity's relationship to fossil fuel is underwriting this invasion,' he said. 'Putin thought he could get away with it because of Europe's dependence on Russian gas. ...I'm really concerned about the impacts to food production in Ukraine,' he said. The country is a key source of grain for parts of the Middle East that face grain shortages because of global warming, showing how global warming impacts and conflict can intensify each other. Russia's aggression and its duplicity leading up to the attack may also call into question whether the country's promises to fight global warming under the Paris agreement mean anything. Vladimir Putin is not an overt climate denier, Schoonover said, but has made clear that he intends for Russia to develop all of the nation's climate-warming fossil fuel reserves, including in dangerous and sensitive environments like the Arctic, and he may be prepared to use force to assert other territorial claims for fossil fuels."** UN Secretary António Guterres delivers the most unvarnished call to action in the history of the UNFCCC: "I have seen many scientific reports in my time, but nothing like this. Today's IPCC report is an atlas of human suffering and a damning indictment of failed climate leadership. With fact upon fact, this report reveals how people and the planet are getting clobbered by climate change. Nearly half of humanity is living in the danger zone – now. Many ecosystems are at the point of no return – now. Unchecked carbon pollution is forcing the world's most vulnerable on a frog march to destruction – now. The facts are undeniable. This abdication of leadership is criminal. The world's biggest polluters are guilty of arson of our only home...Delay means death." ***

* IPCC, 2022: Summary for Policymakers in: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 3–33, <https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/>
https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_SummaryForPolicymakers.pdf

**Bob Berwyn, "'Delay is Death,' said UN Chief António Guterres of the New IPCC Report Showing Climate Impacts Are Outpacing Adaptation Efforts," *Inside Climate News*, February 28, 2022, <https://insideclimatenews.org/news/28022022/ipcc-report-russia-ukraine-adaptation-fossil-fuels/>

***United Nations, António Guterres (UN Secretary-General) to the press conference launch of IPCC report, February 28, 2022, <https://media.un.org/en/asset/k1x/k1xcijxjhp>

2022 (March)

Amazon rainforest closing in on a tipping point with profound implications for biodiversity and climate change

The rain that is so essential to the survival of the Amazon rainforest comes in significant part from evaporation from the trees and other vegetation in the forest itself. The combined effects of deforestation and drought is coming closer to threatening a forest die off of unprecedented scale and impact. A study in *Nature Climate Change* finds that "The resilience of the Amazon rainforest to climate and land-use change is crucial for biodiversity, regional climate and the global carbon cycle. Deforestation and climate change, via increasing dry-season length and drought frequency, may already have pushed the Amazon close to a critical threshold of rainforest dieback...We find that more than three-quarters of the Amazon rainforest has been losing

resilience since the early 2000s, consistent with the approach to a critical transition. Resilience is being lost faster in regions with less rainfall and in parts of the rainforest that are closer to human activity. We provide direct empirical evidence that the Amazon rainforest is losing resilience, risking dieback with profound implications for biodiversity, carbon storage and climate change at a global scale.” * As the *Washington Post* explains the study, the lost “resilience” means that the “vegetation is drier and takes longer to regenerate after a disturbance. Even the most densely forested tracts struggle to bounce back. This widespread weakness offers an early warning sign that the Amazon is nearing its ‘tipping point,’ the study’s authors say. Amid rising temperatures and other human pressures, the ecosystem could suffer sudden and irreversible dieback. More than half of the rainforest could be converted into savanna in a matter of decades — a transition that would imperil biodiversity, shift regional weather patterns and dramatically accelerate climate change.” ** A *Washington Post* interactive report on Amazon deforestation for beef production concludes: “If the Amazon is to die, it will be beef that kills it. And America will be an accomplice.” *** On October 30, Brazil will hold a presidential election, pitting Jair Bolsonaro [see 2021 (March)] against former president Luiz Inácio Lula da Silva (“Lula”), who instituted major efforts to protect the Amazon when he served as president from 2002 to 2010. A film produced by the Editorial Board of the *New York Times* is titled “Brazil’s Presidential Election Will Determine the Planet’s Future.” **** Lula will win the election, and, speaking at COP27 in November, will promise: “There is no planetary security without a protected Amazon. We will do whatever it takes to have zero deforestation and degradations of our biomes. For this reason, I would like to announce that efforts to fight climate change will have the highest priority in my next government. We will prioritize the fight against deforestation of all of our biomes and reverse damage done in recent years by the previous government.” *****

*Chris Boulton et al., “Pronounced loss of Amazon rainforest resilience since the early 2000s,”

Nature Climate Change v. 12, 271–278, March 7, 2022, <https://www.nature.com/articles/s41558-022-01287-8>

**Sarah Kaplan, “Satellite images show the Amazon rainforest is hurtling toward a ‘tipping point’,” *Washington Post*, March 7, 2022,

<https://www.washingtonpost.com/climate-environment/2022/03/07/amazon-rainforest-tipping-point-climate/>; see also, Terrence McCoy,

“How deforestation is pushing the Amazon toward a tipping point,” *Washington Post*, March 14, 2022,

<https://www.washingtonpost.com/world/2022/03/14/amazon-rainforest-deforestation/>

***Terrence McCoy and Julia Ledur, “The Amazon Undone: Devouring the Rainforest,” *Washington Post*, April 29, 2022,

<https://www.washingtonpost.com/world/interactive/2022/amazon-beef-deforestation-brazil/>; see also, Terrence McCoy, “The Amazon

Undone: How the Forest Dies,” *Washington Post*, November 18, 2022,

<https://www.washingtonpost.com/world/interactive/2022/amazon-brazil-tipping-point/>

****Editorial Board, “Brazil’s Presidential Election Will Determine the Planet’s Future,” October 27, 2022,

<https://www.nytimes.com/2022/10/27/opinion/brazil-election-climate-change-amazon-rainforest.html>

*****Patrick Greenfield and Fiona Harvey, “Lula vows to undo environmental degradation and halt deforestation,” *The Guardian*,

November 16, 2021, <https://www.theguardian.com/environment/2022/nov/16/lula-vows-to-undo-brazils-environmental-degradation-and-halt-deforestation>

2022 (March)

Biden Administration adopts first low carbon standards for concrete and asphalt in federally funded construction

In anticipation of the roll out of major federally funded construction projects under the Infrastructure Investment and Jobs Act [2021 (November)], the General Services Administration announces new standards for concrete and asphalt used in nationwide GSA construction,

modernization, and paving projects, designed to lower the carbon footprint of those projects, and “help strengthen American leadership in clean manufacturing, catalyze clean energy innovation, and combat climate change.” Concrete is the most widely used building material, with over 500 million tons produced in the U.S. each year. Over 90% of U.S. paved roads are asphalt-surfaced, with about 420 million tons of asphalt produced in the U.S. each year. As described in the GSA’s press release: “The new low embodied carbon concrete standard requires GSA project contractors to provide environmental product declarations (EPD), where available. An EPD is a standard, third-party-verified summary of the primary environmental impacts – including greenhouse gas (GHG) emissions – from a product’s extraction, transportation, and manufacturing. GSA also now asks its contractors to provide concrete that meets specific numeric limits for the amount of GHG emissions, or ‘embodied carbon,’ associated with its production. GSA’s standard reflects a 20% reduction from national concrete GHG limits. The new asphalt standard requires EPDs and at least two environmentally preferable techniques or practices to be used during the material’s manufacture or installation. Input directly from the asphalt industry helped shape a menu of widely-available practices to improve this material’s environmental footprint. These options include bio-based or alternative binders, recycled content, and reduced mix temperatures. Both standards will evolve as GSA and its partners build implementation experience.” Sonal Larsen, GSA’s Senior Advisor on Climate, emphasizes the advantages of modeling low carbon construction methods in federal projects: “Prioritizing government procurement with lower carbon and cleaner construction materials means helping American manufacturers and workers make products that are more globally competitive – and better for the planet...It makes sense to work strategically with our partners early on because the emissions from constructing a new building can contribute more to climate change than three decades of operating it.”* *E&E News* describes the broad impact of this new standard: “GSA oversees \$75 billion in annual contracts, and the agency’s real estate portfolio comprises more than 370 million square feet. The standards also will govern projects funded through the bipartisan infrastructure bill President Biden signed into law last year, including \$3.4 billion to modernize 26 land ports of entry along the U.S. borders with Canada and Mexico.” The GSA did not attempt to estimate the greenhouse gas emissions that would be saved by implementation of this standard. **

*General Services Administration Press Release, “GSA Lightens the Environmental Footprint of its Building Materials,” March 30, 2022, <https://www.gsa.gov/about-us/newsroom/news-releases/gsa-lightens-the-environmental-footprint-of-its-building-materials-03302022>

**Arianna Skibell, “Government Sets Carbon Limits on Concrete for Federal Projects,” *E&E News*, March 30, 2022, reprinted in *Scientific American*, <https://www.scientificamerican.com/article/government-sets-carbon-limits-on-concrete-for-federal-projects/>

2022 (April)

The U.S. becomes the first nation to include methane emissions from dams and reservoirs in its annual inventory of Greenhouse Gas Emissions and Sinks

All participants in the United Nations Framework Convention on Climate Change (UNFCCC) are required to submit annual estimates of their greenhouse gas emissions, and natural sinks which capture greenhouse gases. The U.S. makes GHG inventory history by including an estimate of the methane emissions from dams and reservoirs in this year’s report, even though there is no regulatory requirement for owners of dams and reservoirs to report their emissions under the Greenhouse Gas Reporting Program.* As reported in *The Revelator*, “While we’ve long known

that coal and gas-fired power plants emit troubling amounts of greenhouse gases, research has found that reservoirs can emit significant amounts of methane, too — which has a global warming potential 85 times that of carbon dioxide over 20 years — along with smaller amounts of nitrous oxide and CO₂. Emissions from some reservoirs can even rival that of fossil fuel power plants. Yet, until now, there’s been no real accounting at the national or international level for these emissions, which fall under the category of ‘flooded lands.’” The GHG Inventory concluded that reservoirs in the United States (not including Alaska, Hawaii, and U.S. Territories) emitted 753 kilotons of methane in 2020, which amounts to 18.8 million metric tons of carbon dioxide equivalent (CO₂e). Texas’ reservoirs collectively emit the largest amount of methane, followed by Florida, Louisiana, and Georgia. ** EPA is working to improve how it calculates those emissions, and is also conducting a four-year study of CO₂ and methane emissions from 108 randomly selected U.S. reservoirs. In March, 2022, more than 130 signers including the Center for Biodiversity, Patagonia, and Earthjustice petitioned the EPA to begin rulemaking that would add dams and reservoirs under the Greenhouse Gas Reporting Program. ***

*Tara Lohan, “United States Includes Dam Emissions in UN Climate Reporting for the First Time,” *The Revelator*, February 3, 2023, <https://therevelator.org/dam-emissions-reporting/>

**EPA (2022) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2020. U.S. Environmental Protection Agency, EPA 430-R-22-003, ES-6 at 6-117 (pdf p. 598) and 6-118 (pdf p. 599), <https://www.epa.gov/ghgemissions/draft-inventory-us-greenhouse-gas-emissionsand-sinks-1990-2020>

***Tara Lohan, “Dam Accounting: Taking Stock of Methane Emissions From Reservoirs,” *The Revelator*, April 25, 2022, <https://therevelator.org/methane-dams-reservoirs/>

2022 (April)

IPCC report on strategies for mitigating climate change offers some hope, precariously hinged on carbon capture and storage

The most controversial challenge of climate change is plotting the strategy to mitigate its causes and effects; this is the task of Working Group III of the U.N. Intergovernmental Panel on Climate Change, which released its final report on April 4, after 40 consecutive hours of “last minute negotiations,” delaying scheduled release by 6 hours, the longest delay in the IPCC’s 34 years. Tackling the first report on mitigation since the Paris Climate Agreement in 2015, “Scientists and officials from nearly 200 countries haggled late into Sunday night over thorny questions such as how much funding wealthy nations should provide for developing countries to tackle climate change, and what emphasis to give policies such as phasing out subsidies for fossil fuels....Seemingly simple language about the need for renewable power sources can be fraught with consequences for low-income countries struggling to guarantee energy access for their citizens, as well as wealthier nations that might be asked to provide financial and technical support for the transition.” Although this is a scientific report, the IPCC process allows for input from policymakers, who had much to say on the subject of mitigation.* The heart of the conundrum faced by global policymakers, summarized by the *New York Times*: “Holding warming to just 1.5 degrees Celsius would require nations to collectively reduce their planet-warming emissions roughly 43 percent by 2030 and to stop adding carbon dioxide to the atmosphere altogether by the early 2050s, the report found. By contrast, current policies by governments are only expected to reduce global emissions by a few percentage points this decade. Last year, fossil fuel emissions worldwide rebounded to near-record highs after a brief dip as a result of the coronavirus

pandemic.”** As stated in the report’s Summary for Policymakers: “All global modelled pathways that limit warming to 1.5°C (>50%) with no or limited overshoot, and those that limit warming to 2°C (>67%), involve rapid and deep and in most cases immediate GHG emission reductions in all sectors. Modelled mitigation strategies to achieve these reductions include transitioning from fossil fuels without CCS [carbon capture and storage] to very low- or zero-carbon energy sources, such as renewables or fossil fuels with CCS, demand side measures and improving efficiency, reducing non-CO2 emissions, and deploying carbon dioxide removal (CDR) methods to counterbalance residual GHG emissions.” *** Writes the *Washington Post* Editorial Board: “Sounds grim. The encouraging part is that progress is still possible — easier, in fact, than one would have expected even a decade ago. The cost of renewables such as wind and solar has plummeted. Battery technology has improved. Some 18 countries have cut their emissions for 10 years straight. The pathway is clearer now than it has ever been.”**** Bob Berwyn, writing for *Inside Climate News*, notes that this is not just another dire scientific warning: “In a way, it’s a final warning, because at the IPCC’s pace, the world most likely will have burned through its carbon budget by the time the panel releases its next climate mitigation report in about five or six years.” Berwyn quotes Peter Kalmus, a federal climate scientist who organizes protests on his own time: “ ‘This IPCC report is absolutely harrowing. Wake up everyone,’ Kalmus wrote on Twitter. ‘Brief summary of the new IPCC report: We know what to do, we know how to do it, it requires taking toys away from the rich, and world leaders aren’t doing it.’”*****As is clear from the quoted passage in the Summary for Policymakers, carbon capture and storage and carbon dioxide removal figure largely in the IPCC’s vision for achieving Paris Climate Agreement goals; many question the expense, safety, and large scale feasibility of these emerging technologies. ***** Two months following this IPCC report, the *Wall Street Journal* will declare that carbon removal is the “fastest-growing area in climate finance.” *****

*Maxine Joselow, “Political wrangling delays release of U.N. climate report,” *Washington Post*,

April 4, 2022, <https://www.washingtonpost.com/politics/2022/04/04/political-wrangling-delays-release-un-climate-report/>

**Brad Plumer and Raymond Zhong, “Stopping Climate Change Is Doable, but Time Is Short, U.N. Panel Warns,” April 4, 2022, <https://www.nytimes.com/2022/04/04/climate/climate-change-ipcc-un.html>

***IPCC, 2022: Summary for Policymakers. In: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, UK and New York, NY, USA,

https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_SummaryForPolicymakers.pdf, C.3

****Editorial Board, “Actually, humanity can still avoid climate catastrophe,” *Washington Post*, April 5, 2022,

<https://www.washingtonpost.com/opinions/2022/04/05/actually-humanity-can-still-avoid-climate-catastrophe/>

*****Bob Berwyn, “One Last Climate Warning in New IPCC Report: ‘Now or Never’,” *Inside Climate News*, April 5, 2022,

<https://insideclimatenews.org/news/05042022/ipcc-report-climate-change/>

*****Maxine Joselow, “The growing chorus for carbon removal,” *Washington Post*, April 26, 2022,

<https://www.washingtonpost.com/politics/2022/04/26/growing-chorus-carbon-capture/>; Nicholas Kusnetz, “Carbon Capture Takes Center Stage, But Is Its Promise an Illusion?” *Inside Climate News*, March 9, 2022,

<https://insideclimatenews.org/news/09032022/carbon-capture-and-storage-fossil-fuels-climate-change/> and other stories in the series “Pipe Dreams: Is Carbon Capture a Climate Solution or a Dangerous Distraction?” listed at <https://insideclimatenews.org/project/pipe-dreams/>;

Nicola Jones, “Solution or Band-Aid? Carbon Capture Projects Are Moving Ahead,” *YaleEnvironment360*, June 7, 2022,

<https://e360.yale.edu/features/solution-or-band-aid-carbon-capture-projects-are-moving-ahead>

*****Amrith Ramkumar and Ed Ballard, “Carbon-Removal Industry Draws Billions to Fight Climate Change,” *Wall Street*

Journal, June 8, 2022, <https://www.wsj.com/articles/carbon-removal-industry-draws-billions-to-fight-climate-change-11654640329>

2022 (April)

Biden CEQ nixes Trump NEPA rule, once again requiring consideration of climate impacts in environmental review of major federal projects

The Trump Administration's amendments to rules under the National Environmental Policy Act had been described as "the single biggest giveaway to polluters in the past 40 years." [2020 (July)] They provided that, in assessing the environmental impact of a proposed federal project, the agency preparing an environmental impact statement should "generally not consider" effects that "are remote in time, geographically remote, or the product of a lengthy causal chain." This and other language in the amendments essentially precluded consideration of climate impacts of federal actions. Two days before Earth Day, the White House Council on Environmental Quality rescinds that rule and restores the language in effect since 1978. The CEQ explains in the *Federal Register* announcement: "restoring language on direct, indirect, and cumulative effects better promotes NEPA's statutory purposes and is more consistent with the extensive NEPA case law. Restoring these phrases to the regulations also is consistent with this Administration's policies to be guided by science and to address environmental protection, climate change, and environmental justice."* As the *Washington Post* describes the change: "Under the rule finalized by the Biden White House this week, regulators will now have to account for how government actions may increase greenhouse gas emissions and fragment wildlife habitat, and whether they will impose new burdens on communities, particularly poor and minority neighborhoods, that have already faced disproportionate amounts of pollution. The move underscores how President Biden is looking for ways to push forward on his climate agenda despite rising concerns about cost increases in the economy." ** The *Wall Street Journal* Editorial Board opines: "Americans are going to need a split-screen for the Biden Administration's policy contradictions. Even as the President on Tuesday promoted the bipartisan infrastructure bill he signed last November, the White House moved to make it harder to build roads, bridges and, of course, oil and natural-gas pipelines."*** In January, 2023, the CEQ will issue an "interim guidance" to agencies under this new rule on how to take into account climate impacts: "Given the urgency of the climate crisis and NEPA's important role in providing critical information to decision makers and the public, NEPA reviews should quantify proposed actions' GHG emissions, place GHG emissions in appropriate context and disclose relevant GHG emissions and relevant climate impacts, and identify alternatives and mitigation measures to avoid or reduce GHG emissions. CEQ encourages agencies to mitigate GHG emissions associated with their proposed actions to the greatest extent possible, consistent with national, science-based GHG reduction policies established to avoid the worst impacts of climate change." ****

*U.S. Council on Environmental Quality, "National Environmental Policy Act Implementing Regulations Revisions," *Federal Register* 87 (April 22, 2022): 23453-23470, <https://www.federalregister.gov/documents/2022/04/20/2022-08288/national-environmental-policy-act-implementing-regulations-revisions>

**Dino Grandoni and Anna Phillips, "Biden restores climate safeguards in key environmental law, reversing Trump," *Washington Post*, April 19, 2022, <https://www.washingtonpost.com/climate-environment/2022/04/19/biden-nepa-climate-trump/>

***Editorial Board, "How to Kill American Infrastructure on the Sly," *Wall Street Journal*, April 20, 2022,

<https://www.wsj.com/articles/how-to-kill-infrastructure-on-the-sly-white-house-biden-council-on-environmental-policy-nepa-11650481710>

****U.S. Council on Environmental Quality, "Notice of interim guidance, request for comments," *Federal Register* 88 (January 9, 2023): 1196-1212, <https://www.federalregister.gov/documents/2023/01/09/2023-00158/national-environmental-policy-act-guidance-on-consideration-of-greenhouse-gas-emissions-and-climate>; For assistance navigating the development of these and other rules through the Obama, Trump and Biden administrations, and links to Federal Register notices, see the Environmental and Energy Law Project (EELP), Harvard Law School, Regulatory Tracker, NEPA Environmental Review Requirements, <https://eelp.law.harvard.edu/2018/08/nepa-environmental-review-requirements/>

2022 (May)

Study finds existing fossil fuel projects will put the planet well over 1.5 °C; almost 40% of “developed reserves” of fossil fuels must be left in the ground

An analysis reported in *Environmental Research Letters* is the first to focus on oil and gas fields and coal mines in operation or under construction (“developed reserves”), as opposed to potential reserves. The researchers conclude that “developed reserves substantially exceed the 1.5 °C carbon budget,” and that “Going beyond recent warnings by the International Energy Agency, our results suggest that staying below 1.5 °C may require governments and companies not only to cease licensing and development of new fields and mines, but also to prematurely decommission a significant portion of those already developed.” The researchers suggest that this has implications for whether governments should be approving any new fossil fuel leases or infrastructure construction, and for investment risk: “Developed reserves are particularly relevant to climate policy because they reflect the cumulative quantity of oil, gas and coal that companies have already discovered and for which a financial and regulatory commitment to extraction has been made. If cumulative potential CO₂ emissions from developed reserves exceed the remaining carbon budgets to limit warming to 1.5 °C or well below 2 °C, this would imply that governments licensing and companies exploring for and developing new fossil fuel reserves is inconsistent with the Paris goals. Furthermore, some existing licences and production, or unabated use, would need to be halted to safely achieve the goals, causing stranded assets.” The study explains the difference between its analysis and the IEA’s [see 2021 (December)]: “One reason our study reaches a stronger conclusion than the IEA (2021) finding that no additional fields and mines are needed is that the IEA scenario includes some CDR [carbon dioxide removal] and significant carbon capture and storage (CCS) of fossil fuel emissions. The IEA acknowledges that CCS availability is one of the greatest uncertainties in its scenario; three decades of efforts to deploy CCS have largely failed.” The study concludes with a policy recommendation: “While most governments continue to plan on the expansion of fossil fuel production..., a small group of governments, including Denmark, Costa Rica, France, Spain, Ireland, and California, have ended licensing and/or set phase-out dates for extraction..., committing to keep some reserves in the ground. Several governments’ launch of the Beyond Oil and Gas Alliance (2021) at the COP26 climate summit in Glasgow could encourage more to follow suit. By doing so, governments could mitigate the risks of carbon lock-in, stranded assets and runaway climate change, and better plan for a just transition.” One of the authors of this study is Malte Meinshausen of the Potsdam Institute for Climate Impact Research, who originated the “carbon budget” approach to measuring progress on climate change [2009 (April)], which has been adopted in the assessments of the Intergovernmental Panel on Climate Change.* A study in *Energy Policy* in July will identify by name and location the 425 biggest fossil development “energy bombs” across the world, each with the potential to produce over 1 gigaton of CO₂ emissions, all of which combined would “exceed the global 1.5 °C carbon budget by a factor of two.” The countries with the greatest carbon bomb potentials are China (141 projects with 332.9 gigaton emissions); United States (28 projects with 151.1 gigaton emissions) and Russia (41 projects with 117 gigaton emissions). 40% of the carbon bomb projects had not yet started extraction as of 2020.**

* Kelly Trout et al., “Existing fossil fuel extraction would warm the world beyond 1.5 °C,” *Environmental Research Letters* v.17, 064010, May 17, 2022, <https://iopscience.iop.org/article/10.1088/1748-9326/ac6228>

**Kjell Kühne et al., “‘Carbon Bombs’ - Mapping key fossil fuel projects,” *Energy Policy*, v. 166, art.113022, July, 2022, <https://doi.org/10.1016/j.enpol.2022.112950> This article includes a history of the Keep it in the Ground (KING) Movement against fossil fuel infrastructures; see also, Damian Carrington and Matthew Taylor, “Revealed: the ‘carbon bombs’ set to trigger catastrophic climate breakdown,” *The Guardian*, May 11, 2022, <https://www.theguardian.com/environment/ng-interactive/2022/may/11/fossil-fuel-carbon-bombs-climate-breakdown-oil-gas>

2022 (June)

Initiative led by climate scientist and activist James Hansen petitions EPA to regulate greenhouse gases under the Toxic Substances Control Act

The Toxic Substances Control Act (TSCA) of 1976 was intended to provide a framework for federal regulation of chemicals found to present “an unreasonable risk of injury to health or the environment,” and to encourage industry to develop adequate data with “respect to the effect of chemical substances and mixtures on health and the environment.”* It was once aptly called “perhaps the most complex, confusing, and ineffective of all our federal environmental protection statutes.”** In 2016, however, it received a major Congressional overhaul, giving it the teeth to better address the pervasive problem of toxic chemicals in commerce in the United States.*** The amended law establishes a process for evaluating high priority chemicals to determine whether or not they present an unreasonable risk to health or the environment, and to develop regulations to address that risk. In the context of multiple legal challenges to EPA’s efforts to regulate greenhouse gases under the Clean Air Act, most notably the case then pending before the Supreme Court of *West Virginia v. EPA* [see below, 2022 (June)] five experts including climate scientist James Hansen, and two nonprofits, Climate Science, Awareness and Solutions and Climate Protection and Restoration Initiative file a petition to the EPA asking the agency to regulate greenhouse gases under TSCA.**** James Hansen sees the petition as an opportunity for the U.S. to more effectively phase out greenhouse gases by putting a carbon fee on them to reflect their actual costs: “We can also be leaders in the solution if we begin to make the polluters pay via a steadily rising carbon fee with the funds distributed to the public (a conservative, bipartisan approach)... Evoking TSCA will not demand an instant carbon price – the timing needs to be sensible. However, it will be a huge step, putting us on a course with the potential to address the climate problem globally. The huge U.S. economy allows the opportunity to affect the global approach via border duties on products from countries that do not have a carbon fee.”***** On September 22, 2022, the EPA will reject the petition. While agreeing about the profound risks of greenhouse gases, the agency will list current steps to reduce greenhouse gas emissions, including the climate-related provisions of the Bipartisan Infrastructure Law and the Inflation Reduction Act, and argue: “Because there are numerous other federal, state and local actions already undertaken or underway to address the climate crisis, and because EPA believes that a complete consideration of the costs ... and discretionary considerations under TSCA would be unlikely to lead to a different outcome than these other actions..., EPA believes it is unnecessary and would be an inefficient use of government resources to initiate a new, resource-intensive rulemaking under TSCA at this time.”***** The petitioners will appeal the denial.*****

*15 U.S.C. secs. 2601 et seq.

**Zygmunt Plater et al., *Environmental Law and Policy: Nature, Law and Society*, 3rd Ed. (Aspen 2004), p. 830

*** Environmental Protection Agency, Assessing and Managing Chemicals under TSCA: The Frank R. Lautenberg Chemical Safety for the 21st Century Act, <https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/frank-r-lautenberg-chemical-safety-21st-century-act>

**** Climate Protection and Restoration Initiative, Petition FAQs, <https://cprclimate.org/access/press-releases/petition-fact-sheet/>; Petition to Phase Out Greenhouse Gas (GHG) Pollution to Restore a Stable and Healthy Climate, June 16, 2022, https://cprclimate.org/wp-content/uploads/2022/06/2022.06.16_TSCA_PETITION_FINAL_PART_Icompressed.pdf

***** James Hansen, Makiko Sato and Reto Ruedy, “Carbon Dioxide Is a Pollutant. Please Help Establish That Fact,” May 2022 Temperature Update, June 17, 2022, <http://www.columbia.edu/~jeh1/mailings/2022/MayTemperatureUpdate.17June2022.pdf>

*****Environmental Protection Agency, Toxic Substances Control Act (TSCA) Section 21 Petition for Rulemaking Under TSCA Section 6; Reasons for Agency Response; Denial of Requested Rulemaking, *Federal Register* 87, 57665-57674, September 21, 2022, <https://www.federalregister.gov/documents/2022/09/21/2022-20257/toxic-substances-control-act-tsca-section-21-petition-for-rulemaking-under-tsca-section-6-reasons>

*****Press release, Climate Protection & Restoration Initiative, “CPR Initiative Sues EPA to Compel Climate Pollution Phase Out,” November 14, 2022, <https://cprclimate.org/cpr-initiative-sues-epa-to-compel-climate-pollution-phase-out/>

2022 (June)

West Virginia v. EPA: Supreme Court hands the Executive branch a preemptive blow on regulating power plant greenhouse gas emissions

The Constitution gives the federal courts authority to decide certain “cases” and “controversies.” Until now, it was well understood that courts would not hear and decide disputes that were no longer “cases” or “controversies,” but rendered “moot,” or resolved, by factual or legal developments. Hence it was a profound surprise to attorneys and jurists when the Supreme Court decided to hear *West Virginia v. EPA*, a challenge to President Obama’s Clean Power Rule, which had been stayed in the courts pending review, then replaced by an entirely different regulation by President Trump.[2014 (June), 2015 (August), 2016 (February), 2017 (March), (October), 2018 (August), 2019 (June)] As the *Washington Post* Editorial Board commented after oral arguments on the case in March: “The Supreme Court’s willingness to consider the case is itself outrageous. The controversy involves the EPA’s authority to regulate emissions from power plants through the Obama administration’s Clean Power Plan. The only problem: The Clean Power Plan is defunct. The Trump administration repealed the program in 2019. A federal court has since issued a stay of that repeal, but the Biden administration has made clear that it intends to propose a new rule, because technology in the energy sector has shifted considerably. ... Why would the Supreme Court interfere now, with no rule in place?” * And as the *Post*’s reporters Robert Barnes and Dino Grandoni note: “Biden’s team has yet to issue its own plan for the power sector. For that reason, environmentalists took it as an ‘earthquake’ when the Supreme Court accepted the case last fall, said Harvard Law School professor Richard Lazarus. It appeared to signal a move on the part of the court’s conservatives to delineate — and probably trim — the EPA’s powers before there were even regulations to review.” ** These concerns are born out in the decision. The holding of the court is that the EPA does not have the authority under section 111 of the Clean Air Act to require reduction in greenhouse gas emissions from power plants by shifting the kind of generation they use from coal to gas, or gas to renewables. The statutory “best system of emission reduction” that the Agency has determined to be “adequately demonstrated” for power plants applies only to technical emissions controls, not to replacement of a dirtier fuel by a cleaner fuel. Congress must have intended the “major question” of fuel replacement to be reserved for subsequent decision by it, rather than determined in rulemaking by Executive agencies. The opinion in effect inaugurated a new, very narrow approach to interpreting the scope of agencies’ authority to implement acts of Congress. Justice Roberts: “This is a major questions

case. EPA claimed to discover an unheralded power representing a transformative expansion of its regulatory authority in the vague language of a long-extant, but rarely used, statute designed as a gap filler. That discovery allowed it to adopt a regulatory program that Congress had conspicuously declined to enact itself. Given these circumstances, there is every reason to ‘hesitate before concluding that Congress’ meant to confer on EPA the authority it claims under Section 111(d).” Justice Kagan’s dissent, joined by Justices Breyer and Sotomayor, retorts: “Today, the Court strips the Environmental Protection Agency (EPA) of the power Congress gave it to respond to ‘the most pressing environmental challenge of our time.’ *Massachusetts v. EPA*, 549 U. S. 497, 505 (2007)...EPA ... serves as the Nation’s ‘primary regulator of greenhouse gas emissions.’ ...And among the most significant of the entities it regulates are fossil-fuel fired (mainly coal- and natural-gas-fired) power plants. Today, those electricity-producing plants are responsible for about one quarter of the Nation’s greenhouse gas emissions. ...Curbing that output is a necessary part of any effective approach for addressing climate change...The premise of the [Clean Power] Plan— which no one really disputes—was that operational improvements at the individual-plant level would either ‘lead to only small emission reductions’ or would cost far more than a readily available regulatory alternative. ...That alternative—which fossil fuel-fired plants were ‘already using to reduce their [carbon dioxide] emissions’ in ‘a cost effective manner’—is called generation shifting. ...The majority says it is simply ‘not plausible’ that Congress enabled EPA to regulate power plants’ emissions through generation shifting. ...But that is just what Congress did when it broadly authorized EPA in Section 111 to select the ‘best system of emission reduction’ for power plants. ...The ‘best system’ full stop—no ifs, ands, or buts of any kind relevant here. The parties do not dispute that generation shifting is indeed the ‘best system’—the most effective and efficient way to reduce power plants’ carbon dioxide emissions...The majority’s decision rests on one claim alone: that generation shifting is just too new and too big a deal for Congress to have authorized it in Section 111’s general terms. But that is wrong. A key reason Congress makes broad delegations like Section 111 is so an agency can respond, appropriately and commensurately, to new and big problems. Congress knows what it doesn’t and can’t know when it drafts a statute; and Congress therefore gives an expert agency the power to address issues—even significant ones—as and when they arise...Statutory history serves only to pile on: It shows that Congress has specifically declined to restrict EPA to technology-based controls in its regulation of existing stationary sources.”***[see 2022 (August), IRA]

*Editorial Board, “Back off, Supreme Court. There’s no need to tie the EPA’s hands as it combats climate change,” *Washington Post*, March 8, 2022, <https://www.washingtonpost.com/opinions/2022/03/08/supreme-court-not-tie-epa-hands-fight-climate-change/>

**Robert Barnes and Dino Grandoni, “In EPA Supreme Court case, the agency’s power to combat climate change hangs in the balance,” *Washington Post*, February 25, 2022, <https://www.washingtonpost.com/politics/2022/02/25/supreme-court-epa-west-virginia/>

****West Virginia v. EPA*, slip opinion, Justice Roberts majority decision at 7, Justice Kagan dissent at 1, 3, 5, 10, https://www.supremecourt.gov/opinions/21pdf/20-1530_n758.pdf; for commentary on this decision see Bill McKibben, “The Supreme Court Tries to Overrule the Climate,” *The New Yorker*, June 30, 2022, <https://www.newyorker.com/news/daily-comment/the-supreme-court-tries-to-overrule-the-climate>; Richard Lazarus, “The Supreme Court just upended environmental law at the worst possible moment,” *Washington Post*, June 30, 2022, <https://www.washingtonpost.com/opinions/2022/06/30/supreme-court-just-upended-environmental-law-worst-possible-moment/>; Richard Schiffman, “Former EPA Head: Supreme Court’s Ruling Is a ‘Body Blow’ to the U.S.” *Scientific American*, July 8, 2022, <https://www.scientificamerican.com/article/former-epa-chief-supreme-courts-ruling-is-a-lsquo-body-blow-rsquo-to-the-u-s/>; Jan Wolfe and Timothy Puko, “Supreme Court Puts Brakes on EPA in Far-Reaching Decision,” *Wall Street Journal*, June 30, 2022, <https://www.wsj.com/articles/supreme-court-limits-environmental-protection-agencys-authority-11656598034>; Editorial Board, “The Supreme Court Restores a Constitutional Climate,” *Wall Street Journal*, June 30, 2022, <https://www.wsj.com/articles/restoring-a-constitutional-climate-west-virginia-v-epa-supreme-court-john->

[roberts-neil-gorsuch-11656620882](https://www.ehponline.com/view/fullarticle.aspx?doi=10.1371/journal.pone.0248882); John Holdren, “Reflections on the Supreme Court’s Decision in West Virginia v. EPA,” *Environmental Health News*, July 18, 2022, <https://www.ehn.org/supreme-court-west-virginia-v-epa-2657686848.html>

2022 (July)

Maine is on track to achieve its long-term climate goals

In 2019, Maine committed by statute to achieve complete carbon neutrality by 2045 and reduce emissions in 2050 to 80 percent lower than they were in 1990. * [2020 (November)] In its biennial progress report to the legislature, the Department of Environmental Protection states: “Maine’s GHG emissions were 25% lower in 2019 than in 1990. Emissions have consistently been at least 10% lower than 1990 levels since 2016. With data now available through December 31, 2019, Maine has achieved the goal of reducing GHG emissions to 10% lower than 1990 levels by January 1, 2020, as set forth in 38 M.R.S. §576 (2003). If emissions continue to decrease at current rates, Maine emissions are projected to be slightly higher than required by the goals of 38 M.R.S. §576-A1; however, the data in this report predate the State’s climate action plan *Maine Won’t Wait*, released in December 2020, which lays out strategies to ensure Maine meets these targets when fully implemented. Results of the analysis of net GHG emissions estimate that, as of 2016, approximately 75% of Maine’s GHG emissions are offset by carbon sequestered in Maine’s environment, and projected data suggest Maine is on target to meet the 2045 carbon neutrality requirement of 38 M.R.S. §576-A, sub-§2-A.2.” Maine DEP Commissioner Melanie Loyzim notes that this report “is the first to quantify the carbon sequestration benefits of Maine’s forests, fields and wetlands. It is essential for the creation and evaluation of emission reduction programs to take into account this more comprehensive view of carbon released and captured within Maine’s borders.” Xue Bai, Ivan Fernandez, and Adam Daigneault of UMaine together with researchers from the Maine Forest Service and Bates College collaborated with the DEP to develop the first-ever carbon budget for Maine. Other highlights of the biennial report are that “Annual CO2 emissions from fossil fuel combustion in the electric power sector have decreased by 91 percent since they peaked in 2002 largely by replacing high carbon fuels with lower carbon energy sources, primarily natural gas and renewable sources,” and that “Maine’s economy has grown while GHG emissions have declined, with 53 percent less GHG emissions per million dollars of state gross domestic product (GDP) in 2019 compared to 1990.”**

*38 M.R.S. 576-A; this statute updated an earlier set of goals enacted in 2003, 38 M.R.S. 576.

**Press release, “Greenhouse Gas Emissions Report shows Maine on pace to meet goals,” Maine Department of Environmental Protection, July 28, 2022, <https://www.maine.gov/dep/news/news.html>; Maine DEP, Report to the Joint Standing Committee on Environment and Natural Resources, 130th Legislature, Second Session, “Ninth Biennial Report on Progress toward Greenhouse Gas Reduction Goals,” July, 2022;

https://www.maine.gov/climateplan/sites/maine.gov.climateplan/files/inline-files/9th_GHG_Report_FINAL%20%28%29.pdf; Xue Bai et al., State of Maine’s Carbon Budget, 2006-2016 (version 1.0) (2020), <https://crsf.umaine.edu/forest-climate-change-initiative/carbon-budget/>

2022 (August)

Congress enacts the Inflation Reduction Act, called a game changer for climate

The long awaited, fiercely negotiated climate initiative originally proposed in President Biden's American Jobs Plan [2021 (March)] has evolved into the Inflation Reduction Act of 2022 (IRA). As *The New Republic* observes, "The fact that anything called climate policy managed to get through a razor-thin 50-50 majority in the U.S. Senate is astonishing."** That is particularly true where "Democrats had to win over the vote of a staunch fossil fuel industry supporter in their own party, Sen. Joe Manchin of West Virginia, who opposed carbon taxes."** Gone is not only the hope of taxing carbon (which was not even included in the Jobs Plan), but also proposals that would have raised \$20 billion a year by eliminating fossil fuel subsidies, and required utilities to deliver a certain percentage of electricity from renewable or other clean energy sources. Other concessions are summarized by the *Washington Post*: "To secure Manchin's support, the Inflation Reduction Act includes several provisions that will benefit the fossil fuel industry: a pledge to open up new oil and gas leasing in the Gulf of Mexico; a commitment that congressional Democrats and the White House will complete a controversial pipeline carrying gas from West Virginia; and a promise to pursue a separate measure that would ease permitting requirements for fossil fuel facilities as well as clean energy infrastructure. It also allocates billions of dollars for carbon capture and storage — a technology that many climate advocates say does not address air pollution and other local threats to communities." *** [re carbon capture and storage, see 2022 (April), IPCC] The IRA dedicates \$369 billion to advance clean energy through tax incentives, rebates and grants. That is a little more than half of Biden's original \$650 billion proposal, but still the largest legislated investment in tackling climate change in history, four times the \$90 billion in climate funding included in the economic stimulus package approved in the first year of President Barack Obama's administration. Key provisions are summarized in the Senate Democrats' press release and include: For consumers: "\$9 billion in consumer home energy rebate programs, focused on low income consumers, to electrify home appliances and for energy efficient retrofits; 10 years of consumer tax credits to make homes energy efficient and run on clean energy, making heat pumps, rooftop solar, electric HVAC and water heaters more affordable; \$4,000 consumer tax credit for lower/middle income individuals to buy used clean vehicles, and up to \$7,500 tax credit to buy new clean vehicles; \$1 billion grant program to make affordable housing more energy efficient." For domestic manufacturing: "Production tax credits to accelerate U.S. manufacturing of solar panels, wind turbines, batteries, and critical minerals processing, estimated to invest \$30 billion; \$10 billion investment tax credit to build clean technology manufacturing facilities, like facilities that make electric vehicles, wind turbines and solar panels." To "decarbonize the economy:" "Tax credits for clean sources of electricity and energy storage and roughly \$30 billion in targeted grant and loan programs for states and electric utilities to accelerate the transition to clean electricity;... A Methane Emissions Reduction Program to reduce the leaks from the production and distribution of natural gas." And this package "includes over \$60 billion in environmental justice priorities to drive investments into disadvantaged communities." The IRA, Senate democrats say, will "put the U.S. on a path to roughly 40% emissions reduction by 2030." **** Al Gore, who organized the first Congressional hearing on climate change in 1982, describes his reaction to passage of the IRA to the *Washington Post*: "I was elated when the result came in. This legislation is a game changer. It will create jobs, lower costs, increase U.S. competitiveness, reduce air pollution and, of course, tackle the climate crisis. We have crossed a major threshold, and it's going to have significant impacts on international climate action, especially going into COP27 this November." ***** An analysis of

the emissions impact of the IRA by Energy Innovation Policy & Technology will conclude that “passing the IRA will reduce GHG emissions an estimated 820 to 1,200 MMTs of carbon dioxide equivalent (CO₂e) in 2030 despite the oil and gas leasing requirements. Those reductions would reduce U.S. emissions 37 to 43 percent below 2005 levels and make significant progress towards achieving the 2030 U.S. NDC [Paris Agreement pledge] of 50 to 52 percent below 2005 GHG emissions.” In response to concern about the concessions made to the fossil fuel industry in the IRA, the analysis finds that “for every ton of emissions generated by IRA oil and gas provisions, at least 28 tons of emissions are avoided by the other provisions.”*****In the IRA Congress also responds to *West Virginia v. EPA*, where Justice Roberts noted that “carbon dioxide...has not been listed as a toxic pollutant.” [2022 (June)] The IRA amends several sections of the Clean Air Act to define “greenhouse gas” as encompassing “the air pollutants carbon dioxide, hydrofluorocarbons, methane, nitrous oxide, perfluorocarbons, and sulfur hexafluoride,” and grants money under the Clean Air Act for any project that “reduces or avoids greenhouse gas emissions and other forms of air pollution.” This language is described as a “powerful disincentive” to new lawsuits challenging regulation of greenhouse gases under the Clean Air Act.”***** Six months after passage of the law, Senator Joe Manchin, interviewed by the *Wall Street Journal*, will decline to describe himself as a Democrat, but says he doesn’t regret voting for the IRA, calling it “the most transformative bill” passed since he has been a lawmaker.*****

*Kate Aronoff, “The Bitter Triumph of the Inflation Reduction Act,” *The New Republic*, August 8, 2022,

<https://newrepublic.com/article/167337/bitter-triumph-inflation-reduction-act>

**Marianne Lavelle, “After 25 Years of Futility, Democrats Finally Jettison Carbon Pricing in Favor of Incentives to Counter Climate Change,” *Inside Climate News*, August 12, 2022, <https://insideclimatenews.org/news/12082022/after-25-years-of-futility-democrats-finally-jettison-carbon-pricing-in-favor-of-incentives-to-counter-climate-change/>

***Sarah Kaplan, “A victory at whose expense? Climate activists grapple with political compromise,” *Washington Post*, August 10, 2022, <https://www.washingtonpost.com/climate-environment/2022/08/10/victory-whose-expense-climate-activists-grapple-with-political-compromise/>

****Press release, Senate Democrats, Summary of the Energy Security and Climate Change Investments in the Inflation Reduction Act of 2022,” August, 2022,

https://www.democrats.senate.gov/imo/media/doc/summary_of_the_energy_security_and_climate_change_investments_in_the_inflation_reduction_act_of_2022.pdf

*****Maxine Joselow, “Al Gore on the Inflation Reduction Act: ‘It took so long’” *Washington Post*, August 16, 2022,

<https://www.washingtonpost.com/politics/2022/08/16/al-gore-inflation-reduction-act-it-took-so-long/>

*****Megan Mahajan, et al., “Updated Inflation Reduction Act Modeling Using the Energy Policy Simulator,” Energy Innovation Policy & Technology, August 2022, <https://energyinnovation.org/wp-content/uploads/2022/08/Updated-Inflation-Reduction-Act-Modeling-Using-the-Energy-Policy-Simulator.pdf>; for Al Gore’s comment on this analysis, see Dan Gearino, “Al Gore Talks Climate Progress, Setbacks and the First Rule of Holes: Stop Digging,” *Inside Climate News*, February 25, 2023,

<https://insideclimatenews.org/news/25022023/al-gore-climate-change-davos-inflation-reduction-act/>

*****Lisa Friedman, “Democrats Designed the Climate Law to Be a Game Changer. Here’s How,” *New York Times*, August 22, 2022, <https://www.nytimes.com/2022/08/22/climate/epa-supreme-court-pollution.html>, quoting Harvard Law School professor Jody Freeman; see also Robinson Meyer, “The EPA Just Quietly Got Stronger,” *The Atlantic*, August 24, 2022,

<https://www.theatlantic.com/science/archive/2022/08/inflation-reduction-act-epa-carrots-sticks/671218/>

on how the IRA will strengthen climate regulation under the Clean Air Act; and E.J. Dionne, “Congress tries to protect the planet from an overreaching court,” *Washington Post*, August 28, 2022, <https://www.washingtonpost.com/opinions/2022/08/28/west-virginia-epa-inflation-reduction-act/>

<https://www.washingtonpost.com/opinions/2022/08/28/west-virginia-epa-inflation-reduction-act/>

*****Dustin Volz, “Joe Manchin Declines to Describe Himself as a Democrat,” *Wall Street Journal*, February 26, 2023,

<https://www.wsj.com/articles/joe-manchin-declines-to-describe-himself-as-a-democrat-3998f275>

2022 (September)

Science advances in effort to predict climate tipping points

Scientists have long feared the threat of “tipping points” in the evolution of climate change: triggers that let nature take over to amplify warming even if humans manage to ramp down emissions. A study from the University of Exeter, Stockholm University and the Potsdam Institute for Climate Impact and published in *Science* comes closer to correlating anticipated tipping points with global surface temperature increases. The researchers conclude that if warming springs past the more ambitious Paris Agreement goal of 1.5 degrees Celsius (warming is currently at 1.1 degrees Celsius, 2 degrees Fahrenheit above preindustrial levels) to 2 degrees Celsius, profound and irreversible changes are likely. As summarized in the *New York Times*: “The changes would have significant, long-term effects on life on Earth. The collapse of the Greenland and West Antarctic ice sheets, for example, would lead to unrelenting sea level rise, measured in feet, not inches, over centuries. The thawing of permafrost would release more heat-trapping gases into the atmosphere, hindering efforts to limit warming. A shutdown of ocean mixing in the North Atlantic could affect global temperatures and bring more extreme weather to Europe.”* The introduction to the *Science* report is titled “Getting tipsy:” “Climate tipping points are conditions beyond which changes in a part of the climate system become self-perpetuating. These changes may lead to abrupt, irreversible, and dangerous impacts with serious implications for humanity. Armstrong McKay et al. present an updated assessment of the most important climate tipping elements and their potential tipping points, including their temperature thresholds, time scales, and impacts. Their analysis indicates that even global warming of 1°C, a threshold that we already have passed, puts us at risk by triggering some tipping points. This finding provides a compelling reason to limit additional warming as much as possible.” The study includes a graphic showing which feedback impacts can be predicted at which level of temperature increase: at under 2 degrees Celsius, the impacts include boreal permafrost abrupt thaw, Greenland and West Antarctic ice sheet collapse, low latitude coral die-off; at 2-4 degrees Celsius, they include loss of mountain glaciers and Amazon rainforest dieback; at 4 or greater degrees Celsius, they include collapse of the AMOC current [2021 (February)], Boreal forest dieback, and collapse of the Boreal permafrost.**

*Henry Fountain, “Failure to Slow Warming Will Set Off Climate ‘Tipping Points,’ Scientists Say,” *New York Times*, September 8, 2022, <https://www.nytimes.com/2022/09/08/climate/global-warming-climate-tipping-point.html>

**Armstrong McKay et al., “Exceeding 1.5°C global warming could trigger multiple climate tipping points,” *Science*, v. 77, i. 6611, September 9, 2022, <https://www.science.org/doi/10.1126/science.abn7950>

2022 (September)

Biden Administration awards offshore oil and gas leases for 1.7 million acres in Gulf of Mexico, but agrees to suspend Trump era leases pending NEPA review

Chevron, Occidental Petroleum, and BP are the purchasers. This is a small part of the 30 million acres subject to litigation [2021 (December), 2022 (January)]; agreement to the sale was a concession to West Virginia Senator Joe Manchin in the negotiations leading to enactment of the IRA. The *Wall Street Journal* reports: “The move marks a dramatic shift for the Biden administration, which has been overseeing an unprecedented slowdown in federal oil-and-gas leasing as it promotes a transition to cleaner energy. In the first 19 months of his administration, President Biden had set a new 70-year low for federal oil-and-gas leasing, awarding just 126,228

total acres, according to a recent Wall Street Journal analysis. Including Wednesday's 1.7 million acres would still leave him far behind his recent predecessors and put him roughly on par with former presidents Lyndon Johnson and Richard Nixon.”* The *Wall Street Journal* editorial board meanwhile criticizes the Biden Administration settlement of environmental legal challenges to Trump era oil and gas leases, by agreeing to conduct new reviews under the National Environmental Policy Act: “The Interior Department last week agreed to conduct additional climate reviews for five federal oil and gas lease sales held in 2019 and 2020 that were challenged by environmental groups. Activists claimed the Trump Administration didn't sufficiently study the climate impact of the leases under the National Environmental Policy Act (NEPA). Rather than defend the earlier environmental reviews, the Biden Administration surrendered to their progressive friends. According to last week's legal settlement, the climate reviews will incorporate the ‘social cost’ of greenhouse gas emissions that could result from the leases. This takes into account indirect global costs of emissions such as property damage from natural disasters, risk of conflict over resources, reduced agricultural productivity from drought, and more. By including the social cost in the NEPA reviews, the Administration will be able to claim the leases have a significant negative environmental impact even when they don't and then seek to cancel them. Alternatively, the Administration could try to force oil and gas producers to mitigate their emissions by helping fund its climate agenda.”**

*Timothy Puko, “Biden Administration Awards Offshore Oil-and-Gas Leases for 1.7 Million Acres in Gulf of Mexico,” *Wall Street Journal*, September 14, 2022, <https://www.wsj.com/articles/biden-administration-awards-offshore-oil-and-gas-leases-for-1-7-million-acres-in-gulf-of-mexico-11663192635>

**Editorial Board, “Biden Freezes Oil and Gas Leases,” *Wall Street Journal*, September 13, 2022, <https://www.wsj.com/articles/biden-freezes-oil-and-gas-leases-joe-manchin-west-virginia-climate-energy-chuck-schumer-11663093146>

2022 (September)

U.S. Senate ratifies the Kigali Amendment to the Montreal Protocol treaty to phase out hydrofluorocarbon greenhouse gas pollutants

Although not a single Republican voted for the Inflation Reduction Act [2022 (August)], there is rare bipartisan support, with 21 Republican senators voting in favor, on the 69-27 approval of an amendment to the Montreal Protocol to phase out production and use of HFCs, chemicals used in refrigeration and air conditioning that are potent greenhouse gases.* [see 2021 (September); 2022 (April); 2018 (October); 2013 (June)] 137 other countries including China have already entered into the agreement. Republican support for the amendment was undoubtedly helped by the US Chamber of Commerce's letter to senators urging approval, because it “would forestall global warming of up to 0.5 degree Celsius” and “enhance the competitiveness of U.S. manufacturers working to develop alternative technologies, and level the global economic playing field.” ** *Inside Climate News* quotes Avipsa Mahapatra, of the Environmental Investigation Agency, on the international significance of the Senate's vote: “ ‘This is the first time the Senate has, in a bipartisan way, signed on to a climate treaty in the last 30 years,’ Mahapatra said of those who voted for the agreement, including Senate minority leader Mitch McConnell (R-Ky.), who for years had mocked and criticized Democrats' efforts to do anything about climate change. ‘I think it does infuse a little bit of hope in our ability to make climate action possible in this country.’”***

*U.S. Senate, Roll Call Vote 117th Congress - 2nd Session On the Resolution of Ratification to Treaty Doc No 117-1, the Kigali Amendment to the Montreal Protocol, https://www.senate.gov/legislative/LIS/roll_call_votes/vote1172/vote_117_2_00343.htm

**U.S. Chamber of Commerce, letter to members of the United States Senate, September 19, 2022,

https://www.uschamber.com/assets/documents/220919_KV_KigaliAmendment_Senate_2022-09-19-194739_euls.pdf

***Phil McKenna, "Senate Votes to Ratify the Kigali Amendment, Joining 137 Nations in an Effort to Curb Global Warming," *Inside Climate News*, September 24, 2022, <https://insideclimatenews.org/news/24092022/senate-kigali-amendment-adoption/>, see also

Maxine Joselow, "Senate set to approve treaty fighting climate super-pollutants," *Washington Post*, September 20, 2022,

<https://www.washingtonpost.com/politics/2022/09/20/senate-set-approve-treaty-fighting-climate-super-pollutants/>

2022 (September)

Denmark is the first U.N. member to commit "loss and damage" support for nations vulnerable to climate change

The idea was floated at COP26 [2021 (November)] and Scotland, host of the conference, pledged 1 million pounds for the Climate Justice Resilience Fund, but there was no formal commitment by other nations to formalize a system of compensation.* At the United Nations General Assembly meeting, Denmark commits \$13 million to assist nations damaged by climate change. The *Washington Post* reports: "In a statement, Danish development minister Flemming Møller Mortensen said that a visit to flood-stricken areas of Bangladesh this spring helped inspire the pledge. 'It is grossly unfair that the world's poorest should suffer the most from the consequences of climate change, to which they have contributed the least,' Mortensen said. Loss and damage funding has long been a rallying cry for climate justice advocates and leaders from vulnerable countries. Wealthy nations, including the United States, have rebuffed those calls, worried that any kind of financial commitment would imply legal liability for climate change's escalating toll. But the issue has gained traction amid increasing devastation from climate disasters, such as the drought-fueled famine in East Africa and Pakistan's recent deadly floods. Some 400 activist groups released a letter this month demanding that finance for loss and damage be added to the agenda for this November's U.N. climate negotiations in Sharm el-Sheikh, Egypt."**

*Sarah Kaplan and Brady Dennis, "Climate change brings irreversible harm to poor countries. At COP26, rich ones face pressure to foot the bill," *Washington Post*, November 8, 2021, <https://www.washingtonpost.com/climate-environment/2021/11/08/climate-change-loss-adaptation-cop26/>

**Sarah Kaplan, "Denmark becomes first U.N. member to pay for 'loss and damage' from climate change," *Washington Post*, September 20, 2022, <https://www.washingtonpost.com/climate-environment/2022/09/20/denmark-climate-change-un-general-assembly/>

2022 (September)

Study of climate impacts of Bitcoin finds that cryptocurrency is "digital crude" rather than "digital gold;" federal and state regulatory actions follow

As explained in *Smithsonian Magazine*, "Bitcoin mining is the process by which new currency enters into circulation and transactions are verified. This process requires specialized computers that solve complex math problems. The first miner to solve a given problem wins a predetermined amount of the digital coins... The miners with the most powerful computers can make more guesses, allowing them to solve a problem more quickly and increase their chance of winning."* All of this requires a tremendous amount of energy, with a discernable carbon footprint. A study

in *Scientific Reports* estimates the climate costs of energy needed to mine Bitcoin (BTC). Its conclusion: “We provide three sustainability criteria for signaling when the climate damages may be unsustainable. BTC mining fails all three. We find that for 2016–2021: (i) per coin climate damages from BTC were increasing, rather than decreasing with industry maturation; (ii) during certain time periods, BTC climate damages exceed the price of each coin created; (iii) on average, each \$1 in BTC market value created was responsible for \$0.35 in global climate damages, which as a share of market value is in the range between beef production and crude oil burned as gasoline, and an order-of-magnitude higher than wind and solar power. Taken together, these results represent a set of sustainability red flags. While proponents have offered BTC as representing ‘digital gold,’ from a climate damages perspective it operates more like ‘digital crude.’”** *Smithsonian* quotes lead author Benjamin Jones: “We find several instances between 2016-2021 where Bitcoin is more damaging to the climate than a single bitcoin is actually worth. Put differently, Bitcoin mining, in some instances, creates climate damages in excess of a coin’s value. This is extremely troubling from a sustainability perspective.” In 2020, Bitcoin used 75.4 terawatt hours of electricity—more than Austria (69.9) or Portugal (48.4).* In March, 2022, President Biden had issued an Executive Order requiring relevant agencies to examine the implications of the dramatic growth of digital assets, including impact on climate.*** In September, 2022, the White House Office of Science and Technology publishes a report recommending further study of climate and energy impacts of cryptocurrency, developing potential performance standards, and providing tools and resources to reduce negative impacts.**** In June, 2022, the New York State Department of Environmental Conservation denied an air permit to a natural gas-fueled power plant near Seneca Lake that used most of the electricity it generated to mine Bitcoin.***** In November, 2022, in response to widespread concern about conversion of old fossil fuel power plants into cryptocurrency mining,***** New York Governor Kathy Hochul will impose the first state moratorium on new and renewed air permits for fossil fuel power plants that house cryptocurrency mining.***** An opinion piece in the *Wall Street Journal* four months later will observe: “Letting crypto remain would allow further damage to accrue, particularly to the environment. Bitcoin’s mechanism wastes zillions of processor cycles in pointless brute-force computations that authenticate mere handfuls of transactions. These computations consume an astonishing amount of electricity and specialized hardware, straining power grids in places as far-flung as Texas, Serbia and Kazakhstan. The demand for mining hardware is large enough to threaten the semiconductor supply chains that are currently snarling auto production and undermining Taiwan’s security. Annually, Bitcoin’s computations produce more carbon emissions than 10 million cars and tens of thousands of metric tons of broken hardware. In a world paying handsomely to arrest global warming, why support a fantasy of value that undermines the goal?” *****

*Margaret Osborne, [“Bitcoin Could Rival Beef or Crude Oil in Environmental Impact,”](#) *Smithsonian Magazine*, October 3, 2022.

**Benjamin Jones et al., [“Economic estimation of Bitcoin mining’s climate damages demonstrates closer resemblance to digital crude than digital gold.”](#) *Scientific Reports*, v. 12, no. 14512, September 29, 2022.

***Executive Office of the President, [“Ensuring Responsible Development of Digital Assets.”](#) Executive Order 14067, *Federal Register* 87 (March 9, 2022): 14143-14152.

****The White House, [“FACT SHEET: Climate and Energy Implications of Crypto-Assets in the United States.”](#) September 8, 2022.

*****Tim Knauss, [“NY denies permit for Bitcoin-mining power plant near Seneca Lake,”](#) *Syracuse.com*, June 30, 2022.

*****James Goodman, [“Bitcoin Seeks ‘Pollution for Profit’ in New York.”](#) *The Progressive*, January 26, 2022.

*****Press release, [“Earthjustice Applauds NY Gov. Hochul for Signing First-in-the-Nation Cryptocurrency Mining Moratorium.”](#) Earthjustice, November 23, 2022; see also, Earthjustice, [“The Environmental Impacts of Cryptomining.”](#) September 23, 2022.

*****Steve Hanke and Matt Sekerke, [“Nothing Redeems Crypto.”](#) *Wall Street Journal*, March 8, 2023; see also, Christian Stoll and others, [“Climate Impacts of Bitcoin Mining in the U.S.”](#) *MIT Center for Energy and Environmental Policy Research*, June 28, 2023.

2022 (October)

Global investment in wind and solar is “turbocharged” by energy crisis, expected to outpace oil and gas for the first time, and to outpace coal in U.S. electricity generation

The war in Ukraine, surging demand after Covid shutdowns, and supply-chain bottlenecks led energy prices to soar in 2022 and many countries turned to bolstering coal, oil and gas production. Nevertheless, *E&E News* reports that an analysis by Oslo-based energy consulting firm Rystad Energy “expects the trend [of growing investments in renewable energy] to continue. In 2022, capital spending on wind and solar is projected to reach \$494 billion, eclipsing the \$446 billion spent on upstream oil and gas production. That marks the first time that spending on wind and solar has eclipsed oil and gas drilling. High power prices will increase the returns for renewable projects. Rystad found that renewable projects in a handful of European countries could pay back their costs within a year at current power prices.”* In December, the International Energy Agency (IEA)’s annual report on renewables will announce that “Renewable power’s growth is being turbocharged as countries seek to strengthen energy security,” and that at this pace “the world [is] set to add as much renewable power in the next 5 years as it did in the past 20.” The IEA press report states: “The global energy crisis is driving a sharp acceleration in installations of renewable power, with total capacity growth worldwide set to almost double in the next five years, overtaking coal as the largest source of electricity generation along the way and helping keep alive the possibility of limiting global warming to 1.5 °C...This massive expected increase is 30% higher than the amount of growth that was forecast just a year ago, highlighting how quickly governments have thrown additional policy weight behind renewables. The report finds that renewables are set to account for over 90% of global electricity expansion over the next five years, overtaking coal to become the largest source of global electricity by early 2025.”** The U.S. Energy Information Administration will also conclude that in the United States renewable sources for electricity generation will reach 22% in 2022, up from 20% in 2021, outpacing coal which will fall from 23% in 2021 to 20% in 2022.”*** On the other hand, *E&E News* will report in early 2023 that U.S. oil and gas production is setting record highs: “Call it a tale of America’s two energy transitions. In one, utilities are rapidly closing coal plants, with consumption of the fossil fuel falling to levels not seen since the Eisenhower administration. In the other, American oil and gas drillers are on track to set new pumping records, driven by high demand at home and abroad. Analysts say the dynamic highlights the challenges facing the Biden administration as it attempts to green the world’s largest economy. The Inflation Reduction Act is injecting a massive amount of cash into clean energy technology, but the transition is uneven. Electric cars and heat pumps are replacing gas cars and furnaces — but they also drive up electricity demand on America’s grid, requiring vast amounts of energy that can’t yet be provided by zero-carbon sources.”****

*Benjamin Storrow, “Clean energy transition gains speed, despite global tumult,” *E&E News Climatewire*, October 17, 2022, <https://www.eenews.net/articles/clean-energy-transition-gains-speed-despite-global-tumult/>; Press release, “Renewable projects payback time drops to under a year in some places – capital investments shoot up,” Rystad Energy, October 11, 2022, <https://www.rystadenergy.com/news/renewable-projects-payback-time-drops-to-under-a-year-in-some-places-capital-inve>

**Press release, “Renewable power’s growth is being turbocharged as countries seek to strengthen energy security,” International Energy Agency, December 6, 2022, <https://www.iaea.org/news/renewable-power-s-growth-is-being-turbocharged-as-countries-seek-to-strengthen-energy-security>

***U.S. Energy Information Administration, Short-Term Energy Outlook, February 7, 2023, <https://www.eia.gov/outlooks/steo/report/electricity.php>

***Benjamin Storrow, “As coal declines, oil and gas emerge stronger than ever,” *E&E News Climatewire*, March 3, 2023, <https://www.eenews.net/articles/as-coal-declines-oil-and-gas-emerge-stronger-than-ever/>

2022 (October)

UN Emissions Gap report acknowledges only “negligible” progress in last year in strengthening pledges to achieve Paris Agreement goals

The 2021 Emissions Gap report prepared by the United Nations Environment Programme (UNEP) and a coalition of research institutions warned that current Nationally Determined Contributions (“NDCs”), or pledges, under the Paris Agreement were putting the planet on track for 2.7 degrees Celsius warming by the end of the century, with catastrophic results; the nations would have to halve their collective greenhouse gas emissions in the next eight years to keep warming below the goal of 1.5 degrees Celsius. [2021 (October)]. At COP 26 in Glasgow, nations collectively agreed to increase their pledges by an undetermined amount by the COP27 meeting in November 2022. This year’s report finds that total pledges to date have been “negligible” in bringing the world closer to effectively holding down warming: “Despite progress since 2021, the report finds that nations have collectively failed to significantly narrow the projected 2030 emissions gap. New and updated NDCs submitted since COP26 take less than 1 per cent off projected 2030 emissions.” The consequent predicted warming by the end of the century is now, based on current national climate and energy policies, up to 2.8 degrees Celsius. The report finds that “only an urgent system-wide transformation can deliver the enormous cuts needed to limit greenhouse gas emissions by 2030: 45 per cent compared with projections based on policies currently in place to get on track to 1.5°C and 30 per cent for 2°C.” The authors lay out a vision for achieving this transformation in multiple sectors of energy and the economy. UN Under-Secretary-General Inger Anderson comments: “This report sends us a very clear message. If we are serious about climate change, we need to kick start a system-wide transformation, now. We need a root-and-branch redesign of the electricity sector, of the transport sector, of the building sector and of food systems. And we need to reform financial systems so that they can bankroll the transformations we cannot escape. I know some people think this can’t be done over the next eight years. But we can’t just throw up our hands and say we failed before we have even really tried. We must try, because every fraction of a degree matters: to vulnerable communities, to those that are yet to be connected to the electricity grid, to species and ecosystems, and to every one of us.” *

*UNEP, Emissions Gap Report 2022, October 27, 2022, <https://www.unep.org/resources/emissions-gap-report-2022>; see also, related studies, Damian Carrington, “World close to ‘irreversible’ climate breakdown, warn major studies,” *The Guardian*, October 27, 2022, <https://www.theguardian.com/environment/2022/oct/27/world-close-to-irreversible-climate-breakdown-warn-major-studies>

2022 (November)

A new approach to quantifying global sources of greenhouse gases unveiled at COP 27

Climate TRACE is a nonprofit coalition of environmental groups, technology companies and academic scientists co-founded by former Vice President Al Gore. Its mission is to “make meaningful climate action faster and easier by mobilizing the global tech community to track greenhouse gas (GHG) emissions with unprecedented detail and speed and provide this data freely to the public.”* Much of current emissions data is provided by governments, and often extrapolated from manufacturing data rather than by direct emissions measurements. Climate TRACE aims to use satellite and other remote sensing technologies, including thermal measurements, applying artificial intelligence to directly estimate emissions. At its unveiling, the organization had catalogued more than 72,000 individual polluting facilities, from steel and cement factories, power plants, oil and gas fields, cargo ships, to feedlots and landfills, a “hyperlocal atlas of the human activities that are altering the planet’s chemistry,” as a *New York Times* article put it. The project’s analysis “suggests that the oil and gas industry emits far more than countries have previously reported, in part because of underestimated emissions from flaring, or the burning of unwanted methane, and the large gas leaks known as ‘super-emitter events.’” The project is working with regional governments in Mexico, Brazil, South Africa, Spain and Italy to identify emitters. The methodology of the project has not yet been peer reviewed. ** The website quotes Al Gore at the unveiling: “The climate crisis can, at times, feel like an intractable challenge – in large part because we’ve had a limited understanding of precisely where emissions are coming from. This level of granularity means that we finally have emissions data that enable us to act decisively. It also means we can prioritize efforts to achieve the deep cuts in greenhouse gas pollution we need to prevent the most catastrophic impacts of the climate crisis.” *

*Climate TRACE, <https://climatetrace.org/>; as of March 6, 2023 the website’s count of facilities measured was 79,815.

**Raymond Zhong, “Who’s Driving Climate Change? New Data Catalogs 72,000 Polluters and Counting,” *New York Times*, November 9, 2022, <https://www.nytimes.com/2022/11/09/climate/climate-change-emissions-satellites.html>

2022 (November)

COP27 authorizes a “loss and damage” fund, but leaves the task of ramping down emissions to another day

The crowning achievement of the 27th UNFCCC Conference of the Parties in Sharm el-Sheikh, Egypt is a conceptual agreement to set up a “loss and damage” fund to reimburse poorer countries for climate related damages; the details of how to finance the fund, how to prioritize recipients, and whether there will be any obligation to participate, is to be determined. The agreement is the result of a campaign by a tenacious coalition of nations that have suffered grievously from climate-related events, led by Pakistan, where a third of the country was under water in unprecedented climate flooding this year.* The coalition countries “were relentless in their pressure campaign, arguing that it was a matter of justice, noting they did little to contribute to a crisis that threatens their existence. They made it clear that a summit held on the African continent that ended without addressing loss and damage would be seen as a moral failure.”** The U.S. and many developed countries have long opposed the concept, fearing it would open them to legal liability for the effects of climate change. The U.S. delegation is the last big emitter to capitulate to the pressure to approve the concept. The final language in the agreement states that participation is not an admission of legal liability. Bill McKibben writes that this focus for the COP is a new one, and reflects a fundamental problem for the planet: “most of the money is in

the Global North, but most of the need is in the Global South. Nearly three hundred years of burning fossil fuels have produced much of that northern wealth, and now the resulting greenhouse gases are heating the planet and producing much of that southern need.” U.S. participation in this fund will require an appropriation by Congress, which is unlikely to be sizeable, writes McKibben: “Congress won’t spend tax dollars on reparations for the descendants of enslaved Africans; they’re even more unlikely to do it for survivors of the climate crisis in Africa or Asia. At least, not in sums remotely equal to the damage: at COP27, a handful of the usual countries (think Denmark) pledged climate-relief aid on the order of about seventy-five million dollars, with an ‘M.’ The initial estimate of the damage from Pakistan’s wild summer of flooding, by contrast, is about forty billion dollars, with a ‘B.’”*** Gerard Baker in the *Wall Street Journal* fears, however, a slippery slope to U.S. liability for trillions: “While you might have spent the weekend marveling at the cost of a turkey, Joe Biden celebrated his 80th birthday by signing the U.S. up to a plan that could eventually commit Americans to transferring trillions of dollars to the rest of the world in perpetuity... Successive administrations, Democratic and Republican, long opposed this idea, justifiably fearing that it represents an open-ended scheme to funnel American taxpayers’ money to beacons of planet-saving good governance like South Africa, Pakistan and Indonesia.”**** Much of the debate over the concept concerned whether China would be categorized as a potential recipient of these funds, or an expected contributor. Since the 1992 Rio Conference, China has been considered a “developing nation” by the UNFCCC and has vigorously resisted a claim that, as the current largest greenhouse gas emitter, it should be recategorized as a developed nation. It has backed calls for a loss and damage fund, siding with other developing nations in the discussions. The conclusion of the negotiations was to include China among the other nations who have an “option” to contribute. ***** In other respects, reports *The Guardian*, the Conference final text “contained a provision to boost ‘low-emissions energy’. That could mean many things, from wind and solar farms to nuclear reactors, and coal-fired power stations fitted with carbon capture and storage. It could also be interpreted to mean gas, which has lower emissions than coal, but is still a major fossil fuel.” An effort to expand COP26’s agreement to phase out coal (from which the U.S. abstained) to an agreement to phase out all fossil fuels failed. An effort to rescind the Conference’s 2009 agreement to support poorer countries’ efforts to adapt to climate change by \$100 billion a year failed, but the pledge, due to be funded by 2020, has not yet been fulfilled.***** In sum, the President of the European Union, Ursula von der Leyen, describes the COP27 deal as “a small step towards climate justice,” but says much more is needed for the planet: “We have treated some of the symptoms but not cured the patient from its fever.”*****

*Mohammed Hanif, “Pakistan’s Biblical Floods and the Case for Climate Reparations,” *The New Yorker*, September 26, 2022,

<https://www.newyorker.com/news/annals-of-a-warming-planet/pakistans-biblical-floods-and-the-case-for-climate-reparations>

**Brad Plumer, et al., “U.N. Climate Talks End With a Deal to Pay Poor Nations for Damage,” *New York Times*, November 20, 2022,

<https://www.nytimes.com/2022/11/20/climate/un-climate-cop27-loss-damage.html>; for an update on implementation of the loss and damage agreement, and some history, see Bob Berwyn, “A Long-Sought Loss and Damage Deal Was Finalized at COP27. Now, the Hard Work Begins,” *Inside Climate News*, March 1, 2023, <https://insideclimatenews.org/news/01032023/cop27-loss-damage-deal-developing-nations/>

***Bill McKibben, “How to Pay for Climate Justice When Polluters Have All the Money,” *The New Yorker*, November 19, 2022,

<https://www.newyorker.com/news/daily-comment/how-to-pay-for-climate-justice-when-polluters-have-all-the-money>

****Gerard Baker, “The West Made the World Prosperous. COP27 Will Make Us Pay,” *Wall Street Journal*, November 21, 2022,

<https://www.wsj.com/articles/the-west-made-the-world-prosperous-and-now-we-must-pay-climate-fund-reparations-united-nations-cop27-capitalism-china-11669039956>

****Maxine Joselow, et al., “How China, the world’s top polluter, avoids paying for climate damage,” *Washington Post*, November 23, 2022, <https://www.washingtonpost.com/climate-environment/2022/11/23/china-climate-finance-cop27/>
*****Fiona Harvey, “What are the key outcomes of Cop27 climate summit?” *The Guardian*, November 20, 2022, <https://www.theguardian.com/environment/2022/nov/20/cop27-climate-summit-egypt-key-outcomes>
*****Bibi van der Zee et al., “EU president says Cop27 deal is ‘small step towards climate justice’ but warns much more to be done – as it happened,” *The Guardian*, November 20, 2022, <https://www.theguardian.com/environment/live/2022/nov/19/cop27-fears-15c-target-danger-negotiations-overrun-live>

2022 (December)

U.S. scientists achieve the first successful fusion reaction in a laboratory

The pursuit of fusion – a controlled reaction that creates large amounts of energy by fusing small nuclei together – has intrigued and inspired scientists since at least the 1920’s. On December 13, U.S. Energy Secretary Jennifer Granholm announces at a press conference that DOE scientists have achieved a fusion reaction, for a split second, at the Lawrence Livermore National Laboratory. *Politico* describes how this happened: “The achievement came when 192 high-energy lasers converged on a diamond capsule containing a cylinder about the size of a peppercorn and filled with deuterium and tritium. The lasers entered either end of the cylinder and heated the contents to over 3 million degrees Celsius. The reaction ‘briefly simulating the conditions of a star,’ National Nuclear Security Administration Administrator Jill Hruby said. Lab lasers had triggered fusion reactions before. But this time, the scientists managed to keep the reaction going long enough to produce three megajoules of energy, more than the two megajoules the lasers had deposited, NNSA Deputy Administrator for Defense Programs Marvin Adams said at the event. The whole reaction took less time than it takes light to travel one inch, Adams added. But that was enough to prove for the first time that it was possible to mash together atoms and release a greater amount of energy than was used to trigger the reaction.” * The technology has inspired hope for an energy future without toxic pollutants, greenhouse gases or radioactive waste. The next step is for the DOE to evaluate competitive grant applications from private entrepreneurs, university scientists, and national laboratory researchers, for projects aimed at enabling a fusion pilot plant to open by the 2030’s. *E&E News* describes some of the challenges ahead: “A utility-scale fusion reactor would have to not just produce a momentary reaction, but rely on durable components and reliable systems that can produce power repeatedly. Those technological building blocks do not yet exist. ‘We have the materials for a [U.S.] pilot, but what we don’t have are the materials that would make a practical, economic, commercial plant,’ said Kathryn McCarthy, an Oak Ridge National Laboratory scientist, speaking at a White House conference on fusion in April.” ** [see 2023 (June)]

*Ben Lefebvre, “U.S. touts fusion breakthrough as one of ‘most impressive scientific feats’ this century,” *Politico*, December 13, 2022, <https://www.politico.com/news/2022/12/13/fusion-breakthrough-doe-energy-sustainability-00073666>

**Peter Behr, “After ‘breakthrough,’ DOE eyes fusion power plant,” *E&E News Energywire*, December 14, 2022, <https://www.eenews.net/articles/after-breakthrough-doe-eyes-fusion-power-plant/>

2022 (December)

2022 is the sixth warmest year on record, marked by extreme heatwaves, flooding, famine and drought

NOAA reports that the combined average land and ocean surface temperature in 2022 was the sixth warmest since 1880, joining the previous seven years as the eight hottest in recorded history. It has been 46 years since the Earth had a colder-than-average year. Upper ocean heat content (OHC) - the amount of heat stored in the upper 2,000 meters of the ocean - was a record high in 2022, surpassing the previous record set in 2021. The four highest OHCs have all occurred in the last four years.* Average temperatures reached 3°C above average over north-western Siberia and 2°C or higher in south-western Europe and Antarctica.** This, at a time, as Elizabeth Kolbert points out, when the world is in the third year of the weather pattern known as La Niña: “La Niña years, which feature unusually cold ocean temperatures in the equatorial Pacific, tend—or, at least, tended—to be cool.”*** As climate scientist James Hansen has warned, sometime in 2023 the planet is likely to shift into the El Niño pattern, and “2024 is likely to be off the chart as the warmest year on record.”**** Global weather disasters topped \$115 billion in insured financial losses around the world, \$14 billion higher than 2021, and 42% higher than the 10-year average.***** 2022 tied 2017 and 2011 for the third highest number of billion-dollar disasters in the United States. Total costs of U.S. weather and climate disasters in 2022 are estimated to be at least \$165 billion.***** As Somini Sengupta notes, the total price tag of the climate provisions of the Inflation Reduction Act, \$369 billion, spread out over 10 years, or just under \$37 billion a year, compares very favorably with the ever escalating costs of climate and weather disasters.***** 2022 has been “a maelstrom of weather extremes, a seesaw fluctuating wildly from significantly dry to record wet conditions,” including five instances of 1,000 year rain events in five weeks.*****The causal connection between our current 1.2 degree Celsius (2.2°F) warming and more intense, longer-duration storms, heatwaves, droughts, flood events, and cold snaps, is clear. ***** 2022 marks the worst megadrought in the Western U.S. in a millennium, putting the Colorado River, which supplies water to more than 40 million Americans and supports food production for the rest of the country, in imminent peril;***** the worst drought in four decades in the Horn of Africa, with four consecutive failed rainy seasons and the fifth projected to fail as well;*****flooding in Pakistan that put one third of the country under water, destroying a million homes and disrupting the lives of 33 million people. Sherry Rehman, Pakistan’s climate minister, sends a message to the people of the Global North: “This dystopia is on our doorstep; it’s going to be next in [your] country. If you’re not understanding that it’s right here, right now, or that actions need to be taken post-haste, then you’re really sleepwalking into annihilation.” ***** The continent of Europe exceeded the less ambitious Paris Agreement goal of limiting average warming to 2 degrees Celsius, measuring 2.3 degrees C warmer than in the preindustrial era. It saw “a staggering 16,000 heat-related deaths in 2022, while weather-related economic damages totaled \$2 billion. Storms and floods accounted for most of the losses.”*****

*National Oceanic and Atmospheric Administration, [“2022 was world’s 6th-warmest year on record,”](#) , January 12, 2023; re ocean temperatures, see also: Chris Mooney and Brady Dennis, [“Oceans surged to another record-high temperature in 2022.”](#) *Washington Post*, January 11, 2023.

**Copernicus Climate Change Service, [“Globe in 2022,”](#) January 10, 2023.

***Elizabeth Kolbert, [“Three Climate Reports: The Good, the Bad, and the Ugly,”](#) *The New Yorker*, January 11, 2023.

****James Hansen, et al., [“August Temperature Update, a ‘Thank You’ & Biden’s Report Card.”](#) September 22, 2022.

*****Lylla Younes, [“The world’s insurance bill from natural disasters this year: \\$115 billion,”](#) *Grist*, December 2, 2022.

*****Adam Smith, [“2022 U.S. billion-dollar weather and climate disasters in historical context.”](#) NOAA Climate.gov, January 10, 2023.

*****Somini Sengupta, [“Billion-dollar disasters.”](#) *New York Times*, September 30, 2022.

*****Matthew Cappucci, [“Five 1,000-year rain events have struck the U.S. in five weeks. Why?”](#) *Washington Post*, August 23, 2022.

*****Jeff Masters and Bob Hensen, [“With global warming of just 1.2°C, why has the weather gotten so extreme?”](#) *Yale Climate Connections*, March 6, 2023.

*****Abraham Lustgarten, [“As Colorado River Dries, the U.S. Teeters on the Brink of Larger Water Crisis.”](#) *ProPublica*, August 25, 2022.

*****Laurin-Whitney Gottbrath, [“Famine at Somalia's door.”](#) *Axios*, September 9, 2022.

*****Justin Worland, [“‘Dystopia on the Doorstep.’ Pakistan's Climate Minister Warns the Global North Is Next.”](#) *Time*, September 30, 2022.

*****E360Digest, [“The Fastest-Warming Continent, Europe Has Already Heated by More Than 2 Degrees C.”](#) *Yale Environment 360*, June 20, 2023.

2022 (December)

The year marks major milestones in U.S. oil and gas exports

In the first half of 2022, the United States became the world’s top exporter of Liquefied Natural Gas, or LNG and U.S. crude oil exports hit an all-time high at four million barrels per day. As reported in *Inside Climate News*, “The sharp rise in crude oil and natural gas exports has been supported by a bipartisan consensus that has spanned three consecutive presidential administrations, each of which has viewed energy exports as a lever of foreign policy. More than anything, though, it is the culmination of a sustained campaign by the oil industry that has seen production soar even as domestic demand for its fuels threatens to decline.” * Meanwhile, oil and gas profits surged. As reported in *The Guardian*, annual reports released in February 2023 will disclose that “the ‘big five’ – Exxon, Chevron, Shell, BP and TotalEnergies – all revealed that last year was the most profitable in their respective histories, as the rising cost of oil and gas, driven in part by Russia’s invasion of Ukraine, helped turbocharge revenues.” **

*Nicholas Kuznetz, [“2022 Will Be Remembered as the Year the U.S. Became the World’s Largest Exporter of Liquefied Natural Gas.”](#) *Inside Climate News*, January 1, 2023.

**Oliver Milman, [“‘Monster profits’ for energy giants reveal a self-destructive fossil fuel resurgence.”](#) *The Guardian*, February 9, 2023.

2022 (December)

Global carbon dioxide emissions will increase by 1% in 2022, with a total of 37.5 GtCO₂ emitted to the atmosphere

As estimated by the Global Carbon Project report, the projected 1% increase in emissions from fossil fuel burning and cement production is significantly less than the post-Covid-19 boost in 2021. The global 1% increase in 2022 is primarily driven by growth in oil use from the delayed rebound of aviation since the Covid-19 pandemic. The rate of increase in fossil CO₂ emissions has slowed, from 3% per year during the 2000s to about +0.5% per year in the past decade, impacted by the Covid-19 slump in 2020. Emissions from India are predicted to grow by 6%, and from the U.S. to grow by 1.5%. Emissions from China are predicted to decline by .9%; and from the E.U. to decline by .8%. * The Rhodium Group will conclude that emissions from the U.S. grew by 1.3% in 2022: “While this is the second year in a row that emissions have increased, it nonetheless marks a change from 2021, when emissions rebounded faster than the economic growth rate. This reversal in 2022 was largely due to the substitution of coal with natural gas—a less carbon-intensive fuel—and a rise in renewable energy generation.” **

* Global Carbon Project, [Global Carbon Budget 2022](#), November 11, 2022.

**Alfredo Rivera et al., [“Preliminary US Greenhouse Gas Emissions Estimates for 2022.”](#) The Rhodium Group, January 10, 2023. See also, Elena Shao, [“U.S. Carbon Emissions Grew in 2022.”](#) *New York Times*, January 10, 2023.

2023 (January)

Study concludes that even with 1.5 degrees Celsius warming, the planet will sustain momentous loss of its mountain glaciers; West Antarctic glacier and Greenland ice sheet also at risk

The Paris Agreement “stretch” policy goal is to limit warming to 1.5 degrees Celsius above pre-industrial levels. [2015 (December)] Glaciologists from Austria, Canada, France, Norway, Switzerland, Britain and the United States set about to determine what the impact on the world’s glaciers, excluding the Greenland and Antarctic ice sheets, would be at this level of warming. Publishing in the journal *Science*, they conclude that “all regions will experience considerable deglaciation at local scales with roughly half of the world’s glaciers by number projected to be lost by 2100, even if temperature increase is limited to +1.5°C. Based on the most recent climate pledges from COP26, global mean temperature is estimated to increase by +2.7°C, which would result in much greater glacier contribution to sea level rise [approximately 5 inches] and the near-complete deglaciation of entire regions including Central Europe, Western Canada and US, and New Zealand.” This is a substantially higher estimate than previous analyses.* In discussing the significance of this study, Chris Mooney in the *Washington Post* notes that “an estimated 1.9 billion people worldwide depend on glaciers for water.”** Meanwhile, researchers studying the Thwaites Glacier in the West Antarctic, the Earth’s widest glacier, have deployed an underwater robot to reveal that warming seas are carving deep crevasses in the underside of the glacier. They conclude that “collapse of Thwaites Glacier, which itself represents more than half a metre of global sea-level-rise potential, could also destabilize neighbouring glaciers that account for a further 3 m of future sea level rise.”*** And in April, a study published in *Earth Systems Data Science* will conclude that the polar ice sheets of Antarctica and Greenland together “now account for a quarter of all sea level rise – a fivefold increase since the 1990’s.” The researchers, funded by NASA and the European Space Agency, estimate that Earth’s polar ice sheets “lost 7,560 billion tonnes of ice between 1992 and 2020 – equivalent to an ice cube that would be 20 kilometres in height,” and that “the seven highest melting years have occurred in the past decade.”****Notes Elizabeth Kolbert, “In one particularly warm year—2019—Greenland shed four hundred and forty-four billion tons of ice; these tons contained enough water to flood the entire state of California to a depth of three feet.”*****

*David Rounce, et al., [“Global glacier change in the 21st century: Every increase in temperature matters.”](#) *Science*, Vol 379, Issue 6627, January 5, 2023.

**Chris Mooney, [“Half of Earth’s glaciers could melt even if key warming goal is met, study says.”](#) *Washington Post*, January 5, 2023.

***Britney Schmidt et al., [“Heterogeneous melting near the Thwaites Glacier grounding line.”](#) *Nature* 614, 471-478, February 16, 2023; Chris Mooney, [“Warming seas are carving into glacier that could trigger sea level rise.”](#) *Washington Post*, February 15, 2023.

****Press Release, [“Polar ice sheet melting records have toppled during the past decade.”](#) Northumbria University, April 20, 2023; Ines Otosaka et al., [“Mass balance of the Greenland and Antarctic ice sheets from 1992 to 2020.”](#) *Earth Systems Data Science*, volume 15, issue 4, April 20, 2023.

*****Elizabeth Kolbert, [“It’s Earth Day—and the News Isn’t Good.”](#) *The New Yorker*, April 22, 2023.

2023 (January)

A first contemporary analysis of the 1970's assessments of climate change by Exxon scientists concludes that the research was spot-on, dramatically at odds with public denial

In the context of the discovery in 2015 of a trove of decades-old research by Exxon scientists on the reality of climate change* and subsequent investigations and lawsuits against the company for failing to disclose the known dangers of their products [see 2015, November], a report in *Science* analyzes the accuracy of the early Exxon research. The study, by Harvard historians of science Naomi Oreskes and Geoffery Supran, and Stefan Rahmstorf, head of Earth System Analysis at the Potsdam Institute for Climate Impact Research, concludes that “in private and academic circles since the late 1970s and early 1980s, ExxonMobil predicted global warming correctly and skillfully. Using established statistical techniques, we find that 63 to 83% of the climate projections reported by ExxonMobil scientists were accurate in predicting subsequent global warming. ExxonMobil’s average projected warming was $0.20^{\circ} \pm 0.04^{\circ}\text{C}$ per decade, which is, within uncertainty, the same as that of independent academic and government projections published between 1970 and 2007. The average ‘skill score’ and level of uncertainty of ExxonMobil’s climate models (67 to 75% and $\pm 21\%$, respectively) were also similar to those of the independent models. Moreover, we show that ExxonMobil scientists correctly dismissed the possibility of a coming ice age in favor of a ‘carbon dioxide induced ‘super-interglacial’; accurately predicted that human-caused global warming would first be detectable in the year 2000 ± 5 ; and reasonably estimated how much CO_2 would lead to dangerous warming.” Yet, the authors note, unlike academic and government scientists working to communicate what they knew about the risk of climate change, “ExxonMobil worked to deny it—including overemphasizing uncertainties, denigrating climate models, mythologizing global cooling, feigning ignorance about the discernibility of human-caused warming, and staying silent about the possibility of stranded fossil fuel assets in a carbon-constrained world.”** In September, the *Wall Street Journal* will issue a related investigative report after obtaining summaries of documents turned over by Exxon’s lawyers to the New York Attorney General pursuant to its investigation into whether Exxon had misled investors about the risks of climate change. One of many revelations: “After a 2011 meeting, [Exxon CEO Rex] Tillerson’s chief of staff, William Colton, emailed colleagues about the CEO’s feedback on a draft disclosure about carbon emissions. Tillerson wanted the words ‘weather extremes and storms’ deleted. ‘His view was that even mentioning a possible connection between climate change and weather was possibly giving the notion more credibility than he would like,’ Colton wrote.” After the Attorney General narrowed the scope of the investigation, these documents were not made public.***

* Neela Banerjee, Lisa Song and David Hasemyer, [“Exxon: The Road Not Taken”](#), *Inside Climate News*, Sept. 15, 2015.

** Geoffery Supran, Stefan Rahmstorf, and Naomi Oreskes, [“Assessing ExxonMobil’s global warming projections.”](#) *Science*, Vol 379, Issue 6628, January 13, 2023; see also, Bill McKibben, [“Godalmighty, Exxon Knew Absolutely Everything.”](#) *The Crucial Years* newsletter, January 12, 2023; Nicholas Kuznetz, [“Exxon Accurately Predicted Global Warming, Years Before Casting Doubt on Climate Science.”](#) *Inside Climate News*, January 12, 2023.

***Christopher Matthews and Collin Eaton, [“Inside Exxon’s Strategy to Downplay Climate Change.”](#) *Wall Street Journal*, September 14, 2023.

2023 (January)

Investigation raises serious questions about the effectiveness of the world's largest issuer of carbon offsets

Carbon offsets are investments that can be made by individuals, small businesses or large corporations to support efforts around the world to reduce carbon emissions, such as protecting forest resources, planting trees, or investing in renewable energy. Those investments are in turn claimed to reduce the carbon footprint of the purchaser in proportion to carbon emissions saved by the investment activity. There is much debate about whether such offsetting actually reduces emissions, and concern revolves around the accuracy of reported benefits of the investment projects.* The markets for these offsets are “voluntary,” in that they are not regulated by governments like carbon credits under cap-and-trade systems, and are estimated to represent about \$2 billion in investments currently, but to have the potential to grow much larger. And they are viewed as essential to meeting the \$12 billion commitment made by the world's nations at the 2021 COP26 to protect and restore the world's forests.** A nine month investigation undertaken by the *Guardian*, the German weekly *Die Zeit* and SourceMaterial, a non-profit investigative journalism organization, examined the Washington D.C. firm Verra, issuer of a verified carbon standard (VCS) that has issued more than one billion carbon credits and approves three-quarters of all voluntary offsets. The authors reviewed three scientific studies, two of which were peer reviewed, which studies used satellite images to check the results of forest offsetting projects. Their conclusion was summarized: “Only a handful of Verra's rainforest projects showed evidence of deforestation reductions, according to two studies, with further analysis indicating that 94% of the credits had no benefit to the climate. The threat to forests had been overstated by about 400% on average for Verra projects, according to analysis of a 2022 University of Cambridge study.” Verra strenuously disputed the conclusions, but will revise its rainforest protection standards.*** In July, the Rainforest Foundation UK will claim that three other verification schemes, the World Bank's Forest Carbon Partnership Facility, the UNFCCC REDD+ Results system, and ART may misrepresent the benefits of offsets.****

*Fiona Harvey, [“Greenwashing or a net zero necessity? Climate scientists on carbon offsetting.”](#) *The Guardian*, January 18, 2023; see also, Brian Palmer, [“Should You Buy Carbon Offsets?”](#), Natural Resources Defense Council, May 11, 2022.

**Fiona Harvey, [“Carbon offsets are flawed but we are now in a climate emergency.”](#) *The Guardian*, January 18, 2023.

***Patrick Greenfield, [“Revealed: more than 90% of rainforest carbon offsets by biggest certifier are worthless, analysis shows,”](#) *The Guardian*, January 18, 2023; Verra, [“Verra Response to Guardian Article on Carbon Offsets.”](#) January 18, 2023; [“Verra Response to Guardian Article.”](#) March 10, 2023; Patrick Greenfield, [“Biggest carbon credit certifier to replace its rainforest offsets scheme.”](#) *The Guardian*, March 10, 2023.

****Victoria Schneider, [“Forest campaign group renews charge that carbon credit verification schemes are flawed.”](#) *Mongabay*, July 28, 2023.

2023 (January)

Study reveals human impacts in the Amazon rainforest vastly outpace natural processes

In one of many manifestations of the Anthropocene epoch [see 1922, Robert Lionel Sherlock], a study published in *Science* compared rates of anthropogenic and natural environmental changes in the Amazon, focusing on deforestation and carbon cycles. The report's introduction underscores the global ecological importance of the Amazon: “The Amazon is the most species-rich subcontinental-scale ecosystem and is home to more than 10% of all named plant and vertebrate species, concentrated into just 0.5% of Earth's surface area. The Amazon rainforest is

also a critical component of the Earth climate system, contributing about 16% of all terrestrial photosynthetic productivity and strongly regulating global carbon and water cycles.” And the Amazon is critically imperiled: “A cumulative total of 17% of the original forest have already been cleared, and 14% replaced, by agricultural land use. After millions of years serving as an immense global carbon pool, under further warming the Amazon rainforest is predicted to become a net carbon source to the atmosphere. Some regions have already made the transition, with forest respiration and burning outpacing forest photosynthesis.” [see 2019 (November), 2020 (March, June), 2021 (March), 2022 (March)] The analysis was based on data compiled for the Science Panel for the Amazon (SPA) Assessment Report, coauthored by 240 scientists from 20 countries. The conclusions are stark: “We found that rates of anthropogenic processes that affect Amazonian ecosystems are up to hundreds to thousands of times faster than other natural climatic and geological phenomena. These anthropogenic changes reach the scale of millions of square kilometers within just decades to centuries, as compared with millions to tens of millions of years for evolutionary, climatic, and geological processes. The main drivers of Amazonian habitat destruction and degradation are land-use changes (such as land clearing, wildfires, and soil erosion), water-use changes (such as damming and fragmenting rivers and increased sedimentation from deforestation), and aridification from global climate change. ...The Amazon is now perched to transition rapidly from a largely forested to a nonforested landscape, and the changes are happening much too rapidly for Amazonian species, peoples, and ecosystems to respond adaptively. Policies to prevent the worst outcomes are known and must be enacted immediately. We now need political will and leadership to act on this information. To fail the Amazon is to fail the biosphere, and we fail to act at our peril.”* The election of Brazilian President Luiz Inácio Lula da Silva in January offered hope for the needed political will, with his pledge to deliver zero deforestation by 2030. But by December it will be evident that progress has been limited because Brazil’s National Congress is controlled by a right-wing majority. Deforestation is projected to hit about 9,000 square kilometers in 2023. **

*James S. Albert, et al., [“Human impacts outpace natural processes in the Amazon.”](#) *Science*, Volume 379 Issue 6630, January 27, 2023.

**Meghie Rodrigues, [“Politics and the environment collide in Brazil: Lula’s first year back in office.”](#) *Nature*, December 21, 2023.

2023 (January)

New wind and solar cost less than all but one coal-fired power plant in the U.S.

In 2019, the thinktank Energy Innovations reported that more than 70 percent of coal plants were more expensive to operate compared to the alternative of building new wind or solar. In its latest analysis, only one U.S. coal plant is now cheaper than new wind or solar, bringing the share to 99 percent. This shift is in part the result of various incentives for renewables in the Inflation Reduction Act [2022 (August)]. The report concludes that “replacing coal plants with local wind and solar would also save enough to finance nearly 150 gigawatts of four-hour battery storage, over 60 percent of the coal fleet’s capacity, and generate \$589 billion in new investment across the U.S.”* As Dan Gearino comments for *Inside Climate News*, “the report’s estimates do not mean that the owners of the coal plants are losing money by continuing to operate them. Indeed, many of the plants are profitable for a number of reasons, including state regulatory systems that allow the owners to pass all costs on to customers and policies from grid operators that allow the

companies to ‘self schedule,’ which means the plants run even when there are less expensive options available on the grid. The larger point is that consumers could save billions of dollars if power plant owners would replace most of their coal plants with a mix of wind and solar power.”**

* Energy Innovation Policy and Technology LLC, [“Coal Cost Crossover 3.0: Local Renewables Plus Storage Create New Opportunities For Customer Savings And Community Reinvestment,”](#) January 29, 2023.

**Dan Gearino, [“New Wind and Solar Are Cheaper Than the Costs to Operate All But One Coal-Fired Power Plant in the United States,”](#) January 30, 2023.

2023 (February)

Antonio Guterres’ briefing to the U.N. General Assembly minces no words on climate

Observing that “We have started 2023 staring down the barrel of a confluence of challenges unlike any other in our lifetimes,” Secretary-General Guterres zeros in on climate:

“We must end the merciless, relentless, and senseless war on nature. (emphasis in original)

It is putting our world at immediate risk of hurtling past the 1.5-degree temperature increase limit and now still moving towards a deadly 2.8 degrees.

Meanwhile, humanity is taking a sledgehammer to our world’s rich biodiversity — with brutal and even irreversible consequences for people and planet.

Our ocean is choked by pollution, plastics and chemicals.

And vampiric overconsumption is draining the lifeblood of our planet — water.

2023 is a year of reckoning. It must be a year of game-changing climate action.

We need disruption to end the destruction.

No more baby steps.

No more excuses.

No more greenwashing.

No more bottomless greed of the fossil fuel industry and its enablers.

...

I have a special message for fossil fuel producers and their enablers scrambling to expand production and raking in monster profits:

If you cannot set a credible course for net-zero, with 2025 and 2030 targets covering all your operations, you should not be in business.

Your core product is our core problem.

We need a renewables revolution, not a self-destructive fossil fuel resurgence.”*

Bill McKibben observes: “Just to be clear, the U.N. Secretary-General is saying that the central problem with climate change is the fossil-fuel industry’s product, that the industry is immorally undermining climate action, and that, if it continues, it should be shut down. This is certainly the truth, but it too often goes unspoken.” After commenting on similar historic calls to action by Pope Francis and Al Gore, McKibben notes: “All of this straight talk and truth-telling is crucially important right now, not just because the world is enduring enormous and unnatural disasters but because these disasters coincide with a man-made flood of obfuscation. Much of that flood is the ‘greenwashing’ that Guterres decries—the efforts of big banks and oil companies to pretend that they’re making progress on climate when they’re not—and some of it is the strange wave of nonsense washing over us in ever greater quantities since Elon Musk’s acquisition of Twitter.” After posting on X formerly known as Twitter about the report in *Science* on Exxon’s early

understanding of climate change and its risks [January, 2023], McKibben received “page after page” of hostile comments insisting the climate was cooling.**

*United Nations Secretary-General Antonio Guterres, [“Briefing to the General Assembly on Priorities for 2023.”](#) February 6, 2023.

**Bill McKibben, [“The U.N. Secretary-General’s Searing Message for the Fossil-Fuel Industry.”](#) *The New Yorker*, February 6, 2023.

2023 (February)

Study concludes feedback mechanisms need more attention in climate modeling; others postulate a dangerous social feedback loop

It has long been understood that feedback loops resulting from biological, chemical, or physical processes can accelerate warming driven by higher concentrations of greenhouse gases in the atmosphere. [(1957, Roger Revelle), (1975, Howard Wilcox), (1979, Jule Charney)] Scientists publishing in the journal *One Earth* examined 41 climate feedback loops and found 27 that increase warming but may not be fully accounted for in climate models. As reported by Bob Berwyn in *Inside Climate News*, study co-author William Ripple “said scientists generally understand the feedback loops individually, but that the models often overlook the cumulative effect all of them together might have over the next 50 to 80 years. ‘We are particularly concerned about several biological feedback loops, including permafrost thawing, forest destruction, loss of soil carbon and smoldering peatlands,’ Ripple said. ‘These feedbacks may contribute significantly to warming over the course of the century.’” While current estimates are that earth’s temperature would warm 2.7 degrees Celsius if countries meet their current emissions reduction targets, the study suggests that if some of the feedback loops accelerate, warming by 2100 could rise to 4 degrees Celsius. The authors urge the Intergovernmental Panel on Climate Change to develop a special report focused on climate feedbacks and the consequences of their interactions and acceleration.* While climate feedback loops are generally understood to be biological, chemical, or physical, recent attention has addressed the risk of social, political, and economic feedback loops. A report published by Chatham House and the Institute for Public Policy Research, two London-based think tanks, warns of a “doom loop:” “The consequences of the crisis and the failure to address it [repairing storm damage, addressing public health emergencies] draw focus and resources from tackling its causes, leading to higher temperatures and ecological loss, which then create more severe consequences, diverting even more attention and resources, and so on.”**

*Bob Berwyn, [“Scientists Examine Dangerous Global Warming ‘Accelerators’”](#) *Inside Climate News*, February 17, 2024; William J. Ripple et al., [“Many risky feedback loops amplify the need for climate action.”](#) *One Earth*, Volume 6 Issue 2 p. 86-91, February 17, 2023.

** Laurie Laybourn, Henry Throp, and Suzannah Sherman, [“1.5°C – dead or alive? The risks to transformational change from reaching and breaching the Paris Agreement goal.”](#) Chatham House and Institute for Public Policy Research, February 16, 2023; Kristoffer Tighe, [“What’s a Climate ‘Doom Loop?’ These Researchers Fear We’re Heading Into One.”](#) *Inside Climate News*, February 17, 2023.

2023 (February)

In 2022 China permitted the highest number of new coal-fired power plants in seven years and four times higher than in 2021

China has made three major pledges to control its greenhouse gases over the last quarter century.

[(2007 June), (2014 November), (2020 September)] Nevertheless, a study by the Center for Research on Energy and Clean Air (CREA) and the Global Energy Monitor (GEM) determined that China granted permits for 106 gigawatts of capacity across 82 locations in 2022, the highest number in seven years and four times higher than in 2021. The *Washington Post* quotes Flora Champenois, a research analyst at GEM: “The speed at which projects progressed through permitting to construction in 2022 was extraordinary, with many projects sprouting up, gaining permits, obtaining financing and breaking ground apparently in a matter of months... China continues to be the glaring exception to the ongoing global decline in coal plant development.” *On a similar note, while China pledged at COP26 in 2021 to fund no new overseas coal plants, lack of transparency has made it impossible to confirm the fulfillment of that pledge.** China surpassed the United States as the world’s largest annual emitter of greenhouse gases in 2006, and is forecast to race by the United States as the largest historic producer in 2050. ***

*Christian Shepherd, [“China’s coal plant approvals highest in seven years, research finds.”](#) *Washington Post*, February 26, 2023; Center for Research on Energy and Clean Air, [“China permits two new coal power plants per week in 2022.”](#) February 27, 2023.

**Chermaine Lee, China’s [“‘No New Coal Overseas’ Pledge Has a Big Catch.”](#) *Fair Planet*, December 14, 2022.

***Harry Stevens, [“The United States has caused the most global warming. When will China pass it?”](#) *Washington Post*, March 1, 2023.

2023 (February)

Americans’ carbon footprints leave residents of other countries in the dust; none more so than the wealthiest Americans

The *New York Times* prepared an analysis of an International Energy Agency report on per capita carbon dioxide emissions by income, demonstrating that “the wealthiest people in the United States have an astonishingly large climate footprint, far larger than rich people in wealthy, industrialized Europe and in fast-rising China.” The details: “The richest 10 percent of Americans, or those who make an average of \$233,600 a year, produces 56.5 tons of carbon dioxide emissions per person, per year on average, according to the I.E.A. analysis. That’s more than double the emissions of the richest 10 percent in Europe. It’s nearly double that of the richest 10 percent of Chinese. Everyone else in the United States has a big footprint, too, relative to their counterparts in Europe, China and India. For instance, the poorest 10 percent of Americans, those making \$2,500 a year on average, have a carbon footprint that’s almost as big as everyone in India, except India’s richest 10 percent. Likewise, the poorest 10 percent of Americans have a climate footprint larger than the poorest 30 percent of Chinese... And bear in mind that the so-called yacht class, the richest 0.1 percent of the population, are super polluters of another order. Their emissions are 10 times as much as the whole world’s richest 10 percent combined.”*

*Somini Sengupta, [“Climate Forward newsletter.”](#) *New York Times*, February 28, 2023; Laura Cozzi, Olivia Chen, Hyeji Kim, [“The world’s top 1% of emitters produce over 1000 times more CO2 than the bottom 1%.”](#) International Energy Agency, February 22, 2023.

2023 (March)

Study reveals record-high CO2 emissions from boreal fires in 2021

Boreal forests are those in the higher latitudes, including Canada, Alaska, Russia and other parts of Eurasia, which are adapted to withstand frigid temperatures year-round. With their abundant deciduous trees and conifers, they are critically important carbon sinks. In 2021, severe heatwaves and drought intensified the boreal fire season. Noting that boreal forests are one of the most extensive and important habitats on Earth and that warming in the Arctic region is happening much faster than in the rest of the planet, a team of scientists from China, Europe, Australia and the United States set out to estimate the amount of carbon dioxide emissions from these fires. Their conclusion, published in *Science*: “Boreal fires, typically accounting for 10% of global fire carbon dioxide emissions, contributed 23% (0.48 billion metric tons of carbon) in 2021, by far the highest fraction since 2000.” In the past, studies have concluded that 80% of the carbon released by fires is taken up by vegetation in subsequent growing seasons; the remaining 20% remains in the atmosphere and contributes to the build-up of atmospheric CO₂. However, climate change may change that: “This increase in fire emissions poses a widening threat to climate, given that part of the emissions might not return to vegetation and soils because of postfire regrowth failure in a warming climate. Extreme fire events are more likely to occur with global warming in the future, which could place the boreal landscape in a frequently disturbed state and substantially suppress the stable storage of carbon. This positive climate–fire feedback exacerbates incomplete postfire recovery and resequencing of carbon after fires in subsequent growing seasons.”*

*Bo Zheng et al., [“Record-high CO₂ emissions from boreal fires in 2021.”](#) *Science*, Vol. 379 Issue 6635, March 3, 2023.

2023 (March)

Biden Administration draws fire for approving the Willow project in the Arctic Petroleum Reserve

President Biden ran on a courageous campaign pledge to ban “new oil and gas permitting on public lands and waters.”* The most controversial drilling project on the table when he took office was the Willow project, in the federally owned Arctic Petroleum Reserve-Alaska, where ConocoPhillips planned to spend \$8 billion to \$10 billion, more than any other oil project nationwide, on a lease acquired from the government in 1999. President Trump’s approval of the project was found “arbitrary and capricious” by the federal District Court in Alaska for its failure to consider the full scope of greenhouse gas emissions or dangers to wildlife, including polar bears. [2021 (June)] In late January, 2023, the Biden Administration released its environmental review, which recommended proceeding with a scaled down permit, reduced from five to three drilling platforms, with protections for birds, caribou and other wildlife. As reported in the *Washington Post*, the Alaska staff of the Bureau of Land Management estimated that the project “could produce between 576 million and 614 million barrels of oil over 30 years. That would be enough for this one project alone to cover nationwide oil consumption for 30 days. And the company has previously said that its estimates are higher, as much as 3 billion.”** The Editorial Board of the *Wall Street Journal* writes: Willow will “create 2,500 mostly union construction jobs, and hundreds more long-term positions. It’s estimated to generate as much as \$17 billion in new revenue for the feds, the state of Alaska, and North Slope and Native communities... Willow should be easy to approve, especially given the world’s growing energy security [*sic*]. If Mr.

Biden kills this project, either outright or on the sly, no one should believe another word he says about energy or oil prices.”*** On March 11, the Biden Administration gave final approval to the project, a politically fraught decision given the unanimous support for Willow from the Alaskan congressional delegation and the legislature, and the strenuous opposition of the nation’s environmental community. The administration pared the approval with a plan to restrict or prohibit oil and gas drilling across 16 million acres in the Alaskan Arctic, both onshore and in coastal waters.**** Comments Bill McKibben: “Here was a brand new project on the most remote and untouched corner of the nation, in a place already so damaged by climate change that its builders may have to refreeze the tundra before they can drill—and yet Biden could not bring himself to say no to the Alaska congressional delegation, nor to campaign advisors who were warning him that the price of gas would doubtless be a topic in the next campaign. He broke a clear campaign promise to say no; it was just too painful for him.”*****

*Juliet Eilperin and Dino Grandoni, [“Biden vowed to ban new drilling on public lands. It won’t be easy.”](#) *Washington Post*, November 19, 2020.

**Timothy Puko, [“Biden team gives nod to huge Alaska oil project, setting up climate fight.”](#) *Washington Post*, February 1, 2023.

*** Editorial Board, [“The Willow Oil Test for Biden.”](#) *Wall Street Journal*, March 1, 2023.

****Nicholas Kuznetz, [“Biden Approves ConocoPhillips’ Willow Project to Drill Oil in the Alaskan Arctic.”](#) *Inside Climate News*, March 14, 2023.

*****Bill McKibben, [“Just Say No.”](#) *The Crucial Years* newsletter, April 7, 2023. See also, on the oil and gas industry’s “newly restored swagger,” Lisa Friedman, [Climate Forward newsletter](#), *New York Times*, March 14, 2023.

2023 (March)

Seniors organize demonstrations against major banks that finance fossil fuels

As reported by Marina Schaufler in the *Maine Monitor*, “On the first morning of spring, with temperatures hovering around freezing, a large flock of retirees descended like robins on a former farm field in Belfast, the site of a sprawling Bank of America office. They were greeting the new season with an urgent demand — that the bank stop funding fossil fuel projects, which endanger life on earth.” This and a demonstration in Portland, Maine were two of 102 events in 30 states and the District of Columbia on March 21. Seniors, among many others, protested at the offices of Bank of America, Chase, Citi and Wells Fargo, banks that have collectively invested more than a trillion dollars since 2016 in fossil fuels. The message: scrap your credit cards in these banks and do business with regional institutions to put more resources into the local economy, “funds that could be used to accelerate adoption of heat pumps, solar panels and other measures to reduce fossil fuel dependency.”* The protests were organized in part by Third Act, founded by Bill McKibben. Observes McKibben: “Done right, protest also builds movement unity. So many groups came together—53 in fact—to pull off this giant day of action, from the very young to the very old. This is not the old-fashioned enviro movement, but one that understands the interplay of street action and congressional lobbying and brand pressure.”**

*Marina Schaufler, [“Mobilizing older Americans to combat the climate crisis.”](#) *Maine Monitor*, April 2, 2023.

**Bill McKibben, [“Rock On.”](#) *The Crucial Years* newsletter, March 25, 2023.

2023 (March)

The IPCC releases the final, “Synthesis Report,” for the Sixth Assessment

Since the Intergovernmental Panel on Climate Change (IPCC) was established by the United Nations in 1988, it has issued six periodic assessments of climate science, the likely impacts of climate change, and the means of mitigating climate impacts. These reflect the collaborative work of thousands of scientists across the world, a quite unprecedented process in the history of science. The Synthesis Report for the Sixth Assessment (AR6) summarizes the key findings of previous reports in this assessment [August, 2021 (science); February, 2022 (impacts); April, 2022 (mitigation)]. Because these reports normally take six to eight years, as the *Guardian* points out, “that means AR6 is effectively the last IPCC report while it is still feasible – only just – to stay within 1.5C.”* The following passage from the Summary for Policymakers describes some conclusions of the Assessment, along with the level of confidence among the collaborating scientists on the reliability of those conclusions: “For any given future warming level, many climate-related risks are higher than assessed in [the Fifth Assessment], and projected long-term impacts are up to multiple times higher than currently observed (high confidence). Risks and projected adverse impacts and related losses and damages from climate change escalate with every increment of global warming (very high confidence). Climatic and non-climatic risks will increasingly interact, creating compound and cascading risks that are more complex and difficult to manage (high confidence).”** The *Washington Post* describes a key conclusion of the report: “The world is likely to pass a dangerous temperature threshold within the next 10 years, pushing the planet past the point of catastrophic warming — unless nations drastically transform their economies and immediately transition away from fossil fuels, according to one of the most definitive reports ever published about climate change.”*** The *Wall Street Journal* emphasizes challenges to avoiding that threshold: “A United Nations panel of scientists said there is a ‘feasible, but narrow pathway’ to avoid the worst effects of climate change, however to do so, the world’s nations must together cut greenhouse-gas emissions 60% by 2035 to limit warming to 1.5 degrees Celsius over preindustrial levels. That level of cuts would require a massive and rapid shift in the world’s energy supply that is under way in some countries, but has been stifled by the war in Ukraine, the global energy crisis and thirst for economic growth in countries like China and India.”**** Elizabeth Kolbert, writing in *The New Yorker* just one week after approval of the Willow project, echoes the pessimism: “Even under a best-case scenario, with global greenhouse-gas emissions declining both quickly and dramatically, ‘warming is *more likely than not* to reach 1.5° C,’ the report states. ...But to imagine at this point that the latest warning from the I.P.C.C. will spur action, when so many previous ones have failed to, requires not just hope but, it would seem, something close to delusion.”*****

*Fiona Harvey, [“What is the IPCC AR6 synthesis report and why does it matter?”](#) *The Guardian*, March 19, 2023.

**IPCC 2023, [Summary for Policymakers](#), p. 14, In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.

***Sarah Kaplan, [“World is on brink of catastrophic warming, U.N. climate change report says.”](#) *Washington Post*, March 20, 2023.

****Eric Niiler, [“Time Is Running Out to Curb Climate Change, IPCC Report Says.”](#) *Wall Street Journal*, March 20, 2023.

*****Elizabeth Kolbert, [“The U.N. Issues a Final Warning on the Climate—and a Plan.”](#) *The New Yorker*, March 20, 2023.

2023 (March)

Focus evolves on environmental and social costs of minerals mining for green technology

It has become increasingly clear that mining for materials necessary for massive production of electric vehicles and other technologies to reduce greenhouse gas emissions is not without its own environmental as well as human costs. *The Guardian* reports that an investigation by the international wildlife charity Fauna & Flora, “adds to the growing controversy that surrounds proposals to sweep the ocean floor of rare minerals that include cobalt, manganese and nickel. Mining companies want to exploit these deposits – which are crucial to the alternative energy sector – because land supplies are running low, they say. However, oceanographers, biologists and other researchers have warned that these plans would cause widespread pollution, destroy global fish stocks and obliterate marine ecosystems.”** *The Energy Mix* reports that a “new report chalks out pathways for the United States to heavily reduce the amount of mined lithium it needs to decarbonize transportation and sidestep ‘irreversible harms’ to water, air, and animal habitats—especially near Indigenous lands.”** Marx Itabelo Lwabanya, and James Huang argue in *Scientific American* that climate policies of the World Bank and President Biden “increase the demand for the raw materials to make green technology, particularly a key ingredient: the mineral cobalt. The [Democratic Republic of Congo] produces more than 70 percent of the world’s cobalt, which has to be mined through intensive labor efforts that often go unregulated. And while a World Bank report acknowledged greater transparency is needed in the mining industry to ensure economic equity, it did not discuss the vast health disparities currently being driven by policies like Biden’s that are meant to better the environment.”*** In discussing *The Limits to Growth* [1972] and the contemporary “degrowth” movement, Bill McKibben asks: “Shouldn’t we make an all-out push for electric vehicles, heat pumps, and cooktops, not to mention solar panels and wind turbines to supply the necessary electricity? The degrowth movement’s answer is, at the least, a muted no. A green-energy boom, the Canadian journalist Andrew Nikiforuk wrote, would come with ‘monstrous ecological costs,’ because of the mining for the minerals needed to produce and use electricity at the required scale. He cited the energy ecologist Vaclav Smil, who recommends that we return ‘to living standards of the 1960s’ so that we can ‘consume less, travel less, build less, eat less wastefully.’” ****

*Robin McKie, “Deep-sea mining for rare metals will destroy ecosystems, say scientists,” *The Guardian*, March 26, 2023; Flora & Fauna, [“Fauna & Flora Deep Sea Mining Report - update March 2023.”](#) March 27, 2023.

**Christopher Bonasia, [“U.S. can shift to EVs without widespread, destructive mining, report finds.”](#) *The Energy Mix*, February 10, 2023; Thea Riofrancos et al., [“Achieving Zero Emissions with More Mobility and Less Mining.”](#) Climate + Community Project, University of California Davis, January, 2023.

*** Marx Itabelo Lwabanya, and James Huang, [“Efforts to Slow Climate Change Could Inadvertently Create Humanitarian Crises.”](#) *Scientific American*, December 1, 2023; see also, Katharine Houreld and Arlette Bashizi, [“Despite reforms, mining for EV metals in Congo exacts steep cost on workers.”](#) *Washington Post*, August 4, 2023.

****Bill McKibben, [“To Save the Planet, Should We Really Be Moving Slower?,”](#) *The New Yorker*, July 5, 2023.

2023 (April)

Biden administration announces proposed vehicle emission standards, estimated to avoid nearly 10 billion tons of CO2 emissions

The announcement of the notice of proposed rulemaking projects wide-ranging impacts from the boldest approach to U.S. vehicle emissions in history. These rules are pollution controls issued under the Clean Air Act, as distinct from the fuel efficiency rules issued in 2021. [2021(December)] The rules once enacted “will accelerate the ongoing transition to a clean

vehicles future and tackle the climate crisis. The proposed standards would improve air quality for communities across the nation, especially communities that have borne the burden of polluted air. Together, these proposals would avoid nearly 10 billion tons of CO2 emissions, equivalent to more than twice the total U.S. CO2 emissions in 2022, while saving thousands of dollars over the lives of the vehicles meeting these new standards and reduce America's reliance on approximately 20 billion barrels of oil imports."* Coral Davenport of the *New York Times* describes the historic impact of these rules: "The new rules would require nothing short of a revolution in the U.S. auto industry, a moment in some ways as significant as the June morning in 1896 when Henry Ford took his 'horseless carriage' for a test run and changed American life and industry." Davenport explains how the rules will work to vastly increase the percentage of all-electric vehicles sold in the United States, which now stands at 5.8 percent of new cars and fewer than 2 percent of new heavy trucks: "The E.P.A. cannot mandate that carmakers sell a certain number of electric vehicles. But under the Clean Air Act, the agency can limit the pollution generated by the total number of cars each manufacturer sells. And the agency has set that limit so tightly that the only way manufacturers can comply is to sell a certain percentage of zero-emissions vehicles. Each model year that the rule is in effect, car companies will report to the federal government the average greenhouse emissions of all new cars sold. Companies that fall short of the standard could be penalized in different ways, including fines of billions of dollars." ** The proposed rules now go out to public comment, finalization and undoubted litigation. The *Wall Street Journal's* Editorial Board's reaction suggests a rough road ahead: "The U.S. auto industry is nominally still privately owned, but it is slowly becoming a de facto state-directed utility. That's the meaning of the Environmental Protection Agency's proposed new vehicle-emissions standards Wednesday that will force-feed the production of electric vehicles, whether or not consumers want them." ***

*U.S. Environmental Protection Agency news release, "[Biden-Harris Administration Proposes Strongest-Ever Pollution Standards for Cars and Trucks to Accelerate Transition to a Clean-Transportation Future.](#)" April 12, 2023.

**Coral Davenport, "[E.P.A. Lays Out Rules to Turbocharge Sales of Electric Cars and Trucks.](#)" *New York Times*, April 12, 2023.

***Editorial Board, "[Biden's EPA Remakes the Auto Industry.](#)" *Wall Street Journal*, April 12, 2023.

2023 (April)

The European Union approves the world's first carbon tax on imports

The EU has an Emissions Trading System, which requires manufacturers to buy permits for their carbon dioxide emissions. The costs of the permits raise the cost of EU goods in international markets, in comparison to goods from countries that don't impose fees on carbon emissions. To level the playing field and encourage carbon pricing mechanisms around the world, the EU created the Carbon Border Adjustment Mechanism, or CBAM, imposing a tariff on imports from countries that don't impose carbon fees in the production of those imports. The tariffs will begin in October on steel and fertilizer and expand over time. As Manuela Andreoni writes in the *New York Times*, "It didn't get a lot of attention, but it's a big deal because these kinds of tariffs could be very effective in reducing the industrial carbon dioxide emissions that are heating the planet to dangerous levels. It's a potentially powerful incentive for countries to curb emissions. But it's also a risky move in some ways because it could disrupt global trade and have an outsize effect on poorer countries." * The *Wall Street Journal* Editorial Board warns that "trade is becoming the next battlefield in the climate wars and it will be a bloody one. Foreign companies and governments have

raised concerns about the European carbon border tax, which imposes complex and costly compliance burdens and then imposes steep default tariffs on companies that don't play along. China and India are in the crosshairs of this border tax, although companies from any country that doesn't impose emissions taxes will have to pay. That includes U.S. firms." The editors conclude: "The European Union has a penchant for racking up firsts that should have stayed 'nevers' and the latest example is the world's first carbon tariff." **

*Manuela Andreoni, [Climate Forward newsletter](#), *New York Times*, April 25, 2023.

**Editorial Board, ["Carbon Tariff Wars Arrive."](#) *Wall Street Journal*, April 20, 2023.

2023 (April)

Supreme Court gives a green light to state and local lawsuits against fossil fuel companies in state courts

Commencing six years ago and inspired by revelations about Exxon's failure to disclose to the public its own science confirming the risks of climate change, numerous states and municipalities have initiated lawsuits for climate damages against fossil fuel companies including ExxonMobil, Shell, and Chevron, for money damages from climate change. They contend that the companies created public and private nuisances and violated state consumer protection statutes. The defendants have fought to transfer the cases to federal courts, concluding they would be a more favorable forum, and arguing that issues concerning greenhouse gases were "inherently federal." Thus far five federal circuit courts of appeal have turned down requests for transfer. On April 25, the Supreme Court denied, with only Brett Kavanaugh dissenting, petitions for review of decisions declining to transfer to federal court claims by Rhode Island, the cities of Baltimore, Honolulu, and Imperial Beach, California, and counties in California and Hawaii. The Biden administration had weighed in, supporting the plaintiffs' desire to stay in state courts and reversing the position taken by the Trump administration. The decision did not address the merits of the claims, and the likely next step will be litigating motions to dismiss the cases.*

*Emma Ricketts, ["Supreme Court Declines to Hear Appeals From Fossil Fuel Companies in Climate Change Lawsuits."](#) *Inside Climate News*, April 25, 2023; Hilary Beaumont, ["Like a dam breaking': experts hail decision to let US climate lawsuits advance."](#) *The Guardian*, April 25, 2023.

2023 (April)

Extreme East African drought attributable to climate change, study finds.

Through 2020 and 2022 and continuing into 2023, East Africa sustained the worst drought in 40 years. As described by World Weather Attribution, an NGO dedicated to quantifying how climate change influences the intensity and likelihood of extreme weather events, "The drought has led to substantial harvest failure, poor pasture conditions, livestock losses, decreased surface water availability and human conflicts, leaving 4.35 million people in need of humanitarian assistance. At least 180,000 refugees from Somalia and South Sudan crossed into the drought-stricken areas of Kenya and Ethiopia." Scientists from Kenya, Mozambique, South Africa, the United States of America, the Netherlands, Germany and the United Kingdom collaborated through World Weather Attribution to assess whether climate change significantly contributed to the likelihood of this massive and enduring drought. Their conclusions: "the combination of low rainfall and

high evapotranspiration as unusual as the recent conditions would not have led to drought at all in a 1.2°C cooler world...In today's climate the same event is now classified as an exceptional drought, with major crop and pasture losses and widespread water shortages. This change in drought severity is primarily due to the strong increase in evaporative demand caused by higher temperatures. Climate change has made events like the current drought much stronger and more likely; a conservative estimate is that such droughts have become about 100 times more likely.”*

*Joyce Kimutai, et al., [“Human-induced climate change increased drought severity in Horn of Africa.”](#) World Weather Attribution, April 27, 2023; Sarah Kaplan, [“Climate change caused catastrophic East Africa drought, scientists say.”](#) *Washington Post*, April 27, 2023.

2023 (May)

Biden Administration Department of Energy permit approval for a major new liquified natural gas export terminal in Alaska spurs concern about climate impacts

The permit is described by a DOE official who spoke on condition of anonymity to *Politico* as a “purely technical” permit which did not address the merits of the proposal. If otherwise approved, the permit would allow the export of liquified natural gas (LNG) from this facility on the south coast of Alaska to most countries around the world. LNG is emerging as a contentious issue for the Biden administration, setting economic and diplomatic advantages against climate goals. As reported in *Politico*, “the country’s role as the world’s top natural gas producer has become a bright spot for the U.S. economy and a lifeline for allies in Europe and Asia, especially amid the disruptions caused by Russia’s war on Ukraine,” but “environmental groups point to estimates from the Energy Department that the project would spew the equivalent of 1.5 billion tons of carbon dioxide into the atmosphere over its 30-year lifetime, even if it uses carbon capture technology. That’s akin to burning more than 8 million rail cars full of coal.” * A week later, 44 congressional Democrats send a letter to the White House Council on Environmental Quality demanding greater scrutiny on how LNG gas projects impact climate change. They raise concerns about methane leakage during the transit process as well as environmental justice, noting that “Existing LNG infrastructure already has a disproportionate impact on Black, Brown, Indigenous, and poor communities; this will only be exacerbated with the addition of the proposed projects.”** The *Washington Post* reports that the letter comes “as the United States is poised to overtake Australia as the world’s biggest LNG exporter this year.”*** In September, Bill McKibben will publish an analysis of the climate risks of the rapid build out of LNG facilities in the *New Yorker*, described in his newsletter as “what might be the next—and perhaps the ultimate—big battle with the fossil fuel industry.” As McKibben relates, since the U.S. fracking explosion, the industry is “in an all-out sprint to get it to market as fast as they can, mostly by exporting it around the world. In the U.S., there are already seven giant LNG export terminals, and there are plans for at least twenty more, mostly along the Gulf of Mexico in Louisiana and Texas, which are close by the giant gas fields of the Permian Basin. If this buildout continues, and if you counted the emissions from this gas against America’s totals, it would mean that American greenhouse gas emissions would not have budged since 2005. Under the arcane rules of global carbon accounting, exported hydrocarbons don’t count against our total—they’re the problem of the country that eventually burns them (in this case mostly in Asia). But the atmosphere doesn’t care; once burned, the carbon quickly disperses around the globe, heating the entire planet.” **** McKibben cites peer reviewed research from scientists from Harvard, Duke and NASA concluding that the life-cycle climate impact of natural gas is at least as bad as coal.***** In October, Cornell University

professor Robert Howarth will post an analysis, pending peer review, concluding that emissions from LNG exports, including leakage in transit, have substantially *more* climate impact than domestically produced coal. Energy In Depth, a project of the Independent Petroleum Association of America, will call Howarth an “activist researcher,” and criticize his “fast-and-loose updating and re-updating” of the analysis.*****

*Ben Lefebvre, [“Another big Alaska fossil fuel project gets Biden team’s blessing.”](#) *Politico*, May 1, 2023.

**[Letter](#) to Brenda Mallory, Chair, Council on Environmental Quality, from Jeffrey A. Merkley et al., May 8, 2023.

***Maxine Joselow, [“The Climate 202 Newsletter.”](#) *Washington Post*, May 8, 2023.

****Bill McKibben, [“It seems like the next big fight.”](#) *The Crucial Years* newsletter, September 25, 2023; Bill McKibben, [“The Biden Administration’s Next Big Climate Decision.”](#) *The New Yorker*, September 22, 2023. See also, Maxine Joselow and Timothy Puko, [“The next front in the climate fight: U.S. exports of natural gas.”](#) *Washington Post*, October 17, 2023.

*****Hiroko Tabuchi, [“Leaks Can Make Natural Gas as Bad for the Climate as Coal, a Study Says.”](#) *New York Times*, July 13, 2023; Deborah Gordon, et al., [“Evaluating net life-cycle greenhouse gas emissions intensities from gas and coal at varying methane leakage rates.”](#) *Environmental Research Letters*, volume 18, number 8, July 17, 2023.

*****Robert Howarth, [“The Greenhouse Gas Footprint of Liquefied Natural Gas \(LNG\) Exported from the United States.”](#) October 24, 2023, revised January 13, 2024; see also, Bill McKibben, [“A Smoking Gun for Biden’s Big Climate Decision?”](#) *The New Yorker*, October 31, 2023; Mandi Risko, [“Guess Who’s Back \(Back Again\): Researcher Once Again Relies on Debunked Research to Make Same Incorrect Lifecycle Emissions Claims.”](#) *Energy In Depth*, January 26, 2024.

2023 (May)

Four studies target the problem of methane leakage

Far too much of global warming in the short term is the result of completely avoidable leakage of methane, rather than carbon dioxide emissions from burning fossil fuels. [2016 (May, October, November); 2017 (May); 2018 (June, September); 2019 (August); 2020 (August); 2021 (May, September)]. And not enough attention has been paid to methane leakage from oil and gas facilities around the world. A *Guardian* report in March used satellite data to reveal that “More than 1,000 ‘super-emitter’ sites gushed the potent greenhouse gas methane into the global atmosphere in 2022.” The worst single leak was a leak of 427 tonnes an hour in August, near Turkmenistan’s Caspian coast, which spewed the pollution “at a rate equivalent to 67m running cars.”* The firm Kayrros was then commissioned by the *Guardian* for a follow-up investigation of two major oil and gas fields in Turkmenistan. Comments Antoine Rostand, the president of Kayrros, on the findings: “Methane is responsible for almost half of short-term [climate] warming and has absolutely not been managed up to now – it was completely out of control.” Together, the two fields released “emissions equivalent to 366m tonnes of CO₂ in 2022, more than the UK’s annual emissions, which are the 17th-biggest in the world.” Turkmenistan is the second biggest supplier of natural gas to China, after Australia.** Meanwhile a study in *Nature Energy* of the approximately 14,000 unplugged, non-producing wells in US Gulf of Mexico offshore waters, inland waters and wetlands estimates that it would cost \$30 billion to plug them to minimize the risk of uncontrolled leakage. If the current owners of these wells do not plug them, liability falls on the original owners, and the study found that “88% of outstanding [“plugging and abandoning”] liability in federal waters “is associated with wells currently or formerly owned by one of the large, financially stable ‘supermajor’ companies.”*** Lastly a study of municipal landfills across the United States concludes that far more needs to be done to control methane leakage from those facilities, which account for 14% of all U.S. methane leakage according to the EPA greenhouse gas inventory. *Inside Climate News* reports: “In 2021, U.S. municipal waste

landfills released 3.7 million metric tons of methane. That is equal to the annual greenhouse gas emissions of 66 million gas powered cars or 79 coal fired power plants, the EPA’s greenhouse gas equivalency calculator shows.” And those figures are likely a large underestimation. The study was led by the Environmental Integrity Project, which sued the EPA in 2022 for failing since 1988 to update its methods for assessing landfill emissions as required by the Clean Air Act, “despite knowing since at least 2008 that they were relying on flawed methods that tend to underestimate emissions.”**** [2023 (December)]

*Damian Carrington, [“Revealed: 1,000 super-emitting methane leaks risk triggering climate tipping points.”](#) *The Guardian*, March 6, 2023.

**Damian Carrington, [“‘Mind-boggling’ methane emissions from Turkmenistan revealed.”](#) *The Guardian*, May 9, 2023.

***Mark Agerton, et al., [“Financial liabilities and environmental implications of unplugged wells for the Gulf of Mexico and coastal waters.”](#) *Nature Energy*, 8, 536–547, May 8, 2023; Hiroko Tabuchi, [“Price to Plug Old Wells in Gulf of Mexico? \\$30 Billion, Study Says.”](#) *New York Times*, May 8, 2023.

****Phil McKenna and Amy Green, [“Federal Regulations Fail to Contain Methane Emissions from Landfills.”](#) *Inside Climate News*, May 18, 2023; Preet Bains, et al., [“Trashing the Climate: Methane from Municipal Landfills.”](#) Environmental Integrity Project, May 18, 2023.

2023 (May)

Biden Administration releases proposed rules for existing fossil fuel burning power plants, the nation’s second largest source of greenhouse gases

After being sent back to the drawing board by the Supreme Court in the highly controversial *West Virginia v. EPA* decision [2022 (June)], and following more than a decade of wrestling back and forth in the endeavor to regulate power plant greenhouse gas emissions [2012 (March), 2014 (June), 2015 (August), 2016 (February, October), 2017 (March, October), 2018 (August), 2019 (June)], President Biden’s EPA throws down a new ambitious, but still measured, gauntlet. As described by Timothy Puko in the *Washington Post*, “To bolster its chances in court, and ease any risk to reliability or consumers, the rules tighten emissions limits at each individual unit — a long-accepted approach under the Clean Air Act — and phase in gradually, with many of the most aggressive requirements coming only in the 2030s. The standards do not require specific types of technology, but instead set limits so stringent that fossil-fuel-burning plants would probably have to use new carbon-capture systems or switch to other fuels such as hydrogen to comply.”* Arianna Skibell notes in *Politico*: “No commercial power plants in the United States use carbon capture now, but EPA views the technology as ready to go... And Biden’s landmark climate law, the Inflation Reduction Act, offers generous tax credits for companies that capture their carbon pollution. Still, there’s no guarantee the proposal will survive the coming attacks from fossil fuel proponents. West Virginia Attorney General Patrick Morrisey, who led the charge against the Obama rule, said his office is prepared for the next fight.”** *Inside Climate News’* analysis notes: “Large categories of coal and natural gas power plants—those that are going to close soon, or are small, or only run intermittently—will not face new requirements at all... Large natural gas plants have until 2035 or 2038 to equip themselves with carbon capture and other technology to cut emissions 90 percent. That suggests the U.S. won’t make it to Biden’s goal of 100 percent carbon-free electricity by 2035 on this rule alone, even if it survives all of the challenges that the industry and states are preparing to launch.”*** An opinion by a Washington based energy lawyer William Scherman in the *Wall Street Journal* argues that reliance on

unproven hydrogen and carbon capture technologies will lead to unreliable power: “We all hope for a cleaner energy future. But that will take time and thoughtful planning. It will take bipartisan support, not radical proposals. Whatever lofty goals the EPA has, they won’t keep us warm at night when the heat goes off.” **** *Politico* reports that the EPA has so far received 17 permit applications for carbon capture projects, and has only processed two of them. It aims to transfer the permit approval process to the states, which may not be equipped to adequately review them for safety. “Some climate activists — who’ve long claimed that carbon capture is merely a way to perpetuate a fossil-fuel economy — say the lack of regulatory apparatus is a sign of rushed decision-making. And they say it could put low-income residents and communities of color at risk, despite the Biden administration’s pledges to address historical disparities in how environmental burdens are distributed.” ***** [see 2018 (October), 2023 (August), 2023 (November) on carbon capture] The rules are open for public comment, possible revision, and undoubted litigation upon finalization.

*Timothy Puko, [“The U.S. is taking a giant step toward meeting its climate goal.”](#) *Washington Post*, May 11, 2023.

**Arianna Skibell, [“Can Biden’s newest climate rule survive?”](#) *Politico*, April 24, 2023.

***Marianne Lavell and Nicholas Kuznetz, [“Biden Power Plant Plan Gives Industry Time, Options for Cutting Climate Pollution.”](#) *Inside Climate News*, May 11, 2023.

****William Scherman, [“The EPA Threatens to Turn Out the Lights.”](#) *Wall Street Journal*, May 18, 2023.

*****Ben Lefebvre and Zack Colman, [“A crucial climate technology provokes fears in oil country.”](#) *Politico*, May 16, 2023; see also, on hydrogen and ammonia as carbon-free fuels, Katherine Bourzac, [“Carbon-free fuels could have a dark side.”](#) *Science News*, November 15, 2023.

2023 (June)

State Farm will not accept applications for new insurance in California

Coming on the heels of astronomical global and U.S. insurance losses in 2021 and 2022 [2021 (December), 2022 (December)], the largest issuer of homeowners insurance in California announces it is pulling out because of “rapidly growing catastrophe exposure.” The *New York Times* reports that Michael Soller, a spokesman for the California Department of Insurance, “said the agency was working to address the underlying factors that have caused disruption in the insurance industry across the country and around the world, including the biggest one: climate change...But Tom Corringham, a research economist with the Scripps Institution of Oceanography at the University of California San Diego who has studied the costs of natural disasters, said that allowing people to live in homes that are becoming uninsurable, or prohibitively expensive to insure, was unsustainable. He said that policymakers must seriously consider buying properties that are at greatest risk, or otherwise moving residents out of the most dangerous communities.” * This follows an announcement that Allstate, the state’s fourth largest homeowners insurer, would stop issuing new policies, and later four smaller companies join the exodus.** Most large homeowners insurance companies have also pulled out of Florida.***

*Christopher Flavelle, Jill Cowan and Ivan Penn, [“Climate Shocks Are Making Parts of America Uninsurable. It Just Got Worse.”](#) *New York Times*, May 31, 2023.

**Dicon Hyatt, [“The Costs Of Climate Change Are Already Here: In Your Homeowners Insurance Bill.”](#) December 26, 2023.

***Ryan Mac, [“Allstate Is No Longer Offering New Policies in California.”](#) *New York Times*, June 4, 2023.

2023 (June)

Oregon federal trial judge accepts amended complaint in groundbreaking youth climate suit, *Juliana v. United States*, but the Biden Administration continues to resist

District Court Judge Ann Aiken, who had in 2016 denied a motion to dismiss this suit challenging the federal government's failure to address climate change [2016 (April)] but whose decision was overruled in the 5th Circuit Court of Appeals [2020 (January)], approved the plaintiffs' motion to amend their complaint. In the amended complaint, the plaintiffs dropped their claims for an injunction against federal policies that enable climate change, such as licensing oil and gas development, and limit their claims to a declaratory judgment that the failure of the federal government to effectively mitigate climate change is a violation of the Constitution. In approving the amended complaint Judge Aiken concluded, "It is a foundational doctrine that when government conduct catastrophically harms American citizens, the judiciary is constitutionally required to perform its independent role and determine whether the challenged conduct, not exclusively committed to any branch by the Constitution, is unconstitutional."** Julia Olson, lead counsel for the youth plaintiffs, stated: "Today's ruling from Judge Aiken is our legal system working the way it should: a fair and well-reasoned application of the law in a vitally important constitutional case where children's lives are at stake. These young people have a right to access their courts and, after several long years, finally have their evidence of climate harm caused by their own government—and how to stop it—heard in open court. Attorney General Garland should treat this like the urgent constitutional case that it is by litigating the case on its merits and presenting their arguments in the light of day at trial, rather than once again seeking to push this case into the dark corners of the shadow docket."** The Biden Administration, however, will follow the strategies of the Trump Administration in seeking to delay or dismiss this suit, filing first a request for an extension of time to answer it, then a motion to stay proceedings pending a new petition for writ of mandamus to the 9th Circuit Court of Appeals.***

*Yale Environment 360, "[Youth Climate Lawsuit Against Federal Government Headed for Trial](#)," E360 Digest, June 2, 2023.

**Press Release, "[Judge Rules in Favor of Juliana v. United States Youth Plaintiffs; Children's Constitutional Climate Case Can Proceed to Trial](#)," Our Children's Trust, June 2, 2023.

***Our Children's Trust, "[Juliana v. United States, Major Moments Timeline](#)," accessed February 2, 2024.

2023 (June)

President Biden signs into law the Fiscal Responsibility Act of 2023, including the most substantive amendments to the National Environmental Policy Act since enactment in 1969

For the Biden administration, it was a Faustian bargain: accept language that might, depending on judicial interpretation, weaken environmental reviews of major oil and gas projects with climate related risks, to avoid a fiscal meltdown. The "FRA" completes a bipartisan agreement to suspend the public debt limit until 2025. The law firm of Perkins Coie notes that with the NEPA amendments built into the debt ceiling bill, "The FRA effectively codifies many of the regulations that the Council on Environmental Quality (CEQ) promulgated in 2020 during the Trump administration." As summarized by Perkins Coie, "The law amends the basic requirements for an environmental impact statement (EIS) [under NEPA]. It provides that an EIS must consider the 'reasonably foreseeable environmental effects of the proposed agency action' and analysis of

a ‘reasonable range’ of alternatives that are ‘technically and economically feasible’ and meet the purpose and need of the proposed action. ...As part of the alternatives analysis, the agency is also now required to consider ‘any negative environmental impacts of not implementing the proposed agency action in the case of a no action alternative,’ which effectively emphasizes the benefits of the agency action by focusing on the negative effects of not implementing the proposed action...The Section 107 amendments also require that lead agencies prescribe procedures for project sponsors to prepare an EA or EIS under agency supervision.” * [1970 (NEPA), and redlined text in note] EarthJustice summarizes the impact of these and other NEPA changes built into the FRA: “For too long Republicans have used NEPA as a scapegoat for project delays, omitting their own complicity in leaving the agencies tasked with completing environmental reviews largely underfunded. This deal would codify provisions that Republicans hostile to NEPA have sought for years.”** On July 31, the Biden administration issued proposed rules for implementing the NEPA amendments. Public comment closed on September 29. Final regulations have not been issued as of year-end 2023.***

*Perkins Coie LLP, [“Substantive NEPA Amendments in the Debt Ceiling Bill.”](#) June 8, 2023; [Fiscal Responsibility Act of 2023](#), H.R. 3746, Title III, Sec. 321; [redline text showing original and 2023 changes.](#)

**Raul Garcia, [“What You Need to Know About the Debt Ceiling and Its Impacts on the Economy and the Environment.”](#) *EarthJustice*, May 31, 2023.

***Hannah Perls, [“Key Changes in CEQ’s Proposed Phase 2 Regulations Implementing NEPA.”](#) Environmental & Energy Law Program, Harvard Law School, August 23, 2023; updates will be posted on the [NEPA Environmental Review Requirements Regulatory Tracker.](#)

2023 (June)

The pursuit of fusion hits a long and rocky road

While a breakthrough in U.S. fusion research was acclaimed last year [2022 (December)], *Scientific American* reports that the world’s largest fusion project is in “big trouble:” “It could be a new world record, although no one involved wants to talk about it. In the south of France, a collaboration among 35 countries has been birthing one of the largest and most ambitious scientific experiments ever conceived: the giant fusion power machine known as the International Thermonuclear Experimental Reactor (ITER). But the only record ITER seems certain to set doesn’t involve ‘burning’ plasma at temperatures 10 times higher than that of the sun’s core, keeping this ‘artificial star’ ablaze and generating net energy for seconds at a time or any of fusion energy’s other spectacular and myriad prerequisites. Instead ITER is on the verge of a record-setting disaster as accumulated schedule slips and budget overruns threaten to make it the most delayed—and most cost-inflated—science project in history.” Journalist Charles Seife, director of the Arthur L. Carter Institute of Journalism at New York University, details delays, overruns, and concerns over employee safety in documents he received pursuant to the U.S. Freedom of Information Act. He concludes: “the project is now entering its third generation of planning and construction, and its important experiments are at least another generation away. ITER has become the Gothic cathedral of our time: a beautiful but immensely complex structure that we pray will help us find salvation from our energy and climate woes.”*

*Charles Seife, [“World’s Largest Fusion Project Is in Big Trouble, New Documents Reveal.”](#) *Scientific American*, June 15, 2023; [ITER website.](#)

2023 (July)

July 6 gives every appearance of being the hottest day in human history

The University of Maine’s Climate Reanalyzer website was one of the first unofficial sources to draw attention to the record breaking temperatures emerging around the world during that week.* State climatologist and UMaine assistant professor Sean Birkel, who built the Climate Reanalyzer in 2012, described to *The Climate Monitor* the major drivers of this unprecedented heat: “a sluggish atmospheric circulation, linked to record-high sea surface temperatures in the North Atlantic and the onset of an El Niño in the Pacific, is helping drive this increase. It's tied not just to the hot weather, but to humidity, wildfires and more.”** By early August, the Copernicus Climate Change Service will confirm that July was globally the hottest month on record.*** Bill McKibben, writing in *The New Yorker*, explains why many scientists believe July 6 was the hottest day *in human history*: “Since 1979, a global network of satellites, ocean buoys, and land stations has been recording average daily temperatures, measured two metres above the ground, around the world. We’re at the very start of what seems likely to be a major El Niño warming event; the previous global high temperature came at the height of the El Niño in 2016, when the average hit 16.92 degrees Celsius, or 62.45 degrees Fahrenheit. Estimates vary somewhat, but on July 3rd the average temperature reached 17.01 C, and three days later it hit 17.23 C, or 63.01 F. Scientists who calculate historic temperatures by examining proxy records, such as lake sediments or ice cores, believe that this may well be the hottest it’s been on Earth since at least the peak of an era known as the Eemian, a hundred and twenty-five thousand years ago, when rising temperatures pushed mastodons north from present-day Texas to the Yukon. This would mean that nothing even remotely resembling a human civilization has ever known a world this hot.”**** Professor Ivan Fernandez of the UMaine Climate Change Institute comments to *The Climate Monitor* in early August: “‘I would argue it's not as much of a concern that we broke a record, it's that we're breaking more records more frequently, which tells us the whole system is adrift.’ The upshot, Fernandez said, is that Mainers should savor this week's cool summer temperatures while they last — because ‘we're on the cool end of the 21st Century.’”**

*Seth Borenstein and Isabella O’Malley, [“Earth hit an unofficial record high temperature this week – and stayed there.”](#) *APNews*, July 6, 2023.

**Annie Ropeik, [“UMaine's surprising role in recording July's extreme heat.”](#) *The Climate Monitor* newsletter, August 4, 2023.

***Nadeem Badshah, [“July was world’s hottest month on record, climate scientists confirm.”](#) *The Guardian*, August 8, 2023.

****Bill McKibben, [“Big Heat and Big Oil.”](#) *The New Yorker*, July 16, 2023.

2023 (July)

The Biden EPA launches three grant competitions to make \$27 billion available for green energy, particularly in disadvantaged communities

Maxine Joselow in the *Washington Post* calls the “green bank,” or Greenhouse Gas Reduction Fund, established by the Inflation Reduction Act [2022 (August)] “arguably one of the least understood and most impactful programs in the climate law.” * EPA administrator Michael Regan announced the first of the three grant competitions in June. “Solar for All,” is intended to facilitate residential solar for low income and working families: “For too long, overburdened

communities on the front lines of the climate crisis have been left behind and locked out of clean energy investments and climate solutions. Thanks to President Biden’s Investing in America agenda, this historic boost in solar investments will advance millions of residential solar projects nationwide, protect people and the planet, deliver environmental justice, save families money, and create good-paying jobs. All communities deserve to participate in America’s growing clean energy economy and under this competition, we will bring more communities along, working together to build a healthier and cleaner future for all.”** Two remaining grant competitions were announced on July, as summarized by the *Washington Post*: “The \$14 billion National Clean Investment Fund will provide grants to two or three “national clean financing institutions,” which will partner with the private sector to finance tens of thousands of clean-energy projects, the EPA said. At least 40 percent of the funds will go to low-income and disadvantaged communities. The \$6 billion Clean Communities Investment Accelerator will provide grants to two to seven ‘hub nonprofit organizations’ that will provide funding and technical assistance to community lenders, the agency said. All of the funds will go to low-income and disadvantaged communities.” Political opposition and tight deadlines challenge the fulfillment of these programs. House Republicans have proposed to rescind nearly \$7.8 million from the green bank, and Rep. Gary Palmer (R-Ala.) has called it a “taxpayer-funded \$27 billion slush fund” that lacks accountability and oversight.”* The Inflation Reduction Act requires the \$27 million to be paid out by September, 2024, or returned to Congress.***

*Maxine Joselow, [“EPA unveils \\$20 billion to finance the fight against climate change.”](#) The Climate 202 newsletter, *Washington Post*, July 14, 2023.

**Environmental Protection Agency news release, [“Biden-Harris Administration Launches \\$7 Billion Solar for All Grant Competition to Fund Residential Solar Programs that Lower Energy Costs for Families and Advance Environmental Justice Through Investing in America Agenda.”](#) June 28, 2023.

***Maxine Joselow, [“The EPA is racing to spend \\$27 billion the GOP wants to repeal.”](#) The Climate 202 newsletter, *Washington Post*, July 5, 2023.

2023 (July)

Study concludes collapse of the AMOC current will come sooner than previous estimates

Publishing in the journal *Nature Communications*, Peter Ditlevsen and Susanne Ditlevsen, of the Niels Bohr Institute, University of Copenhagen, note that “The Atlantic meridional overturning circulation (AMOC) [2018 March, 2021 (February)] is a major tipping element in the climate system and a future collapse would have severe impacts on the climate in the North Atlantic region.” While the IPCC has estimated that full collapse will not come until the end of the 21st century under current emissions projections, the authors, with “statistical significance and data-driven estimators for the time of tipping,” “estimate a collapse of the AMOC to occur around mid-century under the current scenario of future emissions.” To be more precise, “we show that a transition of the AMOC is most likely to occur around 2025-2095 (95% confidence interval).”

* The *Guardian* quotes lead author Peter Ditlevsen: “I think we should be very worried... This would be a very, very large change. The AMOC has not been shut off for 12,000 years.”

**Chelsea Harvey, writing for *Climatewire*, discusses the pros and cons of the approach these researchers took in estimating the timing of the future collapse based on sea surface temperatures in one region of the North Atlantic, and concludes that “there’s some evidence that the models may be underestimating the AMOC’s weakening. But that doesn’t mean the new study overturns

the narrative.” But there’s high concern about the global consequences of the current shutting down: “Many studies predict a significant cooling over parts of Europe, ...potentially by as much as 5 or 10 degrees Celsius. Tropical rain belts might shift their positions, causing some regions to experience more droughts and others to suffer more floods...the North Atlantic may see a major increase in rising seas. If the AMOC can’t ferry large volumes of water around the world, the ocean may absorb less carbon dioxide from the atmosphere. Parts of the deep ocean may receive less oxygen. Marine ecosystems could change in ways scientists are still trying to understand. In short, there could be dramatic consequences. But it’s still a matter of debate whether those looming alterations could happen within the next few decades.”***

*Peter Ditlevsen and Susanne Ditlevsen, [“Warning of a forthcoming collapse of the Atlantic meridional overturning circulation.”](#) *Nature Communications*, volume 14, number 4254, July 25, 2023.

**Damian Carrington, [“Gulf Stream could collapse as early as 2025, study suggests.”](#) *The Guardian*, July 25, 2023.

***Chelsea Harvey, [“Is a mega-ocean current about to shut down? 4 things to know.”](#) *E&E News, Climatewire*, July 28, 2023.

2023 (August)

Analysis concludes “planting a trillion trees” is no solution to climate change

In 2021, House Committee on Natural Resources Ranking Member Bruce Westerman (R-Ark.) joined Minority Leader Kevin McCarthy (R-Calif.) and 70 other representatives to introduce the “Trillion Tree Act,” concluding that “Despite incredible improvements in technology, trees are still the most large-scale, cost-effective and environmentally-friendly carbon sequestration devices we have.” * While this was a step forward in acknowledging the reality of climate change and the need for congressional action, new analysis challenges the assumption that such a program would be effective. Maxine Joselow, writing in the *Washington Post*, reports on an analysis by John Sterman, a professor at the MIT Sloan School of Management, and Andrew P. Jones, executive director of the nonprofit Climate Interactive, which concluded, using a global climate simulator called En-ROADS, that planting a trillion trees would prevent only 0.15 degrees Celsius (0.27 Fahrenheit) of warming by 2100, and sequester only 6 percent of the carbon dioxide that the world needs to meet the goal of the Paris Climate Agreement. The problem is the long lag time for the trees to reach maturity and sequester sufficient carbon.** The study has not been peer-reviewed. It did not attempt to assess the investment involved in keeping the trees alive, particularly in a more hostile climate.***

*Press release, [“Westerman Leads Bipartisan Introduction of The Trillion Trees Act,”](#) U.S. Congressman Bruce Westerman, April 19, 2021.

** Maxine Joselow, [“Republicans want to plant a trillion trees. Scientists are skeptical”](#), *Washington Post*, August 2, 2023; Climate Interactive, [“The Washington Post Shared Our Analysis of A Trillion Trees - Here’s What’s Behind the Numbers,”](#) August 2, 2023.

***Fergus O’Sullivan and Linda Poon, [“The Darker Side of Tree-Planting Pledges.”](#) *Bloomberg CityLab*, July 30, 2021.

2023 (August)

The Heritage Foundation’s “battle plan” for the first 180 days of a Republican presidency includes decimating climate regulations and programs

Lisa Friedman in the *New York Times* describes Project 2025, as a “sweeping strategy” devised by the conservative thinktank the Heritage Foundation [1993, 2017 (October)] where “climate and energy provisions would be among the most severe swings away from current federal policies.” The Heartland Institute [2000, 2012 (May), 2020 (January), 2020 (July)] and the Competitive Enterprise Institute [2004 (August), 2016 (November)] and dozens of other conservative groups collaborated with the Heritage Foundation to create a nearly 1,000-page plan with a \$22 million budget. The plan includes repealing the Inflation Reduction Act [2022 (August)], closing a Department of Energy office that has \$400 billion in loan authority to fund emerging green technologies, “shredding regulations to curb greenhouse gas pollution from cars, oil and gas wells and power plants, dismantling almost every clean energy program in the federal government and boosting the production of fossil fuels — the burning of which is the chief cause of planetary warming.” Friedman adds: “Notably, it also would restart a quest for something climate denialists have long considered their holy grail: reversal of a 2009 scientific finding at the Environmental Protection Agency [2009 (December)] that says carbon dioxide emissions are a danger to public health.”* Paul Krugman observes: “the political force of this drive, and the likelihood that there will be no significant dissent from within the G.O.P. if Republicans do take the White House, has a lot to do with the way science in general and climate science in particular have become a front in the culture war...As recently as the mid-2000s, Republicans and Democrats had similar levels of trust in the scientific community. Since then, however, Republican trust has plunged as Democratic trust has risen; there’s now a 30-point gap between the parties.”** A Washington Post/University of Maryland poll later this month will confirm that Americans are deeply divided — along partisan lines — on whether climate change is helping to drive extreme weather events.***

*Lisa Friedman, [“A Republican 2024 Climate Strategy: More Drilling, Less Clean Energy,”](#) *New York Times*, August 4, 2023; Paul Dans, Spencer Chretien, and Troup Hemenway, [“Project 2025: Presidential Transition Project,”](#) The Heritage Foundation, 2023.

**Paul Krugman, [“Climate Is Now a Culture War Issue,”](#) *New York Times*, August 7, 2023.

*** Amudalat Ajasa, Scott Clement and Emily Guskin, [“Democrats and Republicans deeply divided on extreme weather, Post-UMD poll finds,”](#) *Washington Post*, August 23, 2023.

2023 (August)

Biden administration Department of Energy announces \$1.2 billion to advance the development of the first two commercial-scale direct air capture facilities

Direct air capture (DAC) is a variant of carbon capture technology [2023 (May), power plant rules] that removes carbon dioxide from the ambient air, rather than directly from carbon emitting facilities. The grants will support two planned “Hub” facilities, in Texas and Louisiana. The DOE announcement states that this “will be the world’s largest investment in engineered carbon removal in history and each Hub will eventually remove more than 250 times more carbon dioxide than the largest DAC facility currently operating.” The project is “expected to remove more than 2 million metric tons of carbon dioxide (CO₂) emissions each year from the atmosphere—an amount equivalent to the annual emissions from roughly 445,000 gasoline-powered cars—and create 4,800 good-paying jobs in Texas and Louisiana.” The Hubs will provide for “meaningful community and labor engagement and contribute to the President’s Justice40 Initiative, which set a goal that 40% of the overall benefits of certain federal

investments, such as climate and clean energy, go to disadvantaged communities that have been marginalized and overburdened by pollution and underinvestment.” DOE Secretary Jennifer Granholm states that this emerging technology is essential to meeting climate goals: “Cutting back on our carbon emissions alone won’t reverse the growing impacts of climate change; we also need to remove the CO₂ that we’ve already put in the atmosphere—which nearly every climate model makes clear is essential to achieving a net-zero global economy by 2050.”* *Popular Science* reports that the Texas facility will also receive substantial investment and oversight from 1PointFive, a subsidiary of Occidental, “a hydrocarbon and petrochemical manufacturer long considered to be one of 100 companies responsible for an estimated 71 percent of global emissions”: “While undoubtedly a positive development in carbon sequestration efforts, 1PointFive’s origins illustrate the complicated landscape governments and climate advocates must deal with in the face of such steep environmental stakes.”** [See UN Production Gap Report, 2023 (November)]

*U.S. Department of Energy press release, [“Biden-Harris Administration Announces Up To \\$1.2 Billion For Nation’s First Direct Air Capture Demonstrations in Texas and Louisiana.”](#) August 11, 2023.

**Andrew Paul, [“The US is investing more than \\$1 billion in carbon capture, but big oil is still involved,”](#) *Popular Science*, August 15, 2024.

2023 (August)

Our Children’s Trust wins the first U.S. climate rights trial in Montana lawsuit

In a legal proceeding initiated in 2011, *Held v. Montana*, part of Our Children’s Trust’s long standing effort to bring legal accountability to government’s failure to mitigate climate change [2016 (April), 2020 (January)], sixteen young citizens of Montana went to trial in June 2023. Their complaint relied on language in the Montana state Constitution that guarantees residents “the right to a clean and healthful environment,” and declares that the state and individuals are responsible for maintaining and improving the environment “for present and future generations.” They challenged, among other provisions of Montana law, the Montana Environmental Policy Act, which forbids the State from considering the impacts of greenhouse gases or climate change in their environmental reviews, as well as “the aggregate acts the State has taken to implement and perpetuate a fossil fuel-based energy system.”* The *New York Times* quotes Michael Gerrard, director of the Sabin Center for Climate Change Law at Columbia Law School: “There have been almost no trials on climate change. . . This is the first that will get into the merits of climate change and what needs to be done, and how the state may have to change its policies.”** As announced by Our Children’s Trust, “On August 14, in an historic first, Judge Seeley ruled wholly in favor of the 16 youth plaintiffs in *Held v. State of Montana*, declaring that the state of Montana violated the youth’s constitutional rights, including their rights to equal protection, dignity, liberty, health and safety, and public trust, which are all predicated on their right to a clean and healthful environment. The court invalidated as unconstitutional and enjoined Montana laws that promoted fossil fuels and required turning a blind eye to climate change. The court ruled the youth plaintiffs had proven their standing to bring the case by showing significant injuries, the government’s substantial role in causing them, and that a judgment in their favor would change the government’s conduct.” The state is appealing the decision to the Montana Supreme Court.***

The Court's findings of facts in the 103 page ruling include 142 paragraphs detailing key events in the historic development of climate science, the current understanding of climate science and projections of our climate future, the health impacts on youth and children from a changing climate, the impacts of climate change on Montana's natural environment, and specific health, social and economic impacts on each of the individual plaintiffs.*

* Montana First Judicial District Court, Rikki Held v. State of Montana, [Findings of Fact, Conclusions of Law, and Order](#), August 14, 2023, p. 2

**David Gelles, ["In Montana, It's Youth vs. the State in a Landmark Climate Case."](#) *New York Times*, March 24, 2023.

***Our Children's Trust, ["Historic Trial Concluded June 20, 2023 – The Youth Won!"](#), [text of the closing argument in the trial](#); See also, Celina Zhao, ["In Montana lawsuit, a climate scientist takes the stand."](#) *Science*, June 20, 2023.

2023 (August)

The average sea surface temperature in the Gulf of Mexico for the week of August 14 is 88 degrees F, while Florida approves climate denial classroom videos

Bill McKibben sums up the Florida climate this summer: "On the list of crazy weather records this overheated summer, it's possible that the single most extreme might have been a 101.1 Fahrenheit temperature measured by an ocean buoy at Manatee Bay in Florida in July. That appears to be the hottest temperature ever measured in the ocean; it's in a murky and shallow stretch of the Keys, but across the entire Gulf coast temperatures are truly astounding. The average for the Gulf of Mexico this week is more than 88 degrees Fahrenheit, crushing the average for the date across the last three decades by two and a half degrees... Coral reef researchers were reporting '100% mortality' at sites in the Keys." McKibben notes the irony that the Florida Department of Education has become the first state in the nation to approve the use of classroom educational videos produced by the Prager University Foundation funded in large part by the fracking industry.* The foundation ("PragerU") is not in fact affiliated with any university but describes itself as a "501(c)(3) nonprofit [which] offers a free alternative to the dominant left-wing ideology in culture, media, and education."** *Climatewire* reports that "education experts say [PragerU videos] distort science, history, gender and other topics. And those researchers fear that the nation's third-largest state has opened a door that will help spread the videos to classrooms in other states... PragerU's videos use talking points common among global warming skeptics to frame climate science and policy. ... An eight-minute video, 'Poland: Ania's Energy Crisis,' exemplifies how PragerU introduces climate denialism to children by subtly attacking established science and the people concerned about global warming. In the video, teenager Ania is concerned about climate change because of what she learned at school. Climate-denial talking points are introduced almost verbatim in the trusted voice of Ania's mother and father."***

*Bill McKibben, ["Teachable Moments Require... Teaching."](#) *The Crucial Years* newsletter, August 14, 2023.

** ["What is PragerU?"](#)

***Scott Waldman, ["Florida schools 'hijacked by the left' turn to anti-climate cartoons."](#) *E&E News, Climatewire*, August 7, 2023; PragerU, ["Poland: Ania's Energy Crisis."](#) July 19, 2023. See also, Jackie Flynn Mogensen, ["Florida Approved a PragerU Climate Cartoon for Schools. We Asked a Scientist to Fact-Check It."](#) *Mother Jones*, August 18, 2023.

2023 (September)

Biden administration announces cancellation of 7 drilling leases in the Arctic National Wildlife Refuge, new protection of 13 million acres in the National Petroleum Reserve

Following controversial approval of the Willow project [2023 (March)], the Interior Department takes two steps to expand protected lands in Alaska. The seven leases had been approved by the Trump Administration, but suspended in June, 2021 citing “multiple legal deficiencies in the underlying record supporting the leases.” The proposal to protect, by new regulations, up to 13 million acres in the National Petroleum Reserve in Alaska (NPR-A) had been previewed at the time of the Willow approval. The proposed rule would establish an outright prohibition on any new leasing in 10.6 million acres, more than 40 percent of the NPR-A.* President Biden stated that “We have a responsibility to protect this treasured region for all ages...Canceling all remaining oil and gas leases issued under the previous administration in the Arctic Refuge and protecting more than 13 million acres in the western Arctic will help preserve our Arctic lands and wildlife, while honoring the culture, history, and enduring wisdom of Alaska Natives who have lived on these lands since time immemorial.”**The Editorial Board of the *Wall Street Journal* begs to differ, describing President Biden’s climate agenda as “the most lawless and economically destructive in history,” and faulting Interior Secretary Deb Haaland for criticizing the Trump Administration’s “insufficient analysis under the National Environmental Policy Act, including failure to adequately analyze a reasonable range of alternatives and properly quantify downstream greenhouse gas emissions.” “NEPA doesn’t require a climate analysis,” contends the Editorial Board: “The Administration has written new requirements into NEPA to scotch fossil-fuel projects.”*** NEPA, as amended by the Fiscal Responsibility Act [2023 June] requires federal agencies to “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—(i)reasonably foreseeable environmental effects of the proposed agency action;(ii)any reasonably foreseeable adverse environmental effects which cannot be avoided should the proposal be implemented;(iii)a reasonable range of alternatives to the proposed agency action, including an analysis of any negative environmental impacts of not implementing the proposed agency action in the case of a no action alternative, that are technically and economically feasible, and meet the purpose and need of the proposal...”****

*U.S. Department of the Interior, [“Biden-Harris Administration Takes Major Steps to Protect Arctic Lands and Wildlife in Alaska.”](#) September 6, 2023.

**Lisa Friedman, [“Biden Administration to Bar Drilling on Millions of Acres in Alaska.”](#) *New York Times*, September 6, 2023.

***Editorial Board, [“Biden Freezes Alaskan Oil.”](#) *Wall Street Journal*, September 8, 2023.

**** National Environmental Policy Act of 1969, [Sec. 102, 42 USC 4332 \(C\)](#).

2023 (October)

Supreme Court rejects Republican-led states’ challenge to Biden Administration Social Cost of Carbon in environmental reviews; Biden Administration expands SCC use

Eleven states led by Missouri had challenged the Biden Administration’s Social Cost of Carbon (SCC) used by federal agencies to estimate the economic costs of greenhouse gas pollution [see 2013 (May), 2017 (March), 2018 (September), 2020 (July), 2021 (January, February)]. The

Trump administration had slashed the SCC to around \$1 per metric ton, and the Biden administration increased it to around \$51 using the Obama administration's measure adjusted for inflation. The traditionally conservative 8th Circuit Court of Appeals had dismissed the suit, ruling that the states lacked standing to challenge the cost until they had specific projects that had been allegedly adversely impacted by the higher SCC in environmental reviews. The states brought a Petition for Writ of Certiorari to the Supreme Court, claiming "many different harms and injuries from the interim 'social costs' dramatic increase in the costs from emitting greenhouse gases, including harms to proprietary, sovereign, and procedural interests."* The Supreme Court denied the petition without explanation, in a decision that had largely been expected.** In September, President Biden had issued an executive order directing federal agencies to incorporate the SCC in their budgeting as well as procurement processes: "For over a decade, federal agencies have routinely applied SC-GHG [Social Cost of Greenhouse Gases] values when estimating the benefits and costs of regulations. Today, the Administration is announcing that the President has approved recommendations from the IWG [Interagency Working Group] on the expanded use of the SC-GHG for budgeting, procurement, and other agency decisions, including reaffirming its use for environmental reviews where appropriate."***

*State of Missouri et al. v. Joseph R. Biden Jr. et al., [Petition for Writ of Certiorari](#).

**Zack Budryk, "[Supreme Court passes on red state challenge to Biden 'social cost of carbon' rule](#)," *The Hill*, October 11, 2023; Lesley Clark, Niina H. Farah, "[Why SCOTUS might stop Republican attacks on carbon metric](#)," *E&E News Climatewire*, July 11, 2023.

***The White House, "[FACT SHEET: Biden-Harris Administration Announces New Actions to Reduce Greenhouse Gas Emissions and Combat the Climate Crisis](#)," September 21, 2023.

2023 (October)

California Governor Gavin Newsome signs two unprecedented climate disclosure laws

The State of California has raced ahead of the Securities and Exchange Commission (SEC) in enshrining into law a requirement that companies disclose their greenhouse gas emissions and risks posed by climate change. The SEC proposed such rules in March 2022, and is still deliberating on the path to finalizing them. The Harvard Law School Environmental and Energy Law Program's Regulatory Tracker summarizes the need for such rules: "The impacts of climate change pose enormous risk to the U.S. financial system. These risks can be physical, such as damaged infrastructure and transportation networks due to increasingly severe weather events, wildfires, and sea-level rise, or transitional, such as investment values changing with underlying shifts in energy and climate policy or consumer demand. This climate-related risk results in financial risk for businesses and investors. At the same time, a growing number of companies are setting net-zero goals and other GHG emissions targets, but their reporting is too fragmented and inconsistent to be useful to investors and regulators. ...Concerned that voluntary climate disclosures do not adequately protect investors, the SEC determined that additional disclosure requirements are necessary to provide consistent, comparable information about climate risks in the financial markets." * Forging ahead faster than the SEC, California's Climate Corporate Data Accountability Act will require companies operating in California with annual revenues over \$1 billion to report their greenhouse emissions each year, not only direct ("Scope 1") emissions, but also, as phased in through 2030, "Scope 2 emissions" defined as "indirect greenhouse gas emissions from consumed electricity, steam, heating, or cooling purchased or acquired by a

reporting entity, regardless of location,” and “Scope 3 emissions”: “indirect upstream and downstream greenhouse gas emissions, other than scope 2 emissions, from sources that the reporting entity does not own or directly control and may include, but are not limited to, purchased goods and services, business travel, employee commutes, and processing and use of sold products.”** A related law, the Greenhouse Gases: Climate-related Financial Risk Act, would require companies with revenues exceeding \$500 million to disclose their climate-related financial risks and countermeasures.*** Although the legislation received major support from companies including Microsoft, Ikea U.S.A., Patagonia and Apple, Governor Newsome expressed reservations about implementing rules that are estimated to impact 10,000 companies doing business in California. As reported in *UtilityDive*, the Governor expressed concerns about meeting the deadlines in the bills, and the financial impact of the legislation. He stated that “his administration would work with the authors of both bills and the legislature to address these issues next year.”****

*Environmental and Energy Law Program, Harvard Law School, Regulatory Tracker, [“Financial Regulation, Climate Change, and Climate-related Risk Disclosure”](#)

**Legislature, State of California, [Senate Bill 253, Climate Corporate Data Accountability Act](#).

***Legislature, State of California, [Senate Bill 261, Greenhouse Gases: Climate-related Financial Risk Act](#).

****Zoya Mirza, [“California Gov. Newsom signs climate disclosure bills but worries about ‘overall financial impact,’”](#) *UtilityDive*, October 11, 2023.

2023 (October)

The International Energy Agency’s annual World Outlook Report predicts substantial progress in renewables by 2030, but not enough to keep warming below 1.5 °C.

Described as “the most authoritative global source of energy analysis and projections,” the report predicts “an energy system in 2030 in which clean technologies play a significantly greater role than today. This includes almost 10 times as many electric cars on the road worldwide; solar PV generating more electricity than the entire US power system does currently; renewables’ share of the global electricity mix nearing 50%, up from around 30% today; heat pumps and other electric heating systems outselling fossil fuel boilers globally; and three times as much investment going into new offshore wind projects than into new coal- and gas-fired power plants.” In sum, it concludes that in 2030 global use of fossil fuels will peak and then decline. These predictions are based on the current policy settings of governments. “If countries deliver on their national energy and climate pledges on time and in full, clean energy progress would move even faster. However, even stronger measures would still be needed to keep alive the goal of limiting global warming to 1.5 °C.” *

*Press release, [“The energy world is set to change significantly by 2030, based on today’s policy settings alone,”](#) International Energy Agency, October 24, 2023; International Energy Agency, [World Energy Outlook 2023](#), October 24, 2023. See also, Jillian Ambrose, [“‘Beginning of the end’ of fossil fuel era approaching, says IEA,”](#) *The Guardian*, September 12, 2023; but see a dissenting opinion: George Will, [“The fossil fuel era isn’t done yet, not by a long shot,”](#) *Washington Post*, November 10, 2023.

2023 (October)

Updated carbon budget analysis concludes that we will have only a 50/50 chance of keeping warming below 1.5 °C in six years.

The “carbon budget” is an estimate of the greenhouse gas emissions humans can afford to produce before the internationally agreed warming goal of 1.5 °C above pre-industrial times is exceeded. The latest update indicates that the budget continues to shrink. Researchers, publishing in *Nature Climate Change*, conclude: “the RCB [remaining carbon budget] for a 50% chance of keeping warming to 1.5 °C is around 250 GtCO₂ as of January 2023, equal to around six years of current CO₂ emissions... Key uncertainties affecting RCB estimates are the contribution of non-CO₂ emissions [such as methane], which depends on socioeconomic projections as much as on geophysical uncertainty, and potential warming after net zero CO₂.”*As Damian Carrington reported in *The Guardian*: “Global emissions are expected to reach a record high this year of about 40bn tonnes. To retain the 50% chance of a 1.5C limit, emissions would have to plunge to net zero by 2034, far faster than even the most radical scenarios. The current UN ambition is to cut emissions by half by 2030 and reach net zero by 2050, although existing policies are far from delivering this ambition. If it was achieved, however, it would mean only about a 40% chance of staying below 1.5C, the scientists said, so breaking the limit would be more likely than not.”**

*Robin Lamboll et al., [“Assessing the size and uncertainty of remaining carbon budgets.”](#) *Nature Climate Change* 13, 1360-1367, October 30, 2023.

**Damian Carrington, [“Climate crisis: carbon emissions budget is now tiny, scientists say.”](#) *The Guardian*, October 30, 2024.

2023 (November)

James Hansen study dismisses the possibility of keeping warming under the 1.5°C Paris Agreement ceiling, even in the near future

Former NASA scientist James Hansen is no stranger to startling predictions that come true. He predicted in *Science* in 1981 (accurately) that the Northwest Passage would open in the 21st century as a result of the “Climate impact of increasing atmospheric carbon dioxide” [1981], and delivered riveting testimony before Congress during a hot summer in 1988, stating that “the greenhouse effect is already large enough to begin to affect the probability of extreme events such as summer heatwaves.” [1988 (June)] Hansen, now a director at the Earth Institute at Columbia University, teamed up with scientists around the world to publish a study concluding that “Under the current geopolitical approach to GHG emissions, global warming will likely pierce the 1.5°C ceiling in the 2020s and 2°C before 2050. Impacts on people and nature will accelerate as global warming pumps up hydrologic extremes. The enormity of consequences demands a return to Holocene-level global temperature.” * Hansen stated in a telephone interview with reporters: “The 1.5-degree limit is deader than a doornail... In the next several months, we’re going to go well above 1.5C [Celsius] on a 12-month average. ... For the rest of this decade, the average is going to be at least 1.5.”** About two weeks after publication of the study, preliminary data on global temperatures will conclude that, for November 17, the entire planet averaged more than 2°C (3.6 degrees Fahrenheit) above the preindustrial benchmark.***

*James Hansen, et al., [“Global warming in the pipeline.”](#) Oxford Open Climate Change, *Volume 3, Issue 1*, November 2, 2023.

** Kasha Patel and Shannon Osaka, [“Famed climate scientist has a new, dire prediction.”](#) *Washington Post*, November 2, 2023. See also, James Hansen, et al., [“How We Know that Global Warming is Accelerating and that the Goal of the Paris Agreement is Dead.”](#)

newsletter, November 10, 2023; Chelsea Harvey, [“Earth Reacts to Greenhouse Gases More Strongly Than We Thought.”](#) *E&E News Climatewire*, November 3, 2023.

***Scott Dance, [“Earth passed a feared global warming milestone Friday, at least briefly.”](#) *Washington Post*, November 19, 2023.

2023 (November)

UN Emissions Gap report finds continued failure to progress toward Paris Agreement climate goals

Depressingly titled “Emissions Gap Report 2023: Broken Record – Temperatures hit new highs, yet world fails to cut emissions (again),” the annual report of the United Nations Environment Programme (UNEP) on progress in reducing global greenhouse gas emissions offers no more hope of warding off catastrophic climate consequences than the previous two reports [2022 (October), 2021 (October)]. Last year’s report concluded that nations’ strongest pledges would put the planet on a path to warm by 2.4C (4.3F) by the end of the century; this year upped that figure to 2.5C. “As things stand, fully implementing unconditional Nationally Determined Contributions (NDCs) [nonbinding pledges] made under the Paris Agreement would put the world on track for limiting temperature rise to 2.9°C above pre-industrial levels this century. Fully implementing conditional NDCs [nonbinding pledges that require international assistance to achieve] would lower this to 2.5°C.”*

*United Nations Environment Programme, [“Emissions Gap Report 2023: Broken Record – Temperatures hit new highs, yet world fails to cut emissions \(again\).”](#) November 20, 2023; see also Maxine Joselow, [“Three surprising findings in the latest U.N. emissions report.”](#) *The Climate 202* newsletter, November 20, 2023.

2023 (November)

UN Production Gap Report delivers another failing grade on governments’ policies to promote expansion of fossil fuels

The U.N. Environment Programme’s Production Gap report, prepared in collaboration with five other research and academic institutions, was initiated in 2019 to measure the misalignment between governments’ planned fossil fuel production and global production levels consistent with limiting global warming to 1.5°C or 2°C. [2019 (November)]. The findings in the current report include: “Taken together, government plans and projections would lead to an increase in global coal production until 2030, and in global oil and gas production until at least 2050. This conflicts with government commitments under the Paris Agreement, and clashes with expectations that global demand for coal, oil, and gas will peak within this decade even without new policies”; “Given risks and uncertainties of Carbon Capture and Storage and Carbon Dioxide Removal, countries should aim for a near total phase-out of coal production and use by 2040 and a combined reduction in oil and gas production and use by three-quarters by 2050 from 2020 levels, at a minimum. The potential failure of these measures to become sufficiently viable at scale, the non-climatic near-term harms of fossil fuels, and other lines of evidence, call for an even more rapid global phase-out of all fossil fuels.” * [2023 (August), CDR; 2023 (May), CCS]

*United Nations Environment Programme, [“The Production Gap.”](#) November 8, 2023. See also the UNEP’s [“Adaptation Gap Report: 2023: Underfinanced. Underprepared – Inadequate investment and planning on climate adaptation leaves world exposed.”](#) November 2, 2023; Sara Schonhardt, [“Rich Countries Owe More Than Ever in Climate Adaptation Funding.”](#) *E&E News Climatewire*, November 2, 2023.

2023 (November)

The Fifth National Climate Assessment notes that U.S. emissions have fallen since peaking in 2007, but substantial cuts are required here and around the planet to avoid severe risks

The National Climate Assessment is a congressionally mandated interagency effort that “provides the scientific foundation to support informed decision-making across the United States.” The last report was the 2017 assessment under the Trump administration. [2017 (November)] The good news is that “As US emissions have declined from their peak in 2007, the country has also seen sustained reductions in the amount of energy required for a given quantity of economic activity and the emissions produced per unit of energy consumed. Meanwhile, both population and per capita GDP have continued to grow.... [W]ind and solar energy costs dropped 70% and 90%, respectively, over the last decade, while 80% of new generation capacity in 2020 came from renewable sources...Efforts to adapt to climate change and reduce net greenhouse gas emissions are underway in every US region and have expanded since 2018.” But “while US greenhouse gas emissions are falling, the current rate of decline is not sufficient to meet national and international climate commitments and goals. US net greenhouse gas emissions remain substantial and would have to decline by more than 6% per year on average, reaching net-zero emissions around midcentury, to meet current national mitigation targets and international temperature goals; by comparison, US greenhouse gas emissions decreased by less than 1% per year on average between 2005 and 2019....Global greenhouse gas emissions from human activities continue to increase, resulting in rapid warming and other large-scale changes, including rising sea levels, melting ice, ocean warming and acidification, changing rainfall patterns, and shifts in timing of seasonal events. Many of the climate conditions and impacts people are experiencing today are unprecedented for thousands of years.” * In one important respect, this report is markedly different from its predecessors. *Inside Climate News* observes that “Previous assessments ...often approached the inequitable outcomes of the climate crisis as an afterthought, mentioning ‘social justice,’ ‘climate justice’ or ‘environmental justice’ just a little over a dozen times total in documents that were hundreds of pages long. By contrast, the Fifth National Climate Assessment discusses social, economic and health inequities throughout the entire report and even dedicates a chapter to “social systems and justice,” noting that societal factors, including historic racism, have shaped the climate reality experienced by many low-income families and communities of color today.” **

*A.R. Crimmins, et al., [Fifth National Climate Assessment](#), U.S. Global Change Research Program, Washington, D.C., November 14, 2023.

**Kristoffer Tigue, et al., [“Environmental Justice a Key Theme Throughout Biden’s National Climate Assessment.”](#) *Inside Climate News*, November 14, 2023.

2023 (November)

Scientists discover a way to convert carbon dioxide into “a powdery, harmless fuel that could be converted into clean electricity,” and can be stored safely for decades

It may sound too good to be true, but the report comes from a team of researchers from MIT and Harvard, led by MIT professor Ju Li, and is published in the journal *Cell Reports Physical*

Science. Reported in *E&E News Climatewire*, as reprinted in *Scientific American*, the researchers “exposed CO₂ to catalysts and then electrolysis that turns the gas into a powder called sodium formate, which can be safely stored for decades... Researchers have previously turned CO₂ into fuels that required too much energy to make, or were difficult to store long term. The MIT process gets closer to an ambitious dream: turning captured CO₂ into a feedstock for clean fuel that replaces conventional batteries and stores electricity for months or years. That could fill gaps in the nation’s power grids as they transition from fossil fuels to intermittent solar and wind energy.” *Climatewire* quotes Li: “I think we have a big break here... I could leave 10 tons of this stuff to my granddaughter for 50 years.” The next step: “‘There is this valley of death,’ Li noted, using a term scientists often use to describe the difficult process of scaling up a laboratory solution into a commercial product.” Li is in discussions with commercial companies and “exploring ways heavy industries might use it to meet company CO₂ emission reduction goals.”*

*Zhen Zhang, et al., [“A carbon-efficient bicarbonate electrolyzer.”](#) *Cell Reports Physical Science*, Volume 4, Issue 11, November 15, 2023; John Fialka, [“Scientist Discover How to Convert CO₂ into Powder That Can Be Stored for Decades.”](#) *E&E News Climatewire*, December 20, 2023.

2023 (November)

U.S. and China pledge to work together more closely to fight climate change

In a warm-up for the first meeting between President Biden and President Xi Jinping in a year fraught with increasing tensions, US and China climate envoys John Kerry and Xie Zhenhua appear to have found some common ground in California. The *Guardian* reports that in a joint statement they “pledged to make a success of a crucial UN climate summit starting at the end of this month in Dubai and recommitted to the 2015 Paris climate accord goals of holding global heating to ‘well below’ 2C, while pursuing efforts to limit the increase to 1.5C. ‘The United States and China recognise that the climate crisis has increasingly affected countries around the world... They will work together ... to rise up to one of the greatest challenges of our time for present and future generations of humankind.’... One of the most notable features in the climate statement was that both countries would commit to ‘economy-wide’ nationally determined contributions (NDCs) across all greenhouse gases, not just CO₂. China has previously resisted the idea of specifying which parts of the economy would be covered by its climate pledges.”*

*Amy Hawkins, [“China and US pledge to fight climate crisis ahead of Xi-Biden summit.”](#) *The Guardian*, November 14, 2023.

2023 (November)

Oxfam releases report described in the *Guardian* as “the most comprehensive study of global climate inequality ever undertaken”

Some of the conclusions of *Climate Equality: A planet for the 99%*: “The richest 1 percent (77 million people) were responsible for 16 percent of global consumption emissions in 2019 —more than all car and road transport emissions. The richest 10 percent accounted for half (50 percent) of emissions. It would take about 1,500 years for someone in the bottom 99 percent to produce as much carbon as the richest billionaires do in a year. Every year, the emissions of the richest 1 percent cancel out the carbon savings coming from nearly one million wind turbines. Since the

1990s, the richest 1 percent have used up twice as much of the carbon we have left to burn without increasing global temperatures above the safe limit of 1.5°C than the poorest half of humanity.”

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*Press release, [“Richest 1% emit as much planet-heating pollution as two-thirds of humanity.”](#) Oxfam International, November 20, 2023; Oxfam International, [“Climate Equality: A planet for the 99%.”](#) November 20, 2023; Jonathan Watts, [“Richest 1% account for more carbon emissions than poorest 66%, report says.”](#) *The Guardian*, November 19, 2023.

2023 (December)

UNFCCC Conference of Parties (COP28) meets in Dubai, U.A.E.

Arguably no previous COP has faced more formidable geopolitical challenges: energy and food security threats from the Russian invasion of Ukraine [2022 February]; emerging war in the Middle East; a reinvigorated U.S. Republican extreme right, aiming to recapture the White House for Donald Trump, setting its sights on a broad attack on climate policy and science education [2023 (August)]; years-long drought in Africa [2023 (April)] and ravages of record breaking storms and heat around the world [see 2023 weather recap, below]; science marching ahead with ever more dire data; and Mother Nature warning as clearly as she could about accelerating change. The meeting was undermined even before it began by revelations from the UK Centre for Climate Reporting that COP host country United Arab Emirates and conference chair Sultan Al-Jaber, president of the U.A.E. national oil company Adnoc, were circulating talking points to promote oil and gas deals at the meeting. Reports the *New York Times*, “It remains unclear how many of the talking points were ultimately raised at meetings. But the revelations threatened to make it even more difficult for negotiators to trust each other, and deflated hopes of progress before the summit even begins.”* A related disclosure by the Center for Climate Research showed “the UAE’s close ally, Saudi Arabia, hard at work on an Oil Development Sustainability Programme which involved hooking African and Asian nations on fossil fuels.”** Concern over COP27, where more than “600 lobbyists for petro-industrial interests dwarfed the delegations from many countries,” led to a new policy requiring disclosure of affiliation on name badges and public listings.*** More concern about conference leadership erupted when a video circulated of a live discussion with Mary Robinson, former UN Special Envoy for Climate, in which Al-Jaber stated that “There is no science out there, or no scenario out there, that says that the phaseout of fossil fuel is what’s going to achieve 1.5°C.”**** Then, former Trump White House climate adviser George David Banks, attending Dubai with a group of Republican lawmakers, “predicted in an interview that Trump would use a second term to again withdraw the United States from the Paris climate accord.”***** Nonetheless, COP 28 took some steps forward. Member states announced on the first day of the meeting an agreement on the structure and initial pledges to the “loss and damage” fund approved at COP 27 in Egypt [2022 (November)]. The United Arab Emirates and Germany each pledged \$100 million to the fund; the U.S. committed \$17.5 million. *U.S. News & World Report* observes that “Despite being top contributors to global carbon emissions...China and India have not announced plans to contribute to the ‘loss and damage’ fund, and reportedly have argued they would qualify to receive funds as developing countries, according to the BBC.”***** Most remarked about, and perhaps indeed remarkable, is the conclusion of the summit, in overtime. As Elizabeth Kolbert reports in *The New Yorker*, Al Jaber submitted draft text under Article II A, where “nations were exhorted to take steps to reduce

greenhouse-gas emissions, including ‘transitioning away from fossil fuels in energy systems, in a just, orderly and equitable manner.’ By this point, the session had already gone into overtime, and the new draft, dubbed the U.A.E. Consensus, was quickly adopted. Al Jaber declared the deal ‘historic,’ adding, ‘We have delivered a paradigm shift.’” Kolbert comments: “The most upbeat assessments held that the agreement would send a strong signal—to politicians, to investors, and to activists. ... But how is it possible that twenty-eight negotiating sessions were needed to agree on what has been self-evident all along, which is that dealing with climate change will require phasing out or transitioning away from fossil fuels? It is this question which brings us to possibility No. 2: ‘That this deal has been hailed as a landmark is more a measure of previous failures,’ is how James Dyke, the assistant director of the Global Systems Institute, at Britain’s University of Exeter, put it.”*****

*Manuela Andreoni, [“Using climate talks to sell fossil fuels,”](#) Climate Forward newsletter, *New York Times*, November 28, 2023.

**Bill McKibben, [“A Corrupted COP,”](#) *The Crucial Years* newsletter, November 28, 2023.

***Bob Berwyn, [“UN Adds New Disclosure Requirements For Upcoming COP28, Acknowledging the Toll of Corporate Lobbying,”](#) *Inside Climate News*, June 18, 2023.

****Mitchell Beer, [“‘No Science’ Linking Fossil Fuel Phaseout to 1.5°C target, Al Jaber Claims in ‘Ill-Tempered’ Video,”](#) *The Energy Mix*, December 3, 2023.

*****Maxine Joselow and Timothy Puko, [“Specter of second Trump term looms over global climate talks,”](#) *Washington Post*, December 11, 2023.

*****Julia Haines, [“What Countries Have Pledged to the ‘Loss and Damage’ Climate Change Fund,”](#) *U.S. News & World Report*, December 12, 2023.

*****Elizabeth Kolbert, [“What Did COP28 Really Accomplish?”](#) *The New Yorker*, December 13, 2023.

2023 (December)

Biden administration EPA releases final methane rules at COP28

More than three years in the making, and reflecting growing understanding of the outsized impact on climate change from methane leakage from oil and gas facilities [2023 (May), LNG and leakage studies], the rule is much tougher than the Obama era regulation. The rule aims, the EPA states, “to prevent 1.5 billion metric tons of greenhouse gas emissions, and deliver billions of dollars in health and economic benefits.” Unlike the Obama regulation which set standards for only new sources, this regulation covers “hundreds of thousands of existing sources nationwide, promot[ing] the use of cutting-edge methane detection technologies... In 2030 alone, the expected reductions are equivalent to 130 million metric tons of carbon dioxide – more than the annual emissions from 28 million gasoline cars. The rule would achieve a nearly 80 percent reduction below the future methane emissions expected without the rule. These reductions are greater than what was projected for the 2022 and 2021 proposals, thanks to changes that strengthen provisions to limit wasteful, polluting flaring of natural gas and analytical updates that better capture the impacts of this rulemaking.”*As *Climatewire* explained the rule’s new approach to flaring: “Environmentalists cheered the final rule’s tougher stance on routine flaring. Last year’s draft allowed producers to continue the practice of burning off gas at oil wells if an engineer certified that it would be technically infeasible or unsafe to retrofit with the equipment needed to utilize the gas, transport it to market or reinject it. Flaring turns methane gas into CO₂, reducing the amount of heat it traps. But research shows that flares frequently malfunction, spewing methane into the atmosphere. The final rule includes a near-total ban on flaring at newer facilities except

in emergencies. But it gives companies two years to retrofit their operations before the ban would take effect — a nod to industry concerns that an immediate ban would lead to a run on equipment. And it allows some older, low-emitting wells to continue to burn off gas.”** When *Scientific American* summarized this and President Biden’s most important other accomplishments on climate and environmental justice in 2023, the journal noted: “The durability of this progress made under Biden will depend in large part on how the 2024 election shakes out because Republican candidates have vowed to try to undo many of his efforts. But if all goes right, the country could still meet his goal of reducing U.S. emission by half.”***

*Press release, [“Biden-Harris Administration Finalizes Standards to Slash Methane Pollution, Combat Climate Change, Protect Health, and Bolster American Innovation.”](#) Environmental Protection Agency, December 2, 2023.

**Jean Chemnick, [“New EPA Methane Rule Will Slash Emissions from Oil and Gas.”](#) *E&E News/Climatewire*, December 4, 2023.

***Andrea Thompson, [“The Most Important Climate Stories of 2023 Aren't All Bad News.”](#) *Scientific American*, December 27, 2023.

2023 (December)

2023 is officially the hottest year on record

As reported in *Science*, “It comes as no surprise to anyone who sweated through it: 2023 was the hottest year in human history. Average surface temperatures rose nearly 0.2°C above the previous record, set in 2016, to 1.48°C over preindustrial levels, the European Union’s Copernicus Climate Change Service reported today. ... The extreme conditions are a ‘dramatic testimony of how far we now are from the climate in which our civilization developed,’ said Carlo Buontempo, Copernicus’s director, in a statement.”* Just a sliver under, then, the “stretch” goal of the Paris Climate Agreement to limiting warming to under 1.5°C. In October, Ian Livingston in the *Washington Post* presented five charts that help readers grasp the enormity of this record-breaking year: globally, “no previous September was close to as warm as last month — which was 0.93 degrees Celsius above normal;” Miami had so far “registered 175 hours with a heat index — how hot it feels factoring in humidity — of 105 or greater. That’s more than three times the previous record;” by the end of the season in October, “more than 45 million acres in Canada had gone up in smoke, an area more than double the previous record;” “global oceans have run incomprehensibly warm for most of the year” (Livingston cites a July article reporting that “The North Atlantic has baked in record daily warmth every day since early March. With the average sea surface temperature in this region now approaching 77 degrees Fahrenheit, as hot as it’s ever been and more than 2.5 degrees above average, the North Atlantic has warmed almost beyond the most extreme predictions of climate models.”); total area of global sea ice, critical to keeping the planet’s heat in check, “has descended to its lowest level in the satellite record.”** The warming has had “cascading effects” for the indigenous communities and wildlife across the Arctic.*** In July, the *Washington Post* reports, “China set an all-time high of nearly 126 degrees Fahrenheit, while Death Valley hit 128 degrees, two shy of the highest reliably measured temperature on Earth. Phoenix experienced a record-breaking 19th consecutive day at or above 110 degrees Tuesday. And in the Middle East, the heat index reached 152 degrees, nearing — or surpassing — levels thought to be the most intense the human body can withstand.”**** In August, Hawaii sustained one of the deadliest wildfires in US history, climate change turning a lush state into a “tinder box.”***** The NOAA annual analysis of billion-dollar U.S. weather and climate disasters concludes: “The cost of the 19 severe storm events in 2023 was \$54 billion, setting a new record for costliest year on record for that peril (previous record: \$44 billion in 2011). The

most expensive disaster of 2023, the \$14.5 billion drought and heatwave that affected much of the South and Midwest, ranked as the nation's seventh-costliest drought since 1980. Billion-dollar events now account for over 85% of the total U.S. losses for all weather-related disasters; this fraction was just 75% in 1980-2000."*****

*Paul Voosen, "[2023 was the hottest year on record—and even hotter than expected.](#)" *Science* news, January 9, 2024; see also *Science* Special Issue "[An Unhealthy Climate.](#)" vol. 381 issue 6665, 1386-1407, September 26, 2023.

**Ian Livingston, "[Earth's climate shatters heat records. These 5 charts show how.](#)" *Washington Post*, October 24, 2023; Tim Meko and Dan Stillman, "[Ocean temperatures are off the charts. Here's where they're highest.](#)" *Washington Post*, July 28, 2023.

*** Rick Thoman, Matthew L. Druckenmiller, Twila A. Moon, "[From Wildfires to Melting Sea Ice, the Warmest Summer on Record Has Had Cascading Effects across the Arctic.](#)" *Scientific American*, January 10, 2024.

****Scott Dance, "[The heat index reached 152 degrees in the Middle East — nearly at the limit for human survival.](#)" July 18, 2023.

***** Christopher Flavelle and Manuela Andreoni, "[How Climate Change Turned Lush Hawaii Into a Tinderbox.](#)" *New York Times*, August 14, 2023.

*****National Oceanic and Atmospheric Administration, "[Billion-Dollar Weather and Climate Disasters](#)," March 8, 2024; Jeff Masters and Bob Hensen, "[U.S. billion-dollar weather disasters set an all-time record in 2023, with 28.](#)" *Yale Climate Connections*, January 9, 2024.