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VICE RANKING MEMBER
COMMITTEE ON
SCIENCE, SPACE, AND TECHNOLOGY

COMMITTEE ON NATURAL RESOURCES

JOINT ECONOMIC COMMITTEE

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April 11, 2017

Dear Chairman Smith:

At the House Science, Space, and Technology hearing titled *Climate Science: Assumptions, Policy, Implications, and Scientific Method* on March 29, 2017, a number of false or misleading statements were made. Since I have been a member of the House Science Committee, I have been increasingly concerned by sweeping statements and allegations not supported by accepted science or fact made by Majority Members and witnesses. It is hard not to conclude that these misleading statements are an attempt to attack the scientific consensus of climate change and undermine climate science.

As part of the hearing record, I am enclosing a number of comments submitted to my office from several scientists and experts that attempt to correct the record. A sampling of these "fact checks" follows:

Claim: On page 11 of Dr. John Christy's written testimony he states, "Consensus, however, is a political notion, not a scientific notion."

Fact: Numerous peer-reviewed studies show that climate experts are in almost unanimous agreement that humans are the dominant cause of modern climate change. The most recent review (Cook et al., 2016) of these various studies found: "We examine the available studies and conclude that the finding of 97% consensus in published climate research is robust and consistent with other surveys of climate scientists and peer-reviewed studies."
http://iopscience.iop.org/article/10.1088/1748-9326/11/4/048002

- Submitted by Scott A Mandia, Asst. Chair & Professor of Physical Sciences, Suffolk County Community College, American Geophysical Union Fellow and recipient of the 2014 American Geophysical Union Ambassador Award

Claim: "That is not known as an objective writer or magazine." – Chairman Lamar Smith, referring to the journal of Science.

Fact: As *Science* is one of the oldest and most widely-respected scientific publications in the world, scientists and journalists (and audible members of the hearing's viewing gallery) were shocked by Smith's allegation that the outlet, or its writers, were not objective. Originally founded with financial help from Alexander Graham Bell, the periodical has been in continuous publication since 9 February 1883, as discussed in a history of its origins.

Among the numerous monumentally significant papers published in the journal are Albert Einstein's formulation of gravitational lensing, the complete map of the entire human genome, the first evidence of a link between HIV and AIDS, and numerous Nobel Prize winning discoveries. Based on a combination of factors (including the number of times its papers are cited), *Science* is consistently ranked (including by the NIH, an organization over which Smith's committee has jurisdiction) as being among highest-impact journals in all of science.

- Snopes, *Chair of House Science Committee Says the Journal 'Science' Is Not Objective,* March 29, 2017, by Alex Kasprak

Claim: Professor Curry's claim that climate scientists ignore or underplay key uncertainties.

Fact: This claim is simply untrue. Let me give you an example from climate change detection and attribution ("D&A") research. In D&A studies, we routinely consider uncertainties in computer model estimates of the climate change "signal" (the climate response to changes in external factors, such as human-caused changes in greenhouse gases) and to uncertainties in estimates of the "noise" of natural climate variability. We routinely consider uncertainties in the climate observations themselves. We routinely examine whether our ability to identify human-caused "fingerprints" is sensitive to such model and data uncertainties, or is affected by the statistical choices we make in comparing simulations and observations. A paper published in PNAS, Proceedings of the National Academy of Sciences, in 2009 provides one of many possible examples of how scientists address such uncertainties in a thorough and responsible way.

- Submitted by Benjamin D. Santer, Ph.D., Atmospheric Scientist in the Program for Climate Model Diagnosis and Intercomparison, Lawrence Livermore National Laboratory (LLNL), Livermore, California

Sincerely,

Donald S. Beyer Jr.
Member of Congress

Response to Congressional Hearing
Naomi Oreskes
Professor
Departments of the History of Science and Earth and Planetary Sciences
Harvard University
10 April 2017

Among climate scientists, "refutation fatigue" has set in. Over the past two decades, scientists have spent so much time and effort refuting the misperceptions, misrepresentations and in some cases outright lies that they scarcely have the energy to do so yet again.[1] The persistence of climate change denial in the face of the efforts of the scientific community to explain both what we know and how we know it is a clear demonstration that this denial represents the willful rejection of the findings of modern science. It is, as I have argued elsewhere, *implicatory denial*.[2] Representative Smith and his colleagues reject the reality of anthropogenic climate change because they dislike its implications for their economic interests (or those of their political allies), their ideology, and/or their world-view. They refuse to accept that we have a problem that needs to be fixed, so they reject the science that revealed the problem.

Denial makes a poor basis for public policy. In the mid-century, denial of the Nazi threat played a key role in the policy of appeasement that emboldened Adolf Hitler. Denial also played a role in the neglect of intelligence information which, if heeded, could have enabled military officers to defend the Pacific Fleet against Japanese attack at Pearl Harbor. And denial played a major role in the long delay between when scientists demonstrated that tobacco use caused a variety of serious illnesses, including emphysema, heart disease, and lung cancer, and when Congress finally acted to protect the American people from a deadly but legal product.

A key element of the tobacco industry strategy was the recruitment of a handful of dissenting scientists willing to dispute the findings of epidemiologists, pathologists, and oncologists who had showed, in controlled studies and epidemiological investigations, that smoking posed a major threat to public health.[3] The tobacco industry was not especially clever: in any scientific discussion it is easy to find an individual, or an handful of individuals, whose views diverge from the mainstream and use them to create the impression of scientific debate. (As any professor knows, it is easy to confuse your students, harder to get them to understand complex matters.) The tobacco case is

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[1] Notable examples are The Royal Society, 2005, https://www.south-ayrshire.gov.uk/documents/royal%20soc%20guide%20to%20cc%20facts%20and%20fiction.pdf; the work of scientists at the web sites http://www.realclimate.org/ and Skeptical science.com, https://www.skepticalscience.com/; and : https://climate.nasa.gov/evidence/. Scientists at NASA have a particularly well-produced site aimed at children: https://climatekids.nasa.gov/climate-change-evidence/. See also my own work including Oreskes, Naomi, 2004. "The scientific consensus on climate change," *Science* 306: 1686; The American Denial of Global Warming 2007, https://www.youtube.com/watch?v=2T4UF_Rmlio; and Oreskes, Naomi and Erik M. Conway, 2010. *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming*. (New York: Bloomsbury Press.)

[2] Oreskes and Conway, *Merchants of Doubt.* See also David Michaels, 2008 Doubt is their Product (New York: Oxford University Press).

[3] Allan Brandt, 2007. The Cigarette Century (New York: Basic Books)

infamous not because it is unique, but because it was uniquely damaging: tobacco products took millions of American lives, and continue to take millions of lives every year around the globe.[4]

The individual scientists who worked with the tobacco industry—whatever their reasons, principled or pecuniary—were entitled to their views. But the American people were entitled to know the truth—that these views were not supported by the weight of scientific evidence. The American people were likewise entitled to have public health policy informed by truth—not falsehoods, resentment, or wishful thinking.

Given this, it serves little purpose to reiterate the various ways in which the claims of Drs. Pielke, Christy and Curry have already been many times refuted. However, it may be useful (1) to point out that their claims are contradictory and self-refuting, and (2) to note the absurdity of a Member of Congress who has no scientific training lecturing the scientific community about appropriate scientific method.

(1) Dr. Christy, Curry and Piekle's claims are contradictory and self-refuting

The witnesses in the recent hearing have on various occasions claimed both that there was no a consensus among their scientific colleagues, and that these same colleagues have bullied them and stifled dissent. Both of these claims might be false, but they cannot both be true. Either we have a scientific consensus, in which case the dismissal of competing views might occur on the grounds that further discussion of refuted claims is a waste of scarce scientific resources. Certainly, this has occurred in scientific communities in the past. Although it is by no means demonstrated that this has occurred, it would be consistent with normal scientific practice. On the other hand, if we do not have a scientific consensus, then notion of stifling "dissent" is incoherent.

In fact, both claims are false. The existence of a scientific consensus on anthropogenic climate change has been repeatedly documented quantitatively since my original article published in 2004.[5] Yet, despite this overwhelming consensus, all three of the witnesses have managed to get a hearing for their views in the scientific community. Indeed, I would argue that the scientific community—aware of the profound significance of the issue of anthropogenic climate change—has bent over backwards to consider possible alternatives and give a fair hearing to potentially refuting arguments. This suggestion is supported by the publication records of the three witnesses, all of whom have had many papers accepted in peer-reviewed journals, and in fact have extremely high citation indices. A quick search on Google Scholar shows that Dr. Christy has published scores of scientific papers with over 5000 citations, and an admirable H-index of 31. Dr. Curry has similarly published scores of papers with > 4800 citations; her H-index is 36. Dr. Pielke has a staggering citation level of >11,000; his H-index is also 36. These statistics prove that whatever the source of their discontent, it is not because their views have not had a sustained and substantial hearing.

It is true that the views of these witnesses have been criticized by colleagues, in some cases harshly so. But this is how science works: a scientist may propose, his or her colleagues dispose. Moreover, Drs. Christy, Curry and Pielke have all have harshly criticized the views of others, not only in the

[4] http://www.who.int/mediacentre/factsheets/fs339/en/

[5] Oreskes, Naomi, 2004. "The scientific consensus on climate change," *Science* 306: 1686;

halls of science, but in in blog posts, in opinion pieces, and in the halls of the U.S. Congress. If being publicly criticized means you have been bullied, then I, and many others in the scientific community, could say that we have been bullied by Dr. Curry. Personally, I do not say that: I say that we are both figures in a public debate, which at times gets heated.

(2) It is preposterous for a Member of Congress to instruct the scientific community about appropriate scientific method

Chairman Smith ended his (written) opening statement with these words: "Only when scientists follow the scientific method can policy-makers be confident that they are making the right decisions." But it is not for a Congressman to judge what constitutes appropriate scientific method; that is a task for scientists, and perhaps for historians and philosophers of science. Moreover, Chairman Smith has missed the point. Scientists are not "making decisions." Scientists are studying the natural world and reporting their findings. It is up to our leaders to make decisions, and as citizens we have the right to expect that those decisions be based on good information, not denial.

Four hundred years ago, the Catholic Church--at that time the governing body of the region of the world we now call Italy--put Galileo on trial for his scientific findings.[6] Galileo tried to defend himself by noting that he was not trying to usurp legitimate political or ecclesiastical authority; as he famously put it, science does not tell us how to go to heaven, but only how the heavens go. But just as Galileo recognized that it was not the role of scientists to determine how to rule civil society or the Church, so it was not the role of the Church or civil society to rule science. Despite what some people say or believe, climate scientists are not trying to tell us how to live, or to tell how Congress how to govern. They are only trying to tell us how the climate system works, and to explain to us the changes that are now underway--and are more or less sure to worsen--as a consequence of our activities unless we take steps to address them.

One of life's challenges is that we must rely on scientists to explain complex phenomena that we are not, otherwise, in a position to understand on our own. This was true in Galileo's day, and it is true, *a fortiori*, today. Frederick von Hayek is a hero to many conservatives today, and he noted in his important work *The Constitution of Liberty* that "civilization enable us constantly to profit from knowledge which we individually do not possess."[7] Science is the ultimate example of this. Science does not tell us what to do about climate change, but it does tell us that if we do not address it, some people will profit, but the great majority of us will suffer.

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[6] For a useful update from the Catholic perspective see http://www.catholiceducation.org/en/controversy/common-misconceptions/the-galileo-affair.html

[7] Frederick von Hayek, 1960. http://iea.org.uk/sites/default/files/publications/files/Hayek's%20Constitution%20of%20Liberty.pdf, quotation on p 25.

CLAIM:
Dr. John Christy made claims that climate models do not replicate observational data on page 4 of his written testimony.

SHORT ANSWER:
Dr. Christy continues to rely upon incorrect, misleading, and unpublished work to support his contrarian views on the climate. He claims, without merit, that models are running far warmer than measurements. He ignores the vast majority (99.8%) of the Earth's climate where models are in excellent agreement with measurements. Then, he conveniently combines multiple datasets into a single curve which hides the fact that his results are one fourth that of other groups. Finally, he appears to ignore all the other evidence from around the world about climate change. Simply put, Dr. Christy cherry-picked data to support his view but even his cherry-picked data are misleading."

LONG ANSWER:
"Dr. Christy is wrong and his presentation is misleading. First, why is it wrong? Climate models are one tool we use to predict the future climate – although not the only one. Climate models have actually underpredicted the rate of global warming.

For instance, a recently published peer-reviewed study showed climate models are underpredicting ocean warming (where 93% of the heat goes).

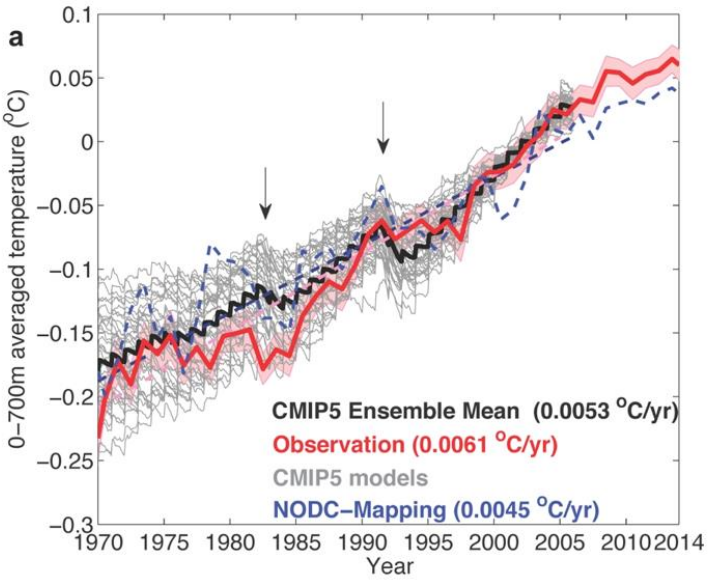

Figure 1. Comparison of measurements with model predictions (from L. Cheng, J. Zhu, and J.P. Abraham, Global Upper Ocean Heat Content Estimation: Recent Progresses and the Remaining Challenges, *Atmospheric and Oceanic Science Letters*, Vol. 8, pp. 333-338, 2015.)

Models are also underpredicting ice loss as well, for instance

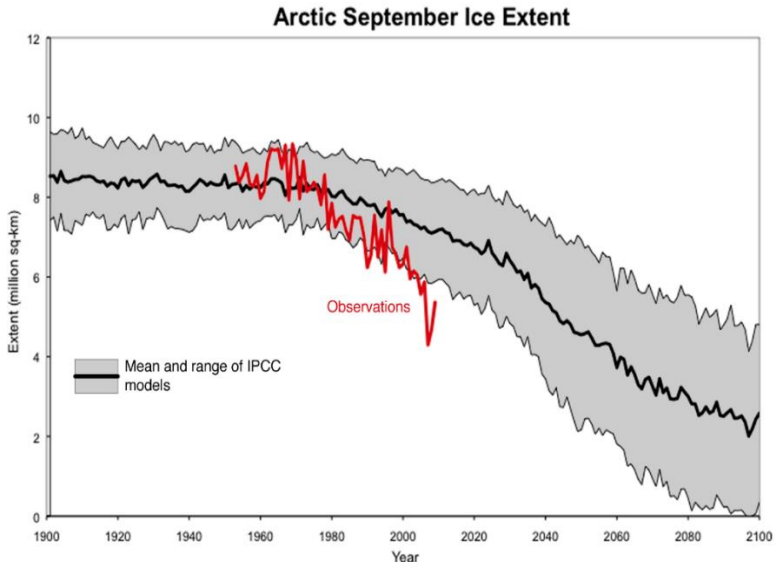

Figure 2. Comparison of predictions and observed Arctic ice loss (from Stroeve at el., 2007, available at http://nsidc.org/icelights/2011/02/23/is-dirty-air-adding-to-climate-change-2/.)

And models are dead on in predicting the rise of air temperatures near the Earth surface

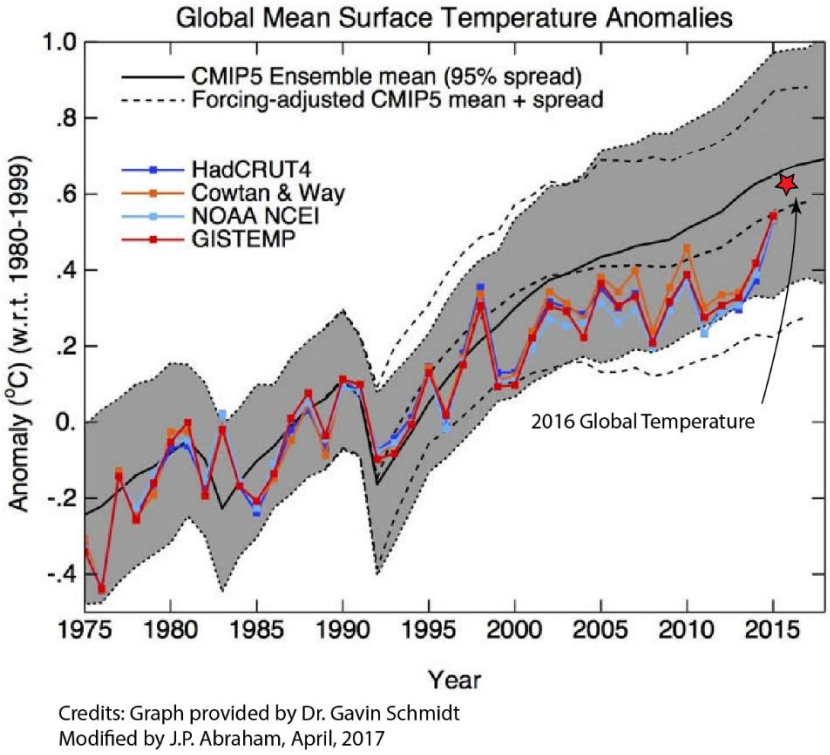

Figure 3. Comparison of Earth near-surface temperatures with climate models (Abraham, Cheng, Mann, in press).

So, models are getting it right. But what about Christy's graph shown below from Page 5 of his written testimony?

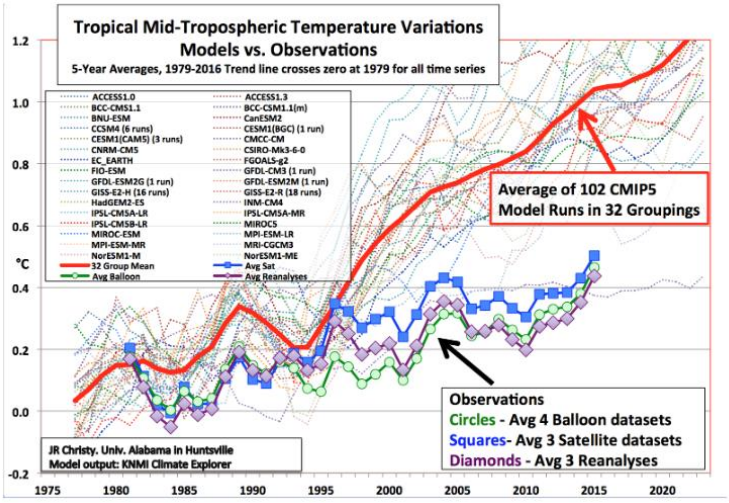

Figure 4. Figure 2 from John Christy Congressional testimony.

To get this figure and make his conclusions, he had to make two fundamental errors.

First, he had to neglect all oceans, lower atmosphere, ice, and land temperatures and only focus on a very small part of the atmosphere which has 0.2%. Yes, that is right, less than 1% of the Earth's climate system. The other parts of the system, the models are getting it right or underpredicting climate change.

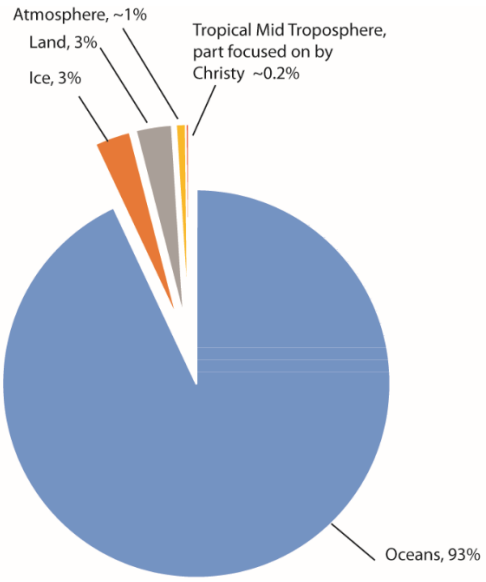

Figure5. Christy ignores 99.8% of climate.

Secondly, Christy combines multiple datasets into single symbols. This hides the fact that his own group's data is warming at less than 25% what some other data sets show!

Table 1 – Various warming rates of the mid-troposphere from different research groups (From Po-Chedley et al. 2015)

Group	**Warming rate (°C/decade)**
UW method 1	0.114
UW method 2	0.124
NOAA	0.105
RSS	0.089
UAH	0.029

Had Christy been more honest and plotted each set of satellite data, it would show that his work is an outlier and the other groups are much closer to the models.

Christy and his team have a many history of making errors that other researchers have had to correct. For instance, his lower tropospheric temperature measurements were originally reported to show that the earth was cooling in the mid to late 1990s. Other researchers found significant errors in his work and after multiple corrections, his data was brought into agreement with other teams. This history of errors and omissions explain why many scientists do not take Dr. Christy to be a credible source. Many scientists go their entire career without making significant errors such as those Christy has made in the past ~ 20 years."

John Abraham, PhD
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Throughout Dr. Judith Curry's written and verbal testimony she casts doubt on the overwhelming scientific consensus that humans are primarily responsible for modern climate change. In fact, she even states that this consensus is "manufactured" which to me in an assault on the integrity of the scientific process and scientists in general. She also targets the IPCC as if it were the only body reporting on the issue of climate change.

On page 11 of Dr. John Christy's written testimony he states, "Consensus, however, is a political notion, not a scientific notion." So we claim that the apple falls from a tree because of a political notion? Of course not! That is absurd, just as is Dr. Christy's statement.

Numerous peer-reviewed studies show that climate experts are in almost unanimous agreement that humans are the dominant cause of modern climate change. The most recent review (Cook et al., 2016) of these various studies found: "We examine the available studies and conclude that the finding of 97% consensus in published climate research is robust and consistent with other surveys of climate scientists and peer-reviewed studies."

http://iopscience.iop.org/article/10.1088/1748-9326/11/4/048002

President Abraham Lincoln formed the United States National Academy of Sciences in order to tap our country's foremost experts to respond to questions of science by Congress and The White House. A joint statement by the US National Academy of Sciences and the UK Royal Society also confirms that humans are responsible for modern day climate change:

"CLIMATE CHANGE IS ONE OF THE DEFINING ISSUES OF OUR TIME. It is now more certain than ever, based on many lines of evidence, that humans are changing Earth's climate. The atmosphere and oceans have warmed, accompanied by sea-level rise, a strong decline in Arctic sea ice, and other climate-related changes."

http://dels.nas.edu/resources/static-assets/exec-office-other/climate-change-QA.pdf

The United States military agrees:

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

2014 QDR

https://climateandsecurity.org/2014/03/04/climate-change-and-national-security-in-the-2014-quadrennial-defense-review/

Health officials agree:

Climate change is among the greatest health risks of the 21st Century. Rising temperatures and more extreme weather events cost lives directly, increase transmission and spread of infectious diseases, and undermine the environmental determinants of health, including clean air and water, and sufficient food.

At the same time, many of the same policy and technology choices that drive climate change, such as polluting energy sources and unsustainable transport systems, also have large immediate and local health impacts - most notably the more than seven million deaths that are caused each year by air pollution.

Addressing climate change is necessary – and is also a huge opportunity for public health. Stronger and more climate resilient health systems can save lives now, and protect from climate risks in the future. Taking health into account when choosing mitigation policies can reduce the growing burdens and financial costs of respiratory, heart and other non-communicable diseases."

World Health Organization

http://www.who.int/globalchange/mediacentre/news/global-programme/en/

Financial Risk Experts agree:

"Based on the changes in weather extremes, it can be predicted that the cost of climate change will be substantial, and that it will steadily rise unless hazard-specific adaptation measures are adopted. It is now an economic imperative to invest in mitigating the effects of greenhouse gases to slow the pace of climate change, and, thereby, achieve a long-term reduction in the economic impact from adaptation costs and losses. Even if global climate protection measures prove successful, a further increase in temperature can be expected in the medium term because greenhouse gases such as CO2 retain a climate-changing effect in the atmosphere over many decades. Preventive measures against natural catastrophes and adjustments to climate change are essential.

We are convinced that there are particular regions and hazards where climate change is already having a definite influence on losses. Significant effects have to be accounted for in risk management approaches of the insurance industry. Where necessary, allowances have already been made for changes in probability distributions of claims.

Since the influence of climate change increases with time, the insurance industry must recognize, quantify and make allowances for these changes over time in the form of risk-adequate pricing.

In the short term, (re)insurance prices are largely determined on the basis of supply and demand. In the long term, however, they reflect the calculated loss expectancy."

Munich RE

https://www.munichre.com/us/weather-resilience-and-protection/rise-weather/statement-climate-change/index.html

I suggest that our political leaders follow the lead of our military, health, and financial experts who make critical decisions based on the way things are and not based on the way they wish them to be.

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Suffolk County Community College
American Geophysical Union Fellow
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Dr. Curry indicated that she changed her mind about climate science after the emails leaked from the Climate Research Unit (CRU). She portraits the climate research community as uncritical servants for the UNFCCC/IPCC who may suffer from cognitive biases or "groupthink". She also thinks there still are too many key unknowns to conclude about climate change, that climate models are not reliable, and that an apparent anthropogenic warming trend may be due to natural variations.

My response:

- Investigations into the stolen and leaked emails from CRU have concluded no wrong-doing, and one cannot judge all of climate science from a limited circle of scientists and a few anecdotes - CRU is only a part of the scientific community.
- Dr. Curry's negative impression of the climate research community is entirely subjective because it is so large and complex that it's impossible to have a full overview. Her view is purely subjective, like everybody else's. Her concerns about cognitive biases contradicts scientists' dream to discover and publish findings which differ. Objective science is transparent where others can reproduce the results independently, which is generally the case in climate sciences.
- Dr. Curry's testimony is largely a general ramble on philosophy and lacks specific points on the weakness of our understanding of earth's climate.
- The IPCC does not do any research. It evaluates published science through assessment reports. Dr. Curry exaggerates and misrepresents the role of the UNFCCC and the IPCC.
- Climate models are extended versions of weather forecast models which successfully predict the weather (validated on a daily basis).
- Forecasts made at different times of the season and at different latitudes indicate that they are able to predict the systematic changes in weather caused by changes in the local energy balance due to solar inclination. Global warming is also due to a systematic change in the earth's energy balance.
- The climate models are able to reproduce the most important natural variations in climate. Some of them have been used in modern seasonal forecasts which predicted the 2015-2016 El Niño nine months in advance.
- It is true that there are a number of causes of climate change, including manmade causes. The amplitude of natural variations in climate depends on feedback processes that act to reinforce an initial change.
- Many of these feedbacks respond to changes in temperature (e.g. atmospheric moisture, snow/ice, biological response) and do not discriminate between natural fluctuations or forced changes. The presence of pronounced natural variations suggests strong amplifying feedbacks which also are expected to result in a high climate sensitivity. Strong natural fluctuations are indicators of high risks in terms of climate change.

During the testimony, Dr. Christy claimed that climate models are unable to simulate past changes based on a comparison between satellite/radiosonde/reanalysis data and model results for the tropical troposphere.
- "The traditional scientific method has not been consistently followed in todays pronouncement of climate change"
- "Deliberate consideration of the major influences by natural variability on the climate has been conspicuously absent in the current explanations of climate change by the well-funded climate science industry."
- "Multiple runs from a single institution's model category were averaged into a single time series here."

- “Is the red line significantly different from the others?”
- “… models, to varying degrees, are tuned to agree with the surface temperature observations already”

My response:

- Dr. Christy’s evaluation shows different quantities which are not directly comparable and not expected to follow each other. Averaging multiple runs from a single institution’s model in a comparison with observations implies comparing pears and apples. His statistical test of different trends between observations and model averages suffer from the same elementary mistake.
- The observed temperature evolution is not expected to follow average of a range of climate model results, just like any single simulation from the group is not expected to follow the average of the same group of climate model results.
- Dr. Christy’s evaluation used a selected region (20°S-20°N, 0-50,000ft) which does not have a clear relation to the global mean temperature, but is a limited region in the atmosphere which is strongly influenced by tropical cloud processes (the Hadley Cell) and the hydrological cycle.
- Our understanding of the clouds and the hydrological cycle is incomplete in terms of modeling, and hence the uncertainty surrounding climate sensitivity.
- One cannot falsify anthropogenic climate change by showing that climate models are inconsistent with the observations. It would only show that the climate models are inconsistent with observations. In some cases, the observations may be questionable.
- Satellites do not measure temperature directly, but measure (microwave) light emitted from oxygen molecules and use a model (algorithm) to estimate what temperatures would emit such light, taking into account different heights in the atmosphere and that some of the light might be absorbed or scattered. It is misleading to label one as ‘model’ and the other as ‘observations’ when both involve models with different levels of complexity.
- The curve representing the climate models in Dr. Christy’s graph seems to suggest a warming exceeding 1°C between 1979-2015. The same quantity seems to be lower in different independent analyses and more in line with the observations. The end-points of Dr. Christy’s curves spanning 1979-2016 with 5-year annual means should not be 1979 and 2016. These issues put the results into question, and it is important to see exactly how the curves were produced and the recipe behind the analysis.
- The disclosure of computer codes and data should be requirements for such testimonies and Dr. Christy’s claim “The traditional scientific method has not been consistently followed in todays pronouncement of climate change” makes this particularly appropriate.
- The tuning of models is not based on trends, and they have not been given the answer ahead of time.
- In Fig 5. Dr. Christy cherry-picks one region that supports his claim and excludes the data which contradicts his claim (the stratosphere). This is contrary to the scientific method.
- It is wrong to claim that the IPCC conclusions only rely on climate models and that changes in the sun can explain the recent warming.

Rasmus Benestad, Ph.D.
Senior Scientist
The Norwegian Meteorological Institute (MET Norway)
(personal views and may not necessarily represent those of MET Norway)

I wish to make four points in response to some of the statements made at the House Science, Space, and Technology hearing entitled "Climate Science: Assumptions, Policy, Implications, and Scientific Method," held on March 29, 2017.

The first notes a paper published in Journal of Climate earlier this year where I was lead author. This paper rebuts two key elements of testimony provided by John Christy at the December 2015 "Data or Dogma?" hearing in the U.S. Senate. It also rebuts an incorrect statement made by Senator Ted Cruz during the same Dec. 2015 hearing. The paper is relevant to the current (March 2017) hearing of the House Science, Space, and Technology Committee because Christy's new testimony simply repeats most of the elements of his Dec. 2015 testimony.

The second notes a piece of information is a paper published in Science in 2011. The paper is relevant to the discussion (during the March 2017 hearing of the House Science, Space, and Technology Committee) of the reproducibility of scientific results. The key point of the 2011 paper is that important aspects of the atmospheric temperature datasets developed by Prof. Christy and colleagues are irreproducible. Other research teams have not been able to replicate Christy's results. This was true not only in 2011. It remains true today (see, for example, the 2015 Journal of Climate paper by Po-Chedley et al.).

The third notes a piece of information relates to Professor Curry's claim that climate scientists ignore or underplay key uncertainties. This claim is simply untrue. Let me give you an example from climate change detection and attribution ("D&A") research. In D&A studies, we routinely consider uncertainties in computer model estimates of the climate change "signal" (the climate response to changes in external factors, such as human-caused changes in greenhouse gases) and to uncertainties in estimates of the "noise" of natural climate variability. We routinely consider uncertainties in the climate observations themselves. We routinely examine whether our ability to identify human-caused "fingerprints" is sensitive to such model and data uncertainties, or is affected by the statistical choices we make in comparing simulations and observations. The fourth appended paper (which was published in PNAS in 2009) provides one of many possible examples of how scientists address such uncertainties in a thorough and responsible way.

One final comment. At the March 2017 hearing, both Prof. Christy and Prof. Curry called for the introduction of a military-style "red team/blue team" approach to evaluate the credibility of IPCC and NAS climate science assessments. They argued that their own critical assessments of climate science had been ignored by the "mainstream" scientific community. In fact, the converse is true. I would argue that the "mainstream" scientific community has devoted an inordinate amount of time and energy to addressing the flawed claims of Prof. John Christy, Prof. Judith Curry, Prof. Dick Lindzen, Prof. Pat Michaels, and others. The flawed claims of these individuals have failed to pass rigorous scientific muster. In my opinion, what requires investigation is how individuals like Prof. John Christy have been able to present demonstrably incorrect information to Congress – again, and again, and again – without any professional consequences.

Benjamin D. Santer, Ph.D.
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The Honorable Lamar Smith
Chairman
Committee on Science, Space, and Technology
U.S. House of Representatives
Washington, D.C. 20515

Cc: Honorable Eddie Bernice Johnson
Ranking Member
Committee on Science, Space, and Technology

March 28, 2017

Dear Mr. Smith,

We are coauthors of the Fyfe *et al.* paper published in 2016 in *Nature Climate Change*.[1] You recently referenced this paper at a Subcommittee hearing on March 16, 2016.[2] We are writing to clarify what the Fyfe *et al*. paper actually finds and claims. We also want to ensure that the conclusions of the Fyfe *et al*. paper are not misconstrued as a criticism of Thomas Karl, of the Karl *et al.* paper published in *Science* in 2015,[3] or of the valuable research that Dr. Karl and his team have performed over many years.

Thomas Karl is a first-rate climate scientist. He served NOAA with distinction for decades. Dr. Karl and his colleagues at the National Center for Environmental Information (NCEI) developed rigorous scientific methods for estimating global changes in land and ocean surface temperatures. This is a critically important area of climate science.

NCEI made its surface temperature data sets freely available to the climate science community. This helped scientists around the world to conduct research on the size, rate, and causes of long-term temperature change, and helped to improve our knowledge of natural climate variability. NCEI temperature data are also key yardsticks for evaluating the performance of computer models of the climate system.

Science is dynamic, not static. All surface temperature data sets have evolved over time, as scientists found better ways of accounting for the effects of changes in measurement systems, measuring practices, and the geographical coverage of observations. Similar improvements have occurred in measurements of the heat content of the world's oceans, and in satellite estimates[4,5,6] of temperature change in Earth's atmosphere. The evolution of observed temperature data sets is a normal, on-going scientific process. It is not evidence of questionable behavior.

In their 2015 *Science* paper, Karl *et al*. identified changes in three different aspects of surface temperature measurement systems. These observing system changes must be addressed in order to reliably estimate the true, climate-related temperature signals in the data. After accounting for

the evolution of the measuring system, Karl *et al*. concluded that the rate of surface warming in the first 15 years of the 21st century was "at least as great as (in) the last half of the 20th century".

Fyfe *et al*. acknowledged the "high scientific value" of the work performed by Dr. Thomas Karl and his colleagues. We stand by our statement. It is of great benefit to understand how observational temperature data are affected by changing measurement systems. Karl *et al*. deserve credit for focusing attention on this issue, and for inspiring important research on the further improvement of surface temperature datasets.[7]

While Karl *et al*. focused on developing a better understanding of temperature observations, Fyfe *et al*. summarized and synthesized scientific understanding of decadal changes in warming arising from natural variability of the climate system. The emphasis in the Fyfe *et al*. paper was on studying internal variability (caused by phenomena like El Niños, La Niñas,[8] and the Interdecadal Pacific Oscillation[9,10,11,12]) and on assessing the effects of natural external changes in volcanic aerosols[13] and the Sun's energy output.[14]

Fyfe *et al*. found that the rate of temperature increase in the early 21st century was slower than during the latter part of the 20th century. Reduced warming was apparent in both surface observations and in satellite measurements of the temperature of Earth's lower atmosphere (the troposphere).

The bottom line is that Karl *et al*. and Fyfe *et al*. reached different conclusions regarding the warming rate in the early 21st century. This was largely due to different justifiable choices the two sets of authors made about the timescales and periods of interest. The Karl *et al*. finding – that the recent rate of surface warming is larger than in previous data sets – is supported by an independent study of surface temperature measurements.[7] Other sources of information support the Fyfe *et al*. finding of a reduced rate of surface warming in the early 21st century. These sources include independent satellite estimates of tropospheric temperature change, physical understanding of the waxing and waning of different "modes" of internal variability, and measurements of the changes over time in volcanic aerosols and the Sun.

All of the factors studied by Karl *et al*. and Fyfe *et al*. (changing observing systems, internal variability, and natural variations in the Sun and volcanoes) affect temperature records, and affect our interpretation of the size and significance of decade-to-decade changes in warming rate. The scientific challenge is to reliably quantify the contribution of each factor to short-term changes in warming rate.[15]

Finally, we would like to emphasize that Karl *et al*. and Fyfe *et al*. agree on the most important scientific points. We agree that human influence on climate is real, is large, and is ongoing. We agree that this influence is primarily due to fossil fuel burning, and to the resulting human-caused changes in atmospheric levels of heat-trapping greenhouse gases.[16] We agree that human-caused changes in greenhouse gases should lead – and do lead – to global-scale warming of Earth's atmosphere, oceans, and land surface.[17] We agree that we have identified large global warming signals in the observed surface temperature changes from the late 19th century to the present,[18] in the satellite atmospheric temperature data that have featured prominently in recent Congressional hearings,[19,20] and in ocean heat content measurements.[21]

And we agree with Karl *et al*. that on top of the underlying global-scale warming trend over the past 150 years, we should see – and do see – natural, decade-to-decade ups and downs caused by internal variability, volcanic activity, and changes in the Sun's energy output. These decade-to-decade fluctuations in warming are not a scientific surprise. They have been discussed at length in every national and international assessment of climate science. Sometimes the "ups" act in the same direction as human influences, leading to accelerated warming. Sometimes the "downs" lead to a short-term decrease in warming. Our disagreement with Karl *et al*. about the size of the most recent short-term fluctuation does not call into question the reality of long-term human-caused warming.

Sincerely,

Dr. Benjamin D. Santer
Lawrence Livermore National Laboratory

Dr. Matthew H. England
ARC Centre of Excellence for Climate System Science
University of New South Wales, Australia

Dr. Ed Hawkins
National Centre for Atmospheric Science
Dept. of Meteorology, University of Reading, UK

Prof. Michael E. Mann
Dept. of Meteorology and Earth and Environmental
Systems Institute, Pennsylvania State University

Dr. Gerald A. Meehl
National Center for Atmospheric Research

Dr. Yu Kosaka
Research Center for Advanced Science and Technology,
University of Tokyo, Japan

Dr. Shang-Ping Xie
Scripps Institution of Oceanography
University of California at San Diego

P.S.: We are also submitting a letter from our colleagues at the Canadian Centre for Climate Modelling and Analysis: Dr. John Fyfe, Dr. Greg Flato, Dr. Nathan Gillett, and Dr. Neil Swart. Dr. Fyfe was the lead author of the 2016 Fyfe *et al*. *Nature Climate Change* paper, and Drs. Flato, Gillett, and Swart are co-authors of the Fyfe *et al*. paper. All four of our colleagues affirm their scientific support for the statements we have made in our letter.

[1]Fyfe, J.C., G.A. Meehl, M.H. England, M.E. Mann, B.D. Santer, G.M. Flato, E. Hawkins, N.P. Gillett, S.-P. Xie, Y. Kosaka, and N.C. Swart, 2016: Making sense of the early 2000s global warming slowdown. *Nature Climate Change*, **6**, 224-228.

[2]https://science.house.gov/sites/republicans.science.house.gov/files/documents/HHRG-114-SY18-WState-S000583-20160316.pdf

[3]Karl, T.R., A. Arguez, B. Huang, J.H. Lawrimore, J.R. McMahon, M.J. Menne, T.C. Peterson, R.S. Vose, and H.-M. Zhang, 2015: Possible artifacts of data biases in the recent global surface warming hiatus. *Science*, **348**, 1469-1472.

[4]Santer, B.D., T.M.L. Wigley, and K.E. Taylor, 2011: The reproducibility of observational estimates of surface and atmospheric temperature change. *Science*, **334**, 1232-1233.

[5]Wentz, F.J., and M. Schabel, 1998: Effects of orbital decay on satellite-derived lower tropospheric temperature trends. *Nature*, **394**, 661-664.

[6]Mears, C. A., and F.J. Wentz, 2005: The effect of diurnal correction on satellite-derived lower tropospheric temperature. *Science*, **309**, 1548-1551.

[7]Hausfather, Z., K. Cowtan, D.C. Clarke, P. Jacobs, M. Richardson, and R. Rohde, 2017: Assessing recent warming using instrumentally homogeneous sea surface temperature records. *Sci. Adv.*, **3**, e1601207.

[8]Kosaka, Y., and S.-P. Xie, 2013: Recent global-warming hiatus tied to equatorial Pacific surface cooling. *Nature*, **501**, 403-407.

[9]Meehl, G.A., J.M. Arblaster, J.T. Fasullo, A. Hu, and K.E. Trenberth, 2011: Model-based evidence of deep-ocean heat uptake during surface-temperature hiatus periods. *Nature Climate Change*, **1**, 360-364.

[10]England, M.H., et al., 2014: Recent intensification of wind-driven circulation in the Pacific and the ongoing warming hiatus. *Nature Climate Change*, **4**, 222-227.

[11]Trenberth, K.E., 2015: Has there been a hiatus? *Science*, **349**, 791-792.

[12]Steinman, B.A., M.E. Mann, and S.K. Miller, 2015: Atlantic and Pacific multidecadal oscillations and Northern Hemisphere temperatures. *Science*, **347**, 988-991.

[13]Solomon, S., J.S. Daniel, R.R. Neely, J.-P. Vernier, E.G. Dutton, and L.W. Thomason, 2011: The persistently variable "background" stratospheric aerosol layer and global climate change. *Science*, **333**, 866-870.

[14]Kopp, G., and J.L. Lean, 2011: A new, lower value of total solar irradiance: Evidence and climate significance. *Geophysical Research Letters*, **38**, L01706, http://dx.doi.org/10.1029/2010GL045777.

[15]Flato, G.M., et al., 2013: Evaluation of climate models. In: *Climate Change 2013: The Physical Science Basis*. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Stocker, T.F., et al. (eds.), Cambridge University Press, pp. 741-866.

[16]The basis for our understanding of human-induced changes in climate stretches back to the 1850s, when carbon dioxide was first identified as a greenhouse gas. It is not a new development. Similarly, our observational understanding of large-scale temperature change dates back to the 1930s, when it was first shown that global land areas were warming (see ref. 17).

[17]Hawkins, E., and P.D. Jones, 2013: On increasing global temperatures: 75 years after Callendar. *Quarterly Journal of the Royal Meteorological Society*, **139**, 1961-1963.

[18]Bindoff, N. *et al*. Detection and attribution of climate change: from global to regional. In: *Climate Change 2013: The Physical Science Basis*. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Stocker, T.F., et al. (eds.), Cambridge University Press, 867-952.

[19]Santer, B.D., et al., 2013a: Identifying human influences on atmospheric temperature. *Proceedings of the National Academy of Sciences*, **110**, 26-33.

[20]Santer, B.D., et al., 2013b: Human and natural influences on the changing thermal structure of the atmosphere. *Proceedings of the National Academy of Sciences*, **110**, 17235-17240.

[21]Gleckler, P.J., et al., 2012: Robust evidence of human-induced global ocean warming on multi-decadal time scales. *Nature Climate Change*, **2**, 524-529.

Environment and Climate Change Canada
Environnement et Changement climatique Canada

Dr. Ben Santer
Lawrence Livermore National Laboratory

27 March 2017

Dear Dr. Santer,

As co-authors of the Fyfe *et al.* Commentary published in 2016 in *Nature Climate Change* we thank you for your letter clarifying what our Commentary actually says and does not say. We are in full agreement with your scientific characterization of our Commentary and how it pertains to the Karl *et al.* paper published in 2015 in *Science Magazine*.

As you correctly point out our Commentary reiterates that the rate of global surface temperature increase in the early-2000s was slower than during the latter part of the twentieth century. Our Commentary does not say that the recent correction to observations of surface temperature has led to disagreement over whether the human influence on climate change is real or ongoing. Nor does it say that that human-caused global warming has stopped, paused, or even slowed.

It is well understood that human influence has been the dominant cause of observed warming since the mid-20th century, and that future increases in greenhouse gases will lead to further warming. Nothing in our Commentary contradicts this understanding.

Sincerely,

John Fyfe

For Drs. John C. Fyfe, Gregory M. Flato, Nathan P. Gillett and Neil C. Swart.
The Canadian Centre for Climate Modelling and Analysis, Environment and Climate Change Canada

Canada

Scientists' reactions to House Science Committee hearing

Here is a list of scientists' comments in reaction to statements made during the House Committee on Science, Space, and Technology hearing held on March 29th

> "there is disagreement among scientists as to whether human-caused emissions of greenhouse gases is the dominant cause of recent warming, relative to natural causes" [Judith Curry]

Timothy Osborn (https://www.uea.ac.uk/environmental-sciences/people/profile/t-osborn), Professor of Climate Science, University of East Anglia:
This is incorrect: assessments of the cause of recent warming consistently find that greenhouse gases are the dominant cause of recent warming. These assessments consider other climate forcings, including natural effects (the most important ones on timescales of decades are variations in solar and volcanic activity) and human-caused aerosols, but the most likely effect of these other forcing would have been to cause global cooling in recent decades. Thus, there is agreement between scientists that the observed warming is due to human-caused emissions of greenhouse gases.

> "It is an empirical fact that the Earth's climate has warmed overall for at least the past century. However, we do not know how much humans have contributed to this warming and there is disagreement among scientists as to whether human-caused emissions of greenhouse gases is the dominant cause of recent warming, relative to natural causes" [Judith Curry]

Gavin Schmidt (https://www.giss.nasa.gov/staff/gschmidt/), Director, NASA Goddard Institute for Space Studies:
There is indeed overwhelming evidence for warming in the last

century. Curry's claim that no one knows the attribution of this to human impacts is not a valid description of the state of knowledge. There are indeed plenty of studies that use statistical or model-based fingerprints to assess this and they overwhelmingly find a dominance of human activities over natural forcings or internal variability. For the more recent period (1950 onwards) the claims are even stronger—that effectively all the warming is caused by human activity with only a ~10% uncertainty due to internal variability. One can always find something to disagree with in such a statement, but disagreement in the absence of any quantitative result to the contrary is not worth much. Curiously, the paper that Curry cites to claim a low sensitivity (Lewis and Curry, 2015) assumes that all the warming is human caused.

> "the models are simply too sensitive to the extra GHGs that are being added to both the model and the real world." [John Christy]

Victor Venema (http://www2.meteo.uni-bonn.de/mitarbeiter/venema/), Scientist, University of Bonn, Germany:
John Christy provides no evidence that the discrepancy is due to the models and not due to errors in his dataset. Or due to errors in the comparison.

Even if the reason were the climate models themselves, his claim that models are thus too sensitive to greenhouse gases is a second step into evidence-less territory. Without given any evidence for it, Christy seems to assume that the reason cannot be any other factor such as the historical increases in small airborne particles (aerosols) or historical land-use changes.

> "There is little scientific basis in support of claims that extreme weather events – specifically, hurricanes, floods, drought, tornadoes – and their economic damage have increased in recent decades due to the emission of greenhouse gases. In fact, since 2013 the world and the United States have had a remarkable stretch of good fortune with respect to extreme weather, as compared to the past." [Roger Pielke Jr]

Kerry Emanuel (http://climatefeedback.org/reviewers/kerry-

emanuel/)**, Professor of Atmospheric Science, MIT:**

Most of the published scientific work concerns the expected response of tropical cyclones to climate change and anticipates that such storms will become stronger and perhaps less frequent, but at a rate that should not be formally detectable until mid-century. Yet there is clear satellite-based evidence (e.g. Elsner et al., Nature, 2008; Kossin et al. J. Climate, 2013)* of increasing incidence of the strongest storms, as theory dating back to 1987 predicted.

- Elsner et al. (2008) The increasing intensity of the strongest tropical cyclones (http://www.nature.com/nature/journal/v455/n7209/abs/nature07234.html), Nature
- Kossin et al. (2013) Trend Analysis with a New Global Record of Tropical Cyclone Intensity (http://journals.ametsoc.org/doi/abs/10.1175/JCLI-D-13-00262.1), Journal of Climate

James Elsner (http://climatefeedback.org/reviewers/james-elsner)**, Professor, Florida State University:**

While there is little scientific evidence that there will be more (or fewer) hurricanes or more hurricanes hitting the U.S., there is strong theoretical and statistical evidence that the strongest hurricanes are getting stronger as the oceans heat up due to global warming from the emission of greenhouse gases. In fact, there is statistical evidence that the magnitude of economic damage in the U.S. from hurricanes increases with rising ocean temperature.

- Elsner, J. B, J. P. Kossin and T. H. Jagger (2008). "The increasing intensity of the strongest tropical cyclones (http://myweb.fsu.edu/jelsner/PDF/Research/ElsnerKossinJagger2008.pdf)". In: Nature 455.7209, pp. 92-95
- Elsner, J. B. (2007b). "Granger causality and Atlantic hurricanes (http://myweb.fsu.edu/jelsner/PDF/Research/Elsner2007.pdf)". In: Tellus A 59.4, pp. 476-485.
- Jagger, T. H, J. B. Elsner and R. K. Burch (2011). "Climate and solar signals in property damage losses from hurricanes affecting the United States (http://myweb.fsu.edu/jelsner/PDF/Research/JaggerElsnerBurch2011.pdf)". In: Natural Hazards 58.1, pp. 541-557.

> "they added that if there was a slight or modest global warming that the sea levels would fall not rise" [Mo Brooks]

Matt King (http://www.utas.edu.au/profiles/staff/geography-environmental/matt-king), Professor, University of Tasmania:
This is incorrect. Warming has been occuring through the 20th century and glaciers around the world, plus Greenland, have been melting. Further melting in the future will see a substantial further reduction in glacier and ice sheet mass, most of which will end up in the ocean and produce sea level rise.

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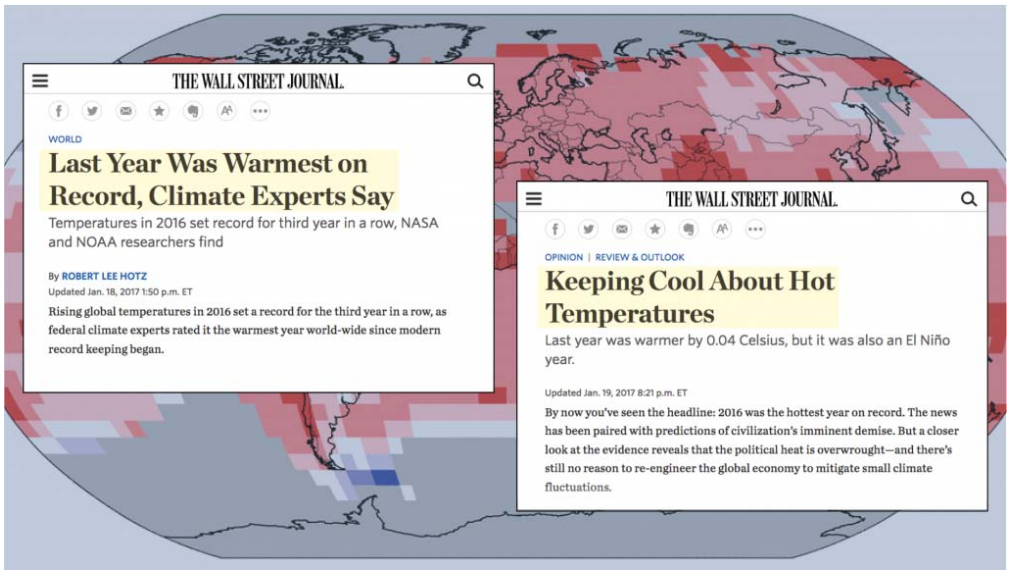
Wall Street Journal articles on 2016 heat record send contradicting messages



On January 18, NASA and NOAA released the data showing that 2016 was the warmest year on record in both datasets. All other major global surface temperature datasets, including the UK Met Office, Japanese Meteorological Agency, and Berkeley Earth datasets, indicated a new record, as well. The Wall Street Journal reported this news in a story by science journalist Robert Lee Hotz headlined "Last Year Was Warmest on Record, Climate Experts Say (http://via.hypothes.is/http://www.wsj.com/articles/last-year-was-hottest-on-record-climate-experts-say-1484756646)". But soon

afterward, a Wall Street Journal editorial titled "Keeping Cool About Hot Temperatures (http://via.hypothes.is/http://www.wsj.com/articles/keeping-cool-about-hot-temperatures-1484871286)" questioned whether a record had even been set, and minimized the significance of the observed warming trend.

We selected key claims from each of the two articles to be reviewed for accuracy (listed below).

The scientists who reviewed these claims found that the 'news story' was mostly accurate. It faithfully reported the NOAA and NASA rankings while adding accurate context on the contribution of El Niño to the record warming (claim 1).

In a paragraph comparing recent years to temperatures during the El Niño of 1997-1998, the article could be clearer about the relationship between short-term variations and the long-term warming trend, and exaggerates the significance of updates to some datasets in affirming the continuation of that long-term trend, but is still fairly accurate (claim 2 & 3).

> [For another accurate article detailing the 2016 temperature announcement, check out coverage in The Washington Post (http://climatefeedback.org/evaluation/scientists-officially-declare-2016-hottest-year-record-chris-mooney-the-washington-post/).]

The 'editorial' article, however, bases its argument on inaccurate claims and selective reporting. Selecting only one of the global surface temperature datasets, it misrepresents the impact of error bars on record rankings. It inaccurately claims that "no one really knows if last year was a record" (claim 4). Last year is, indeed, ranked as the warmest year on record in each of the datasets.

The editorial also claims that climate model projections have overestimated the warming trend (claim 5). As the scientists who reviewed this claim note, this is due partly to a misunderstanding of the impact of natural variability, partly to misrepresenting the warming rate predicted in the IPCC report, and partly to misrepresenting the observed warming rate in recent years.

Climate Feedback has now evaluated a number of articles (http://climatefeedback.org/outlet/the-wall-street-journal/) appearing in the Op-Ed section of the Wall Street Journal that have misrepresented climate science, downplaying the documented

impacts of climate change. In this case, the editorial fails to acknowledge the facts—and the understanding of the role of human-induced climate change in 2016's record warmth —accurately reported in the paper's own news story.

Last year, Forbes ran a similar set of contradictory articles. An opinion post we reviewed (http://climatefeedback.org/evaluation/james-taylor-2015-was-not-even-close-to-hottest-year-on-record/) falsely claimed that 2015 failed to set a record for warmest year, while another article (http://www.forbes.com/sites/alexknapp/2016/01/20/climate-scientists-report-that-2015-was-the-hottest-year-on-record/#4e15b24b1b46) accurately reported the data showing that 2015 did indeed set a record. However the inaccurate article had been read 20 times more than the accurate one (as of Jan 27, 2017, according to Forbes statistics). While contradictory stories might seem to provide a sort of balance, this misunderstands what balance means in science—reporting the weight of evidence— and it leaves more readers confused rather than informed about reality.

SCIENTISTS' FEEDBACK

Article 1 (news story): "Last year was warmest on record, climate experts say"

> CLAIM 1: "Rising global temperatures in 2016 set a record for the third year in a row, as federal climate experts rated it the warmest year world-wide since modern record keeping began."

Zeke Hausfather (https://scholar.google.com/citations?hl=en&user=Chq-VAIAAAAJ), Research Scientist, Berkeley Earth:
2016 did indeed set a record for the third year in a row for both U.S. surface temperature series (NASA and NOAA), as well as that of the UK's Hadley Centre. It was only the second record in a row for the Berkeley Earth and Cowtan and Way series, which have 2010 slightly edging out 2014. In all five records 2010 and

2014 are effectively tied, so this slight difference in ordering does not reflect any fundamental disagreements. In all five series 15 out of the last 16 years were the warmest ever recorded:

Rank	NASA	NOAA	Berkeley	Hadley	C&W	Scale:
1	2016	2016	2016	2016	2016	>= 2000
2	2015	2015	2015	2015	2015	< 2000
3	2014	2014	2010	2014	2010	
4	2010	2010	2014	2010	2014	
5	2005	2005	2005	2005	2005	
6	2013	2013	2007	1998	2007	
7	2007	2007	2006	2013	2009	
8	2009	1998	2009	2003	2013	
9	1998	2009	2013	2009	2006	
10	2002	2006	2002	2006	1998	
11	2012	2012	1998	2002	2003	
12	2006	2002	2003	2007	2002	
13	2003	2003	2012	2012	2012	
14	2011	2011	2011	2004	2011	
15	2004	2001	2001	2001	2001	
16	2001	2004	2008	2011	2004	
17	2008	2008	2004	2008	2008	

(http://climatefeedback.org/wp-content/uploads/2017/01/hausfather_Warmest-Years.png)

> CLAIM 2:"global land and sea surface temperatures were boosted by a powerful El Niño current in the Pacific and by rising concentrations of heat-trapping greenhouse gases in the atmosphere. During 2016, the average temperature across global land and ocean surfaces was 1.69°F (0.94°C) above the 20th-century average"

Zeke Hausfather (https://scholar.google.com/citations?hl=en&user=Chq-VAIAAAAJ), Research Scientist, Berkeley Earth:

This is accurate: depending on the analysis, scientists have found that El Niño added anywhere between 0.1 and 0.2 °C to 2016 temperatures, and a smaller amount to 2015 temperatures. However, when scientists use the same process to remove the effect of El Niño from all years, they still find that 2015 and 2016 were the two hottest years on record (though whether 2016 beats 2015 depends on the El-Niño corrected dataset's Arctic coverage). For more details, see this blog post (https://tamino.wordpress.com/2017/01/18/global-

temperature-the-big-3/) applying the methods from Foster and Rahmstorf (http://iopscience.iop.org/article/10.1088/1748-9326/6/4/044022/meta).

> CLAIM 3:"Some researchers have argued that the rise in global temperatures peaked during the very strong El Niño year of 1998 and has stalled since. NOAA scientists and other research groups, however, re-examined the data and reported in several studies over the past two years that the apparent slowdown was due to measurement errors that, when corrected, show that global temperatures have risen steadily."

Zeke Hausfather (https://scholar.google.com/citations?hl=en&user=Chq-VAIAAAAJ), Research Scientist, Berkeley Earth:
This statement is reasonably accurate, though after the past three record years you would have difficulty finding researchers who think warming has stalled through present (some do still argue that the 1998-2012 period was anomalous). Measurement error played a role in the elimination of the apparent slowdown, as we discuss in Hausfather et al 2017, but the single largest factor was the temperatures of the prior three years.

Piers Forster (http://www.see.leeds.ac.uk/people/p.forster), Professor, University of Leeds:
This is partly correct, I would say.

The rate of temperature rise has been slower over last 1.5 decades than in the 1990s, but as datasets of global temperature have been improved, there is less evidence for a real stalling of the temperature rise since 2000 (or 1998). Temperatures have risen steadily.
It's not really down to measurement errors, though. The biggest factors in improving the datasets of global surface temperatures are in the way individual measurements are aggregated for making a globally averaged time series. These improvements come from better accounting for the considerable Arctic warming over recent decades, and more

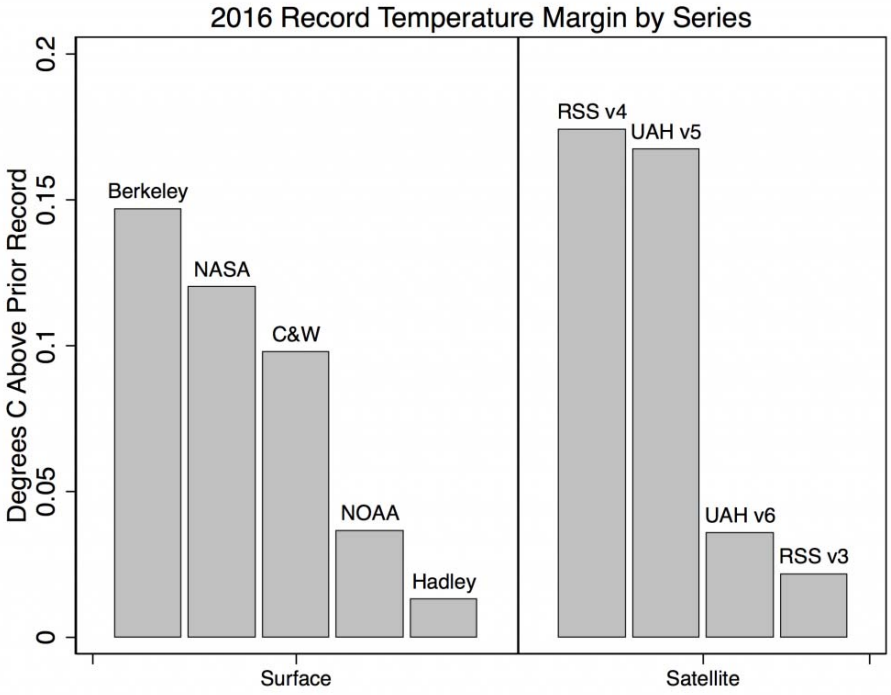
careful accounting for rates of warming differences in the surface layer of the ocean with the rates of warming at 2 meter altitude, used for compiling global surface temperature trends*.

- Hausfather et al (2017) Assessing recent warming using instrumentally homogeneous sea surface temperature records (http://advances.sciencemag.org/content/3/1/e1601207), Science Advances

Article 2 (Editorial): "Keeping cool about hot temperatures"

> CLAIM 4:"2016 edged out 2015 by a mere 0.04 degrees Celsius. That's a fraction of the margin of error. Atmospheric data from satellites detected similarly small warming over previous years. In other words, no one really knows if last year was a record."

Zeke Hausfather (https://scholar.google.com/citations?hl=en&user=Chq-VAIAAAAJ), Research Scientist, Berkeley Earth:
This is selectively reporting only part of the story. While it is true that Hadley, NOAA, UAH(v6 beta), and RSS(v3) only showed a small warming over the previous record (2015 in the surface records, 1998 in the satellite records), the margin in the NASA, Berkeley Earth, Cowtan and Way, UAH(v5.6), and RSS(v4) was highly significant and clear, as shown in the figure below:



In five of the nine datasets we can clearly say it's a record. In the other four it's still more likely than not the warmest year on record.

Christopher Merchant (http://www.met.reading.ac.uk/userpages/nn904972.php), Professor, University of Reading and UK National Centre for Earth Observation:
It is correct to state that the amount by which the recorded global temperature of 2016 exceeds that of 2015 (0.04 ˚C) is within the margin of error (0.15 ˚C) that NOAA quote (table in [1]). One can correctly state that "no one really knows" in that sense. An alternative statement of the same facts is that there is a better-than-even chance that 2016 was warmer than 2015. Note that while 2016 exceeds 2015 by an amount that is statistically small, years previous to 2015 were significantly cooler. For example, the year of the warm temperature "spike" in 1998 [2] discussed later in the article was recorded as 0.27 ˚C cooler than 2015, which illustrates the trend to warmer temperatures underlying the year-to-year fluctuations.

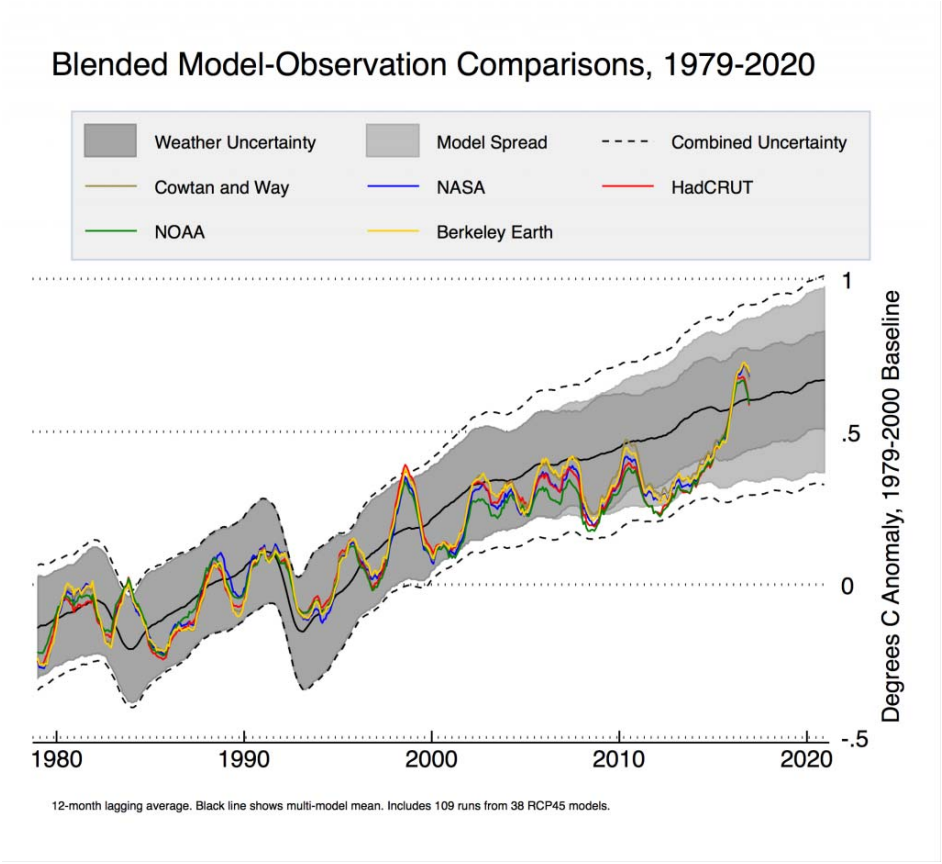
- [1] NOAA National Centers for Environmental Information, State of the Climate: Global Analysis for Annual 2016, http://www.ncdc.noaa.gov/sotc/global/201613 (http://www.ncdc.noaa.gov/sotc/global/201613)
- [2] NOAA National Centers for Environmental information, Climate at a Glance: Global Time Series,

http://www.ncdc.noaa.gov/cag/
(http://www.ncdc.noaa.gov/cag/)

> CLAIM 5:"the warming is not nearly as great as the climate change computer models have predicted. [...]U.N. Intergovernmental Panel on Climate Change simulations forecast surface temperatures to increase on average 0.2 degrees Celsius per decade in the early 21st century. The warming over the first 15 years was closer to 0.05 degrees Celsius."

Zeke Hausfather (https://scholar.google.com/citations?hl=en&user=Chq-VAIAAAAJ), Research Scientist, Berkeley Earth:

Since the start of the 21st century, climate models predict 0.2 ˚C per decade surface warming. Observed surface warming over that same period has been 0.2 ˚C (NASA), 0.19 ˚C (NOAA) 0.18 ˚C (Berkeley/ Cowtan and Way), and 0.16 ˚C (Hadley). All of these are statistically indifferentiable from model projections over this period. In general, recent temperatures have been pretty close to the multi-model mean:



(http://climatefeedback.org/wp-content/uploads/2017/01/hausfather_Models-and-observations-annual-1979-2000-baseline.png)

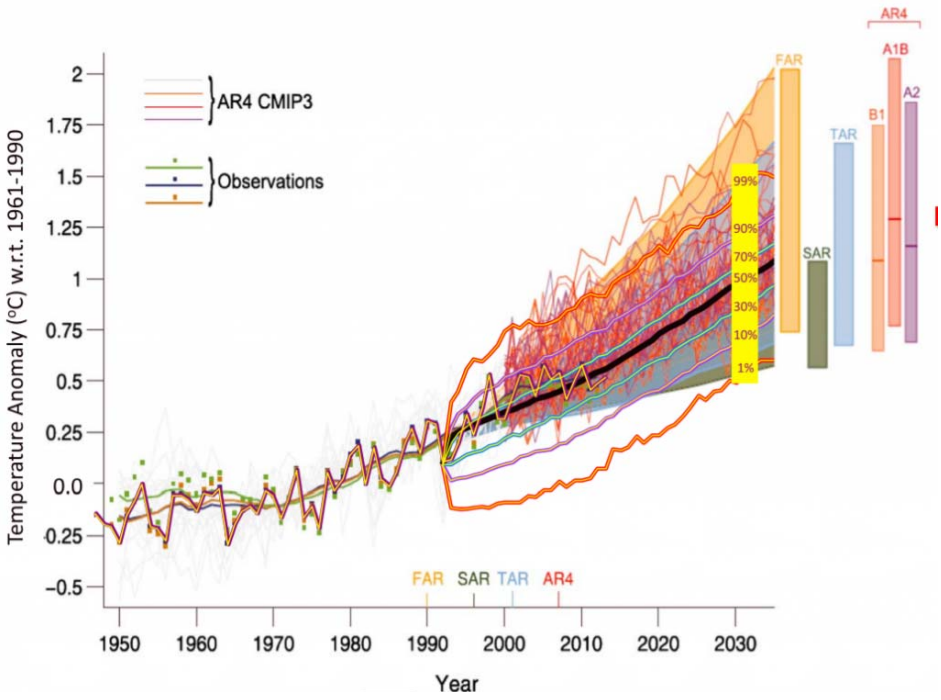
Model comparisons with satellite data are more difficult as satellites don't measure the Earth's surface temperature. Some satellite records (RSSv4, UAHv5.6) are in reasonable agreement with model projections for tropospheric temperatures between 2000 and present, while others (UAHv6 beta, RSSv3) are notably cooler.

Christopher Merchant (http://www.met.reading.ac.uk/userpages/nn904972.php), Professor, University of Reading and UK National Centre for Earth Observation:
Although climate modellers tend to quote the trend to warmer temperatures in units of "degrees per decade", it is a misunderstanding to interpret that to mean that they expect every decade to have that trend. This is why in the quoted statement, the forecast is for increases to be "on average" 0.2 ˚C. Just as weather fluctuates from day to day, there are fluctuations between years and decades, too.

Shaun Lovejoy (http://www.physics.mcgill.ca/~gang/Lovejoy.htm), Professor, McGill University:

The figure below from Lovejoy (2015)* gives some details, but the basic claim of 0.2 ˚C too high is essentially correct. However, as the figure shows, the temperature was accurately forecast (actually hindcast) to within 0.05 ˚C by using a stochastic (not General Circulation Model) modelling approach.

The stochastic approach worked well because the so-called pause (since 1998) was actually simply a return to the long-term (anthropogenically forced) trend that followed the massive pre-pause warming from 1992 to1998. The key point is that the fact that General Circulation Model's tended to over-forecast the warming is a model and/or data problem (there are many different explanations in the literature), but this in no way alters the fact that the temperatures are almost exactly varying about the long term anthropogenic trend as expected.



- Lovejoy (2015) Using scaling for macroweather forecasting including the pause (http://onlinelibrary.wiley.com/doi/10.1002/2015GL065665/full), Geophysical Research Letters

Piers Forster (http://www.see.leeds.ac.uk/people/p.forster), Professor, University of Leeds:
The high emissions scenario (RCP8.5) model simulations did show around 0.2 ˚C warming per decade. But the IPCC report (Chapter 11, WG1, AR5, Fig 11.25) never relied on just these runs to make its prediction. It relied on multiple lines of evidence. Its

temperature prediction was in fact around 0.05 to 0.15 C per decade.

The statement “the warming over the first 15 years is 0.05 ˚C per decade” is not correct. (This was probably meant to be degrees per decade from an old version of the HadCRUT dataset with limited coverage on the Arctic). The latest analysis and synthesis of the different records published in Science in January* constrains sea-surface temperatures trends over the last 19 years to between 0.07 and 0.12 ˚C per decade. Global temperatures have been rising slightly faster than this due to land surface warming more.

- Hausfather et al (2017) Assessing recent warming using instrumentally homogeneous sea surface temperature records (http://advances.sciencemag.org/content/3/1/e1601207), Science Advances

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climate feedback

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Statements on Climate Change from Major Global Scientific Academies, Societies, and Associations

(Updated January 2017 by Dr. Peter Gleick, Pacific Institute, published at National Geographic ScienceBlogs)[1]

Scientific understanding of the role of humans in influencing and altering the global climate has been evolving for over a century. That understanding is now extremely advanced, combining hundreds of years of observations of many different climatic variables, millions of years of paleoclimatic evidence of past natural climatic variations, extended application of fundamental physical, chemical, and biological processes, and the most sophisticated computer modeling ever conducted.

There is no longer any reasonable doubt that humans are altering the climate, that those changes will grow in scope and severity in the future, and that the economic, ecological, and human health consequences will be severe. While remaining scientific uncertainties are still being studied and analyzed, the state of the science has for several decades been sufficient to support implementing local, national, and global policies to address growing climate risks. This is the conclusion of scientific studies, syntheses, and reports to policymakers extending back decades.

Because of the strength of the science, and the depth of the consensus about climate change, the scientific community has worked hard to clearly and consistently present the state of understanding to the public and policymakers to help them make informed decisions. The scientific community does this in various ways. Individual scientists speak out, presenting scientific results to journalists and the public. Scientists and scientific organizations prepare, debate, and publish scientific statements and declarations based on their expertise and concerns. And national scientific organizations, especially the formal "Academies of Sciences," prepare regular reports on climate issues that are syntheses of all relevant climate science and knowledge.

These number and scope of these statements is truly impressive. **Not a single major scientific organization or national academy of science on earth denies that the climate is changing, that humans are responsible, and that some form of action should be taken to address the risks to people and the planet.**

This consensus is not to be taken lightly. Indeed, this consensus is an extraordinarily powerful result given the contentious nature of science and the acclaim that accrues to scientists who find compelling evidence that overthrows an existing paradigm (as Galileo, Darwin, Einstein, Wegener, and others did in their fields).

In a peculiar twist, some have tried to argue that acceptance of the strength of the evidence and the massive consensus in the geoscience community about human-caused climate change is simply "argument from consensus" or "argument from authority" – a classic potential "logical fallacy." Indeed, the mere fact that nearly 100 percent of climate and geoscience professions believe humans are changing the climate does not guarantee that the belief is correct. But arguing that something is false simply because there is a strong consensus ***for*** it is an even worse logical fallacy, especially when the consensus is based on deep, extensive, and constantly tested scientific evidence.

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[1] ***Dr. Gleick is a member of the U.S. National Academy of Sciences and co-founder/president-emeritus of the Pacific Institute, Oakland, California. He is a hydroclimatologist.*** pgleick@pipeline.com.

In fact, this false argument has a name: the ***Galileo Gambit***. It is used by those who deny well-established scientific principles such as the theory of climate change as follows: Because Galileo was mocked and criticized for his views by a majority, but later shown to be right, current minority views that are mocked and criticized must also be right. The obvious flaw in the Galileo Gambit is that being criticized for one's views does not correlate with being right – especially when the criticism is based on scientific evidence. Galileo was right because ***the scientific evidence supported him***, not because ***he was mocked and criticized***. The late professor Carl Sagan addressed this use of the Galileo Gambit in a humorous way when he noted:

> "But the fact that some geniuses were laughed at does not imply that all who are laughed at are geniuses. They laughed at Columbus, they laughed at Fulton, they laughed at the Wright Brothers. But they also laughed at Bozo the Clown." (*Broca's Brain*, 1979)

These statements and declarations (below) about climate change by the world's leading scientific organizations represent the most compelling summary of the state of knowledge and concern about the global geophysical changes now underway, and they provide the foundation and rationale for actions now being debated and implemented around the world. The world ignores them at its peril.

Here, based on information available as of early January 2017, is a synthesis, listing, and links for these public positions and declarations. These statements are summarized below for more than 140 of the planet's top scientific health, geosciences, biological, chemical, physical, agricultural, and engineering organizations. Each statement is archived online as noted in the links. Abbreviated sections of statements only are presented, but readers should consult the full statements for context and content. Also, scientific organizations and committees periodically update, revise, edit, and re-issue position statements.

Allergy and Asthma Network
American Academy of Pediatrics
American Association for the Advancement of Science
American Association of Wildlife Veterinarians
American Astronomical Society
American Chemical Society
American College of Preventive Medicine
American Geophysical Union
American Institute of Biological Sciences
American Institute of Physics
American Lung Association
American Medical Association
American Meteorological Society
American Physical Society
American Psychological Association
American Public Health Association
American Quaternary Association
American Society for Microbiology
American Society of Agronomy
American Society of Civil Engineers
American Society of Ichthyologists and Herpetologists
American Society of Naturalists
American Society of Plant Biologists
American Statistical Association
American Thoracic Society
Association for the Sciences of Limnology and Oceanography
Association for Tropical Biology and Conservation
Association of Ecosystem Research Centers
Asthma and Allergy Foundation of America
Australian Coral Reef Society
Australian Institute of Physics
Australian Medical Association
Australian Meteorological and Oceanographic Society
BioQUEST Curriculum Consortium
Botanical Society of America
Canadian Foundation for Climate and Atmospheric Sciences
Canadian Meteorological and Oceanographic Society
Consortium for Ocean Leadership
Crop Science Society of America
Ecological Society of America
Engineers Australia (The Institution of Engineers Australia)
Entomological Society of America
European Academy of Sciences and Arts
European Federation of Geologists
European Geosciences Union
European Physical Society
European Science Foundation
European Space Sciences Committee
Federation of Australian Scientific and Technological Societies
Geological Society of America
Geological Society of Australia (2009) (See note)
Health Care Climate Council
Health Care Without Harm
Institute of Professional Engineers New Zealand
InterAcademy Council
International Association for Great Lakes Research

International Council of Academies of Engineering and Technological Sciences
International Union for Quaternary Research
International Union of Geodesy and Geophysics
London Mathematical Society
National Association of County and City Health Officials
National Association of Geoscience Teachers
National Association of Hispanic Nurses
National Association of Marine Laboratories
National Environmental Health Association
National Medical Association
National Research Council (U.S.)
Natural Science Collections Alliance
National Society of Professional Engineers
Organization of Biological Field Stations
Public Health Institute
Royal Astronomical Society
Royal Economic Society
Royal Geographic Society
Royal Meteorological Society
Royal Society
Royal Society of Biology (formerly Institute of Biology)
Royal Society of Chemistry
Royal Society of Edinburgh
Royal Society of New Zealand
Society for General Microbiology
Society for Industrial and Applied Mathematics
Society for Mathematical Biology
Society for the Study of Amphibians and Reptiles
Society of American Foresters
Society of Nematologists
Society of Systematic Biologists
Soil Science Society of America
The Academy of Medical Sciences (UK)
The Academy of Social Sciences (UK)
The British Academy for the Humanities and Social Sciences
The British Ecological Society
The Challenger Society for Marine Sciences
The Geological Society (UK)
The Institute of Physics
The Institution of Chemical Engineers
The Institution of Civil Engineers (UK)
The Institution of Environmental Sciences
The Learned Society of Wales
The Wildlife Society
Trust For America's Health
U.S. Climate and Health Alliance
University Corporation for Atmospheric Research
Wellcome Trust
World Federation of Engineering Organizations
World Federation of Public Health Associations
World Health Organization
World Meteorological Organization
Zoological Society of London

Allergy and Asthma Network

April 2016

The AAN is a signatory to the April 2016 statement: http://www.lung.org/our-initiatives/healthy-air/outdoor/climate-change/declaration-on-climate-change.html?referrer=https://www.google.com/

American Academy of Pediatrics

November 2015

http://pediatrics.aappublications.org/content/136/5/992

Rising global temperatures are causing major physical, chemical, and ecological changes in the planet. There is wide consensus among scientific organizations and climatologists that these broad effects, known as "climate change," are the result of contemporary human activity. Climate change poses threats to human health, safety, and security, and children are uniquely vulnerable to these threats…
The social foundations of children's mental and physical health are threatened by the specter of far-reaching effects of unchecked climate change, including community and global instability, mass migrations, and increased conflict. Given this knowledge, failure to take prompt, substantive action would be an act of injustice to all children…
Pediatricians have a uniquely valuable role to play in the societal response to this global challenge…

[The AAP is also a signatory to the April 2016 statement: http://www.lung.org/our-initiatives/healthy-air/outdoor/climate-change/declaration-on-climate-change.html?referrer=https://www.google.com/]

American Association for the Advancement of Science (AAAS)

December 9, 2006, reaffirmed December 2009

http://www.aaas.org/news/aaas-reaffirms-statements-climate-change-and-integrity

The scientific evidence is clear: global climate change caused by human activities is occurring now, and it is a growing threat to society. Accumulating data from across the globe reveal a wide array of effects: rapidly melting glaciers, destabilization of major ice sheets, increases in extreme weather, rising sea level, shifts in species ranges, and more. The pace of change and the evidence of harm have increased markedly over the last five years. The time to control greenhouse gas emissions is now.

[The AAAS has also signed onto more recent letters on climate from an array of scientific organizations, including the June 28, 2016 letter to the U.S. Congress:
https://www.eurekalert.org/images/2016climateletter6-28-16.pdf]

American Association of Wildlife Veterinarians

October 2008

http://www.aawv.net/AAWVPositionClimateChangeFinal.doc

There is widespread scientific agreement that the world's climate is changing and that the weight of evidence demonstrates that anthropogenic factors have and will continue to contribute significantly to global warming and climate change. It is anticipated that continuing changes to the climate will have serious negative impacts on public, animal and ecosystem health due to extreme weather events, changing disease transmission dynamics, emerging and re-emerging diseases, and alterations to habitat and ecological systems that are essential to wildlife conservation. Furthermore, there is increasing recognition of the inter-relationships of human, domestic animal, wildlife, and ecosystem health as illustrated by the fact the majority of recent emerging diseases have a wildlife origin. Consequently, there is a critical need to improve capacity to identify, prevent, and respond to climate-related threats. The following statements present the American Association of Wildlife Veterinarians (AAWV) position on climate change, wildlife diseases, and wildlife health….

American Astronomical Society

June 2, 2004, Endorsement of AGU Statement on Climate Change

The American Geophysical Union (AGU) notes that human impacts on the climate system include increasing concentrations of greenhouse gases in the atmosphere, which is significantly contributing to the warming of the global climate. The climate system is complex, however, making it difficult to predict detailed outcomes of human-induced change: there is as yet no definitive theory for translating greenhouse gas emissions into forecasts of regional weather, hydrology, or response of the biosphere. As the AGU points out, our ability to predict global climate change, and to forecast its regional impacts, depends directly on improved models and observations.

The American Astronomical Society (AAS) joins the AGU in calling for peer-reviewed climate research to inform climate-related policy decisions, and, as well, to provide a basis for mitigating the harmful effects of global change and to help communities adapt and become resilient to extreme climatic events. In endorsing the "Human Impacts on Climate" statement, the AAS recognizes the collective expertise of the AGU in scientific subfields central to assessing and understanding global change, and acknowledges the strength of agreement among our AGU colleagues that the global climate is changing and human activities are contributing to that change.

American Chemical Society

Policy Statement 2013-2016

https://www.acs.org/content/acs/en/policy/publicpolicies/promote/globalclimatechange.html
Careful and comprehensive scientific assessments have clearly demonstrated that the Earth's climate system is changing in response to growing atmospheric burdens of greenhouse gases (GHGs) and absorbing aerosol particles. (IPCC, 2007) Climate change is occurring, is caused largely by human activities, and poses significant risks for—and in many cases is already affecting—a broad range of human and natural systems. (NRC, 2010a) The potential threats are serious and actions are required to mitigate climate change risks and to adapt to deleterious climate change impacts that probably cannot be avoided. (NRC, 2010b, c)
This statement reviews key probable climate change impacts and recommends actions required to mitigate or adapt to current and anticipated consequences.
Climate Change Impacts
…comprehensive scientific assessments of our current and potential future climates clearly indicate that climate change is real, largely attributable to emissions from human activities, and potentially a very serious problem. This sober conclusion has been recently reconfirmed by an in-depth set of studies focused on "America's Climate Choices" (ACC) conducted by the U.S. National Academies (NRC, 2010a, b, c, d). The ACC studies, performed by independent and highly respected teams of scientists, engineers, and other skilled professionals, reached the same general conclusions that were published in the latest comprehensive assessment conducted by the International Panel on Climate Change (IPCC, 2007)…
The range of observed and potential climate change impacts identified by the ACC assessment include a warmer climate with more extreme weather events, significant sea level rise, more constrained fresh water sources, deterioration or loss of key land and marine ecosystems, and reduced food resources— many of which may pose serious public health threats. (NRC, 2010a) The effects of an unmitigated rate of climate change on key Earth system components, ecological systems, and human society over the next 50 years are likely to be severe and possibly irreversible on century time scales…

[The ACS has also signed onto more recent letters on climate from an array of scientific organizations, including the June 28, 2016 letter to the U.S. Congress:
https://www.eurekalert.org/images/2016climateletter6-28-16.pdf]

American College of Preventive Medicine

February 24, 2006, Policy Number 2006-002C

http://web.archive.org/web/20060925182111/http://www.acpm.org/2006-002(C).htm

Climate Change-Abrupt Climate Change and Public Health Implications
BE IT RESOLVED,
THAT: The American College of Preventive Medicine (ACPM) accept the position that global warming and climate change is occurring, that there is potential for abrupt climate change, and that human practices that increase greenhouse gases exacerbate the problem, and that the public health consequences may be severe.
THAT: The ACPM staff and appropriate committees continue to explore opportunities to address this matter, including sessions at Preventive Medicine conferences and the development of a policy position statement as well as other modes of communicating this issue to the ACPM membership.

[The ACPM is also a signatory to the April 2016 statement: http://www.lung.org/our-initiatives/healthy-air/outdoor/climate-change/declaration-on-climate-change.html?referrer=https://www.google.com/]

American Geophysical Union

Adopted by the American Geophysical Union December 2003; Revised and Reaffirmed December 2007, February 2012, August 2013.

http://sciencepolicy.agu.org/files/2013/07/AGU-Climate-Change-Position-Statement_August-2013.pdf

Human- Induced Climate Change Requires Urgent Action
Humanity is the major influence on the global climate change observed over the past 50 years. Rapid societal responses can significantly lessen negative outcomes.

Human activities are changing Earth's climate. At the global level, atmospheric concentrations of carbon dioxide and other heat- trapping greenhouse gases have increased sharply since the Industrial Revolution. Fossil fuel burning dominates this increase. Human- caused increases in greenhouse gases are responsible for most of the observed global average surface warming of roughly 0.8°C (1.5°F) over the past 140 years. Because natural processes cannot quickly remove some of these gases (notably carbon dioxide) from the atmosphere, our past, present, and future emissions will influence the climate system for millennia.

Extensive, independent observations confirm the reality of global warming. These observations show large- scale increases in air and sea temperatures, sea level, and atmospheric water vapor; they document decreases in the extent of mountain glaciers, snow cover, permafrost, and Arctic sea ice. These changes are broadly consistent with long understood physics and predictions of how the climate system is expected to respond to human- caused increases in greenhouse gases. The changes are inconsistent with explanations of climate change that rely on known natural influences…

[The AGU has also signed onto more recent letters on climate from an array of scientific organizations, including the June 28, 2016 letter to the U.S. Congress:
https://www.eurekalert.org/images/2016climateletter6-28-16.pdf]

American Institute of Biological Sciences

[The AIBS is a signatory to the June 28, 2016 letter to the U.S. Congress:
https://www.eurekalert.org/images/2016climateletter6-28-16.pdf]

American Institute of Physics

2004

https://web.archive.org/web/20050217173516/http://www.aip.org/fyi/2004/042.html

The Governing Board of the American Institute of Physics has endorsed a position statement on climate change adopted by the American Geophysical Union (AGU) Council in December 2003. AGU is one of ten Member Societies of the American Institute of Physics. The statement follows:

Human Impacts on Climate
Human activities are increasingly altering the Earth's climate. These effects add to natural influences that have been present over Earth's history. Scientific evidence strongly indicates that natural influences cannot explain the rapid increase in global near-surface temperatures observed during the second half of the 20th century.

Human impacts on the climate system include increasing concentrations of atmospheric greenhouse gases (e.g., carbon dioxide, chlorofluorocarbons and their substitutes, methane, nitrous oxide, etc.), air pollution, increasing concentrations of airborne particles, and land alteration. A particular concern is that atmospheric levels of carbon dioxide may be rising faster than at any time in Earth's history, except possibly following rare events like impacts from large extraterrestrial objects…

American Lung Association

The ALA is a signatory to the April 2016 statement: http://www.lung.org/our-initiatives/healthy-air/outdoor/climate-change/declaration-on-climate-change.html?referrer=https://www.google.com/

American Medical Association

April 4, 2011

http://www.amednews.com/article/20110404/opinion/304049959/4/

Editorial: Confronting Health Issues of Climate Change
If physicians want evidence of climate change, they may well find it in their own offices. Patients are presenting with illnesses that once happened only in warmer areas. Chronic conditions are becoming aggravated by more frequent and extended heat waves. Allergy and asthma seasons are getting longer. Spates of injuries are resulting from more intense ice storms and snowstorms.

Scientific evidence shows that the world's climate is changing and that the results have public health consequences. The American Medical Association is working to ensure that physicians and others in health care understand the rise in climate-related illnesses and injuries so they can prepare and respond to them. The Association also is promoting environmentally responsible practices that would reduce waste and energy consumption.

April 2016

https://assets.ama-assn.org/sub/advocacy-update/2016-04-28.html

Amicus Brief filed before the Supreme Court in support of the Clean Power Plan.
Failure to uphold the Clean Power Plan would undermine [the] EPA's ability to carry out its legal obligation to regulate carbon emissions that endanger human health and would negatively impact the health of current and future generations.

Carbon emissions are a significant driver of the anthropogenic greenhouse gas emissions that cause climate change and consequently harm human health. Direct impacts from the changing climate include health-related illness, declining air quality and increased respiratory and cardiovascular illness. Changes in climate also facilitate the migration of mosquito-borne diseases, such as dengue fever, malaria and most recently the Zika Virus.

"In surveys conducted by three separate U.S. medical professional societies," the brief said, "a significant majority of surveyed physicians concurred that climate change is occurring … is having a direct impact on the health of their patients, and that physicians anticipate even greater climate-driven adverse human health impacts in the future."

American Meteorological Society

August 20, 2012 Statement

[This statement is considered in force until August 2017 unless superseded by a new statement issued by the AMS Council before this date.]

https://www.ametsoc.org/ams/index.cfm/about-ams/ams-statements/statements-of-the-ams-in-force/climate-change/

…Warming of the climate system now is unequivocal, according to many different kinds of evidence. Observations show increases in globally averaged air and ocean temperatures, as well as widespread melting of snow and ice and rising globally averaged sea level. Surface temperature data for Earth as a whole, including readings over both land and ocean, show an increase of about 0.8°C (1.4°F) over the period 1901-2010 and about 0.5°C (0.9°F) over the period 1979–2010 (the era for which satellite-based temperature data are routinely available). Due to natural variability, not every year is warmer than the preceding year globally. Nevertheless, all of the 10 warmest years in the global temperature records up to 2011 have occurred since 1997, with 2005 and 2010 being the warmest two years in more than a century of global records. The warming trend is greatest in northern high latitudes and over land. In the U.S., most of the observed warming has occurred in the West and in Alaska; for the nation as a whole, there have been twice as many record daily high temperatures as record daily low temperatures in the first decade of the 21st century…

There is unequivocal evidence that Earth's lower atmosphere, ocean, and land surface are warming; sea level is rising; and snow cover, mountain glaciers, and Arctic sea ice are shrinking. The dominant cause of the warming since the 1950s is human activities. This scientific finding is based on a large and persuasive body of research. The observed warming will be irreversible for many years into the future, and even larger temperature increases will occur as greenhouse gases continue to accumulate in the atmosphere. Avoiding this future warming will require a large and rapid reduction in global greenhouse gas emissions. The ongoing warming will increase risks and stresses to human societies, economies, ecosystems, and wildlife through the 21st century and beyond, making it imperative that society respond to a changing climate. To inform decisions on adaptation and mitigation, it is critical that we improve our understanding of the global climate system and our ability to project future climate through continued and improved monitoring and research. This is especially true for smaller (seasonal and regional) scales and weather and climate extremes, and for important hydroclimatic variables such as precipitation and water availability…

Technological, economic, and policy choices in the near future will determine the extent of future impacts of climate change. Science-based decisions are seldom made in a context of absolute certainty. National and international policy discussions should include consideration of the best ways to both adapt to and mitigate climate change. Mitigation will reduce the amount of future climate change and the risk of impacts that are potentially large and dangerous. At the same time, some continued climate change is inevitable, and policy responses should include adaptation to climate change. Prudence dictates extreme care in accounting for our relationship with the only planet known to be capable of sustaining human life.

[The AIBS is also a signatory to the June 28, 2016 letter to the U.S. Congress: https://www.eurekalert.org/images/2016climateletter6-28-16.pdf]

American Physical Society

November 14, 2015

https://www.aps.org/policy/statements/15_3.cfm

Statement on Earth's Changing Climate
Earth's changing climate is a critical issue and poses the risk of significant environmental, social and economic disruptions around the globe. While natural sources of climate variability are significant, multiple lines of evidence indicate that human influences have had an increasingly dominant effect on global climate warming observed since the mid-twentieth century. Although the magnitudes of future effects are uncertain, human influences on the climate are growing. The potential consequences of climate change are great and the actions taken over the next few decades will determine human influences on the climate for centuries.
On Climate Science:
As summarized in the 2013 report of the Intergovernmental Panel on Climate Change (IPCC), there continues to be significant progress in climate science. In particular, the connection between rising concentrations of atmospheric greenhouse gases and the increased warming of the global climate system is more compelling than ever. Nevertheless, as recognized by Working Group 1 of the IPCC, scientific challenges remain in our abilities to observe, interpret, and project climate changes. To better inform societal choices, the APS urges sustained research in climate science.
On Climate Action:
The APS reiterates its 2007 call to support actions that will reduce the emissions, and ultimately the concentration, of greenhouse gases as well as increase the resilience of society to a changing climate, and to support research on technologies that could reduce the climate impact of human activities. …

American Psychological Association

The APA is a signatory to the April 2016 statement: http://www.lung.org/our-initiatives/healthy-air/outdoor/climate-change/declaration-on-climate-change.html?referrer=https://www.google.com/

American Public Health Association

November 03, 2015 Policy Statement 20157

https://www.apha.org/policies-and-advocacy/public-health-policy-statements/policy-database/2015/12/03/15/34/public-health-opportunities-to-address-the-health-effects-of-climate-change

[This policy builds upon and replaces existing policies 20078 (Addressing the Urgent Threat of Global Climate Change to Public Health and the Environment) and 9510 (Global Climate Change)]

Public Health Opportunities to Address the Health Effects of Climate Change
Climate change poses major threats to human health, human and animal populations, ecological stability, and human social, financial, and political stability and well-being. Observed health impacts of climate change include increased heat-related morbidity and mortality, expanded ranges and frequency of infectious disease outbreaks, malnutrition, trauma, violence and political conflict, mental health issues, and loss of community and social connections. Certain populations will experience disproportionate negative effects, including pregnant women, children, the elderly, marginalized groups such as racial and ethnic minorities, outdoor workers, those with chronic diseases, and those in economically disadvantaged communities. Climate change poses significant ethical challenges as well as challenges to global and health equity. The economic risks of inaction may be significant, yet many strategies to combat climate change offer near- and long-term co-benefits to health, producing cost savings that could offset implementation costs. At present, there are major political barriers to adopting strategies to mitigate and adapt to climate change. Recognizing the urgency of the issue and importance of the public health role, APHA, the Centers for Disease Control and Prevention, and others have developed resources and tools to help support public health engagement. APHA calls for individual, community, national, and global action to address the health risks posed by climate change. The public health community has critical roles to play, including advocating for action, especially among policymakers; engaging in health prevention

and preparedness efforts; conducting surveillance and research on climate change and health; and educating public health professionals.

[The APHA is also a signatory to the April 2016 statement: http://www.lung.org/our-initiatives/healthy-air/outdoor/climate-change/declaration-on-climate-change.html?referrer=https://www.google.com/]

[The APHA is also a signatory to the June 28, 2016 letter to the U.S. Congress: https://www.eurekalert.org/images/2016climateletter6-28-16.pdf]

American Quaternary Association

September 5, 2006

Letter to EOS of the Council of the AQA
http://onlinelibrary.wiley.com/doi/10.1029/2006EO360008/epdf

The available scientific evidence clearly shows that the Earth on average is becoming warmer… Few credible scientists now doubt that humans have influenced the documented rise of global temperatures since the Industrial Revolution. The first government led U.S. Climate Change Science Program synthesis and assessment report supports the growing body of evidence that warming of the atmosphere, especially over the past 50 years, is directly impacted by human activity.

American Society for Microbiology

2003

Global Environmental Change Statement
http://www.asm.org/images/docfilename/0000006005/globalwarming%5B1%5D.pdf

In 2003, the ASM issued a policy report in which they recommend "reducing net anthropogenic CO_2 emissions to the atmosphere" and "minimizing anthropogenic disturbances of" atmospheric gases: "Carbon dioxide concentrations were relatively stable for the past 10,000 years but then began to increase rapidly about 150 years ago… as a result of fossil fuel consumption and land use change. Of course, changes in atmospheric composition are but one component of global change, which also includes disturbances in the physical and chemical conditions of the oceans and land surface. Although global change has been a natural process throughout Earth's history, humans are responsible for substantially accelerating present-day changes. These changes may adversely affect human health and the biosphere on which we depend. Outbreaks of a number of diseases, including Lyme disease, hantavirus infections, dengue fever, bubonic plague, and cholera, have been linked to climate change."

American Society of Agronomy

May 2011

https://www.soils.org/files/science-policy/asa-cssa-sssa-climate-change-policy-statement.pdf

A comprehensive body of scientific evidence indicates beyond reasonable doubt that global climate change is now occurring and that its manifestations threaten the stability of societies as well as natural and managed ecosystems. Increases in ambient temperatures and changes in related processes are directly linked to rising anthropogenic greenhouse gas (GHG) concentrations in the atmosphere. The potential related impacts of climate change on the ability of agricultural systems, which include soil and water resources, to provide food, feed, fiber, and fuel, and maintenance of ecosystem services (e.g., water

supply and habitat for crop landraces, wild relatives, and pollinators) as well as the integrity of the environment, are major concerns.

Around the world and in the United States (US), agriculture—which is comprised of field, vegetable, and tree crops, as well as livestock production—constitutes a major land use which influences global ecosystems. Globally, crop production occupies approximately 1.8 Billion (B) hectares out of a total terrestrial land surface of about 13.5 B hectares. In addition, animal production utilizes grasslands, rangelands, and savannas, which altogether cover about a quarter of the Earth's land. Even in 2010, agriculture remains the most basic and common human occupation on the planet and a major contributor to human well-being. Changes in climate are already affecting the sustainability of agricultural systems and disrupting production.

[The May 2011 statement was also signed by the Crop Science Society of America and the Soil Science Society of America.]

[The ASoA is also a signatory to the June 28, 2016 letter to the U.S. Congress: https://www.eurekalert.org/images/2016climateletter6-28-16.pdf]

American Society of Civil Engineers

July 18, 2015 Policy Statement 360

There is strong evidence that the climate is changing and will continue to change. Climate scientists project that there will be substantial increases in temperature with related increases in atmospheric water vapor and increases in extreme precipitation amounts and intensities in most geographic regions as a result of climate change. However, while there is clear evidence of a changing climate, understanding the significance of climate change at the temporal and spatial scales as it relates to engineering practice is more difficult.

There is an increasing demand for engineers to address future climate change into project design criteria; however, current practices and rules governing such practices do not adequately address concerns associated with climate change…

Climate change poses a potentially serious impact on worldwide water resources, energy production and use, agriculture, forestry, coastal development and resources, flood control and public infrastructure…

The American Society of Civil Engineers (ASCE) supports:

- Government policies that encourage anticipation of and preparation for impacts of climate change on the built environment.
- Revisions to engineering design standards, codes, regulations and associated laws that govern infrastructure potentially affected by climate change.
- Research, development and demonstration to advance recommended civil engineering practices and standards to effectively address climate change impacts.
- Cooperative research involving engineers with climate, weather, and life scientists to gain a better understanding of the magnitudes and consequences of future extremes.
- Informing practicing engineers, project stakeholders, policy makers and decision makers about the uncertainty in projecting future climate and the reasons for the uncertainty.
- Developing a new paradigm for engineering practice in a world in which climate is changing but the extent and time of local impacts cannot be projected with a high degree of certainty.
- Identifying critical infrastructure that is most threatened by changing climate in a given region and informing decision makers and the public.

American Society of Ichthyologists and Herpetologists

The ASIH is a signatory to the June 28, 2016 letter to the U.S. Congress:
https://www.eurekalert.org/images/2016climateletter6-28-16.pdf

American Society of Naturalists

The ASN is a signatory to the June 28, 2016 letter to the U.S. Congress:
https://www.eurekalert.org/images/2016climateletter6-28-16.pdf

American Society of Plant Biologists

[The ASPB is a signatory to the June 28, 2016 letter to the U.S. Congress:
https://www.eurekalert.org/images/2016climateletter6-28-16.pdf]

American Statistical Association

November 30, 2007

Adopted by the ASA Board of Directors
https://web.archive.org/web/20130307002012/http://www.amstat.org/news/climatechange.cfm

ASA Statement on Climate Change
The American Statistical Association (ASA) recently convened a workshop of leading atmospheric scientists and statisticians involved in climate change research. The goal of this workshop was to identify a consensus on the role of statistical science in current assessments of global warming and its impacts. Of particular interest to this workshop was the recently published Fourth Assessment Report of the United Nations' Intergovernmental Panel on Climate Change (IPCC), endorsed by more than 100 governments and drawing on the expertise of a large portion of the climate science community.

Through a series of meetings spanning several years, IPCC drew in leading experts and assessed the relevant literature in the geosciences and related disciplines as it relates to climate change. The Fourth Assessment Report finds that "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising mean sea level. … Most of the observed increase in globally averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations. … Discernible human influences now extend to other aspects of climate, including ocean warming, continental-average temperatures, temperature extremes, and wind patterns.
The ASA endorses the IPCC conclusions.

[The ASA is also a signatory to the June 28, 2016 letter to the U.S. Congress:
https://www.eurekalert.org/images/2016climateletter6-28-16.pdf]

American Water Resources Association

August 5, 2015

http://www.awra.org/policy/policy-statements-leveraging-IWRM.html

After people, water is our most critical and strategic natural resource, yet the U.S. lack a national strategy for water resources management. In addition, Americans are the world's largest water consumers. Threats of an aging infrastructure, climate change and population growth are so significant that the nation can no longer afford to postpone action. It's imperative that a focused effort be articulated and initiated to create and demonstrate strategies to sustain U.S. water resources. The country's future growth and prosperity depend on it.

American Thoracic Society

The ATS is also a signatory to the April 2016 statement: http://www.lung.org/our-initiatives/healthy-air/outdoor/climate-change/declaration-on-climate-change.html?referrer=https://www.google.com/

Association for the Sciences of Limnology and Oceanography

The ASLO is a signatory to the June 28, 2016 letter to the U.S. Congress: https://www.eurekalert.org/images/2016climateletter6-28-16.pdf

Association for Tropical Biology and Conservation

The ATBC is a signatory to the June 28, 2016 letter to the U.S. Congress: https://www.eurekalert.org/images/2016climateletter6-28-16.pdf

Association of Ecosystem Research Centers

The AERC is a signatory to the June 28, 2016 letter to the U.S. Congress: https://www.eurekalert.org/images/2016climateletter6-28-16.pdf

Asthma and Allergy Foundation of America

The AAFA is a signatory to the April 2016 statement: http://www.lung.org/our-initiatives/healthy-air/outdoor/climate-change/declaration-on-climate-change.html?referrer=https://www.google.com/

Australian Coral Reef Society

June 16, 2006

https://web.archive.org/web/20060322170802/http://www.australiancoralreefsociety.org/pdf/chadwick605a.pdf

There is broad scientific consensus that coral reefs are heavily affected by the activities of man and there are significant global influences that can make reefs more vulnerable such as global warming... It is highly likely that coral bleaching has been exacerbated by global warming.

There is almost total consensus among experts that the earth's climate is changing as a result of the build-up of greenhouse gases. The IPCC (involving over 3,000 of the world's experts) has come out with clear conclusions as to the reality of this phenomenon. One does not have to look further than the collective academy of scientists worldwide to see the string (of) statements on this worrying change to the earth's atmosphere…

September 1, 2016

http://www.australiancoralreefsociety.org/c/document_library/get_file?uuid=2e52d369-95a0-451a-863d-5cae22ed625e&groupId=10136

Science-based policy plan for the Great Barrier Reef
Discussion: Advancing Climate Action in Queensland

Given the observed damage caused by a temperature increase of ~1°C above pre-industrial levels, we urge all possible actions to keep future warming below the 1.5°C target set by the Paris Agreement. The following proposed initiatives will act to reduce the severity of climate-inflicted damage on reefs, helping to avoid total ecological collapse. The ACRS strongly supports the following proposed actions:…

Australian Institute of Physics

March 10, 2005, Policy Document 1.01

https://web.archive.org/web/20080201000000*/http://www.aip.org.au/scipolicy/Science%20Policy.pdf

The AIP supports a reduction of the green house gas emissions that are leading to increased global temperatures, and encourages research that works towards this goal…
Research in Australia and overseas shows that an increase in global temperature will adversely affect the Earth's climate patterns. The melting of the polar ice caps, combined with thermal expansion, will lead to rises in sea levels that may impact adversely on our coastal cities. The impact of these changes on biodiversity will fundamentally change the ecology of Earth…

Australian Medical Association

August 28, 2015

https://ama.com.au/position-statement/ama-position-statement-climate-change-and-human-health-2004-revised-2015

Human health is ultimately dependent on the health of the planet and its ecosystem. The AMA recognises the latest findings regarding the science of climate change, the role of humans, past observations and future projections. The consequences of climate change have serious direct and indirect, observed and projected health impacts both globally and in Australia. There is inequity in the distribution of these health impacts both within and between countries, with some groups being particularly vulnerable. In recognition of these issues surrounding climate change and health, the AMA believes that:

- because climate change involves potentially serious or irreversible harm to the environment and to human health, urgent international cooperation is essential to mitigate climate change. Reducing greenhouse gas emissions within a global carbon budget is necessary to prevent further climate harm as a result of human activity.
- Australia should adopt mitigation targets within an Australian carbon budget that represents Australia's fair share of global greenhouse gas emissions, under the principle of common but differential responsibilities.
- climate policies can have public health benefits beyond their intended impact on the climate. These health benefits should be promoted as a public health opportunity, with significant potential to offset some costs associated with addressing climate change.
- the health impacts of climate change and the health co-benefits of climate mitigation policies both bear economic costs and savings. Economic evaluations of the costs and benefits of climate policies must therefore incorporate the predicted public health impact accrued from such policies and the public health costs of unmitigated climate change.
- Regional and national collaboration across all sectors, including a comprehensive and broad reaching adaptation plan is necessary to reduce the health impacts of climate change. This requires a National Strategy for Health and Climate Change.
- there should be greater education and awareness of the health impacts of climate change, and the public health benefits of mitigation and adaptation.
- renewable energy presents relative benefits compared to fossil fuels with regard to air pollution and health. Therefore, active transition from fossil fuels to renewable energy sources should be considered.
- decarbonisation of the economy can potentially result in unemployment and subsequent adverse health impacts. The transition of workers displaced from carbon intensive industries must be effectively managed.

Australian Meteorological and Oceanographic Society

February 2, 2016

http://www.amos.org.au/Main/About_us/Statements/Main/Statements.aspx?hkey=2f71e26e-372c-41b2-a1e0-700d89c3d4f5

Statement on Climate Change
Global climate has changed substantially.
Global climate change and global warming are real and observable…
Human influence has been detected in the warming of the atmosphere and the ocean globally, and in Australia
It is now certain that the human activities that have increased the concentration of greenhouse gases in the atmosphere contribute significantly to observed warming. Further it is extremely likely that these human activities are responsible for most of the observed global warming since 1950. The warming associated with increases in greenhouse gases originating from human activity is called the enhanced greenhouse effect….
Our climate is very likely to continue to change as a result of human activity
Global temperature increases are already set to continue until at least the middle of this century even if emissions were reduced to zero. The magnitude of warming and related changes can be limited depending on the total amount of carbon dioxide and other greenhouse gases ultimately emitted as a result of human activities; future climate scenarios depend critically on future changes in emissions…

BioQUEST Curriculum Consortium

BioQUEST is a signatory to the June 28, 2016 letter to the U.S. Congress:
https://www.eurekalert.org/images/2016climateletter6-28-16.pdf

Botanical Society of America

The BSA is a signatory to the June 28, 2016 letter to the U.S. Congress:
https://www.eurekalert.org/images/2016climateletter6-28-16.pdf

Canadian Foundation for Climate and Atmospheric Sciences

November 25, 2005

https://scentofpine.files.wordpress.com/2011/05/cfcas-letter-to-canadian-prime-minister-paul-martin-nov-2005.pdf

We, the members of the Board of Trustees of CFCAS and Canadian climate science leaders from the public and academic sectors in Canada, concur with The Joint Science Academies statement that *"climate change is real"* and note that the 2004 Arctic Climate Impact Assessment concluded that Arctic temperatures have risen at almost twice the rate of the rest of the world over the past few decades. Furthermore, we endorse the assessment of climate science undertaken by the Intergovernmental Panel on Climate Change (IPCC) and its conclusion that "There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities."
There is now increasing unambiguous evidence of a changing climate in Canada and around the world…
There is an increasing urgency to act on the threat of climate change. Significant steps are needed to stop the growth in atmospheric greenhouse gas concentrations by reducing emissions.

Since mitigation measures will become effective only after many years, adaptive strategies as well are of great importance and need to begin now….

Canadian Meteorological and Oceanographic Society

2013-2014

http://www.cmos.ca/site/ps_pos_statements?a=7

Updated Statement on Human-Induced Climate Change
…Since the industrial revolution of the early 19th century, human activities have also markedly influenced the climate. This well-documented human-induced change is large and very rapid in comparison to past changes in the Earth's climate…
Even if the human-induced emission of greenhouse gases into the atmosphere were to cease today, past emissions have committed the world to long-term changes in climate. Carbon dioxide emitted from the combustion of fossil fuels will remain in the atmosphere for centuries to millennia, and the slow ocean response to atmospheric warming will cause the climate change to persist even longer. Further CO2 emissions will lead to greater human-induced change in proportion to total cumulative emissions. Meaningful interventions to mitigate climate change require a reduction in emissions. To avoid societally, economically, and ecologically disruptive changes to the Earth's climate, we will have little choice but to leave much of the unextracted fossil fuel carbon in the ground…
The urgent challenges for the global community, and Canadians in particular, are to learn how to adapt to the climate changes to which we are already committed and to develop effective and just responses to avoid further damaging climate change impacts for both present and future generations.

Consortium for Ocean Leadership

The COL is a signatory to the June 28, 2016 letter to the U.S. Congress:
https://www.eurekalert.org/images/2016climateletter6-28-16.pdf

Crop Science Society of America

May 2011

https://www.soils.org/files/science-policy/asa-cssa-sssa-climate-change-policy-statement.pdf

A comprehensive body of scientific evidence indicates beyond reasonable doubt that global climate change is now occurring and that its manifestations threaten the stability of societies as well as natural and managed ecosystems. Increases in ambient temperatures and changes in related processes are directly linked to rising anthropogenic greenhouse gas (GHG) concentrations in the atmosphere. The potential related impacts of climate change on the ability of agricultural systems, which include soil and water resources, to provide food, feed, fiber, and fuel, and maintenance of ecosystem services (e.g., water supply and habitat for crop landraces, wild relatives, and pollinators) as well as the integrity of the environment, are major concerns.

Around the world and in the United States (US), agriculture—which is comprised of field, vegetable, and tree crops, as well as livestock production—constitutes a major land use which influences global ecosystems. Globally, crop production occupies approximately 1.8 Billion (B) hectares out of a total terrestrial land surface of about 13.5 B hectares. In addition, animal production utilizes grasslands, rangelands, and savannas, which altogether cover about a quarter of the Earth's land. Even in 2010, agriculture remains the most basic and common human occupation on the planet and a major contributor

to human well-being. Changes in climate are already affecting the sustainability of agricultural systems and disrupting production.

[The May 2011 Statement was also signed by the American Society of Agronomy and the Soil Science Society of America.]

[The CSSA is also a signatory to the June 28, 2016 letter to the U.S. Congress: https://www.eurekalert.org/images/2016climateletter6-28-16.pdf]

Ecological Society of America

(As of January 2017)

http://www.esa.org/esa/esa-position-statement-ecosystem-management-in-a-changing-climate/

ESA Position Statement: Ecosystem Management in a Changing Climate
Ecosystems are already responding to climate change. Continued warming—some of which is now unavoidable—may impair the ability of many such systems to provide critical resources and services like food, clean water, and carbon sequestration. Buffering against the impacts of climate change will require new strategies to both mitigate the extent of change and adapt to changes that are inevitable. The sooner such strategies are deployed, the more effective they will be in reducing irreversible damage.
Ecosystems can be managed to limit and adapt to both the near- and long-term impacts of climate change. Strategies that focus on restoring and maintaining natural ecosystem function (reducing deforestation, for example) are the most prudent; strategies that drastically alter ecosystems may have significant and unpredictable impacts…
The Reality of Climate Change
The Earth is warming— average global temperatures have increased by 0.74°C (1.3°F) in the past 100 years. The scientific community agrees that catastrophic and possibly irreversible environmental change will occur if average global temperatures rise an additional 2°C (3.6°F). Warming to date has already had significant impacts on the Earth and its ecosystems, including increased droughts, rising sea levels, disappearing glaciers, and changes in the distribution and seasonal activities of many species…
The Source of Climate Change
Most warming seen since the mid 1900s is very likely due to greenhouse gas emissions from human activities. Global emissions have risen rapidly since pre-industrial times, increasing 70% between 1970 and 2004 alone…
The Future of Climate Change:
Even if greenhouse gas emissions stop immediately, global temperatures will continue to rise at least for the next 100 years. Depending on the extent and effectiveness of climate change mitigation strategies, global temperatures could rise 1-6°C (2-10°F) by the end of the 21st century, according to the Intergovernmental Panel on Climate Change. Swift and significant emissions reductions will be vital in minimizing the impacts of warming…

[The ESA is also a signatory to the June 28, 2016 letter to the U.S. Congress: https://www.eurekalert.org/images/2016climateletter6-28-16.pdf]

Engineers Australia (The Institution of Engineers Australia)

November 2014

https://www.engineersaustralia.org.au/sites/default/files/climate_change_policy_nov_2014.pdf

Engineers Australia accepts the comprehensive scientific basis regarding climate change, the influence of anthropogenic global warming, and that climate change can have very serious community consequences. Engineers are uniquely placed to provide both mitigation and adaptation solutions for this serious global problem, as well as address future advances in climate change science.
This Climate Change Policy Statement has been developed to enable organisational governance on the problem, and provide support for members in the discipline and practice of the engineering profession.
Context
Building upon a long history of Engineers Australia policy development, and as the largest technically informed professional body in Australia, Engineers Australia advocates that Engineers must act proactively to address climate change as an ecological, social and economic risk…

Entomological Society of America

The ESA is also a signatory to the June 28, 2016 letter to the U.S. Congress:
https://www.eurekalert.org/images/2016climateletter6-28-16.pdf

European Academy of Sciences and Arts

March 3, 2007

http://www.euro-acad.eu/downloads/memorandas/lets_be_honest_-_festplenum_03.03.07_-_final2.pdf

Human activity is most likely responsible for climate warming. Most of the climatic warming over the last 50 years is likely to have been caused by increased concentrations of greenhouse gases in the atmosphere. Documented long-term climate changes include changes in Arctic temperatures and ice, widespread changes in precipitation amounts, ocean salinity, wind patterns and extreme weather including droughts, heavy precipitation, heat waves and the intensity of tropical cyclones. The above development potentially has dramatic consequences for mankind's future…

European Federation of Geologists

January 23, 2008

http://eurogeologists.eu/wp-content/uploads/2015/10/Position-Paper_Carbon-Capture-and-geological-Storage.pdf

The EFG recognizes the work of the IPCC and other organizations, and subscribes to the major findings that climate change is happening, is predominantly caused by anthropogenic emissions of CO_2, and poses a significant threat to human civilization.
Anthropogenic CO_2 emissions come from fossil carbon sources, such as coal, oil, natural gas, limestone and carbonate rocks. Thriving and developing economies currently depend on these resources. Since geologists play a crucial role in their exploration and exploitation, we feel praised by the increasing welfare, but also implicated by the carbon curse.
It is clear that major efforts are necessary to quickly and strongly reduce CO_2 emissions. The EFG strongly advocates renewable and sustainable energy production, including geothermal energy, as well as the need for increasing energy efficiency.

European Geosciences Union

November 2008

http://www.egu.eu/about/statements/egu-position-statement-on-ocean-acidification/

EGU position statement on climate/ocean acidification
Impacts of ocean acidification may be just as dramatic as those of global warming (resulting from anthropogenic activities on top of natural variability) and the combination of both are likely to exacerbate consequences, resulting in potentially profound changes throughout marine ecosystems and in the services that they provide to humankind...

Since the beginning of the industrial revolution the release of carbon dioxide (CO_2) from our industrial and agricultural activities has resulted in atmospheric CO_2 concentrations that have increased from approximately 280 to 385 parts per million (ppm). The atmospheric concentration of CO_2 is now higher than experienced on Earth for at least the last 800,000 years (direct ice core evidence) and probably the last 25 million years, and is expected to continue to rise at an increasing rate, leading to significant temperature increases in the atmosphere and ocean in the coming decades…

Ocean acidification is already occurring today and will continue to intensify, closely tracking atmospheric CO2 increase. Given the potential threat to marine ecosystems and its ensuing impact on human society and economy, especially as it acts in conjunction with anthropogenic global warming, there is an urgent need for immediate action.

This rather new recognition that, in addition to the impact of CO_2 as a greenhouse gas on global climate change, OA is a **direct** consequence of the absorption of anthropogenic CO_2 emissions, will hopefully help to set in motion an even more stringent CO_2 mitigation policy worldwide. The only solutions to avoid excessive OA are a long-term mitigation strategy to limit future release of CO_2 to the atmosphere and/or enhance removal of excess CO_2 from the atmosphere.

European Physical Society

November 2007

http://archive.iupap.org/epspositionpaper.pdf

The emission of anthropogenic greenhouse gases, among which carbon dioxide is the main contributor, has amplified the natural greenhouse effect and led to global warming. The main contribution stems from burning fossil fuels. A further increase will have decisive effects on life on earth. An energy cycle with the lowest possible CO2 emission is called for wherever possible to combat climate change.

2015 Statement

http://www.eps.org/resource/resmgr/policy/eps-pp-EuropeanEnergyPol2015.pdf

The forthcoming United Nations Climate Change Conference (Paris, December 2015) will be held with the objective of achieving a binding and global agreement on climate-related policy from all nations of the world. This conference, seeking to protect the climate, will be a great opportunity to find solutions in the human quest for sustainable energy as a global endeavour. The Energy Group of the European Physical Society (EPS) welcomes the energy policy of the European Union (EU) to promote renewable energies for electricity generation, together with energy efficiency measures. This policy needs to be implemented by taking into account the necessary investments and the impact on the economical position of the EU in the world. Since the direct impact of any EU energy policy on world CO_2 emissions is rather limited, the best strategy is to take the lead in mitigating climate change and in developing an energy policy that offers an attractive and economically viable model with reduced CO_2 emissions and lower energy dependence…

European Science Foundation

2007

http://archives.esf.org/fileadmin/Public_documents/Publications/MB_Climate_Change_Web.pdf

The scientific evidence is now overwhelming that climate change is a serious global threat which requires an urgent global response, and that climate change is driven by human activity… Enough is now known to make climate change the challenge of the 21st century, and the research community is poised to address this challenge…

There is now convincing evidence that since the industrial revolution, human activities, resulting in increasing concentrations of greenhouse gases have become a major agent of climate change. These greenhouse gases affect the global climate by retaining heat in the troposphere, thus raising the average temperature of the planet and altering global atmospheric circulation and precipitation patterns.
While on-going national and international actions to curtail and reduce greenhouse gas emissions are essential, the levels of greenhouse gases currently in the atmosphere, and their impact, are likely to persist for several decades. On-going and increased efforts to mitigate climate change through reduction in greenhouse gases are therefore crucial…

European Space Sciences Committee

December 2015

http://archives.esf.org/media-centre/ext-single-news/article/essc-statement-on-climate-change-1096.html

The European Space Sciences Committee (ESSC) supports the Article (2) agreement on climate change of the Declaration of the '2015 Budapest World Science Forum on the enabling power of science' urges such a universal agreement aiming at stabilising atmospheric concentrations of greenhouse gases and reducing the amount of airborne particles.
The ESSC encourages countries to reduce their emissions in order to avoid dangerous anthropogenic interference with the climate system, which could lead to disastrous consequences. Such consequences, albeit from natural evolution, are witnessed in other objects of our Solar System.

Federation of Australian Scientific and Technological Societies

September 4, 2008

https://scentofpine.files.wordpress.com/2012/09/fasts-statement-on-climate-change-sep-2008.pdf

Global climate change is real and measurable. Since the start of the 20th century, the global mean surface temperature of the Earth has increased by more than 0.7°C and the rate of warming has been largest in the last 30 years… Key vulnerabilities arising from climate change include water resources, food supply, health, coastal settlements, biodiversity and some key ecosystems such as coral reefs and alpine regions. As the atmospheric concentration of greenhouse gases increases, impacts become more severe and widespread. To reduce the global net economic, environmental and social losses in the face of these impacts, the policy objective must remain squarely focused on returning greenhouse gas concentrations to near pre-industrial levels through the reduction of emissions… The spatial and temporal fingerprint of warming can be traced to increasing greenhouse gas concentrations in the atmosphere, which are a direct result of burning fossil fuels, broad-scale deforestation and other human activity.

Geological Society of America

Adopted in October 2006; revised April 2010; March 2013; April 2015

Decades of scientific research have shown that climate can change from both natural and anthropogenic causes. The Geological Society of America (GSA) concurs with assessments by the National Academies of Science (2005), the National Research Council (2011), the Intergovernmental Panel on Climate Change (IPCC, 2013) and the U.S. Global Change Research Program (Melillo et al., 2014) that global climate has warmed in response to increasing concentrations of carbon dioxide (CO2) and other greenhouse gases. The concentrations of greenhouse gases in the atmosphere are now higher than they have been for many thousands of years. Human activities (mainly greenhouse-gas emissions) are the dominant cause of the rapid warming since the middle 1900s (IPCC, 2013). If the upward trend in greenhouse-gas concentrations continues, the projected global climate change by the end of the twenty-first century will result in significant impacts on humans and other species. The tangible effects of climate change are already occurring. Addressing the challenges posed by climate change will require a combination of adaptation to the changes that are likely to occur and global reductions of CO2 emissions from anthropogenic sources…

[The GSA is also a signatory to the June 28, 2016 letter to the U.S. Congress: https://www.eurekalert.org/images/2016climateletter6-28-16.pdf]

Health Care Without Harm

The HCWH is a signatory to the April 2016 statement: http://www.lung.org/our-initiatives/healthy-air/outdoor/climate-change/declaration-on-climate-change.html?referrer=https://www.google.com/

Health Care Climate Council

The HCCC is a signatory to the April 2016 statement: http://www.lung.org/our-initiatives/healthy-air/outdoor/climate-change/declaration-on-climate-change.html?referrer=https://www.google.com/

Institute of Professional Engineers (New Zealand)

2001

https://web.archive.org/web/20080815000000*/http://www.ipenz.org.nz/ipenz/forms/pdfs/Info_Note_6.pdf

Human activities have increased the concentration of these atmospheric greenhouse gases, and although the changes are relatively small, the equilibrium maintained by the atmosphere is delicate, and so the effect of these changes is significant. The world's most important greenhouse gas is carbon dioxide, a by-product of the burning of fossil fuels.
... Professional engineers commonly deal with risk, and frequently have to make judgments based on incomplete data. The available evidence suggests very strongly that human activities have already begun to make significant changes to the earth's climate, and that the longterm risk of delaying action is greater than the cost of avoiding/minimising the risk.

InterAcademy Council

2007

http://www.interacademycouncil.net/24026/25142.aspx

Scientific evidence is overwhelming that current energy trends are unsustainable.

Immediate action is required to effect change in the timeframe needed to address significant ecological, human health and development, and energy security needs. Aggressive changes in policy are thus needed to accelerate the deployment of superior technologies. With a combination of such policies at the local, national, and international level, it should be possible—both technically and economically—to elevate the living conditions of most of humanity, while simultaneously addressing the risks posed by climate change and other forms of energy-related environmental degradation and reducing the geopolitical tensions and economic vulnerabilities generated by existing patterns of dependence on predominantly fossil-fuel resources…

The Study Panel believes that, given the dire prospect of climate change, the following three recommendations should be acted upon *without delay and simultaneously*:

- Concerted efforts should be mounted to improve energy efficiency and reduce the carbon intensity of the world economy, including the worldwide introduction of price signals for carbon emissions, with consideration of different economic and energy systems in individual countries.
- Technologies should be developed and deployed for capturing and sequestering carbon from fossil fuels, particularly coal.
- Development and deployment of renewable energy technologies should be accelerated in an environmentally responsible way.

Taking into account the three urgent recommendations above, another recommendation stands out by itself as a moral and social imperative and should be pursued with all means available

International Association for Great Lakes Research

February 25, 2009

http://iaglr.org/scipolicy/factsheets/iaglr_crossroads_climatechange.pdf

While the Earth's climate has changed many times during the planet's history because of natural factors, including volcanic eruptions and changes in the Earth's orbit, never before have we observed the present rapid rise in temperature and carbon dioxide (CO_2).
Human activities resulting from the industrial revolution have changed the chemical composition of the atmosphere....
Deforestation is now the second largest contributor to global warming, after the burning of fossil fuels.
These human activities have significantly increased the concentration of "greenhouse gases" in the atmosphere…
As the Earth's climate warms, we are seeing many changes: stronger, more destructive hurricanes; heavier rainfall; more disastrous flooding; more areas of the world experiencing severe drought; and more heat waves.

International Council of Academies of Engineering and Technological Sciences

2007

http://www.caets.org/cms/7122/7735.aspx

As reported by the Intergovernmental Panel on Climate Change (IPCC), most of the observed global warming since the mid-20th century is very likely due to human-produced emission of greenhouse gases and this warming will continue unabated if present anthropogenic emissions continue or, worse, expand without control. CAETS, therefore, endorses the many recent calls to decrease and control greenhouse gas emissions to an acceptable level as quickly as possible.

International Union for Quaternary Research

http://www.inqua.org/files/iscc.pdf

Climate change is real

There is now strong evidence that significant global warming is occurring. The evidence comes from direct measurements of rising surface air temperatures and subsurface ocean temperatures and, indirectly, from increases in average global sea levels, retreating glaciers, and changes in many physical and biological systems. It is very likely that most of the observed increase in global temperatures since the mid-twentieth century is due to human-induced increases in greenhouse gas concentrations in the atmosphere (IPCC 2007). Human activities are now causing atmospheric concentrations of greenhouse gases – including carbon dioxide, methane, tropospheric ozone, and nitrous oxide – to rise well above pre-industrial levels.

Carbon dioxide levels have increased from 280 ppm in 1750 to over 380 ppm today, higher than any previous levels in at least the past 650,000 years. Increases in greenhouse gases are causing temperatures to rise; the Earth's surface warmed by approximately 0.6°C over the twentieth century. The Intergovernmental Panel on Climate Change (IPCC) has forecast that average global surface temperatures will continue to increase, reaching between 1.1°C and 6.4°C above 1990 levels, by 2100.

The uncertainties about the amount of global warming we face in coming decades can be reduced through further scientific research. Part of this research must be better documenting and understanding past climate change. Research on Earth's climate in the recent geologic past provides insights into ways in which climate can change in the future. It also provides data that contribute to the testing and improvement of the computer models that are used to predict future climate change.

Reduce the causes of climate change

The scientific understanding of climate change is now sufficiently clear to justify nations taking prompt action. A lack of full scientific certainty about some aspects of climate change is not a reason for delaying an immediate response that will, at a reasonable cost, prevent dangerous anthropogenic interference with the climate system. It is vital that all nations identify cost-effective steps that they can take now to contribute to substantial and long-term reduction in net global greenhouse gas emissions. Action taken now to reduce significantly the build-up of greenhouse gases in the atmosphere will lessen the magnitude and rate of climate change. Fossil fuels, which are responsible for most of carbon dioxide emissions produced by human activities, provide valuable resources for many nations and will provide 85% of the world energy demand over the next 25 years (IEA 2004). Minimizing the amount of this carbon dioxide reaching the atmosphere presents a huge challenge but must be a global priority.

International Union of Geodesy and Geophysics

July 2007

Resolution 6: The Urgency of Addressing Climate Change

Considering,

The advances in scientific understanding of the Earth system generated by collaborative international, regional, and national observations and research programs; and

The comprehensive and widely accepted and endorsed scientific assessments carried out by the Intergovernmental Panel on Climate Change and regional and national bodies, which have firmly established, on the basis of scientific evidence, that human activities are the primary cause of recent climate change;

Realizing,
Continuing reliance on combustion of fossil fuels as the world's primary source of energy will lead to much higher atmospheric concentrations of greenhouse gases, which will, in turn, cause significant increases in surface temperature, sea level, ocean acidification, and their related consequences to the environment and society;

Stabilization of climate to avoid "dangerous anthropogenic interference with the climate system", as called for in the UN Framework Convention on Climate Change, will require significant cutbacks in greenhouse gas emissions during the 21st century; and

Mitigation of and adaptation to climate change can be made more effective by reducing uncertainties regarding feedbacks and the associated mechanisms;

Urges,
Nations collectively to begin to reduce sharply global atmospheric emissions of greenhouse gases and absorbing aerosols, with the goal of urgently halting their accumulation in the atmosphere and holding atmospheric levels at their lowest practicable value;

National and international agencies to adequately support comprehensive observation and research programs that can clarify the urgency and extent of needed mitigation and promote adaptation to the consequences of climate change;

Resource managers, planners, and leaders of public and private organizations to incorporate information on ongoing and projected changes in climate and its ramifications into their decision-making, with goals of limiting emissions, reducing the negative consequences of climate change, and enhancing adaptation, public well-being, safety, and economic vitality; and

Organizations around the world to join with IUGG and its member Associations to encourage scientists to communicate freely and widely with public and private decision-makers about the consequences and risks of on-going climate change and actions that can be taken to limit climate change and promote adaptation; and

Resolves,
To act with its member Associations to develop and implement an integrated communication and outreach plan to increase public understanding of the nature and implications of human-induced impacts on the Earth system, with the aim of reducing detrimental consequences.

London Mathematical Society

The LMS is a signatory to the July 21, 2015 UK science communiqué on climate change
https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF

National Academies

Over the past two decades, a wide range of national academies of sciences around the world have issued reports, statements, scientific summaries, and letters to policymakers about climate change. Some of these are cited in specific sections above and below. A list of the academies participating includes the national academies of:

African Academy of Sciences

Australia
Belgium (both French and Flemish language academies)
Brazil
Cameroon
Canada
China
France
Germany
Ghana
India
Indonesia
Ireland
Italy
Japan
Kenya
Madagascar
Malaysia
Mexico
National Academies of the United States
New Zealand
Nigeria
Poland
Royal Society of Canada
Royal Society of New Zealand
Royal Society of the United Kingdom
Royal Swedish Academy of Sciences
Russian Academy of Sciences
Senegal
South Africa
Sudan
Sweden
Tanzania
the Caribbean
Turkey
Uganda
Zambia
Zimbabwe

National Association of County and City Health Officials

The NACCHO is a signatory to the April 2016 declaration: http://www.lung.org/our-initiatives/healthy-air/outdoor/climate-change/declaration-on-climate-change.html?referrer=https://www.google.com/

National Association of Geoscience Teachers

November 10, 2008

http://nagt.org/nagt/policy/ps-climate.html

The National Association of Geoscience Teachers (NAGT) recognizes: (1) that Earth's climate is changing, (2) that present warming trends are largely the result of human activities, and (3) that teaching climate change science is a fundamental and integral part of earth science education. The core mission of NAGT is to "*foster improvement in the teaching of the earth sciences at all levels of formal and informal instruction, to emphasize the cultural significance of the earth sciences and to disseminate knowledge in this field to the general public*." The National Science Education Standards call for a populace that understands how scientific knowledge is both generated and verified, and how complex interactions between human activities and the environment can impact the Earth system. Climate is clearly an integral part of the Earth system connecting the physical, chemical and biological components and playing an essential role in how the Earth's environment interacts with human culture and societal development. Thus, climate change science is an essential part of Earth Science education and is fundamental to the mission set forth by NAGT. In recognition of these imperatives, NAGT strongly supports and will work to promote education in the science of climate change, the causes and effects of current global warming, and the immediate need for policies and actions that reduce the emission of greenhouse gases.

National Association of Hispanic Nurses

The NAHN is a signatory to the April 2016 declaration: http://www.lung.org/our-initiatives/healthy-air/outdoor/climate-change/declaration-on-climate-change.html?referrer=https://www.google.com/

National Association of Marine Laboratories

The NAML is a signatory to the June 28, 2016 letter to the U.S. Congress: https://www.eurekalert.org/images/2016climateletter6-28-16.pdf

National Environmental Health Association

The NEHA is a signatory to the April 2016 declaration: http://www.lung.org/our-initiatives/healthy-air/outdoor/climate-change/declaration-on-climate-change.html?referrer=https://www.google.com/

National Medical Association

The NMA is a signatory to the April 2016 declaration: http://www.lung.org/our-initiatives/healthy-air/outdoor/climate-change/declaration-on-climate-change.html?referrer=https://www.google.com/

National Research Council (U.S.)

2010 (one of many statements)

https://www.nap.edu/catalog/12782/advancing-the-science-of-climate-change

Climate change is occurring, is caused largely by human activities, and poses significant risks for -- and in many cases is already affecting -- a broad range of human and natural systems. The compelling case for these conclusions is provided in *Advancing the Science of Climate Change*, part of a congressionally requested suite of studies known as America's Climate Choices. While noting that there is always more to learn and that the scientific process is never closed, the book shows that hypotheses about climate change are supported by multiple lines of evidence and have stood firm in the face of serious debate and careful evaluation of alternative explanations.

[The U.S. National Academies of Sciences have also signed a long series of statements with other national academies around the world in support of the state-of-the-science.]

Natural Science Collections Alliance

The NSCA is a signatory to the June 28, 2016 letter to the U.S. Congress: https://www.eurekalert.org/images/2016climateletter6-28-16.pdf

National Society of Professional Engineers

July 2010

https://www.nspe.org/resources/issues-and-advocacy/take-action/position-statements/air-pollution

Acid rain, toxic air pollutants, and greenhouse gas emissions are a major threat to human health and welfare, as well as plant and animal life. Based on recognized adequate research of the causes and effects of the various forms of air pollution, the federal government should establish environmentally and economically sound standards for the reduction and control of these emissions.

Organization of Biological Field Stations

The OBFS is a signatory to the June 28, 2016 letter to the U.S. Congress: https://www.eurekalert.org/images/2016climateletter6-28-16.pdf

Public Health Institute

The PHI is a signatory to the April 2016 declaration: http://www.lung.org/our-initiatives/healthy-air/outdoor/climate-change/declaration-on-climate-change.html?referrer=https://www.google.com/

Royal Astronomical Society

The RAS is a signatory to the July 21, 2015 UK science communiqué on climate change https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF

Royal Economic Society

The RES is a signatory to the July 21, 2015 UK science communiqué on climate change https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF

Royal Geographic Society

The RGS is a signatory to the July 21, 2015 UK science communiqué on climate change https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF

Royal Meteorological Society

2007, 2011, 2015

https://web.archive.org/web/20110321102247/http://www.rmets.org/news/detail.php?ID=332

https://web.archive.org/web/20070415000000*/http://www.rmets.org/pdf/ipcc.pdf

The Fourth Assessment Report (AR4) of the Inter-Governmental Panel on Climate Change (IPCC) is unequivocal in its conclusion that climate change is happening and that humans are contributing significantly to these changes. The evidence, from not just one source but a number of different measurements, is now far greater and the tools we have to model climate change contain much more of

our scientific knowledge within them. The world's best climate scientists are telling us it's time to do something about it.
Carbon Dioxide is such an important greenhouse gas because there is an increasing amount of it in the atmosphere from the burning of fossil fuels and it stays in the atmosphere for such a long time; a hundred years or so. The changes we are seeing now in our climate are the result of emissions since industrialisation and we have already set in motion the next 50 years of global warming – what we do from now on will determine how worse it will get.

The RMS is also a signatory to the July 21, 2015 UK science communiqué on climate change
https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF

Royal Society (U.K.)

The RS is a signatory to the July 21, 2015 UK science communiqué on climate change
https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF

Climate change is one of the defining issues of our time. It is now more certain than ever, based on many lines of evidence, that humans are changing Earth's climate. The atmosphere and oceans have warmed, accompanied by sea-level rise, a strong decline in Arctic sea ice, and other climate-related changes. The evidence is clear.

Royal Society of Biology (Formerly the Institute of Biology)

https://www.rsb.org.uk/policy/policy-issues/environmental-sciences/climate-change/climate-change-statement

We strongly support the introduction of policies to significantly reduce UK and global greenhouse gas emissions, as we feel that the consequences of climate change will be severe.
We believe that biologists have a crucial role to play in developing innovative biotechnologies to generate more efficient and environmentally sustainable biofuels, and to capture and store greenhouse gases from power stations and the atmosphere.
It is important for the government to continue to consult scientists, to review policy, and to encourage new technologies so as to ensure the best possible strategies are used to combat this complex issue.
We are in favour of reducing energy demands, in particular by improvements in public transport and domestic appliances.
As some degree of climate change is inevitable, we encourage the development of adaptation strategies to reduce the effects of global warming on our environment.

Current

https://www.rsb.org.uk/policy/policy-issues/environmental-sciences/climate-change

There is an overwhelming scientific consensus worldwide, and a broad political consensus, that greenhouse gas emissions are affecting global climate, and that measures are needed to reduce these emissions significantly so as to limit the extent of climate change. The term 'climate change' is used predominantly to refer to global warming and its consequences, and this policy briefing will address these issues.
What is global warming?
Although long-term fluctuations in global temperature occur due to various factors such as solar activity, there is scientific agreement that the rapid global warming that has occurred in recent years is mostly anthropogenic, i.e. due to human activity. The absorption and emission of solar radiation by greenhouse gases causes the atmosphere to warm.

What global warming has occurred?
Human activities such as fossil fuel consumption and deforestation have elevated atmospheric levels of greenhouse gases such as carbon dioxide, methane and nitrous oxide significantly since pre-industrial times.

The RSB is also a signatory to the July 21, 2015 UK science communiqué on climate change
https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF

Royal Society of Chemistry

The RSC is a signatory to the July 21, 2015 UK science communiqué on climate change
https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF

Royal Society of Edinburgh

The RSE is a signatory to the July 21, 2015 UK science communiqué on climate change
https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF

Royal Society of New Zealand

2016

http://royalsociety.org.nz/expert-advice/papers/yr2016/climate-change-implications-for-new-zealand/

Key aspects of global climate change
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 oceans have warmed, the amounts of snow and ice have diminished, and sea level has risen.
Key findings
Global surface temperatures have warmed, on average, by around one degree Celsius since the late 19th century. Much of the warming, especially since the 1950s, is very likely a result of increased amounts of greenhouse gases in the atmosphere, resulting from human activity.
The Northern Hemisphere have warmed much faster than the global average, while the southern oceans south of New Zealand latitudes have warmed more slowly. Generally, continental regions have warmed more than the ocean surface at the same latitudes.
Global sea levels have risen around 19 cm since the start of the 20th century, and are almost certain to rise at a faster rate in future.
Surface temperature is projected to rise over the 21st century under all assessed emission scenarios. It is very likely that heat waves will occur more often and last longer, and that extreme precipitation events will become more intense and frequent in many regions. The ocean will continue to warm and acidify, and global mean sea level will continue to rise.
Relatively small changes in average climate can have a big effect on the frequency of occurrence or likelihood of extreme events.
How the future plays out depends critically on the emissions of greenhouses gases that enter the atmosphere over coming decades.
New Zealand is being affected by climate change and impacts are set to increase in magnitude and extent over time.
Floods, storms, droughts and fires will become more frequent unless significant action is taken to reduce global emissions of greenhouse gases, which are changing the climate.
Even small changes in average climate conditions are likely to lead to large changes in the frequency of occurrence of extreme events. Our societies are not designed to cope with such rapid changes.

Society for General Microbiology

The SGM is a signatory to the July 21, 2015 UK science communiqué on climate change
https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF

Society for Industrial and Applied Mathematics

The SIAM is a signatory to the June 28, 2016 letter to the U.S. Congress:
https://www.eurekalert.org/images/2016climateletter6-28-16.pdf

Society for Mathematical Biology

The SMB is a signatory to the June 28, 2016 letter to the U.S. Congress:
https://www.eurekalert.org/images/2016climateletter6-28-16.pdf

Society for the Study of Amphibians and Reptiles

The SSAR is a signatory to the June 28, 2016 letter to the U.S. Congress:
https://www.eurekalert.org/images/2016climateletter6-28-16.pdf

Society of American Foresters

Adopted December 8, 2008; Revised December 7, 2014

http://www.eforester.org/Main/Issues_and_Advocacy/Statements/Forest_Management_and_Climate_Change.aspx

The Society of American Foresters (SAF) believes that climate change policies and actions should recognize the role that forests play in reducing greenhouse gas (GHG) emissions through 1) the substitution of wood products for nonrenewable building materials, 2) forest biomass substitution for fossil fuel-based energy sources, 3) reducing wildfire and other disturbance emissions, and 4) avoided land-use change. SAF also believes that sustainably managed forests can reduce GHG concentrations by sequestering atmospheric carbon in trees and soil, and by storing carbon in wood products made from the harvested trees. Finally, climate change policies can invest in sustainable forest management to achieve these benefits, and respond to the challenges and opportunities that a changing climate poses for forests.

Of the many ways to reduce GHG emissions and atmospheric particulate pollution, the most familiar are increasing energy efficiency and conservation, and using renewable energy sources as a substitution for fossil fuels. Equally important is using forests to address climate change. Forests play an essential role controlling GHG emissions and atmospheric GHGs, while simultaneously providing essential environmental and social benefits, including clean water, wildlife habitat, recreation, and forest products that, in turn, store carbon.

Finally, changes in long-term patterns of temperature and precipitation have the potential to dramatically affect forests nationwide through a variety of changes to growth and mortality (USDA Forest Service 2012). Many such changes are already evident, such as longer growing and wildfire seasons, increased incidence of pest and disease, and climate-related mortality of specific species (Westerling et al. 2006). These changes have been associated with increasing concentrations of atmospheric carbon dioxide (CO2) and other GHGs in the atmosphere. Successfully achieving the benefits forests can provide for addressing climate change will therefore require explicit and long-term policies and investment in managing these changes, as well as helping private landowners and

public agencies understand the technologies and practices that can be used to respond to changing climate conditions…

Society of Nematologists

The SoN is a signatory to the June 28, 2016 letter to the U.S. Congress:
https://www.eurekalert.org/images/2016climateletter6-28-16.pdf

Society of Systematic Biologists

The SSB is a signatory to the June 28, 2016 letter to the U.S. Congress:
https://www.eurekalert.org/images/2016climateletter6-28-16.pdf

Soil Science Society of America

May 2011; 2016

https://www.soils.org/files/science-policy/asa-cssa-sssa-climate-change-policy-statement.pdf

A comprehensive body of scientific evidence indicates beyond reasonable doubt that global climate change is now occurring and that its manifestations threaten the stability of societies as well as natural and managed ecosystems. Increases in ambient temperatures and changes in related processes are directly linked to rising anthropogenic greenhouse gas (GHG) concentrations in the atmosphere. The potential related impacts of climate change on the ability of agricultural systems, which include soil and water resources, to provide food, feed, fiber, and fuel, and maintenance of ecosystem services (e.g., water supply and habitat for crop landraces, wild relatives, and pollinators) as well as the integrity of the environment, are major concerns.

Around the world and in the United States (US), agriculture—which is comprised of field, vegetable, and tree crops, as well as livestock production—constitutes a major land use which influences global ecosystems. Globally, crop production occupies approximately 1.8 Billion (B) hectares out of a total terrestrial land surface of about 13.5 B hectares. In addition, animal production utilizes grasslands, rangelands, and savannas, which altogether cover about a quarter of the Earth's land. Even in 2010, agriculture remains the most basic and common human occupation on the planet and a major contributor to human well-being. Changes in climate are already affecting the sustainability of agricultural systems and disrupting production.

[The May 2011 Statement was also signed by the American Society of Agronomy and the Crop Science Society of America.]

[The SSSA is also a signatory to the June 28, 2016 letter to the U.S. Congress:
https://www.eurekalert.org/images/2016climateletter6-28-16.pdf]

The Academy of Medical Sciences (UK)

The AMS is a signatory to the July 21, 2015 UK science communiqué on climate change
https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF

The Academy of Social Sciences (UK)

The AoSS is a signatory to the July 21, 2015 UK science communiqué on climate change
https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF

The British Academy for the Humanities and Social Sciences

The BAHSS is a signatory to the July 21, 2015 UK science communiqué on climate change https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF

The British Ecological Society

The BES is a signatory to the July 21, 2015 UK science communiqué on climate change https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF

The Challenger Society for Marine Sciences

The CSMS is a signatory to the July 21, 2015 UK science communiqué on climate change https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF

The Geological Society (UK)

November 2010 (updated 2013 and 2015)

https://www.geolsoc.org.uk/~/media/shared/documents/policy/Climate%20Change%20Statement%20final%20%20%20new%20format.pdf?la=en

https://www.geolsoc.org.uk/climaterecord

The last century has seen a rapidly growing global population and much more intensive use of resources, leading to greatly increased emissions of gases, such as carbon dioxide and methane, from the burning of fossil fuels (oil, gas and coal), and from agriculture, cement production and deforestation. Evidence from the geological record is consistent with the physics that shows that adding large amounts of carbon dioxide to the atmosphere warms the world and may lead to: higher sea levels and flooding of low-lying coasts; greatly changed patterns of rainfall; increased acidity of the oceans; and decreased oxygen levels in seawater…
There is now widespread concern that the Earth's climate will warm further, not only because of the lingering effects of the added carbon already in the system, but also because of further additions as human population continues to grow…

[The GS is also a signatory to the July 21, 2015 UK science communiqué on climate change https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF]

The Institute of Physics

The IoP is a signatory to the July 21, 2015 UK science communiqué on climate change https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF

The Institution of Chemical Engineers

The ICE is a signatory to the July 21, 2015 UK science communiqué on climate change https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF

The Institution of Civil Engineers

The ICE is a signatory to the July 21, 2015 UK science communiqué on climate change https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF

The Institution of Environmental Sciences

The IES is a signatory to the July 21, 2015 UK science communiqué on climate change https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF

The Learned Society of Wales

The LSoW is a signatory to the July 21, 2015 UK science communiqué on climate change https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF

The Wildlife Society (international)

November 2011 Statement

http://wildlife.org/wp-content/uploads/2014/05/PS_GlobalClimateChange.pdf

Human activities over the past 100 years have caused significant changes in the earth's climatic conditions, resulting in severe alterations in regional temperature and precipitation patterns that are expected to continue and become amplified over the next 100 years or more. Although climates have varied since the earth was formed, few scientists question the role of humans in exacerbating recent climate change through the increase in emissions of greenhouse gases (e.g., carbon dioxide, methane, water vapor). Human activities contributing to climate warming include the burning of fossil fuels, slash and burn agriculture, methane production from animal husbandry practices, and land-use changes. The critical issue is no longer "whether" climate change is occurring, but rather how to address its effects on wildlife and wildlife- habitats…

Trust For America's Health

The TFAA is a signatory to the April 2016 statement: http://www.lung.org/our-initiatives/healthy-air/outdoor/climate-change/declaration-on-climate-change.html?referrer=https://www.google.com/

U.S. Climate and Health Alliance

The USCHA is a signatory to the April 2016 statement: http://www.lung.org/our-initiatives/healthy-air/outdoor/climate-change/declaration-on-climate-change.html?referrer=https://www.google.com/

University Corporation for Atmospheric Research

The UCAR is a signatory to the June 28, 2016 letter to the U.S. Congress: https://www.eurekalert.org/images/2016climateletter6-28-16.pdf

Wellcome Trust

Wellcome is a signatory to the July 21, 2015 UK science communiqué on climate change https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF

World Federation of Engineering Organizations

May 24, 2016

http://www.wfeo.org/wp-content/uploads/declarations/WFEO_Statement_for_UNFCCC_SB44_Bonn_Meeting.pdf

Now that the world has negotiated the Paris agreement to mitigate GHGs and pursue adaptation to the changing climate, the focus must now turn towards implementation to turn the words into action. The world's engineers are a human resource that must be tapped to contribute to this implementation. All countries use engineers to deliver services that provide the quality of life that society enjoys, in particular, potable water, sanitation, shelter, buildings, roads, bridges, power, energy and other types of infrastructure. There are opportunities to achieve GHG reduction as well as improving the climate resilience of this infrastructure through design, construction and operation all of which require the expertise and experience of engineers. Engineers are problem-solvers and seek to develop feasible solutions that are cost-effective and sustainable.

Engineers serve the public interest and offer objective, unbiased review and advice. Having their expertise to evaluate the technical feasibility and economic viability of proposals to reduce GHGs and to adapt to climate change impacts should be pursued. Engineers input and action is required to implement solutions at country and local levels.

The international organization known as the World Federation of Engineering Organizations consist of members of national engineering organizations from over 90 developing and developed countries representing more than 20 million engineers. The WFEO offers to facilitate contact and engagement with these organizations to identify subject matter experts that will contribute their time and expertise as members of the engineering profession. The expertise of the world's engineers is needed to help successfully implement the Paris agreement. We encourage all countries to engage their engineers in this effort. The WFEO is prepared to assist in this effort.

December 8, 2015

http://www.wfeo.org/wp-content/uploads/declarations/WFEO-COP-21_Engineering_Summit_Statement.pdf

The WFEO consists of national members representing more than 85 countries as well as 10 regional engineering organizations. These members collectively engage with more than 20 million engineers worldwide who are committed to serve the public interest through Codes of Practice and a Code of Ethics that emphasize professional practice in sustainable development, environmental stewardship and climate change.

WFEO, the International Council for Science (ICSU) and the International Social Science Council (ISSC) are co-organizing partners of the UN Major Group on Scientific and Technological Communities, one of the nine major groups of civil society recognized by the United Nations.

Engineers acknowledge that climate change is underway and that sustained efforts must be undertaken to address this worldwide challenge to society, our quality of life and prosperity. Urgent actions are required and the engineering profession is prepared to do its part towards implementing cost-effective, feasible and sustainable solutions working in partnership with stakeholders.

World Federation of Public Health Associations

May 14, 2001

https://web.archive.org/web/20081217173936/http://www.wfpha.org/Archives/01.22%20Global%20Climate%20Change.pdf

Noting the conclusions of the United Nations' Intergovernmental Panel on Climate Change (IPCC) and other climatologists that anthropogenic greenhouse gases, which contribute to global climate change, have substantially increased in atmospheric concentration beyond natural processes and have increased by 28 percent since the industrial revolution….Realizing that subsequent health effects from such perturbations

in the climate system would likely include an increase in: heat-related mortality and morbidity; vector-borne infectious diseases,… water-borne diseases…(and) malnutrition from threatened agriculture….the World Federation of Public Health Associations…recommends precautionary primary preventive measures to avert climate change, including reduction of greenhouse gas emissions and preservation of greenhouse gas sinks through appropriate energy and land use policies, in view of the scale of potential health impacts...

World Health Organization

June 2016

http://www.who.int/mediacentre/factsheets/fs266/en/

Over the last 50 years, human activities – particularly the burning of fossil fuels – have released sufficient quantities of carbon dioxide and other greenhouse gases to trap additional heat in the lower atmosphere and affect the global climate.
In the last 130 years, the world has warmed by approximately 0.85oC. Each of the last 3 decades has been successively warmer than any preceding decade since 1850.
Sea levels are rising, glaciers are melting and precipitation patterns are changing. Extreme weather events are becoming more intense and frequent…

Many policies and individual choices have the potential to reduce greenhouse gas emissions and produce major health co-benefits. For example, cleaner energy systems, and promoting the safe use of public transportation and active movement – such as cycling or walking as alternatives to using private vehicles – could reduce carbon emissions, and cut the burden of household air pollution, which causes some 4.3 million deaths per year, and ambient air pollution, which causes about 3 million deaths every year.

In 2015, the WHO Executive Board endorsed a new work plan on climate change and health. This includes:
Partnerships: to coordinate with partner agencies within the UN system, and ensure that health is properly represented in the climate change agenda.
Awareness raising: to provide and disseminate information on the threats that climate change presents to human health, and opportunities to promote health while cutting carbon emissions.
Science and evidence: to coordinate reviews of the scientific evidence on the links between climate change and health, and develop a global research agenda.
Support for implementation of the public health response to climate change: to assist countries to build capacity to reduce health vulnerability to climate change, and promote health while reducing carbon emissions.

WHO Call For Urgent Action 2015

http://www.who.int/globalchange/global-campaign/cop21/en/

Climate change is the greatest threat to global health in the 21st century.
Health professionals have a duty of care to current and future generations. You are on the front line in protecting people from climate impacts - from more heat-waves and other extreme weather events; from outbreaks of infectious diseases such as malaria, dengue and cholera; from the effects of malnutrition; as well as treating people that are affected by cancer, respiratory, cardiovascular and other non-communicable diseases caused by environmental pollution.
Already the hottest year on record, 2015 will see nations attempt to reach a global agreement to address climate change at the United Nations Climate Change Conference (COP) in Paris in December. This may be the most important health agreement of the century: an opportunity not only to reduce climate change

and its consequences, but to promote actions that can yield large and immediate health benefits, and reduce costs to health systems and communities…

World Meteorological Organization

2016

https://public.wmo.int/en/our-mandate/climate

Since the beginning of the 20th century, scientists have been observing a change in the climate that cannot be attributed solely to natural influences. This change has occurred faster than any other climate change in Earth's history and will have consequences for future generations. Scientists agree that this climate change is anthropogenic (human-induced). It is principally attributable to the increase of certain heat absorbing greenhouse gases in our atmosphere since the industrial revolution. The ever-increasing amount of these gases has directly lead to more heat being retained in the atmosphere and thus to increasing global average surface temperatures. The partners in the WMO Global Atmosphere Watch (GAW) compile reliable scientific data and information on the chemical composition of the atmosphere and its natural and anthropogenic change. This helps to improve the understanding of interactions between the atmosphere, the oceans and the biosphere.

November 8, 2016

https://public.wmo.int/en/media/press-release/global-climate-2011-2015-hot-and-wild

The World Meteorological Organization has published a detailed analysis of the global climate 2011-2015 – the hottest five-year period on record - and the increasingly visible human footprint on extreme weather and climate events with dangerous and costly impacts.
The record temperatures were accompanied by rising sea levels and declines in Arctic sea-ice extent, continental glaciers and northern hemisphere snow cover.
All these climate change indicators confirmed the long-term warming trend caused by greenhouse gases. Carbon dioxide reached the significant milestone of 400 parts per million in the atmosphere for the first time in 2015, according to the WMO report which was submitted to U.N. climate change conference.

Zoological Society of London

The Zoological Society is a signatory to the July 21, 2015 UK science communiqué on climate change https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF

National Academies of Science (selected joint statements)

Many national science academies have published formal statements and declarations acknowledging the state of climate science, the fact that climate is changing, the compelling evidence that humans are responsible, and the need to debate and implement strategies to reduce emissions of greenhouse gases. A few examples of joint academy statements are listed here.

2001

http://science.sciencemag.org/content/292/5520/1261

Following the release of the third in the ongoing series of international reviews of climate science conducted by the Intergovernmental Panel on Climate Chang (IPCC), seventeen national science

academies issued a joint statement, entitled "The Science of Climate Change," acknowledging the IPCC study to be the scientific consensus on climate change science.

The statement was signed by:
Australian Academy of Sciences, Royal Flemish Academy of Belgium for Sciences and the Arts, Brazilian Academy of Sciences, Royal Society of Canada, Caribbean Academy of Sciences, Chinese Academy of Sciences, French Academy of Sciences, German Academy of Natural Scientists Leopoldina, Indian National Science Academy, Indonesian Academy of Sciences, Royal Irish Academy, Accademia Nazionale dei Lincei (Italy), Academy of Sciences Malaysia, Academy Council of the Royal Society of New Zealand, Royal Swedish Academy of Sciences, Turkish Academy of Sciences, and Royal Society (UK).

2005

http://nationalacademies.org/onpi/06072005.pdf

Eleven national science academies, including all of the largest emitters of greenhouse gases, signed a statement that the scientific understanding of climate change was sufficiently strong to justify prompt action. The statement explicitly endorsed the IPCC consensus and stated:

> "…there is now strong evidence that significant global warming is occurring. The evidence comes from direct measurements of rising surface air temperatures and subsurface ocean temperatures and from phenomena such as increases in average global sea levels, retreating glaciers, and changes to many physical and biological systems. It is likely that most of the warming in recent decades can be attributed to human activities (IPCC 2001). This warming has already led to changes in the Earth's climate."

The statement was signed by the science academies of:
Brazil, Canada, China, France, Germany, India, Italy, Japan, Russia, the United Kingdom, and the United States.

2007

http://www.pik-potsdam.de/aktuelles/nachrichten/dateien/G8_Academies%20Declaration.pdf

In 2007, seventeen national academies issued a joint declaration reconfirming previous statements and strengthening language based on new research from the fourth assessment report of the IPCC, including the following:

> "It is unequivocal that the climate is changing, and it is very likely that this is predominantly caused by the increasing human interference with the atmosphere. These changes will transform the environmental conditions on Earth unless counter-measures are taken."

The thirteen signatories were the national science academies of Brazil, Canada, China, France, Germany, Italy, India, Japan, Mexico, Russia, South Africa, the United Kingdom, and the United States.[30]

2007

http://www.interacademies.net/File.aspx?id=4825

In 2007, the Network of African Science Academies submitted a joint "statement on sustainability, energy efficiency, and climate change:"

> "A consensus, based on current evidence, now exists within the global scientific community that human activities are the main source of climate change and that the burning of fossil fuels is largely responsible for driving this change. The Intergovernmental Panel on Climate Change (IPCC) reached this conclusion with "90 percent certainty" in its Fourth Assessment issued earlier this year. The IPCC should be congratulated for the contribution it has made to public understanding of the nexus that exists between energy, climate and sustainability."

The thirteen signatories were the science academies of Cameroon, Ghana, Kenya, Madagascar, Nigeria, Senegal, South Africa, Sudan, Tanzania, Uganda, Zambia, Zimbabwe, as well as the African Academy of Sciences.

June 2008

http://www.nationalacademies.org/includes/climatechangestatement.pdf

In 2008, the thirteen signers of the 2007 joint academies declaration issued a statement reiterating previous statements and reaffirming "that climate change is happening and that anthropogenic warming is influencing many physical and biological systems." Among other actions, the declaration urges all nations to "(t)ake appropriate economic and policy measures to accelerate transition to a low carbon society and to encourage and effect changes in individual and national behaviour."

The thirteen signatories were the national science academies of Brazil, Canada, China, France, Germany, Italy, India, Japan, Mexico, Russia, South Africa, the United Kingdom, and the United States.[30]

May 2009

In May 2009, thirteen national academies issued a joint statement that said among other things:

> "The IPCC 2007 Fourth Assessment of climate change science concluded that large reductions in the emissions of greenhouse gases, principally CO_2, are needed soon to slow the increase of atmospheric concentrations, and avoid reaching unacceptable levels. However, climate change is happening even faster than previously estimated; global CO_2 emissions since 2000 have been higher than even the highest predictions, Arctic sea ice has been melting at rates much faster than predicted, and the rise in the sea level has become more rapid. Feedbacks in the climate system might lead to much more rapid climate changes. The need for urgent action to address climate change is now indisputable."

The thirteen signatories were the national science academies of Brazil, Canada, China, France, Germany, Italy, India, Japan, Mexico, Russia, South Africa, the United Kingdom, and the United States.[30]

July 2015

https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF

In July 2015, the Royal Society and member organizations issued a joint "U.K. Science Communiqué on Climate Change." In part, that statement reads:

> "The scientific evidence is now overwhelming that the climate is warming and that human activity is largely responsible for this change through emissions of greenhouse gases.

> Governments will meet in Paris in November and December this year to negotiate a legally binding and universal agreement on tackling climate change.
>
> Any international policy response to climate change must be rooted in the latest scientific evidence. This indicates that if we are to have a reasonable chance of limiting global warming in this century to 2°C relative to the pre-industrial period, we must transition to a zero-carbon world by early in the second half of the century.
>
> To achieve this transition, governments should demonstrate leadership by recognising the risks climate change poses, embracing appropriate policy and technological responses, and seizing the opportunities of low-carbon and climate-resilient growth."

It was signed by:
The Academy of Medical Sciences (UK)
The Academy of Social Sciences (UK)
The British Academy for the Humanities and Social Sciences
The British Ecological Society
The Geological Society (UK)
The Challenger Society for Marine Sciences
The Institution of Civil Engineers (UK)
The Institution of Chemical Engineers
The Institution of Environmental Sciences
The Institute of Physics
The Learned Society of Wales
London Mathematical Society
Royal Astronomical Society
Royal Economic Society
Royal Geographic Society
Royal Meteorological Society
Royal Society
Royal Society of Biology
Royal Society of Chemistry
Royal Society of Edinburgh
Society for General Microbiology
Wellcome Trust
Zoological Society of London

Selected Letters and Declarations on Climate Change from Multiple Science Organizations

October 2009 Climate Letter sent to the U.S. Senate

http://www.aaas.org/sites/default/files/migrate/uploads/1021climate_letter1.pdf

"Observations throughout the world make it clear that climate change is occurring, and rigorous scientific research demonstrates that the greenhouse gases emitted by human activities are the primary driver. These conclusions are based on multiple independent lines of evidence and contrary assertions are inconsistent with an objective assessment of the vast body of peer-reviewed science. Moreover, there is strong evidence that ongoing climate change will have broad impacts on society, including the global economy and on the environment. For the United States, climate change impacts include sea level rise for coastal

states, greater threats of extreme weather events, and increased risk of regional water scarcity, urban heat waves, western wildfires, and the disturbance of biological systems throughout the country. The severity of climate change impacts is expected to increase substantially in the coming decades.
If we are to avoid the most severe impacts of climate change, emissions of greenhouse gases must be dramatically reduced. In addition, adaptation will be necessary to address those impacts that are already unavoidable."

Signed
American Association for the Advancement of Science
American Chemical Society
American Geophysical Union
American Institute of Biological Sciences
American Meteorological Society
American Society of Agronomy
American Society of Plant Biologists
American Statistical Association
Association of Ecosystem Research Centers
Botanical Society of America
Crop Science Society of America
Ecological Society of America
Natural Science Collections Alliance
Organization of Biological Field Stations
Society for Industrial and Applied Mathematics
Society of Systematic Biologists
Soil Science Society of America
University Corporation for Atmospheric Research

May 2011 Climate Change Policy Statement from the American Society of Agronomy, Crop Science Society of America, Soil Science Society of America

https://www.soils.org/files/science-policy/asa-cssa-sssa-climate-change-policy-statement.pdf

A comprehensive body of scientific evidence indicates beyond reasonable doubt that global climate change is now occurring and that its manifestations threaten the stability of societies as well as natural and managed ecosystems. Increases in ambient temperatures and changes in related processes are directly linked to rising anthropogenic greenhouse gas (GHG) concentrations in the atmosphere. The potential related impacts of climate change on the ability of agricultural systems, which include soil and water resources, to provide food, feed, fiber, and fuel, and maintenance of ecosystem services (e.g., water supply and habitat for crop landraces, wild relatives, and pollinators) as well as the integrity of the environment, are major concerns.

Around the world and in the United States (US), agriculture—which is comprised of field, vegetable, and tree crops, as well as livestock production—constitutes a major land use which influences global ecosystems. Globally, crop production occupies approximately 1.8 Billion (B) hectares out of a total terrestrial land surface of about 13.5 B hectares. In addition, animal production utilizes grasslands, rangelands, and savannas, which altogether cover about a quarter of the Earth's land. Even in 2010, agriculture remains the most basic and common human occupation on the planet and a major contributor to human well-being. Changes in climate are already affecting the sustainability of agricultural systems and disrupting production.

July 21, 2015 Science communiqué on climate change from the United Kingdom Royal Academies of Science

https://royalsociety.org/~/media/policy/Publications/2015/21-07-15-climate-communique.PDF

The scientific evidence is now overwhelming that the climate is warming and that human activity is largely responsible for this change through emissions of greenhouse gases.
Governments will meet in Paris in November and December this year to negotiate a legally binding and universal agreement on tackling climate change.
Any international policy response to climate change must be rooted in the latest scientific evidence. This indicates that if we are to have a reasonable chance of limiting global warming in this century to 2°C relative to the pre-industrial period, we must transition to a zero-carbon world by early in the second half of the century.
To achieve this transition, governments should demonstrate leadership by recognising the risks climate change poses, embracing appropriate policy and technological responses, and seizing the opportunities of low-carbon and climate-resilient growth.

Signed by
The Academy of Medical Sciences (UK)
The Academy of Social Sciences (UK)
The British Academy for the Humanities and Social Sciences
The British Ecological Society
The Geological Society (UK)
The Challenger Society for Marine Sciences
The Institution of Civil Engineers (UK)
The Institution of Chemical Engineers
The Institution of Environmental Sciences
The Institute of Physics
The Learned Society of Wales
London Mathematical Society
Royal Astronomical Society
Royal Economic Society
Royal Geographic Society
Royal Meteorological Society
Royal Society
Royal Society of Biology
Royal Society of Chemistry
Royal Society of Edinburgh
Society for General Microbiology
Wellcome Trust
Zoological Society of London

April 4, 2016 Declaration on Climate from Leading U.S. Public Health Organizations

http://www.lung.org/our-initiatives/healthy-air/outdoor/climate-change/declaration-on-climate-change.html?referrer=https://www.google.com/

As leading public health, disease advocacy and medical organizations, we reiterate our longstanding commitment to addressing climate change as a public health issue. The statement below articulates our consensus on the health impacts of climate change and the need for action to protect public health.
The health impacts of climate change demand **immediate action**.

The **science is clear**; communities across the nation are experiencing the health impacts of climate change, including:
Elevated **ozone** and **particulate** air pollution, linked to asthma attacks, cardiovascular disease and premature death;
Extreme weather patterns, such as heat and severe storms, cause droughts, wildfires and flooding that destabilize communities, especially those least equipped to defend themselves; and
Increased **vector-borne diseases** by expanding seasons and geographic ranges for ticks, mosquitoes and other disease-carrying insects to roam.
The **most vulnerable**—children, seniors, low income communities, some communities of color, and those with chronic disease—disproportionately bear the health impacts of climate change.
Bold action is needed to address climate change by cleaning up major sources of carbon pollution including **power plants**, cars, trucks and other mobile sources.
Communities must have the tools and resources to adapt to and **mitigate the unique impacts** of climate change in their communities.
The **Climate Action Plan** will help cut carbon pollution and other greenhouse gases, preparing the U.S. to address climate impacts we can't avoid and to lead the world in our global climate efforts.
We **commend President Obama** and his entire team for bringing greater awareness to the public health impacts of climate change.
The public health, disease advocacy and medical community are united in our efforts to protect the public from the risks of climate change.
SIGNED
Allergy and Asthma Network
American Academy of Pediatrics
American College of Preventive Medicine
American Lung Association
American Public Health Association
American Psychological Association
American Thoracic Society
Asthma and Allergy Foundation of America
Health Care Without Harm
Health Care Climate Council
National Association of County and City Health Officials
National Association of Hispanic Nurses
National Environmental Health Association
National Medical Association
Public Health Institute
Trust For America's Health
U.S. Climate and Health Alliance

June 2016 Letter to the U.S. Congress from 31 Major Scientific Organizations

https://www.eurekalert.org/images/2016climateletter6-28-16.pdf

June 28, 2016
Dear Members of Congress,
We, as leaders of major scientific organizations, write to remind you of the consensus scientific view of climate change.
Observations throughout the world make it clear that climate change is occurring, and rigorous scientific research concludes that the greenhouse gases emitted by human activities are the primary driver. This conclusion is based on multiple independent lines of evidence and the vast body of peer-reviewed science.

There is strong evidence that ongoing climate change is having broad negative impacts on society, including the global economy, natural resources, and human health. For the United States, climate change impacts include greater threats of extreme weather events, sea level rise, and increased risk of regional water scarcity, heat waves, wildfires, and the disturbance of biological systems. The severity of climate change impacts is increasing and is expected to increase substantially in the coming decades.
To reduce the risk of the most severe impacts of climate change, greenhouse gas emissions must be substantially reduced. In addition, adaptation is necessary to address unavoidable consequences for human health and safety, food security, water availability, and national security, among others.
Signed,
American Association for the Advancement of Science
American Chemical Society
American Geophysical Union
American Institute of Biological Sciences
American Meteorological Society
American Public Health Association
American Society of Agronomy
American Society of Ichthyologists and Herpetologists
American Society of Naturalists
American Society of Plant Biologists
American Statistical Association
Association for the Sciences of Limnology and Oceanography
Association for Tropical Biology and Conservation
Association of Ecosystem Research Centers
BioQUEST Curriculum Consortium
Botanical Society of America
Consortium for Ocean Leadership
Crop Science Society of America
Ecological Society of America
Entomological Society of America
Geological Society of America
National Association of Marine Laboratories
Natural Science Collections Alliance
Organization of Biological Field Stations
Society for Industrial and Applied Mathematics
Society for Mathematical Biology
Society for the Study of Amphibians and Reptiles
Society of Nematologists
Society of Systematic Biologists
Soil Science Society of America
University Corporation for Atmospheric Research

November 22, 2016 Letter from Mayors

https://medium.com/@ClimateMayors/open-letter-to-president-elect-donald-trump-on-climate-policy-and-action-33e10dcdcf85#.2le5g4y2i

Open Letter to President-elect Donald Trump on Climate Action

January 2017 Letter from Over 200 Universities and Colleges

http://secondnature.org/higher-education-climate-action-letter/

We, the undersigned leaders of higher education institutions throughout the United States, recognize our academic and ethical responsibilities to current and future generations to take aggressive climate action; to reduce our sector's carbon pollution, to support interdisciplinary climate education, and to continue research that expands our understanding of rapidly changing earth systems. We are committed to developing and deploying innovative climate solutions that provide a prosperous future for all Americans. We join our colleagues in the business and investment communities in supporting the science-based targets outlined in the Paris Climate Agreement. In fact, many of our institutions have voluntarily set even more aggressive carbon reduction goals to lead our sector forward and to demonstrate what is possible for others…

Uncommitted

Two organizations have been identified that issued statements explaining decisions *not* to comment on climate:

American Association of Petroleum Geologists

Climate change is peripheral at best to our science […] AAPG does not have credibility in that field […] and as a group we have no particular knowledge of global atmospheric geophysics.

American Institute of Professional Geologists

In March 2010, AIPG's Executive Director issued a statement regarding polarization of opinions on climate change within the membership and announced that the AIPG Executive had made a decision to cease publication of articles and opinion pieces concerning climate change

One organization has been identified that issued a climate statement in 2009 and at a later date withdrew it. At present, it has no formal statement:

Geological Society of Australia

2009 Statement (see Note below)

Human activities have increasing impact on Earth's environments. Of particular concern are the well-documented loading of carbon dioxide (CO_2) to the atmosphere, which has been linked unequivocally to burning of fossil fuels, and the corresponding increase in average global temperature. Risks associated with these large-scale perturbations of the Earth's fundamental life-support systems include rising sea level, harmful shifts in the acid balance of the oceans and long-term changes in local and regional climate and extreme weather events. GSA therefore recommends...strong action be taken at all levels, including government, industry, and individuals to substantially reduce the current levels of greenhouse gas emissions and mitigate the likely social and environmental effects of increasing atmospheric CO_2.

(Note: No current statement. This 2009 statement has been removed and no revised statement has been issued. The GSA noted: "After a long and extensive and extended consultation with society members, the GSA executive committee has decided not to proceed with a climate change position statement.")

--- end ---