

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



M A Y 2 0 0 8

The new energy economy is upon us, and the states are already playing a key role in the research, development, and deployment process that will simultaneously stimulate growth and achieve our climate goals.

DANIEL KAMMEN

Class of 1935 Distinguished Professor of Energy; Professor, Energy and Resources Group, Goldman School of Public Policy and Department of Nuclear Engineering; Co-Director, Berkeley Institute of the Environment; Founding Director, Renewable and Appropriate Energy Laboratory, University of California, Berkeley

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

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

The carbon dioxide we emit today will remain in the atmosphere for well more than a century, thus adding inexorably to the warming of the planet.

JERRY MAHLMAN

Senior Science Fellow, National Center for Atmospheric Research, Boulder, CO; Former Director, Geophysical Fluid Dynamics Laboratory

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

Recent events have demonstrated the world's vulnerability to climate-related natural disasters. Further delaying action on climate change may make these events even more catastrophic in the future.

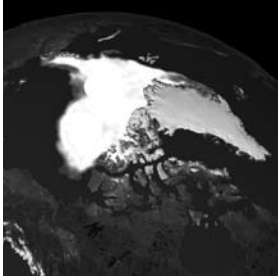
ROBERT E. DICKINSON

Professor of Atmospheric Sciences, School of Earth and Atmospheric Sciences, Georgia Institute of Technology; Member, National Academy of Sciences; Member, National Academy of Engineering

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



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

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, convening author, or review editor on an assessment or special report. The IPCC shares the 2007 Nobel Peace Prize.
<http://www.ipcc.ch>

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*

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- 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. Halsnaes, 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).

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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.

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In Their Own Words:

Personal quotes from selected endorsers of the U.S. Scientists and Economists'

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

The world's two largest emitters of CO₂— the U.S. and China—use each other's lack of climate policy as an excuse to justify their own inaction. The time to implement cost effective domestic policy is now.

MAXIMILIAN AUFFHAMMER

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



The time is ripe for deploying and developing technologies to reduce emissions. These solutions will not only make our cities better for our health and well being, but also help us avoid irreversible climate changes in future generations.

JONATHAN FINK

The Julie Ann Wrigley Director, Global Institute of Sustainability; University Sustainability Officer, Office of the President, Arizona State University

Our research team has documented extensive local extinctions of one alpine species, almost certainly due to global warming. We must act now to prevent further losses to our biological heritage.

PETER F. BRUSSARD

Professor Emeritus of Biology, University of Nevada; Past President, Society for Conservation Biology

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

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. CLEVELAND

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

Cutting carbon—if done right—can spur the economy through energy savings and job growth.

EBAN GOODSTEIN

Professor of Economics, Lewis & Clark College, Portland, OR; Director, Focus the Nation

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

Call for Swift and Deep Cuts in Greenhouse Gas Emissions

It is time for the United States to re-establish itself as a leader in global environmental stewardship, and this should start with greenhouse gas emissions reductions.

PAUL B. SHEPSON

Director, Purdue Climate Change Research Center, Purdue University, IN

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

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



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

LEON M. LEDERMAN

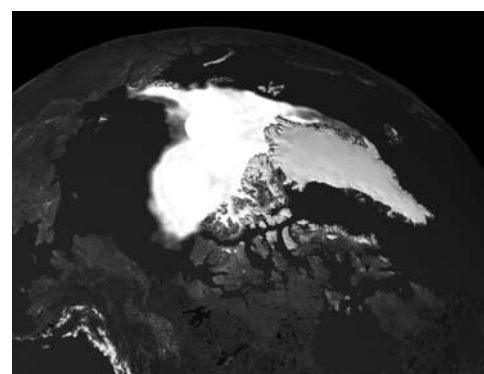
Director Emeritus, Fermi National Accelerator Laboratory, Batavia, IL; Nobel Prize Winner in Physics; National Medal of Science Recipient; Member, National Academy of Sciences

As emissions increase, any delays in action necessitate larger emissions cuts and higher mitigation costs in the future.

TOM TIETENBERG

Mitchell Family Professor of Economics, Colby College, Waterville, ME; Former President, Association of Environmental and Resource Economists

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

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 and Lead Author, Fourth Assessment Report of the Intergovernmental Panel on Climate Change

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We need to act expeditiously. A decade of delay will have a century of consequence.

HENRY N. POLLACK

Professor Emeritus of Geophysics, Department of Geological Sciences, University of Michigan

Our great-great-grandchildren will deeply regret that the trade-off we left them was a higher income but a hotter climate. At little cost to ourselves we can leave a better world for them.

THEODORE GROVES

Professor of Economics, University of California, San Diego

Changes in fall foliage, maple syrup production, and the ski season are already under way here in New England. By developing smart energy policies, we can drive innovative solutions that limit the future impacts of a changing climate and maintain much of the region's special character.

BARRETT N. ROCK

Professor of Natural Resources and Institute for the Study of Earth, Oceans and Space, University of New Hampshire; Lead Author, NE Regional Overview of the National Assessment Project

The IPCC process is an unprecedented consensus of a huge community of scientists and other experts on all dimensions of climate change.

DORK SAHAGIAN

Professor of Geophysics, Department of Earth and Environmental Sciences and Director, Lehigh University Environmental Initiative, Lehigh University; Contributing Author, Second and Fourth Assessment Reports of the Intergovernmental Panel on Climate Change; Former Executive Officer, International Geosphere Biosphere Program: Global Analysis, Integration and Modeling

I am a scientist curious about this unprecedented global experiment, and a parent ashamed by what we are leaving to our children.

DENNIS A. HANSELL

Chairman, Division of Marine and Atmospheric Chemistry, Rosenstiel School of Marine and Atmospheric Science, University of Miami; Member, Executive Committee of the Joint Global Ocean Flux Study; Vice-Chair, Executive Committee of the Integrated Marine Biogeochemistry and Ecosystem Research Project

There are costs to letting climate change happen, and there are costs from trying to limit it. Each of these costs has a different profile over time and across the world's population. The distribution of public attitudes about fairness and responsibility may have to change substantially before some countries will be moved to pursue aggressive policies to limit climate change.

TRUDY ANN CAMERON

R. F. Mikesell Professor of Environmental and Resource Economics, Department of Economics, University of Oregon

Both the science and the economics make clear that the time for U.S. leadership on climate change is now. Let us delay no longer.

PETER C. FRUMHOFF

Director of Science and Policy and Chief Scientist, Climate Campaign, Union of Concerned Scientists, Cambridge, MA; Lead Author, Fourth Assessment Report of the Intergovernmental Panel on Climate Change; Co-organizer, U.S. Scientists and Economists' Call for Swift and Deep Cuts in Greenhouse Gas Emissions



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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



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

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



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; 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