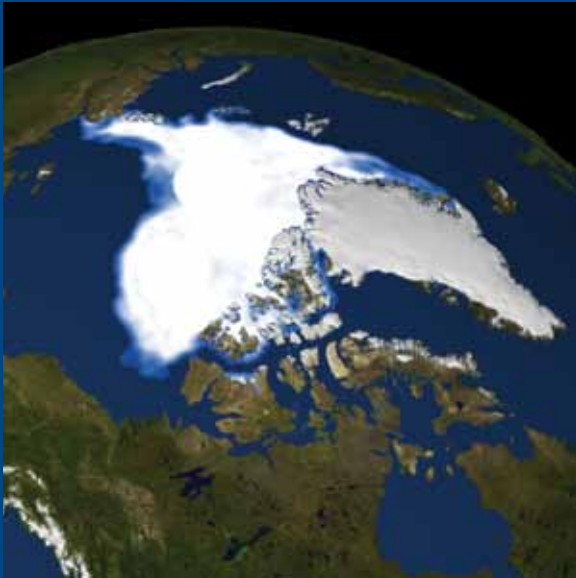


ARKANSAS



U.S. SCIENTISTS AND ECONOMISTS' CALL FOR SWIFT AND DEEP CUTS IN GREENHOUSE GAS EMISSIONS



MARCH 2010

Physicists tend to be supercritical of strong conclusions, but the data on global warming now indicate the conclusions are not nearly strong enough.

LEON M. LEDERMAN

Director Emeritus, Fermi National Accelerator Laboratory, Batavia, IL; Nobel Prize Winner in Physics; National Medal of Science Recipient; Member, National Academy of Sciences

Global warming is one of the most pressing problems of our time. If we fail to address it, the costs to adapt our infrastructure and agricultural systems will be overwhelming. Dealing effectively with the problem of climate change could help keep us fully employed for a generation.

JAMES K. GALBRAITH

Lloyd M. Bentsen Jr. Chair in Government/Business Relations, University of Texas, Austin

Over the last 30 years I've watched many glaciers shrink in South America. It's also happening in Europe, North America, China, and the Himalayas. More than 90 percent of the world's glaciers are receding—they have no political agenda. Science is about what is, not about what any of us believe.

LONNIE G. THOMPSON

Distinguished University Professor, School of Earth Sciences; Research scientist and glaciologist, Byrd Polar Research Center, The Ohio State University; National Medal of Science Recipient; Member, National Academy of Sciences; Tyler Prize for Environmental Achievement

The message from California to federal policy makers is encouraging—we know that a combination of political will and smart policies that promote energy conservation and technological innovation can cost-effectively reduce global warming emissions.

MICHAEL HANEMANN

Chancellor's Professor, Agricultural and Resource Economics Department, Goldman School of Public Policy, University of California, Berkeley; Director, California Climate Change Center

The climate system is telling us a consistent story of human influence. We can read that story in records of temperature, rainfall, ice, snow, sea level, and even in the behavior of extreme events. The message in this story: natural causes alone simply cannot explain all these changes.

BENJAMIN SANTER

Research Scientist, Program for Climate Model Diagnosis and Intercomparison, Lawrence Livermore National Laboratory; MacArthur Fellow; Second and Fourth Assessment Reports of the Intergovernmental Panel on Climate Change

Preventing dangerous climate change is a great investment. It will cost between one and two percent of GDP, and the benefits will be between 10 and 20 percent. That's a return of 10 to 1—attractive even to a venture capitalist.

GEOFFREY HEAL

Paul Garret Professor of Public Policy and Corporate Responsibility, Columbia Business School, New York, NY; Co-organizer, U.S. Scientists and Economists' Call for Swift and Deep Cuts in Greenhouse Gas Emissions

Only a very few years remain in which drastic reductions in global emissions must begin if warming is to be limited to 2°C or any other reasonable level. The world is squandering valuable time, and time is running out.

RICHARD C.J. SOMERVILLE

Distinguished Professor Emeritus and Research Professor, Scripps Institution of Oceanography, University of California, San Diego; Fourth Assessment Report of the Intergovernmental Panel on Climate Change

Adaptation for both human and natural ecosystems will likely be more difficult and costly for a faster rate of warming than for slower rates. Delaying action is an extremely risky path to continue on.

STEPHEN H. SCHNEIDER

Professor, Department of Biological Sciences, Stanford University, CA; Co-Director, Center for Environmental Science and Policy; Co-director, Interdisciplinary Program in Environmental Resources; Member, National Academy of Sciences; MacArthur Fellow; Lead Author, Second Assessment Report of the Intergovernmental Panel on Climate Change (IPCC); Coordinating Lead Author of the Third and Fourth Assessment Reports of the IPCC; Co-organizer, U.S. Scientists and Economists' Call for Swift and Deep Cuts in Greenhouse Gas Emissions

U.S. Scientists and Economists' Call for Swift and Deep Cuts in Greenhouse Gas Emissions

We call on our nation's leaders to swiftly establish and implement policies to bring about deep reductions in heat-trapping emissions. The strength of the science on climate change compels us to warn the nation about the growing risk of irreversible consequences as global average temperatures continue to increase over pre-industrial levels (i.e., prior to 1860).^{1,2} As temperatures rise further, the scope and severity of global warming impacts will continue to accelerate.

The 2007 report of the Intergovernmental Panel on Climate Change² unequivocally concluded that our climate is warming, stating with at least 90 percent certainty that the warming of the last several decades is primarily due to human activities. Global average temperatures have already risen ~ 0.7°C (1.3°F) over the last 100 years, and impacts are now being observed worldwide.^{1,2} Human-caused emissions to date have locked in further changes including sea-level rise that will intensify coastal flooding, and dramatic reductions in snowpack that will disrupt water supplies in the western United States.^{1,3} If emissions continue unabated, our nation and the world will face more sea level rise, heat waves, droughts, wildfires, snowmelt, flood risk, and public health threats, as well as increased rates of plant and animal species extinctions.^{1,4}

The longer we wait, the harder and more costly it will be to limit climate change and to adapt to those impacts that will not be avoided. Many emissions reduction strategies can be adopted today that would save consumers and industry money while providing benefits for air quality, energy security, public health, balance of trade, and employment.^{5,6}

All nations must commit to a goal designed to limit further harm. The United States, the European Union, and a number of other countries have recognized the need for limiting global warming to no more than 2°C (3.6°F) above pre-industrial levels.⁷ Emerging science must be regularly evaluated to assess whether this goal is sufficient.

The UN Framework Convention on Climate Change recognizes that all nations have a responsibility to curb global warming, consistent with their respective contribution to emissions and capacity to act. Recent analyses indicate the United States—even with aggressive action by other nations—would need to reduce its emissions on the order of 80 percent below 2000 levels by 2050 to have a reasonable chance of limiting warming to 2°C.⁸

A strong U.S. commitment to reduce emissions is essential to drive international climate progress. Voluntary initiatives to date have proven insufficient. **We urge U.S. policy makers to put our nation onto a path today to reduce emissions on the order of 80 percent below 2000 levels by 2050. The first step on this path should be reductions on the order of 15-20 percent below 2000 levels by 2020, which is achievable and consistent with sound economic policy.**^{5,6}

There is no time to waste. The most risky thing we can do is nothing.

1 Parry, M.L., O.F. Canziani, J.P. Palutikof, and co-authors. 2007. Technical Summary. In: *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden, and C.E. Hanson, eds. Cambridge University Press, 23-78. For impacts on North America see Field, C.B., L.D. Mortsch, M. Brklacich, D.L. Forbes, P. Kovacs, J.A. Patz, S.W. Running, and M.J. Scott. 2007. North America. In: *Climate Change 2007: Impacts, Adaptation*

- and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden, and C.E. Hanson, eds. Cambridge University Press, 617-652. For additional reasons for concern see section 5.2 of Intergovernmental Panel on Climate Change Fourth Assessment Report Climate Change 2007: Synthesis Report.
- 2 Solomon, S., D. Qin, M. Manning, R.B. Alley, T. Berntsen, N.L. Bindoff, Z. Chen, A. Chidthaisong, J.M. Gregory, G.C. Hegerl, M. Heimann, B. Hewitson, B.J. Hoskins, F. Joos, J. Jouzel, V. Kattsov, U. Lohmann, T. Matsuno, M. Molina, N. Nicholls, J. Overpeck, G. Raga, V. Ramaswamy, J. Ren, M. Rusticucci, R. Somerville, T.F. Stocker, P. Whetton, R.A. Wood, and D. Wratt. 2007. Technical Summary. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, and H.L. Miller, eds. Cambridge University Press.
 - 3 Barnett, T.P. D.W. Pierce, H.G. Hidalgo, C. Bonfils, B.D. Santer, T Das, G. Bala, A.W. Wood, T. Nozawa, A.A. Mirin, D.R. Cayan, M.D. Dettinger. 2008. Human-Induced Changes in the Hydrology of the Western United States, *Science*, 10.1126/science.1152538
 - 4 Frumhoff, P.C., J.J. McCarthy, J.M. Melillo, S.C. Moser, and D.J. Wuebbles. 2007. Confronting Climate Change in the U.S. Northeast: Science, Impacts, and Solutions. Synthesis report of the Northeast Climate Impacts Assessment (NECIA). Cambridge, MA: Union of Concerned Scientists.
 - 5 Barker T., I. Bashmakov, L. Bernstein, J.E. Bogner, P.R. Bosch, R. Dave, O.R. Davidson, B.S. Fisher, S. Gupta, K. Halsnæs, G.J. Heij, S. Kahn Ribeiro, S. Kobayashi, M.D. Levine, D.L. Martino, O. Masera, B. Metz, L.A. Meyer, G.-J. Nabuurs, A. Najam, N. Nakicenovic, H.-H. Rogner, J. Roy, J. Sathaye, R. Schock, P. Shukla, R.E.H. Sims, P. Smith, D.A. Tirpak, D. Urge-Vorsatz, and D. Zhou. 2007. Technical Summary. In: Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer, eds. Cambridge University Press.
 - 6 Creyts, J., A. Derkach, S. Nyquist, K. Ostrowski, and J Stephenson. 2007. Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost? McKinsey & Company. And Stern, N. 2007. The Economics of Climate Change: The Stern Review. Cambridge University Press.
 - 7 Declaration of the leaders: The major economies forum on energy and climate. Presented at the G8 Summit, L'Aquila, Italy, July 9, 2009. Online at http://www.g8italia2009.it/static/G8_Allegato/MEF_Declaration1.pdf.
 - 8 Luers, A.L., M.D. Mastrandrea, K. Hayhoe, and P.C. Frumhoff. 2007. How to Avoid Dangerous Climate Change: A Target for U.S. Emissions Reductions. Cambridge, MA: Union of Concerned Scientists (www.ucsusa.org/global_warming/science/emissionstarget.html). This report assesses the U.S. contribution needed to stabilize atmospheric concentrations of greenhouse gases at a level <450 CO₂ equivalent (CO₂eq, the concentration of all greenhouse gases expressed in terms of CO₂), under conservative assumptions. These include developing nations' average annual emissions peak between 2020 and 2025 –10 to 15 years after those of industrialized nations. Developing nations follow the Energy Information Agency (EIA) "low-growth" emissions trajectory up to their peak followed by average annual reductions rates that match those of industrialized nations. Report assumptions also include allowing atmospheric concentrations to briefly go above (i.e. "overshoot") the target before returning to it by the end of the century. Stabilizing atmospheric concentrations at 450 ppm CO₂eq provides a roughly 50-50 chance of limiting global average temperatures from rising more than 2°C above pre-industrial temperatures (M. Meinshausen, W.L. Hare, T.M.L. Wigley, D.P. van Vuuren, M.G.J. den Elzen, and R. Swart. 2006. Multi-gas emission pathways to meet climate targets. *Climatic Change* 75: 151-194). Literature estimates for global emissions reductions required to achieve a specific temperature or stabilized atmospheric concentration goal may vary as a result of whether or not concentrations are allowed to overshoot and return to the stabilization target and to representation of results in terms of different reference base years (e.g., 1990, 2000, 2005). See footnote 2 above with references therein and the 2007 Bali Climate Declaration by Scientists (online at <http://www.climate.unsw.edu.au/bali>; accessed December 2007).

Arkansas Institutional Affiliations of Endorsers

The endorsers of the U.S. Scientists and Economists' Call for Swift and Deep Cuts in Greenhouse Gas Emissions are based at a wide variety of institutions, including universities and colleges, government agencies, businesses, and nonprofit organizations. The endorsers have included their institutional affiliation for identification purposes only, and the listing below should not be construed to imply any institutional endorsement.

Arkansas State University, Beebe
Hendrix College

National Audubon Society
University of Arkansas, Fayetteville

University of Arkansas, Hot Springs
University of Arkansas, Little Rock

University of Arkansas, Monticello
University of Central Arkansas

The 16 Arkansas Endorsers of the U.S. Scientists and Economists' Call for Swift and Deep Cuts in Greenhouse Gas Emissions

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Emeritus Professor
Department of Physics and Astronomy
University of Arkansas, Little Rock
Little Rock, AR

Jeffrey S. Gaffney, Ph.D.

Professor and Chair
Department of Chemistry
University of Arkansas, Little Rock
Little Rock, AR

The tragic failure of our political leaders to reduce our dependence on petroleum over the last three decades has harmed our nation's economy and national security and made it far more difficult to prevent the worst consequences of climate change.

MALCOLM K. CLEAVELAND

Professor Emeritus of Geography, Department of Geosciences and Tree-Ring Laboratory, University of Arkansas, Fayetteville

Courtney D. Hatch, Ph.D.

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Conway, AR

Climate change is happening and may occur at a rate that will lead to unprecedented impacts on agriculture and our environment. We need to address the potential problem and consider solutions for a sustainable energy economy.

JEFFREY S. GAFFNEY

Professor and Chair, Department of Chemistry,
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Andy A. Radomski, Ph.D.

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Conway, AR

The future of our society depends on effectively managing and reducing greenhouse gas emissions. Public and private research and development support for these efforts will allow us to transition to a carbon-neutral energy system that improves both environmental quality and economic growth.

GORDON RAUSSER

Robert Gordon Sproul Distinguished Professor, Agricultural and Resource Economics Department, University of California, Berkeley; Co-founder and former Director, LECG, a global expert services company; Former chief economist of the U.S. Agency for International Development

One plausible climate change scenario projects that Washington County, ME, may have a late century temperature range similar to Washington, DC, today—with a likely loss of our spruce-fir forest. That is why Maine and our folks in Washington need to lead the way in major emissions cuts.

ROBERT W. KATES

Independent Scholar; Presidential Professor of Sustainability Science, University of Maine; Recipient, National Medal of Science; Member, National Academy of Sciences; MacArthur Fellow; Fourth Assessment Report of the Intergovernmental Panel on Climate Change

Evidence is mounting from many different scientific disciplines that Earth's natural systems are already undergoing rapid change. We need to act now to reduce heat-trapping gas emissions, for the sake of our children and the other species with whom we share this planet.

PAMELA A. MATSON

Dean, School of Earth Sciences and Goldman Professor of Environmental Studies, Stanford University, CA; Member, National Academy of Sciences; MacArthur Fellow; Past President, Ecological Society of America

Recent research at The Ohio State University—including detailed biomass, wind, and solar data and full cost assessments of coal-based options of electric power generation—demonstrates that Ohio can utilize more renewable energy, emit fewer greenhouse gases, and reduce the impacts of coal mining with only modest increases in electric utility rates.

FRED HITZHUEN

Professor of Agricultural, Environmental, and Development Economics, The Ohio State University

Historically, technological innovation has been one of the primary drivers of economic growth. With the right policies and incentives in place, a green revolution in renewable energy could not only free us from our dependence on fossil fuels, but also be an engine of growth for the next generation.

RICHARD JENSEN

Professor of Economics and Econometrics, University of Notre Dame, IN

I think the world has never faced a problem like global warming and the enormous environmental destruction it can cause. The impacts will be felt most severely by poor people around the world, which in turn will have serious repercussions for all of us.

EDWARD L. MILES

Virginia & Prentice Bloedel Professor of Marine & Public Affairs, Institute for Marine Studies; Senior Fellow, Joint Institute for the Study of Atmosphere and Oceans, University of Washington; Lead Author, Second Assessment Report of the Intergovernmental Panel on Climate Change; Member, National Academy of Sciences

Cap and trade is a market-driven mechanism long endorsed by economists. Since its implementation with the Clean Air Act Amendments of 1990, the cap and trade program has removed sulfur from our atmosphere at less than one-fifth of original cost projections and has been instrumental in reducing acid deposition in New Hampshire's forests, lakes, and rivers.

JOHN HALSTEAD

Professor of Environmental and Resource Economics, University of New Hampshire, Durham

Our research indicates that we can't count on forests alone to absorb much of the carbon dioxide we are emitting to the atmosphere; we've got to tackle emissions at their source.

WILLIAM H. SCHLESINGER

President, The Cary Institute of Ecosystem Studies, Millbrook, NY; Member, National Academy of Sciences; Past President, Ecological Society of America

The consequences of global climate change constitute one of the most serious threats facing humanity. While the poor and the impoverished will suffer the most, the potential for catastrophic climate change that can adversely affect the habitability of the entire planet is quite real.

JAGADISH SHUKLA

Distinguished University Professor of Earth Sciences and Global Change, and Chair, Climate Dynamics Program, George Mason University, VA; President, Institute of Global Environment and Society; Lead Author, Fourth Assessment Report of the Intergovernmental Panel on Climate Change

Since petroleum's discovery in 1859, innovation has radically changed the structure and development of the world economy. Today, we must pursue innovation in clean energy, which offers similar long-term growth prospects. Delaying the necessary incentives and institutions to foster this transition will only narrow our choices and increase our costs.

EDWARD B. BARBIER

John S. Bugas Professor of Economics, Department of Economics and Finance, University of Wyoming

Sea ice is rapidly receding; permafrost is thawing; and areas of formerly treeless, windswept tundra are being taken over by shrubs. The Arctic is on the fast track of climate change.

MARK C. SERREZE

Research Professor of Geography, Senior Research Scientist, National Snow and Ice Data Center, Boulder, CO; Fellow, Cooperative Institute for Research in Environmental Studies

The climate system is sufficiently complex that no one can say with certainty what is going to happen. We can say—with certainty—that without action to reduce emissions enormous risks are being run.

CARL WUNSCH

Cecil and Ida Green Professor of Physical Oceanography, Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology; Member, National Academy of Sciences

Since the release of the third IPCC climate assessment report, I have become more pessimistic about the observed and potential adverse impacts of climate change. These impacts are being observed more quickly, and in some cases more severely, than my colleagues and I thought when we were writing the 2001 report.

JOEL SMITH

Stratus Consulting, Inc., Boulder, CO; Coordinating Lead Author, Third Assessment Report of the Intergovernmental Panel on Climate Change

Investing now in energy efficiency and low-carbon technologies not only will create new business opportunities, but is also likely to be less expensive than a crash program to implement these solutions at a future date, when it will be more difficult to limit climate impacts.

ANTHONY C. FISHER

Professor of Agricultural and Resource Economics, Agricultural and Resource Economics Department, University of California, Berkeley

Endorser Criteria: Ph.D. or doctoral candidate professionals with expertise relevant to our understanding of the scientific and economic dimensions of climate change, its impacts, and solutions.

Key to Awards and Honors

- 1 Nobel Laureate: Nobel Prize winner in Chemistry, Economics, or Physics (<http://nobelprize.org>)
- 2 NAS: Member of the United States National Academy of Sciences of the National Academies (<http://www.nasonline.org>)
- 3 NAE: Member of the United States National Academy of Engineering of the National Academies (<http://www.nae.edu>)
- 4 NMS: Recipient of the United States National Medal of Science (<http://www.nsf.gov/od/nms/medal.jsp>)
- 5 MacArthur: Recipient of the MacArthur Fellowship Award (<http://www.macfound.org>)
- 6 IPCC: Intergovernmental Panel on Climate Change. Lead author, contributing author, or review editor on an assessment or special report. The IPCC shares the 2007 Nobel Peace Prize. (<http://www.ipcc.ch>)



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Back Cover Photos: Rotunda (Jupiter Images), White House (Photos.com)

The United States worked with other nations to take on the ozone threat; so, too, must we lead the international effort to reduce heat-trapping emissions that cause climate change.

MARIO J. MOLINA

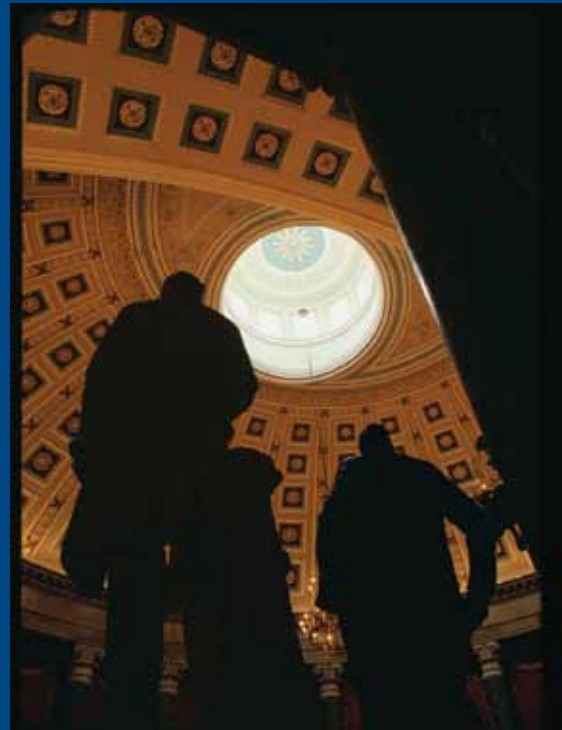
Professor of Chemistry and Biochemistry, Center for Atmospheric Sciences, Scripps Institution of Oceanography, University of California, San Diego; Nobel Prize Winner in Chemistry; Member, National Academy of Sciences; Co-organizer, U.S. Scientists and Economists' Call for Swift and Deep Cuts in Greenhouse Gas Emissions



In the economic emergency we are experiencing, some people think that we cannot afford to address the problem of climate change. It's the other way around: If we don't act now we will run into even greater economic problems in the future.

ELINOR OSTROM

Professor, Indiana University, Bloomington; Nobel Prize Winner in Economics; Member, National Academy of Sciences



The economic and social costs of global warming could be huge. We need to act now to limit them.

ERIC MASKIN

Albert O. Hirschman Professor of Social Science, Institute for Advanced Study, Princeton, NJ; Nobel Prize Winner in Economics; Member, National Academy of Sciences; Kempe Award in Environmental Economics

Economists now join climate scientists in a unified call for action to address the causes of climate change. Failure to act now is the most risky and most expensive thing we could do.

JAMES J. MCCARTHY

Alexander Agassiz Professor of Biological Oceanography, Department of Organismic and Evolutionary Biology and Department of Earth and Planetary Sciences, Harvard University, MA; Co-chair, Third Assessment Report of the Intergovernmental Panel on Climate Change; Lead Author, Arctic Climate Impact Assessment; Past President, American Association for the Advancement of Science; Co-organizer, U.S. Scientists and Economists' Call for Swift and Deep Cuts in Greenhouse Gas Emissions