

## U.S. Follows Mexico, Ratifies Ozone Treaty

*The U.S. Senate voted 83-0 on March 14 to ratify the Ozone Treaty which was signed in Montreal last September, becoming the second nation, after Mexico, to take action. Other nations are well along in the goal to have the treaty enter into the force of law by January 1, 1989.*

Both Japan and the European Community are anticipated to follow along this spring. In order for the treaty to become effective, eleven nations, representing two-thirds of world consumption of chlorofluorocarbons (CFCs) and halons, must ratify it.

To control these chemicals, the U.S. EPA has already issued proposed regulations, providing for a staged, 50 percent reduction over the next decade. These regulations were published in the Federal Register last December. Opportunity to comment closed February 8. The EPA is under court order to issue final regulations by August 1.

The nations signing the Ozone Treaty constitute nearly all the world's major producing and consuming countries. The accord provides for a near-term freeze, followed by scheduled reductions, in the use of several CFC and bromine (halon)

compounds. These synthetic chemicals are suspected of depleting the ozone layer, resulting in increased ultraviolet radiation reaching the surface of the Earth. As greenhouse gases, they contribute to global warming and the consequences for agriculture and rising sea levels.

Richard Benedick, principal U.S. negotiator for the Montreal Treaty, has commented that among the features that make it historic is the fact that for the first time, nations are attempting to impose controls on an important industrial sector *before* actual damages to human health and ecology.

### *Climate Protection Act Passed:*

## EPA Receives Mandate But Loses Funds

In an unusual turn of events, Congress in late December 1987 provided strong new statutory authority to the U.S. Environmental Protection Agency (EPA) to spearhead federal climate protection efforts while slashing the funds for analysis of greenhouse effect and stratospheric ozone protection options. Administrator Lee M. Thomas is now wrestling with the question of whether to plunge ahead without the funds to carry out the activity.

The Global Climate Protection Act, passed as part of the FY 1988 and 1989 State Department authorization, directed EPA to spearhead Federal climate protection activity and granted a similar mandate to the State Department in international negotiations. The Act appeared to reflect Congress' approval of the strong role EPA and the State Department played in negotiation of the Montreal Protocol to protect the ozone layer. Yet the same month that EPA found its statutory climate protection

mandate bolstered, its funds for FY 1988 for both greenhouse effect and stratospheric protection were slashed to \$4 million.

The slash of about 30 percent from EPA's FY 1987 funding seemed a direct result of the chaotic FY 1988 appropriations process. The Senate had voted \$7 million which would have allowed EPA to maintain the momentum of its global climate and stratospheric protection initiatives. In the House-Senate conference, the Senate acceded to the House's \$4 million figure.

The Congressional action appeared traceable to confusion linked to the unusual circumstances under which EPA received its FY 1987 climate and stratospheric program funds. A shrewdly executed initiative in the fall of 1986 by Vermont Senator Patrick Leahy, the ranking Democrat on EPA's appropriations subcommittee, resulted in earmarking of \$6.5 million in FY funds for climate protection and research activities. In fact, as EPA sought to produce two major reports on the greenhouse effect for Congress, support an aggressive U.S. role in the UNEP stratospheric negotiations and prepare implementing regulations, it was still forced to borrow additional funds from other programs. Moreover, the Administration FY 1988 budget request had been developed before Leahy's last minute FY 1987 coup. When the Administration's FY 1988 budget request sought little for climate or stratospheric protection programs, the House moved to boost the

## Panel Reports Global Ozone Drop

Recent findings concerning global ozone levels have added to the concerns aroused by the disclosure last September that springtime Antarctic ozone levels were the lowest ever recorded.

Average annual ozone levels in 1986 showed decreases ranging from 1.7 to 3 percent in the Northern hemisphere when compared to 1969, NASA scientist Robert Watson reported at a press conference on March 15. In winter the decreases were even more pronounced, ranging from 2.3 to 6.2 percent.

This latest report was issued by the Ozone Trends Panel, formed in 1986 and involving more than 100 scientists. The Panel has made a critical reanalysis and interpretation of ground-based and satellite data instead of relying, as in previous reviews, on surveys of published literature.

The Panel reported global decreases after allowing for solar cycles and other variability. In the Southern hemisphere at all latitudes south of 60 degrees south, ozone appears to have decreased by 5 percent since 1979. Global averages show a reduction of about 2.5 percent from October 1978 to October 1985.

British and American scientists found that the winter mass of extremely cold air over Antarctica lingered weeks longer than usual this year along with the seasonal ozone hole. Some expressed concerns about the possible implications for both

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# Reagan-Gorbachev Communique Supports US-Soviet Joint Efforts on Climate Issues

Shortly before President Reagan met with Soviet General Secretary Gorbachev in Washington last December, a group of 19 U.S. Senators wrote to the President urging that an initiative on the international environmental problem of the greenhouse effect and global climate change be included in the agenda of their upcoming summit discussions.

Not long thereafter, and just six weeks following the First North America Conference on Climate Change, the world climate community was delighted to see joint U.S.-Soviet cooperation on global climate issues become a prominent part of the Reagan-Gorbachev summit communique. The text of the statement follows:

With reference to their November 1985 Agreement in Geneva to cooperate in the preservation

of the environment, the two leaders approved a bilateral initiative to pursue joint studies in global climate and environmental changes through cooperation in areas of mutual concern, such as protection and conservation of stratospheric ozone, and through increased data exchanges pursuant to the U.S.-Soviet Environmental Protection Agreement and the Agreement between the United States of America and the Union of Soviet Socialist Republics concerning cooperation in the exploration and use of outer space for peaceful purposes. In this context, there will be a detailed study on the climate of the future. The two sides will continue to promote broad international and bilateral cooperation in the increasingly important area of global climate and environmental change.

Below is a list of the senators signing the letter to the President, stressing that the

initiative they backed would be a "valuable concrete product of the summit that would be widely recognized as an instance of sensible, mutually beneficial cooperation." The diverse philosophical points of view among the signers is an indication of the widespread support in this country of action on the climate issue.

Senators Baucus (*Montana*), Mitchell (*Maine*), Gore (*Tennessee*), Matsunaga (*Hawaii*), Burdick (*North Dakota*), Warner (*Virginia*), Symms (*Idaho*), Daschle (*South Dakota*), DeConcini (*Arizona*), Packwood (*Oregon*), Chafee (*Rhode Island*), Durenberger (*Minnesota*), Stafford (*Vermont*), Kerry (*Massachusetts*), Roth (*Delaware*), Wirth (*Colorado*), Biden (*Delaware*), Fowler (*Georgia*), Pell (*Rhode Island*).

## Symposium Consensus Indicates Impact of Climate Change on Wildlife May Vary Sharply Among Species

Climate change is likely to have a significant impact on wildlife in North America. Its most significant effects are likely to come through transformation or destruction of habitats, and the magnitude and direction of such effects are likely to vary significantly among species. These predictions were shared by most of the presenters at a day and a half Symposium on the Impact of Climate Change on Wildlife held in Washington, D.C., January 21-22, 1988. Convened by the Climate Institute under a cooperative agreement with the U.S. Environmental Protection Agency, this event was also co-sponsored by the World Wildlife Fund Conservation Foundation, which hosted the meeting, and the National Audubon Society, which plans to publish the proceedings.

Dr. Robert Peters of the World Wildlife Fund suggested that climate change of the magnitude and pace projected by current climate models would be likely to produce extinctions of a large number of plants and animals. He noted that the migration potential of many plants is quite slow and that rapid climate change may pose great risks for their survival as well as for animal species that depend on such vegetation for food or habitat. Dr. Stephen Leatherman, Director of the Laboratory for Coastal Research of the University of Maryland, discussed the likely loss of wetland habitat which could be expected from climate change induced sea level rise. He noted that the rate of sea level rise may increase as much as five-fold, producing through "marsh-drowning" a loss of 50 to 80 per-

cent of U.S. marshes by the year 2100. Leatherman noted that there had been a one foot sea level rise over the last century along the Atlantic Coast with about half due to local subsidence and half to global trends. He detailed the loss of 5,000 acres of marshes since 1938 at the Blackwater Wildlife Refuge—about one third of Blackwater's total acreage. Leatherman noted that marsh loss is particularly acute in Louisiana which "is losing 40 acres of marsh a day, where entire parishes [counties] will disappear, and where shore lines are eroding 20 to 30 meters per year."

### Habitat Loss and Fragmentation

Robert Breckenridge of the Department of Energy's Idaho Falls Engineering Laboratory provided a briefing on a study he is conducting of likely effects of climate change on wildlife refuges maintained by the U.S. Fish and Wildlife Service. Wildlife refuge managers and contaminant specialists have been asked to assess the vulnerability of particular refuges to habitat destruction as a result of climate change. Dr. John Fay of the Division of Endangered Species and Habitat Conservation of the U.S. Fish and Wildlife Service noted his agency's willingness to factor climate change into endangered species determinations. Stating that loss and fragmentation of habitat are by far the greatest source of endangerment of species, he suggested that habitats may move out from under species and the swiftness of climate change may outpace the ability of many species to migrate.

Presentations by Dr. J.P. Myers, Vice President of the National Audubon Society, and Hugh Boyd of the Canadian Wildlife Service indicated that climate warming in the Arctic may produce sharply differing effects among various species of Arctic migratory birds. Myers predicted "large and possibly calamitous effects" on some Arctic shore birds. Focusing his analysis on 32 species of shore birds, he indicated that the 5-10 degree Centigrade rise in average annual Arctic temperatures predicted for the next century could seriously disrupt their hatching patterns. He noted that the emergence of the young of many shore birds is acutely timed to the availability of flightless insects on which these young birds feed. Boyd suggested that several species of Canadian Arctic nesting geese might be expected to flourish in a warmer climate. He presented estimates of geese population since 1949 indicating that severely cold winters had often sharply

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### CLIMATE ALERT

*Quarterly Newsletter published by the Climate Institute*

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## Wildlife Symposium

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reduced populations of Arctic geese. Milder Arctic winters could be beneficial to such Arctic geese. Myers pointed out that as herbivores these geese might be expected to benefit from a general increase in Arctic temperatures but that shore birds who depend heavily on insects for food might be harmed severely.

### Seasonal Extremes Versus Means

The next day Dr. Russell Graham of the Illinois State Museum reviewed paleoclimatic data and predicted that climate warming would be likely to benefit some species of mammals and harm others. He stated that extremes, rather than means, govern the distribution of mammals. Graham pointed out that the range of the musk ox is controlled by summer heat due to its inability to perspire. The changes in seasonal extremes and in seasonal distributions of precipitation could be more significant than increases in mean temperature. Graham predicted differential migration of particular species of mammals and in general a greater range for Southern species.

In a concluding panel discussion, Indur Goklany of the Office of Policy Analysis of the U.S. Department of Interior, Dr. Daniel Dudek of the Environmental Defense Fund, Anthony Janetos of EPA's Office of Research and Development and Dr. John Fay sought to delineate guidance for researchers and policymakers concerned with the impact of climate change on wildlife. Goklany stated that the Department of Interior, the largest land owner and most significant wildlife manager in the nation, is just beginning to grapple with the considerable ramifications of climate change for its varied operations. He noted that a departmental working group has been established for this purpose. Dudek projected that climate change could create more intensive use of marginal land and water supplies, creating greater competition for resources and threatening wildlife habitats. Janetos stated that while global climate models are becoming more reliable, the regional nature of climate change is poorly understood as is likely seasonable variability, both critical factors in assessing potential impacts of climate change on wildlife. He also noted the need for research into such issues as the interactive effects of air quality on crops and vegetation and the implications for habitats and wildlife. Fay noted that for some endangered species "the guy who wants to build a shopping center today may be more important [a threat] than global climate change." He suggested, however, that some endangered species may function like the proverbial "canary in a mineshaft" providing early indications of climate change.

## EPA Workshop Examines Links Between Agriculture and Climate Change

As an early step in carrying out a Congressional mandate to examine environmental effects of climate change and possible policy options, the EPA Office of Policy Planning and Evaluation held the first in a series of workshops on February 29 and March 1.

Dennis Tirpak, Director of the Strategic Studies Staff of EPA, set the stage with a scientific overview of the recent rises in the principal trace gases produced by agricultural activities: carbon dioxide, nitrous oxide, and methane. One estimate ranks deforestation as accounting for 25 percent of the current emission of CO<sub>2</sub> into the atmosphere. More than 10 percent of nitrous oxide emissions result from fertilizers, with China, the USSR and the U.S. together accounting for 50 percent of nitrogen fertilizer use. Biomass burning and fossil fuels contribute another 30% of N<sub>2</sub>O emissions.

### N<sub>2</sub>O Emission Sources

Reports on the source of nitrous oxide emissions pointed up the urgent need for more field research and more reliable data which was reiterated in presentations throughout the workshop.

Research suggests that 10-year-old estimates of nitrogen applied as fertilizer escaping into the troposphere are too large by a factor of 100, according to Gary Breitenbeck of Louisiana State University. Little is known about the influence of tillage and herbicides on emissions. Nitrous oxide goes down as well as up, entering into the ground water which is then used in irrigation. No one has looked at this potential contribution to emissions, Breitenbeck said.

According to Paul Stangels of the International Fertilizer Development Center, Asian farmers are only benefiting from one bag in three of the fertilizer they apply. The rest is wasted. There is no single formula or agreement on what processes and mechanisms are involved in the loss, and data applying throughout the world are not available.

Huge variations in emissions among soil types and drainage indicate a need for a much larger scale of studies, looking beyond the field to the whole landscape, possibly by such techniques as remote sensing, according to Peter Groffman of the University of Rhode Island.

We can tolerate releasing a certain amount of carbon into the atmosphere through deforestation, said Carl Gallegos of U.S. AID. But there is not much tolerance for the accompanying losses in biodiversity, water, and soil. We need scientific data to measure the trade-offs.

### Alternatives to Reduce Emissions

Options for reducing emissions are limited. Rolland Hauck of TVA projected that world population growth will require a huge increase in nitrogen fertilizer within the next 70 years unless there is a major breakthrough in the type of agriculture practiced. In the developing countries, 80 percent of energy produced comes from burning wood and other biomass. But less than 25 percent of the forests in the world are currently managed, including tree-planting to replace those used for fuel. In Africa, the ratio of deforestation to reforestation is 20 to 1, in Latin America 15 to 1. To ameliorate climate would entail a 5 to 15-fold increase in reforestation. Fifty million hectares should be reforested before the year 2000, Gallegos concluded.

The participants did not view the situation as hopeless. Don Johnson of Colorado State University described various options for reducing methane emissions from livestock, including variations in diet and inhibitors.

A study by the Office of Technology Assessment looked at 28 technologies to decrease emissions. Yao-Chi Lu of USDA reported that applications of the new technologies will lead not only to a reduction of emissions into the atmosphere but also to a decrease in use of land and other inputs devoted to agriculture. The technologies include advances in genetic engineering, enhancing of photosynthesis, nitrogen fixation, engineering of crops to produce chemicals that affect the growth of other plants.

D. S. Mikkelsen of the University of California at Davis, responded to pessimism about the end of the green revolution and the resulting decline in the rate of growth of rice production on which developing countries depend. He pointed out that developing countries have a great distance to go to achieve the yields and benefits of the green revolution, with fertilizer, irrigation and new hybrids increasing yields. While there are technical options to decreasing emissions with the increased production, he did not see any solutions to reducing them substantially.

There is no constructive dialogue with deforesting countries and too much confrontation, said Pedro Sanchez of North Carolina State University. Developed countries emphasize catastrophic effects and leave policy and development work grossly underfinanced. While fire is bad for the atmosphere, burning is the most efficient way to clear land. There are management methods, however, to reduce the harmful effects.



# Unique Awards Presented to Dr. Roger Revelle and Senator John Chafee

The Climate Institute initiated annual awards to be given in each of two categories, the first for scientific achievement increasing our knowledge of global climate change and the second for advancing public understanding of the challenge posed by climate change.

An Awards Committee consisting of members of the Climate Institute's Board of Directors sought the advice of prominent scientists and others knowledgeable about global climate issues. After receiving the recommendations of its Awards Committee, chaired by Roger Strelow, the Climate Institute Board unanimously chose Dr. Roger Revelle and Senator John Chafee as the first two recipients of its annual awards.



Stephen Leatherman presenting plaque to Roger Revelle for outstanding scientific achievement.

Dr. Revelle was cited for outstanding scientific achievement in furthering knowledge of the global climate system. "Dr. Revelle is widely regarded as both the leading oceanographer and climatologist in the world during the past generation," according to the Climate Institute.

Dr. Revelle, who currently heads the Committee on Climate of the American Association for the Advancement of Science, has performed research and analysis of many aspects of the problem of greenhouse effect induced global warming. His groundbreaking work concerns issues such as probable future changes in sea level resulting from increased atmospheric carbon dioxide, effects of global warming on water supplies in the Western United States, the role of the methane hydrates in increasing global warming and effects of the El Nino/Southern Oscillation on the atmospheric content of carbon dioxide.

Senator Chafee was selected for his achievements in advancing public understanding of the challenges posed by greenhouse effect



Paul Pritchard presents award to Senator Chafee for advancing public understanding of climate.

induced global warming and stratospheric ozone depletion.

"The two day Senate hearings on the greenhouse effect and stratospheric ozone depletion convened and chaired by Senator Chafee were a watershed in focusing public attention on these issues and building the consensus for the historic breakthrough in the UNEP stratospheric protection negotiations," the Climate Institute said in announcing the award.



Stephen Schneider, F. Sherwood Rowland, Joan Rowland, and James Hansen chat at opening reception.

Richard Morgenstern of EPA, Roger Strelow, General Electric, and Charles Powers, Chairman of Conference, chat before panel.



Both Dr. Revelle and Senator Chafee were honored at the Awards Dinner kicking off the Conference. Senator Chafee provided the principal address at the dinner, reiterating his call for placing climate change on the summit agenda. Dr. Revelle presided the next day at a panel on Early Signals of Climate Change.

The awards given to Dr. Revelle and Senator Chafee consisted of plaques to each of which was attached a drill bit used in the first ice coring ever done on the Tibetan Plateau. The drill bits were provided to the Climate Institute by the University of Nebraska Ice Coring Project.



Ambassador Benedick reports on Montreal Protocol at awards dinner.



National Climate Program Office Director Alan Hecht chairs opening session.



## Soviets Join Participants in U.S.-Canadian Conclave on Preparing for Climate Change

Three hundred participants from the United States and Canada and a delegation from the Soviet Union assembled in Washington from October 27-29 last year to hold discussions centering on the effects of climate change in North America. \*

Instead of focusing on the enormity of the problem and the hopelessness of individual actions to stem the adverse effects, the agenda broke the discussion into chewable pieces. Attendees explored practical means both of limiting greenhouse gas emissions and constructing strategies which would help adapt to and mitigate the effects of

global warming.

Attendance and active participation by a four-member Soviet delegation further increased interest at the Conference on the possibility of climate change being placed on the agenda of the Reagan-Gorbachev summit. Headed by Dr. Mikhail Budyko, one of the world's most highly respected climatologists, the Soviet delegation was in this country to attend the USA-USSR Bilateral for Environmental Cooperation. A further global dimension was added by conference participation from members of the United Nations Environment Programme,



Paul Pritchard, Conference convener, welcomes Joan Martin-Brown and Reuben Olembo of UNEP.



Mikhail Budyko of USSR addresses Conference.



J.A.W. McCulloch, Director General, Canadian Climate Centre, conversing with John Topping, Climate Institute President.

the World Bank and several foreign embassies.

Conference *Proceedings*, available by mid-March, will stimulate further discussions of workable response strategies to the challenge posed by rapid climate change. The *Proceedings* will be distributed to Conference registrants, sponsoring organizations, and Climate Institute members as of March 1988. Additional copies, published by Government Institutes, Inc., will be available from them at 966 Hungerford Drive, #24, Rockville, MD 20850, (301) 251-9250, for \$74 a copy.

## Leatherman Elected Chairman of Climate Institute Board and Schneider Joins Board

At its January 14, 1988 meeting the Climate Institute Board elected as Chairman Dr. Stephen Leatherman, Director of the Laboratory for Coastal Research of the University of Maryland. Leatherman, who is widely regarded as one of the leading experts in the world on effects of sea level rise on coastal areas, has testified before the Senate on likely effects of climate change and sea level rise on coastal wetlands and ocean beaches.

Leatherman, who has been the Institute's Treasurer since 1987, succeeds Founding Chairman Paul Pritchard, President of the National Parks and Conservation Association. Pritchard, the Convener of the October 1987 First North American Conference on Preparing for Climate Change, recently assumed the Chairmanship of the Natural Resources Council of America, an umbrella organization of environmental and natural resource groups. As Founding Chairman, Pritchard remains an active member of the Institute's Board.

Michael Brewer, Vice President of the Dun & Bradstreet Corporation, was elected Vice Chairman of the Institute's Board. Brewer has headed governmental affairs

and environmental programs at Harvard University and Cummins Engine Company. Joseph A. Cannon, President of Geneva Steel in Provo, Utah, was chosen as the Institute's Finance Chairman. John Topping, a former Staff Director of EPA's Office of Air and Radiation and co-author of a recent book on air quality management, was reelected as the Institute's President.

### Board Members Chosen

Dr. Stephen Schneider, Director of the Interdisciplinary Climate Systems Section of the National Center for Atmospheric Research in Boulder, Colorado, was elected to the Institute's Board. Schneider, who delivered the Scientific keynote to the Institute's October 1987 Conference, is internationally renowned for his publications and scientific research on the greenhouse effect and for his ability to convey complex scientific concepts to general audiences. At the same time Dr. Schneider was elected to the Board, the Board reelected its 13 pre-existing members. Besides each of the officers already listed members include John Bond, an attorney with McClintock Kirwan in Los Angeles

and organizer of the Institute's recent Fisheries Symposium; Mark Goldberg, Publisher of the *McKinsey Quarterly* and Director of Public Affairs of McKinsey & Company; Thomas Grumbly, President of Clean Sites, Inc.; Rafe Pomerance, Senior Associate at the World Resources Institute and Chairman of the American Rivers Conservation Council; Daniel Power, a Nashville, Tennessee civil engineer and city planner who is chairing the Climate Institute's upcoming Symposium on the Impact of Climate Change on Infrastructure Planning; Dr. Charles W. Powers, Partner of Resources for Responsible Management Inc. and Founder of both the Health Effects Institute and Clean Sites; Roger Strelow, Vice President for Corporate Environmental Programs of General Electric Company; and Charlene Sturbitts, an attorney with Webster and Sheffield.

Besides its diverse representation from the scientific, research, environmental, corporate and legal communities, the Institute's Board includes individuals who have held senior policy positions in each of the last four national Administrations.



## 1988 Calendar of Climate-Related Events

<b>March 7</b> Washington, DC Briefing on Planned US-USSR Climate Research Activities for 1988. Alan Hecht, NCPO/NOAA	<b>March 30</b> U.S. Congress Sanford Hearings on Sustainable Development. Contact: Susan Drake	<b>June 14-15</b> Washington, DC Resources for the Future Conference, "Controlling and Adapting to Greenhouse Warming." Contact: Bill Easterling, 202/328-5018 National Academy of Sciences
<b>March 7-11</b> San Diego, CA GAIA Conference	<b>March 30-31</b> Washington, DC EPA OPPE Workshop on Energy Supply Technologies. Contact: Joel Scheraga, 202/382-3354	<b>June 14-15</b> Honolulu, HI Pacific Rim Conference of the International Energy Workshop (co-sponsored by the East-West Center and IASIA).
<b>March 9</b> Washington, DC Dinner Discussion with senior corporate and financial officials re impacts of climate change. Climate Institute	<b>April 5-7</b> Washington, DC Conservation Foundation, "Climate Change and Biological Impacts."	<b>June 21</b> Dallas, TX Session on Effects of Stratospheric Ozone and Climate Change on Tropospheric Ozone Attainment. Contact: Paul Shapiro, 202/382-2583 Annual Meeting of Air Pollution Control Assoc.
<b>March 10</b> U.S. House of Rep. Hearing: "Global Warming," in Subcommittee on Human Rights and International Organizations, Committee on Foreign Affairs. 9:30/10:00-12. Contact: Kerry Bolognese	<b>April 5-8</b> Washington, DC EPA OPPE Peer Review Workshop on Water Resource Agriculture Effects Projects. Contact: Joel Smith, EPA, 202/475-9655	<b>June 27-30</b> Toronto, Canada World Conference on The Changing Atmosphere: Implications for Global Security, hosted by the Canadian Government, support by UNEP, WMO, etc. Contact: Howard Ferguson, Conference Director, 416/665-4760
<b>March 10-11</b> Airlie, VA Congressional Staff Retreat on Climate Change. Environmental and Energy Study Institute and World Resources Institute	<b>April 8</b> Washington, DC "US-USSR Environmental Agreement; Follow-up to 11th Joint Committee Meeting." 3 to 5 pm. EPA, 1103 West Tower, 401 M	<b>August 8-13</b> Goteborg, Sweden IOC/IAMAP Quadrennial Ozone Symposium.
<b>March 17-18</b> Chicago, IL NAS Panel on "Great Lakes Water Levels—Shoreline Dilemmas." WSTB Colloquium Series. One session entitled, "Global Climate Change and the Effect on Great Lakes Water Level." (Joel Smith, EPA, invited to give paper.) Closed. Copies of final report and overview available in about 6 months. Contact: Sheila David, NRC, 202/334-3422.	<b>April 21-22</b> Washington, DC Climate Institute: Symposium on the Implications of Climate Change for Infrastructure Planning. Contact: John Topping, 202/547-0104 Hall of States, 444 North Capitol St.	<b>August 18-24</b> Lille, France International Radiation Symposium.
<b>March 23</b> Washington, DC Symposium on Ozone Depletion, Greenhouse Gases, and Climate Change, sponsored by NRC Board of Atmospheric Sciences and Committee on Global Change. Open to Washington community. Contact: John Perry 202/334-3517 Lecture Room, NAS	<b>April 26-28</b> U.S. House of Rep. Hearings in Subcommittee on HUD & Independent Agencies, Appropriations Committee.	<b>September 20-23</b> Columbus, OH International Conference on Sustainable Agricultural Systems. Contact: Clive A. Edwards, Dept. of Entomology, The Ohio State University, 1735 Neil Ave., Columbus, OH 43210 The Ohio State University
<b>March 24-25</b> Washington, DC Climate Institute: Symposium on Impact of Climate Change on the Third World: Implications for Economic Development and Financing. Contact: John Topping, 202/547-0104 Conservation Foundation, 1250 24th St., NW	<b>April 28-29</b> WRI/ALA Mintzer: OPPE (WRI/EPA) LDC Energy Paths Workshop. Contact: Irving Mintzer, WRI, 202/638-6300	<b>September 27-29</b> Chicago, IL First U.S.-Canada Symposium on Climate Impact on the Great Lakes, co-sponsored by Canadian Climate Program, National Climate Program, U.S. EPA. Contact: William Bolhofer, 202/443-8981
<b>March 29-31</b> Madison, WI Second Conference on Polar Meteorology and Oceanography. AMS	<b>May 2-3</b> Berkeley, CA EPA OPPE Workshop on Energy Efficiency and End Use Strategies. Contact: Joel Scheraga, 202/382-3354	<b>October 4-6</b> Washington, DC Conference on Biological Diversity, sponsored by World Wildlife Fund, Conservation Foundation, U.S. EPA, National Park Service, DOE, et al. Contact: Robert Peters, 202/778-9610 NAS
<b>March 30</b> New York, NY University Seminar on Global Habitability. "The Role of Oceans in the Global Carbon Cycle." Contact: Ruth Levenson, 212/280-8300 Columbia University	<b>May 9-13</b> Nijmegen, Netherlands Atmospheric Ozone Research and its Policy Implications, Ozone Symposium co-sponsored by EPA and Netherlands Ministry of Housing, Physical Planning and Environment	<b>October (No date set)</b> Boulder, CO NCAR on Effect of Climate Change on Ecosystems and Forests. -Contact: Michael Fosberg, 202/235-8195 Second Annual Joint Meeting of Forest Service/NCAR
	<b>May 9-13</b> Snowmass, CO NASA Meeting on Antarctic Ozone Hole. Contact: Robert Watson, NASA, 202/453-1481	<b>November (No date set)</b> Washington, DC Second North American Conference on Preparing for Climate Change. -Contact: John Topping, 202/547-0104 Climate Institute
	<b>May 17-20</b> Hamilton, Ontario "Climate Change and Great Lakes Water Quality Management." One day in 3-day conference of the International Association of Great Lakes Researchers. Contact: Holly Hartman, Great Lakes Environmental Research Laboratories, 2205 Commonwealth Blvd., Ann Arbor, MI 48105	

### YES, I wish to join in the vital activities of the Climate Institute.

I am enclosing annual membership dues. Regular rate: \$100. Reduced rate: \$50, available to members of environmental, non-profit or government groups or to registrants of Climate Institute conferences or symposia. Members will receive the quarterly newsletter *Climate Alert* as well as reduced rates to Institute events.

I am enclosing registration payment for the *Symposium on Impact of Climate Change on the Third World*, March 24-25, 1988. Non-members \$25. Member \$15. (Please call 202/547-0104 for reservation. Space is limited.)

I am enclosing registration payment for the *Symposium on the Implications of Climate Change for Infrastructure Planning*, April 21-22, 1988. Non-members \$25. Member \$15.

I am enclosing a tax-deductible contribution of \_\_\_\_\_ to support the Institute.

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# Symposium on the Impact of Climate Change on the Third World: Implications for Economic Development and Financing

March 24-25, 1988, Washington, D.C.

Convened by the Climate Institute with the U.S. Environmental Protection Agency and The Conservation Foundation as co-sponsors. Conference registration begins at 8:30 a.m. Thursday March 24 at the Conservation Foundation, 1250 24th Street, N.W., Washington, D.C. 20037.

## AGENDA FOR THURSDAY, MARCH 24

9:00-11:45 a.m. Morning Session

**Introductory Address** by Ambassador Richard Benedick, The Conservation Foundation, *Symposium Chairman*

Dr. James Hansen, *Director*, Goddard Institute for Space Studies, "Expected changes in climate over the next several decades."

Dr. Hassan Virji, National Science Foundation, "How global warming may affect monsoon patterns."

Dr. Robert Watson, NASA, "Stratospheric ozone protection."

Dr. Michael Oppenheimer, Environmental Defense Fund, "How global warming and stratospheric ozone depletion could affect public health and the environment in developing countries."

LUNCH (on-site)

12:45-3:30 p.m. Afternoon Session

**Implications of Climate Change for Third World Agriculture** (Panel Discussion)

Dr. Cynthia Rosenzweig, Columbia University, "An overview of likely effects of climate change on Third World agriculture."

Dr. Daniel Dudek, Environmental Defense Fund, "Likely impact of global warming on agriculture in semi-arid countries."

Dr. Daniel Hillel, The World Bank, Discussant.

Dr. Norman Rosenberg, Resources for the Future, Discussant.

**Factoring Climate Change Into Water Resource Planning in the Third World** (Panel Discussion)

Dr. James Broadus, Woods Hole Oceanographic Institution, "Rising sea level and damming of rivers: Possible effects in Egypt and Bangladesh."

Dr. Hind Sadek, "A Marine Park in Sinai: An Example of Economic and Sustainable Development."

Samuel A. Sherer, Esq., International Development Law Institute, Discussant.

7:00 p.m. Buffet Dinner: 220 Maryland Avenue, N.E.

## AGENDA FOR FRIDAY, MARCH 25

9:00 a.m.-1:00 p.m. Closing Session

**Implications of Climate Change and Sea Level Rise for Third World Coastal Projects** (Panel Discussion)

Dr. Stephen Leatherman, University of Maryland, "Likely impact of sea level rise on the coasts of South America."

Jim Titus, U.S. EPA, "Likely impact of climate change on island nations."

Dr. Robert Buddemeier, Lawrence Livermore National Laboratory, "Impacts of climate change on coral reefs, islands and tropical coasts."

**Environmentally Beneficial Strategies of Achieving Economic Development in the Third World** (Panel Discussion)

Dr. Irving Mintzer, World Resources Institute, "An overview of emissions scenarios."

Dr. William Chandler, Battelle Pacific Northwest Laboratories, "Climatic consequences of alternative energy strategies in Asia."

John Hoffman, U.S. EPA, "Technology choice, CFCs and developing country economic growth."

Concluding remarks by Ambassador Benedick

## New Concerns

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global climate change and the earth's protective ozone shield. There was speculation that the low ozone level may have contributed to the persistence of the cold air, as less ozone was present to absorb the sun's warmth.

An article in the March 4, 1988 issue of *Science* by Donald R. Blake and F. Sherwood Rowland of the University of California at Irvine linked destruction of ozone in the stratosphere to the steadily growing concentrations of methane in the atmosphere. Methane, which is a highly absorbent greenhouse gas, has been regarded as slowing the rate of ozone depletion by breaking down chlorofluorocarbon compounds. Blake and Rowland's analysis indicates that methane does play just such a role outside of Antarctica.

Blake and Rowland conclude that methane has the opposite effect in Antarctica. They indicate that this occurs when methane reaching the stratosphere combines with hydroxyl radicals to form water

vapor. During the nearly six-month Antarctic night the stratosphere is cold enough for water vapor to freeze into clouds of ice crystals. The crystalline surfaces in these clouds tremendously accelerate the chemical reactions by which chlorofluorocarbons break down ozone.

Blake and Rowland conclude that methane's catalyzing of reactions destroying ozone in Antarctica outweighs the buffering effect of methane on stratospheric depletion outside Antarctica. The result, the two scientists suggest, is a net loss of ozone across the globe. The *Science* article indicates that concentrations of methane in the atmosphere have risen 11 percent since 1978. A recent EPA-sponsored Workshop on Agriculture and Climate Change estimated that the current methane emissions break out as follows: rice production 26 percent; wetlands 22 percent; biomass burning 16 percent; domestic animals, largely cattle, 15 percent; fossil fuel production 14 percent; wild animals and termites 4 percent; land fills 2 percent; and oceans 1 percent.

## Climate Protection Act

Continued from page 1

funding. Its \$4 million figure seemed intended to maintain the pace of the EPA effort, but was a significant underestimate due to confusion over the scope of the new EPA program.

The budget squeeze is not likely to prevent EPA from developing the detailed regulations needed to control emissions of chlorofluorocarbons and other ozone-depleting compounds, but it could crimp the agency's ability to support the international assessment process envisioned in the Montreal Protocol. The shortfall seems virtually certain to hobble the nascent EPA climate impact analysis program. Facing a court order and a treaty mandate, EPA's stratospheric protection program seems destined to claim the bulk of the \$4 million. Offsetting this budgetary setback at EPA, however, has been growth in funding for climate research at such agencies as NOAA and the Forest Service.



# Symposium on the Implications of Climate Change for Infrastructure Planning

April 21–22, Washington, D.C.

*Convened by the Climate Institute, with the U.S. Environmental Protection Agency and The Urban Institute as co-sponsors. Conference registration begins at 8:30 am on Thursday, April 21 at the Hall of States, Rooms 237 and 239, 444 North Capitol Street, Washington, D.C. 20001.*

## AGENDA FOR THURSDAY, APRIL 21

### 9:00–11:45 am Morning Session: **AN OVERVIEW**

Daniel Power, Nashville, Tennessee, Climate Institute, *Symposium Chairman*, **Welcoming Remarks**

Scientific presentation on expected changes in climate, sea level and hydrology over the next several decades.

G. Thomas Kingsley, Urban Institute, "The likely effects of climate warming on public investments in air conditioning, heating, road maintenance and subway operations in Cleveland, Ohio."

LUNCH (On-site)

### 1:15–6 p.m. Afternoon Session

#### **The Implications of Climate Change and Sea Level Rise for Infrastructure Planning in Coastal Areas**

(Panel Discussion)

**Moderator:** Dr. Stephen Leatherman, *Chairman of the Climate Institute.*

**Panelists:** William Hyman, Urban Institute, "The likely impact of climate change and sea level rise on bridges, the water supply, and waste treatment and disposal in Greater Miami."

Marilyn Manzer, Discovery Consultants, Ltd., Wolfville, Nova Scotia, "An overview of the effects of sea level rise on coastal communities in Atlantic Canada."

#### **Likely Impact of Changes in Climate and Hydrology on Water Resource Planning** (Panel Discussion)

**Panelists:** Dr. Joseph Knox, Lawrence Livermore National Laboratory, "Implications of climate change for water resource planning in the Tennessee Valley and in California."

J. Christopher Walker, Urban Institute, "Potential effects of climate change on reservoirs and water supplies of major American cities."

Dr. William Easterling, Resources for the Future, Discussant.

5:00–6:00 pm Reception

## AGENDA FOR FRIDAY, APRIL 22

9:00–10:45 am

#### **Implications of Climate Change and Sea Level Rise for Sewer and Drainage Systems** (Panel Discussion)

**Moderator:** Daniel Power, Climate Institute

**Panelists:** Jim Titus, U.S. EPA, "The effect of climate change on coastal drainage systems—a close look at Charleston, South Carolina, and Fort Walton Beach, Florida."

Panelist from Drexel University to discuss likely impact of climate change and sea level rise on New York City sewers and subways.

10:45 am–12:45 pm

#### **Factoring Climate Change Into Infrastructure Planning and Financing** (Panel Discussion)

**Moderator:** Michael Brewer, *Vice President*, Dun & Bradstreet

**Panelists:** Indur Goklany, U.S. Department of Interior.

Samuel Sherer, Climate Institute.

Nathan Gross, *Director of Zoning*, D.C. Office of Planning.

## CLIMATE INSTITUTE

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## SECOND N.A. CONFERENCE

The Climate Institute is planning to convene a *Second North American Conference on Preparing for Climate Change* later this year. Besides Canada, special efforts are being made to include Mexico and other nations in Central America and the Caribbean area.

Watch for further details in the next issue of *Climate Alert*.

*The Climate Institute is a private, nonprofit organization formed to advance public understanding of global warming produced by the greenhouse effect and of strategies to avert stratospheric ozone depletion.*