Climate Change and Civil Society: Acting Now to Protect Our Future

Conference Proceedings

Tufts Institute of the Environment
&
Tufts Climate Initiative

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Fletcher School of Law and Diplomacy
Tufts University
Medford, MA 02155

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PREFACE

Within the last decade, global climate change has emerged as a central environmental threat for our civilization. In 1997, the US and other governments around the world negotiated the Kyoto Protocol on global warming to begin addressing the problem. To date the US Senate has refused to ratify this Protocol for political reasons but that does not mean that we must wait to take action. With the national leadership seemingly paralyzed on this issue, members of American civil society – corporations, municipalities, churches, universities, students and individuals are starting to take immediate action to prevent global warming by reducing their greenhouse gas emissions.

The conference on "Climate Change and Civil Society" was held at the Fletcher School of Law and Diplomacy at Tufts University on April 24, 1999 and sponsored by the Tufts Institute of the Environment and the Tufts Climate Initiative. As The Boston Globe editorialized that day, the conference "embod[ied] a principle deeply rooted in the American tradition and particularly in New England. This is the principle that truly important matters need not be left to the languorous workings of government but may be accomplished by citizens acting on their own initiative." In other words, voluntary reduction of greenhouse gas emissions embraces the New England tradition of strong self-reliance and national leadership.

More than 200 participants from all parts of society in New England gathered at Tufts University to learn how they could directly reduce the greenhouse gas emissions that cause global climate change. This conference attracted those who want to act on the issue of global warming, and thereby convened an elite group of innovative environmental leaders from New England.

This report compiles summaries written by Tufts University students of most presentations and discussions from the conference. Ideally, it will allow us to share the insights brought to the conference, and perhaps even provoke the reader to start reducing greenhouse gas emissions from their home, workplace or mode of transportation. Finally we are pleased to report that the conference has spawned a new organization that will work as part of civil society to reduce the release of greenhouse gases. *Clean Air Cool Action* will open for action in early 2000.

Kelly Sims, Project Manager, Tufts Climate Initiative
Medford, August 12, 1999

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WELCOME SPEECH BYTUFTS UNIVERSITY PRESIDENT JOHN DIBIAGGIO

I am delighted to welcome this distinguished group to Tufts University to address the critical and pressing issue of "Climate Change and Civil Society."

Several months ago, Sir John Browne, the CEO of British Petroleum called climate change the single most important public policy issue facing the energy industry. Last Tuesday, Tufts' own graduate, the Honorable Bill Richardson, US Secretary of Energy, spoke from this very lectern and told this auditorium packed full of students that, "The most important issue that you will face as adults will be greenhouse gases."

"I am pleased to [...] publicly commit Tufts University to meet or beat the Kyoto goal of a seven percent reduction below 1990 in our carbon dioxide emissions by the year 2012."

He might also have added that no issue has proven more difficult for governments to address, which is why I am so supportive of the direction that is being taken by those of you here today. This conference brings together two crucial strands of the Tufts mission and curriculum.

Tufts has a long-standing commitment to addressing environmental issues, and "environment" is one of our university signature programs. Tufts has a dozen graduate and two undergraduate environmental degree programs that address environmental science, environmental health, environmental technology and environmental policy. Our new Tufts Institute of the Environment coordinates these programs and events like this conference.

Yesterday, also in this auditorium, Tufts celebrated the second strand represented by its new book series on civil society, and began a dialogue on its intellectual underpinnings. Building upon the long tradition of volunteerism on the part of our students and the citizen education programs of the Lincoln Filene Center, Tufts seeks to promote a greater understanding of civil society through research and teaching as we encourage our students to become active citizens and to assume community leadership responsibilities. As many of you know, the tradition of a spring environmental conference to mobilize citizens and organizations to protect the environment was started by the late Nancy Anderson of our Lincoln Filene Center who ran the New England Environmental conference for almost 20 years.

Civil society can often accomplish what government can not do or will not attempt. This is certainly the case for climate change. Our national government is moving slowly and some

elements have vowed to block action entirely. Meanwhile, heat-trapping greenhouse gases continue to accumulate in the atmosphere, and evidence of rising temperatures, melting glaciers, sea level rise, increases in regional air pollution and rapidly altering ecosystems continue to accumulate. Despite the existence of an international agreement that the United States and other industrial countries should reduce their greenhouse gas emissions, the glacial pace of implementation decreases the likelihood that the modest goals of the Kyoto Protocol will be met. It is therefore time for the individuals, environmental organizations, universities, churches and other institutions, municipalities and companies gathered here today to begin reversing our own ever-rising carbon dioxide and other industrial greenhouse gases.

I am pleased to join with several other organizations and companies today and publicly commit Tufts University to meet or beat the Kyoto goal of a seven percent reduction below 1990 in our carbon dioxide emissions by the year 2012. I welcome Second Nature, Woods Hole Research Center, Trigen Corporation and others who have agreed to setting this goal for themselves and encourage others to do the same.

The Tufts Climate Initiative has established our 1990 baseline emissions level, and calculated our current energy related emissions. Yes, unfortunately our emissions have risen. Our facilities managers and students have already begun to identify opportunities to lower our emissions through fuel switching, improved operations, and retrofitting of existing buildings. We are also exploring the opportunities for using passive solar and other renewables in some of our new construction. Our first major project will be the renovation of the Medical and Veterinary school complex on our Boston campus that is expected to reduce carbon emissions by many tons per year, and eventually save the University more than $1 million in energy costs annually.

Tufts is looking for partnerships with utilities, corporations and other organizations to find better and more effective ways to reduce our energy use and emissions. We look forward to working with all of you today, and over the next decade as we embark on a new and sustained effort to address the critical issue of climate change. I wish you all success and look forward to seeing the report of your findings and recommendations.

Tufts Welcoming Remarks from Professor William Moomaw, Director of Tufts Institute of the Environment

President DiBiaggio, on behalf of all of us at Tufts I wish to thank you for your support and leadership for environmental programs, and on behalf of all of us here, wish to express our appreciation for boldly endorsing the Tufts Climate Initiative to meet or beat the Kyoto target. The cooperation and enthusiastic engagement of members of your administration in moving forward to address the challenge of ever growing energy use and greenhouse gas releases from the University has energized students, faculty and staff, and helped to make this reality.

" Last year's global average temperature substantially exceeded the previous record of 1997, and continued an extraordinary run of high temperatures that we now know exceed any that have been seen since Y1K was a problem. "

Our efforts at Tufts have engaged students, faculty, staff and facilities managers in a coordinated effort to find cost effective ways to reduce university greenhouse gases. Student projects have designed combined heat and power facilities for the athletic complex, designed wind and solar options for the new Wildlife Veterinary clinic in Grafton, explored ways to improve the efficiency of frame buildings on campus, lead to a solar PV installation here in Medford in collaboration with the City of Medford. Next spring there will be a course in economics that will teach students about cost benefit analysis, discounting, and other economic principles using Tufts greenhouse gas reductions as the real world examples. All of these efforts feed into a supportive facilities operation that was already making great strides in slowing the growth of Tufts University energy use and greenhouse gas emissions.

I wish to also wish to recognize the efforts of Tom Casten of Trigen Corporation, George Woodwell of the Woods Hole Research Center and Tony Cortese of Second Nature who have also agreed that their organizations will commit themselves to meeting or beating the Kyoto target. I also wish to recognize the pioneering effort of Nancy Skinner, the Executive Director, US Campaign, Cities for Climate Protection, International Council of Local Environmental Initiatives, who pioneered the concept of civil society action to address climate change.

The past two years have been extraordinary ones for climate change science and policy. As greenhouse gases continue to accumulate in the atmosphere, more and more evidence has accumulated that the earth's climate system is changing. Last year's global average temperature substantially exceeded the previous record of 1997, and continued an extraordinary run of high temperatures that we now know exceed any that have been seen since Y1K was a problem. New climate models suggest that it is not just temperature rise that will provide the major disruptions, but the dramatic redistribution and availability of moisture that will have the greatest consequences for human society and natural ecosystems. The pace of collapsing ice sheets in Antarctica and the thinning of the Greenland ice cap remind us that we are setting in motion changes that, because of the long atmospheric lifetime of carbon dioxide and many other greenhouse gases, are irreversible on the scale of centuries.

Unfortunately, the accelerating pace of glacial retreat has been offset by an appalling deceleration in the pace of political response to the threat of climate change by national governments. It appears that we have entered an era where glacial response by governments would signify a more rapid response than we are seeing today. The euphoria of Rio and Kyoto has been replaced by two more years of diplomatic wrangling following Buenos Aires. The Hagel-Byrd amendment has forced US policy into an unproductive attempt to bludgeon developing countries into greenhouse gas reductions even as they struggle to lift billions of people out of poverty. Where is the sense of mission "to protect the climate system from anthropogenic change," or the sense of cooperation between developed and developing countries that prevailed in the Climate Convention?

The US is proud to be first in many ways, and we are number one in greenhouse gas emissions. With less than five per cent of the world's population, we release nearly one-quarter of the world's carbon dioxide and higher percentages of many other greenhouse gases. Leadership is not about asking China to do something. Leadership is about taking responsibility for our actions, and acting accordingly. I am deeply disappointed that our national leaders are retreating on this issue despite the best efforts of many fine people.

"When the people will lead, their leaders will follow."
"Since our national leaders have failed us, it is time for us, the members of civil society, to take the lead on climate change."

In 1990, I was in Leningrad, and spotted a small bumper sticker pasted above the driver of a bus. To my surprise, it was in English, and read, "When the people will lead, their leaders will follow." I knew then that time was running out for the old regime of the Soviet Union. Since our national leaders have failed us, it is time for us, the members of civil society, to take the lead on climate change.

Why wait for the Senate? Yes, it would be useful to have a ratified Kyoto Protocol, but ratification of the treaty will not of itself reduce greenhouse gases. Even if Kyoto were ratified, it would still be up to the corporations, universities, municipalities, churches and individuals of the United States to reduce emissions. If we wait for ratification, there will simply not be enough time to slow greenhouse gas emissions enough to meet the Kyoto target of a 7 per cent reduction below 1990 levels by 2012.

Let us proceed with implementation without ratification! Let's just do it! By the end of the day, we hope to determine whether civil society on a regional basis wishes to rise to the challenge and create a coalition that would move ahead, reducing our emissions in a significant and accountable manner. To assist us in this effort, we have assembled a group of extraordinary visionaries and doers. People who are already making a difference to help us see how we might proceed together. Thank you very much for coming today. We look forward to a stimulating conference.

Carol Carmichael, Director, Center for Sustainable Technology Georgia Institute of Technology

Georgia Tech, which graduates two percent of the engineering force in the US, has designed a number of university management, research and education programs for sustainable development. Through this three-pronged approach, students — and ultimately the professional engineering field — will increasingly address environmental issues in technology development and planning. Climate change, as opposed to other global environmental concerns, encompasses a clear set of indicators and cross-boundary technology issues, and meets the university's needs as an anchor to focus investment and program strategies. Georgia Tech's two goals to address climate change are to increase the percentage of renewable energy use, and to carry out the university's upcoming and extensive construction plans for the next fifteen years without increasing current greenhouse gas emission levels.

Summary by: Ellen Shaw

Sister Pat Daly, OP, Executive Tri State Coalition for Responsible Investment and Board Member, Interfaith Center on Corporate Responsibility

Sister Pat Daly is known to many for leading an effort as an individual to influence corporate shareholders to address the problems of climate change. Sister Daly believes that we all have the ability to lead a power change towards combating climate change. Passivity, she stated, is the greatest sin of our nation, and it is passivity that has given us climate change. Good people have caused climate change and we need to acknowledge that before we are able to break the passivity.

Since climate change is not a simple issue, she believes that we are called to study this complex problem. But we ought not to be paralyzed by complexity, because that creates passivity. Sister Daly argues that consumerism is driving the problem and that corporations are capitalizing on our behavior. On the positive side, corporations are also responsible to their shareholders and they recognize the power of shareholders. Just recently, Sister Daly met with the CEOs of J.P. Morgan and Exxon to discuss next steps needed to tackle the issue of sustainable development. In closing, Sister Daly said she is certain that the powers of the planet and the powers of heaven are supporting us in our efforts.

"Passivity is the greatest sin of our nation, and it is passivity that has given us climate change. Good people have caused climate change and we need to acknowledge that before we are able to break the passivity."

Summary by: Imke Wesseloh

Nancy Skinner, Executive Director, US Campaign, Cities for Climate Protection, International Council for Local Environmental Initiatives

Nancy Skinner, Director of the ICLEI U.S. Program based in Berkeley, CA, urged conference participants to get involved in their local governments as agents of reform. She believes that all power comes from the bottom-up, and therefore the power of change is in the realm of the community activists. She states that citizens need to work with their local governments and demand action from their public officials. The local government presides over several areas that contribute to global climate change emissions. For example, the transportation systems available within a town and the land use of a town will impact the quantity of emissions generated from that town. Opportunities to reduce the quantity of emissions generated include clustering development and regulating the energy efficiency of buildings. Ms. Skinner urged citizens to get their local officials to sign the Cities 21 Climate Change Memorandum of Understanding that will require officials to take action to reduce a city's emissions.

Summary by: Allison Quaid-dos Santos

Joe Romm, Director of the Center for Energy and Climate Solutions, author of Cool Companies

Mr. Romm expressed his regrets that Gil Bamford, Vice President, Toyota Corp. was unable to attend the conference due to a cancelled flight because of weather. He shared with the audience some points that Gil Bamford would have talked about. Stating that the key to every corporate success is protecting the brand, he pointed out that as much as quality and safety have been the prominent features of Toyota in the past, this will be complimented by a new feature: A climate-friendly car and a cleaner production process. He stated that Toyota has also been a leader in buying renewable energy for its manufacturing process.

Mr. Romm encouraged everyone to play a role in emission reduction strategies, especially corporate America. Based upon his own work, which is published in his book Cool Companies, which was available at the conference for the first time, he stated that any type of factory can cut their energy use by 30-50% at a net profit.

Tom Casten, CEO of Trigen Energy Corporation, author of Turning Down the Heat

Trigen's mission is to reduce fossil fuel usage and carbon dioxide emissions to one-half of those currently generated by today's electric power plants. The average US power plant was built in 1964 using 1950's technology, which is only 33% efficient, while a modern combined heat and power plant, of the type recently installed at the University of Maryland by Trigen, can utilize 65 – 80% of fossil fuel energy to produce electricity and heat for the campus. This can dramatically reduce CO2 emissions by much more than is required by the Kyoto protocol.

Summaries by: Imke Wesseloh

INDIVIDUALS

Kelly Sims, Project Manager, Tufts Climate Initiative

In discussing ways in which the individual can combat climate change, a vast array of possibilities were reviewed. Suggestions included reducing carbon dioxide emissions from cars by utilizing public transport, walking, forming carpools and keeping cars tuned. Homeowners may consider switching from oil to natural gas, using energy efficient lights and appliances, turning off lights and appliances when not in use, keeping the heat low, composting, and using less hot water. Consumers can also reduce emissions by choosing products wisely, eating less meat, and purchasing local produce.

Examples of how motivated individuals can encourage others to partake in emissions reduction activities were also described. It became clear that some people are motivated by concern for climate change, while others are motivated by the costs associated with wasting energy, and others by the perceived notion of doing the right thing. Furthermore, in trying to promote climate change abatement activities, the motivated individual should educate the public about the breadth of the issue. Each individual is part of a network that includes their school or workplace, neighborhood, city, state and country. Climate change relates to numerous environmental problems (i.e. ozone depletion, air pollution) which can each be dealt with in the context or separate from global warming.

Summary by Halley Rosen

MUNICIPALITIES

Nancy Skinner, ICLEI; Mark Eldgridge, Director of Planning and Zoning, City of Burlington, VT; Debra Sachs, Projects Director, Regional Planning Commission, Chittenden County, VT

Ms. Skinner began the session by stating that each city can commit to reduce the quantity of emissions that it generates. They can conduct a community-wide baseline emission inventory, and based upon an analysis of the data, target areas for emission reductions. Areas most commonly targeted include transportation, building codes, waste management, and land use.

Mr. Eldridge. Director of Planning in Burlington, VT, described the sustainable development policies in his town. They have implemented several innovative waste management and transportation programs. His overview of the progressive policies implemented by the city demonstrates the fact that a city has several entry-points where it can promote sustainable development.

In addition, he stated that leadership and vision were critical to achieving sustainable goals with a local government.

Ms. Sachs, of the Chittenden Community Regional Commission, described the process the Commission has undertaken to promote sustainable development within the Vermont region. She stated that one way to attract stakeholders into the sustainable process is by emphasizing the self-interest aspect of such a program. Additional lessons learned from the Commission are that leadership is essential to the process, as well as education, and making the issues locally relevant. Ms. Skinner concluded the session by encouraging conference participants to get involved with their local governments.

Summary by: Allison Quaid-dos Santos

CORPORATIONS

Roger Borghesani, Corporate Energy Director, Polaroid Corporation
Tom Casten, Trigen Energy Corporation.

Thomas Casten, President and CEO of Trigen Energy Corporation, and Roger Borghesani, Corporate Energy Director for Polaroid Corporation, moderated a lively discussion among interested parties ranging from students to regulatory authorities. Both discussion leaders highlighted lessons learned from their own experiences with corporate efforts to address climate change. Based on the successful approach taken by Polaroid, Mr. Borghesani encouraged other corporations to establish a team of employees to develop an energy policy and a long-term energy plan, to implement and review the effectiveness of energy projects, and to advocate for appropriate capital programs to promote energy conservation. He explained how voluntary government programs like Energy Star Buildings and Climate Wise can help corporations develop an effective energy strategy and leverage their efforts through publicity opportunities. Mr. Borghesani also urged corporations to take what steps they can manage to take, rather than doing nothing at all. Polaroid Corporation has committed to reduce its total energy usage by 1% annually for the next five years. The corporation projects that this modest commitment will bring its annual energy cost savings to over $3.5 million dollars by 2000.

Polaroid, like other corporations, has to approach environmental issues with an eye toward profitability, and in this sense, the company has found some measures that are both environmentally friendly and profitable. Energy use is a primary target; the company spent more than $22 million on energy in 1998. The bill would have been higher, but Polaroid was able to save through use of efficient lighting, cogeneration, high-efficiency chillers, energy management systems, and more. These technologies saved money, but also cut greenhouse gas emissions by an estimated 39 million pounds. Polaroid now has a Corporate Energy Council to design management programs with energy savings in mind. The company follows the CERES principles, and plans to advocate efficiency and awareness through product stewardship, annual reports, and communications with customers and other stakeholders.

Thomas Casten pointed to a lack of trust between corporations and environmentalists as one of the greatest obstacles facing corporate commitments to mitigating climate change. Most environmental legislation came into being in the 1970s when climate change was not understood and when advanced energy efficiency and renewable energy technologies were less available. Today, Casten argues, corporations could have an incentive to implement low cost, low emissions operating strategies if environmental regulations were based on pollution per unit output, rather than the traditional command and control approach. Casten highlighted electric industry restructuring as an important opportunity to implement market based environmental policies. He also encouraged corporations to make it known that climate change mitigation policies will not result in a net loss of jobs, but rather a retraining of employees and the creation of thousands of new jobs.

Summary By: Ellen Shaw and Nicole Robillard

INSTITUTIONS

Tony Cortese, Second Nature
Nan Jenks Jay, Middlebury College

Purchasing power among universities is substantial – US universities alone, purchase more than all but twenty countries in the world. The potential for universities to act as leaders is substantial and institutional change is a process of building a coalition at every level. To be effective requires leadership, and a lot of recognition and support. Initiatives can come from many areas. For example at University of Houston, the CFO started with an environmental mentality that was driven by the administrators. They put energy cost savings into a fund for new projects. They have a grant program for paying for half the project cost if it reduces campus environmental impact. At SUNY Buffalo the Energy officer helped campus save $9 million a year by getting president and provost support and engaged faculty and students to do much of the research.

Dr. Cortese contended that the university is a community, within a larger community, within the biosphere. He believes that full integration of all levels of hierarchy is essential and therefore students must work to green the campus and the community. Universities must practice what they preach and become the leaders of environmental policy, instead of followers of civil society. Integrating environmental perspectives into college courses is key. Support from important faculty members and the administration helps integrate environment and sustainability.

Tony Cortese said that the diffusion issue is the biggest challenge. Universities must identify the correct players and select a collaborative goal. By affecting their own circle, they will continually expand the scale outward. It is good to look for commonality among potential partners and develop ways to achieve goals together so that the overall effect is greater. For example, one could form a cooperative for purchasing to have more effect on distributors. He urged listeners to think of non-traditional partners or establish environmental purchas-

ing criteria. He pointed out that sometimes cities or towns often think of universities as problems, not benefits. He argued that the more diverse the group, the better the dissemination, because the group is not blocked by traditional limits of interaction. Dr. Cortese believes climate change encourages systemic thinking, and an understanding of tradeoffs, and relative effects. He suggested universities might also want to adapt literature for specific levels (maintenance, transportation, etc) to make the knowledge more identifiable for specific niches in order to bring more people on board.

"Climate change encourages systemic thinking, and an understanding of tradeoffs, and relative effects."

Nan Jenks Jay commented that it is extremely difficult to effect change in educational institutions. She presented the case study of Middlebury College, which is located in Vermont. Switching to more environmentally friendly technologies requires an institutional shift. Energy conservation needs to be part of larger, more integrated system. Middlebury is designing large part of the campus to be more pedestrian friendly – enhancing bicycle facilities year-round (lockers, racks, paths), sidewalks, shuttle bus. There is an electric truck on campus, as part of pilot project with Evermont, which was procured through facilities management (not top-down) and which can be borrowed by any staff member on the weekends. The truck drivers are becoming educators, since so many people ask them about the truck labels. One can not simply have good ideas and just tell people to go with them, but they must follow through with them personally. The Middlebury Environmental Council may come up with good ideas, but if they just try to hand them off, they are unlikely to be implemented.

Middlebury College has also built a new "green" Social Sciences building – the building has triple glazed windows, impermeable skin, and heat exchangers on top floor. It used 125,000 board-ft of green-certified wood. This started a new industry in VT (green-certified). The initiative came from Board of Trustees.

Universities have to first find out what is needed. Determine the present status to create a baseline, conduct a yearly audit to measure progress and to make choices about future activities. Middlebury is now working with trustees and architects to review every new building to integrate new technologies and to establish a standard for new buildings.

Institutions must think of what they can do on a larger scale. Who makes the decisions? Trustees who are bold and progressive, as well as leadership at all levels. Good ideas need to be recognized. Nan Jenks-Jay feels she can take risks without fear of losing job. Middlebury has a systemic structure that supports environmental decision-making. She receives feedback from all levels having different environmental priorities.

Summary by: Robert Blair

STATE OF CLIMATE CHANGE POLICY

Kilaparti Ramakrishna, Deputy Director, Woods Hole Research Center Sue Tierney, Principal, Economics Resource Group, Inc.

The first half of this seminar focused on the international debate between developing and developed countries over the implementation of climate change policy. Developing countries believe that the industrialized world is responsible for the large part of the current climate problem and therefore, they should be the ones implementing the changes. Developed nations, on the other hand, feel that developing nations will be the future cause of harm and should begin implementing changes now. The one policy area that both developing and developed nations agree on is the implementation of clean development mechanisms. Though the United States plays a key role in this international climate debate, it has yet to ratify the Kyoto Protocol, further delaying the adoption of this international agreement.

The second topic of discussion was the state of US energy policy. Current policy is "business-as-usual," which incorporates three strategic goals - maximizing energy productivity, preventing pollution, and ensuring US security. Ms. Tierney advocated using market solutions whenever possible. During the last twenty-five years, there has not been a significant change in energy use, energy policy, or energy efficiency. Yet, Americans are driving more and oil prices are at an all time low. In order to reach the emissions goal of Kyoto, there will have to be more expensive fuel prices, less energy use, higher fuel efficiency, and more technological innovation. People will have to change their behavior as well as get organized to push for policy changes.

Summary By: Jane Iwaki

THE STATE OF CLIMATE SCIENCE

Michael McElroy, Earth and Planetary Sciences, Harvard University
William Moomaw, Fletcher School of Law and Diplomacy, Tufts University

Using measurements based on atmospheric extracts from 550,000 year-old ice samples, it has been established that our atmosphere currently has the highest concentration of CO2 during that period. Previously, CO2 has fluctuated between 200 ppm (parts per million) and 280 ppm in the interglacial and glacial periods, but starting 150 years ago CO2 levels began increasing very rapidly to the current level of 360 (ppm). The centuries long atmospheric lifetime of greenhouse gases such as CO2 means that today's emissions are creating essentially irreversible changes for many future generations.

The United States should act independently to reduce CO2 levels because we may face large economic costs in both the short and long-run. Recent weather abnormalities such as hurricanes, flooding and mudslides can often be attributed to climate change and their immediate economic costs have been substantial. Furthermore, if the climate starts changing at unpre-

dictable levels it will no longer be possible to base future development and investments decisions on the past by using relevant historical environmental precedents. Climate change will also make ecosystems vulnerable and probably lead to unknown systemic changes in both rich and poor countries.

The climate has experienced great "flips" in the past, which provide evidence that there may be a possibility for a "flip" in the future. 11,000 years ago the temperature dropped six to seven degrees and stayed that way for 1,500 years only to return to the original temperature in less than ten years. 5000 years ago the sea abruptly rose four meters in less than 140 years. When looking at climate science, the role of the ocean warming and historical precedent are also important.

Unfortunately the debate portrayed in the media is inaccurate and does not reflect the dynamic process of science. Science is a work-in-progress where conclusions change over the long term so they cannot be portrayed as a "closed book." We should avoid scientific debates in the media because of the tendencies to simplify issues, masking intricacies and overall accuracy.

Summary by: Tomas Dinges

EMISSION REDUCTION STRATEGIES

Deborah Gordon, Yale University Transportation Project; Joe Romm, Center for Energy and Climate Solutions, author of Cool Companies

Deborah Gordon, of the Yale University Transportation Project, discussed the important role which transportation plays in global climate change and highlighted a number of economic incentives and disincentives that governments could employ to bring about change.

Economic incentives included:

- "pay-as-you-drive insurance" which raises operating costs for vehicle owners who drive the most and imposes surcharges on poling auto mobiles like sport utility vehicles;
- renewable fuels incentives in the form of tax credits;
- "fee-bate" programs that impose a surcharge on vehicles that pollute the most while providing rebates to cleaner vehicles.

Some disincentives discussed included:

- gasoline taxes;
- jet fuel taxes;
- age indexed vehicle registration fees which would make owners of older, more polluting cars pay more.

Equity concerns were raised in response to several of the proposed measures, as elderly and lower income people tend to own older, more polluting cars. Ms. Gordon discussed how technological advancement will likely lead to a transition to cleaner vehicles but that, given the low cost of fuel, a timely response must be initiated by effective and innovative regulations. Ms. Gordon urged policy-makers to focus on "two-fers:" those regulations that marry SOx and NOx reductions with CO2 reductions.

The impact of the commercial sector on greenhouse gas emissions was the highlight of Joe Romm's comments. Mr. Romm explained that relatively few companies have serious energy strategies in place, and that an enormous untapped potential exists for energy and cost savings in the US commercial building stock. Romm outlined a few case studies from his book, Cool Companies, as models for corporate actions to reduce facility energy use and increase process efficiency. Romm stressed that, in order to initiate a broad move toward energy efficiency by corporate America, an increased level of awareness must emerge among shareholders, facility managers and corporate decision-makers regarding the cost savings potential associated with energy efficiency efforts.

Summary by: Nicole Robillard

GREEN DESIGN

Gunnar Hubbard, Principal, McCoppin Studios
David Orr, Professor, Oberlin College

The three guiding principles of green design are as follows:

- Living off solar income instead of nonrenewables
- Thinking of whole systems
- Protecting biological and cultural diversity.

One excellent example of green architecture is the new environmental studies center being built at Oberlin College. The vision was for the building to be completely sustainable. Through the use of technologies in solar energy and water purification systems, the building has zero discharge and is actually a net exporter of energy. A plan of full-cost accounting has been implemented in which both monetary loans and loans by the natural system are being repaid. There is a motto of no ugliness, either ecological or human.

A green design approach takes a whole team effort, architect, structural engineer, landscape architect, electricians, environmental engineer and others to gain a holistic construction design. The whole system design encompasses three concepts: end-use and least cost principles, front-loaded design and especially teamwork. As a result of this approach, operations and maintenance costs, energy efficiencies, pollution prevention and improvement of worker health and safety all benefit.

The greater goal at Oberlin was to build a model of sustainability that people could see and

touch, creating a link and awareness between people and their surrounding environments. Oberlin College is one of the many institutions of higher education utilizing their leverage power to enact change.

Summary by: Jane Iwaki and Angela Ma

PUBLICITY AND PUBLIC EDUCATION
Chris Ball, Outreach Director, Ozone Action
Jon Coifman, Associate Director, Environmental Media Services

This seminar addressed a number of points important in getting people to take action for environmental issues. There are three things that anyone can do now to immediately take action on issues:

- Write to your Congressional representative
- Write letters to the editor which will educate readers on current issues
- Vote your proxy in shareholder resolutions related to the environment

More specifically, there are things you can do if you're more dedicated or have the resources:

- Organize briefing sessions with your representatives and the media to change misconceptions
- Use paid advertising- include empowering messages that inform the public how they can get involved, along with a hotline number or address
- Use similar issues that support your own in order to gain broader support
- Get universities involved with campus-wide activism
- Get the message to shareholders
- Business outreach: try to get corporations involved to support the cause
- Try to reach non-traditional constituencies

The second group of suggestions takes more dedication but are important in getting the message across. Remember to use repetition so that the public, representatives, and media are well informed and understand the issues.

Summarized by: Stephanie Kawachi

HOW TO DO AN EMISSIONS INVENTORY
Arden Ahnell, British Petroleum
Ralph Torrie, Torrie Smith Associates

Arden Ahnell provided an overview of the process and reasoning behind British Petroleum's (BP) CO2 emissions inventory. Since the company's management has made a bold commitment to reduce its CO2 emissions to 20% below 1990 levels by 2010, the emissions inventory was necessary to establish a baseline for future comparison. Mr. Ahnell explained that anoth-

er reason BP conducted the inventory was to test out the process to prepare for the possibility that CO2 emissions permit trading may emerge in the future. Upon completing the inventory, BP turned emissions output into a commodity for trade among the company's business units. The program has been underway since 1998. Mr. Ahnell explained that actually calculating the CO2 emissions was relatively simple. The greatest challenges BP faced while conducting the inventory were collecting energy usage data from all branches of the large corporation, and avoiding double counting. Based on the numerous requests BP has received to obtain copies of their environmental protocol, Ahnell expects that more and more companies will initiate their own emissions reduction and accounting efforts.

Ralph Torrie is also a pioneer of emissions inventories. His company, Torrie Smith Associates Inc., produced software for the International Council for Local Environmental Initiatives (ICLEI) which allows participating municipalities to conduct their own emissions inventories with ease and efficiency. Torrie explained some of the most important issues regarding the process of conducting effective emissions inventories for the purposes of the ICLEI program. In contrast to BP's approach, Torrie stressed that cities and towns conducting inventories for the ICLEI program do not need to track emissions as carefully as if they were conducting the inventory for the purposes of permit trading. Rather, the ICLEI inventory functions more as a metric for estimating future savings resulting from efforts such as energy efficiency and waste reduction projects. Torrie also explained that conducting an emissions inventory for a large energy user like a municipality can be much more complex than an inventory for a single entity, as a municipality must estimate the emissions of all of the residents and businesses within its borders. Given the purpose of such an inventory, the ability to track data becomes more important than data quality. Torrie Smith Associates' software has all of the energy unit conversions and emissions calculations embedded within it, making the emissions inventory process manageable for any local government employee, regardless of his/her background in energy. The company also produces a version of the software for individual energy users.

With the help of software such as the programs produced by Torrie Smith Associates, the greatest barrier to emissions inventories could lie in data collection. However, several other factors, such as standardization and double counting, could become increasingly important depending on the future of climate change policy.

Summary by: Nicole Robillard

Municipalities - Developing an Action Plan

A major difficulty in acting on climate change is that it is not foremost in people's minds. It takes a back-burner position compared to other, more visible issues.

Many ideas about how to get people involved in climate change protection were discussed:

- Show economic benefits through energy savings
- Appeal to a sense of social responsibility
- Bring the issue to the attention of state officials - connect not to global climate change, but instead to tangible local concerns such as reducing traffic congestion, budget constraints, air pollution, etc.
- Address "livability" issues (locating buildings, schools, etc. close to where people live so they don't have to drive so much)
- Relate to health needs
- Orchestrate efforts with Department of Transportation
- Get buy-in by legislative and executive levels as well as households
- Identify the "lever-point" to target how to get a city involved
- Make known the cost of CO2 being emitted into the air.
- Show that climate change initiatives are good for the economy, and are not job losers
- Promote activity through newspaper articles
- Identify baseline numbers (ICLEI has software available)
- Look to "sister-city" programs to promote CC initiatives for participants
- Collaborate with other organizations such as: Rebuild America, Welfare to work, Green Decade ect.
- Invite speakers to talk to local leaders, community groups (e.g. Ross Gelbspan, author of Heat is On)
- While states set building codes, cities may modify them to promote energy effi ciency
- Help elect candidates who promote the importance of addressing climate change
- Identify other groups who are addressing climate change and share success stories
- Educate community in many ways, for example, Chittenden County, VT is preparing a bicycle trail with educational break stops for people to learn about climate change.

Summary by Ann Stafford

Corporations: Developing an Action Plan

In order to develop an action plan, the group reviewed the main barriers blocking corporate commitments to climate change mitigation and then proposed solutions to each. Some of the main barriers included:

1) Corporations struggle to make their shareholders happy in the short run and cannot justify the long-term capital expenditures associated with some energy efficiency improvements;
2) Since energy costs very little and represents a relatively small portion of a corporation's overall budget, it is not a priority for corporate managers;
3) Regulations change very slowly and the regulatory tools that could prove most effective and economically efficient are often the most politically infeasible;
4) Corporations are afraid to become involved in climate change policy, as they disap prove of the policy mechanisms being discussed, and are often unwilling to admit that climate change is a real problem.

To address these barriers, the group proposed that:

1) Corporations and environmental organizations must collaborate and form partnerships;
2) Government, environmental organizations and green product marketers must increase the level of awareness among corporations that saving energy can increase profits;
3) Stockholder initiatives could encourage stockholders to invest in companies with a strong environmental record;
4) Make energy efficiency part of an energy manager's job description;
5) Incorporate a performance based metric into electric industry restructuring laws;
6) Increase policy research to identify the most effective ways to address barriers.

Individuals: Developing an Action Plan

Participants in the discussion worked through a Personal Greenhouse Gas Inventory and shared the results with each other. Most participants were surprised how much their use of transportation contributed to their own emissions. Participants made a number of suggestions for how to involve more individuals such as:

- Identifying model citizens that others can copy;
- Creating a web site on "Environment and Boston;"
- Helping to network environmentally-minded people;
- Community organizing;
- A high-visibility political effort;
- Encourage different levels of participation;
- Create concrete tools to help people reduce emissions;
- Use people's influence within communities to effect change;
- Try to involve those who don't have much time;
- Develop case studies and distribute examples widely.

One participant commented that he learned that passivity is not a good response to the threat of climate change because if he doesn't do something about it himself, he is inadvertently hurting the rest of us. It was predicted that SUVs may become a huge symbol of environmental vulgarity.

CONFERENCE SPEAKERS

In alphabetical order:

Arden Ahnell, Manager, British Petroleum
Chris Ball, Outreach Director, Ozone Action
Roger Borghesani, Corporate Energy Director, Polaroid Corp.
Carol Carmichael, Georgia Institute of Technology
Tom Casten, President and CEO of Trigen Energy Corp.
Jon Coifman, Associate Director, Environmental Media Services
Anthony Cortese, Director, Second Nature
Sister Pat Daly, OP, Executive Director, Tri State Coalition for Responsible Investment and Board Member, Interfaith Center on Corporate Responsibility
Mark Eldridge, Director of Planning and Zoning, City of Burlington, VT
Deborah Gordon, Yale University Transportation Project
Katy Hatcher, Energy Star Buildings Public Partnership, U.S. Environmental Protection Agency
Gunnar Hubbard, Principal, McCoppin Studios
Professor Nan Jenks Jay, Director of Environmental Programs, Middlebury College
Michael McAteer, New England Electric Service
Professor Michael McElroy, Department of Earth & Planetary Sciences; Harvard University
Professor William Moomaw, Fletcher School of Law and Diplomacy and Director of Tufts Institute of the Environment.
David Orr, Professor, Oberlin College
Kilaparti Ramakrishna, Deputy Director, Woods Hole Research Center
Joe Romm, Director of the Center for Energy and Climate Solutions, author of Cool Companies
Debra Sachs, Projects Director, Regional Planning Commission, Chittenden County, VT
Kelly Sims, Tufts Climate Initiative Project Manager, Tufts Institute of the Environment
Nancy Skinner, Executive Director, U.S. Campaign, Cities for Climate Protection, International Council of Local Environmental Initiatives
Sue Tierney, Principal, Economics Resource Group, Inc.
Ralph Torrie, Director, Torrie Smith Associates

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Disclaimer:

Any inaccuracies in the content or presentation of these summaries should not be attributed to the original speaker. Every effort has been made to ensure precision in the representation of the presentations and discussions that took place on April 24, 1999.

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ARDEN DAVID AHNELL
MANAGER - EXTERNAL AFFAIRS HEALTH , SAFETY & ENVIRONMENT
BP AMOCO

Mr. Ahnell is currently the HSE External Affairs Manager for North American in the newly merged BP Amoco Group. Prior to the merger he was Program Manager for Climate Change activities at BP America with a co-ordinating role for climate change technology across the BP Group. His climate activities include climate change emissions reduction, activities implemented jointly, emissions trading, and external representation.

Sir John Browne, BP Amoco's Chief Executive has set out the Group's position on Climate Change in a May 1997 speech: "If we are all to take responsibility for the future of our planet, then it falls to us to begin to take precautionary action now". BP Amoco's program includes emissions monitoring and control, energy efficiency, a leading solar power business, demonstration efforts on emissions trading and joint implementation, research, and contributing to the public policy debate.

Mr. Ahnell recently returned from an assignment in London as manager of a business support team of 40+ Health, Safety, and Environmental (HSE) specialists providing services world-wide. In addition, he also managed HSE issues associated with divestment and acquisition of major businesses and was responsible for HSE at BP Sunbury, a technology site of 1600+ staff.

Earlier in his career he was a division manager in BP Research and prior to joining BP in 1982, he held various positions in US state government.

He is a University of Illinois graduate with a M.S. Environmental Engineering.

CHRISTOPHER BALL
OUTREACH DIRECTOR. OZONE ACTION

Christopher Ball is Director of Outreach at Ozone Action. The organization's outreach campaigns focus on organizing and educating a variety of constituencies ranging from coastal mayors to investment managers for leadership in response to global warming. Currently, Ozone Action is leading a nationwide student divestment campaign focused on corporations that have maintained membership in the Global Climate Coalition. Previously, Chris worked at the White House Council on Environmental Quality and was an environmental education teacher at the Echo Hill Outdoor School in Worton, Maryland. He graduated from Bowdoin College with an A.B. in environmental studies and government and is currently pursuing a J.D. at the Georgetown University Law Center.

ROGER F. BORGHESANI
CORPORATE ENERGY DIRECTOR, POLAROID CORPORATION

Mr. Borghesiani currently holds the positions of Corporate Energy Director and Co-director of Product Safety of Polaroid Corporation. He is responsible for the direction, organization and reporting of the corporate energy activities worldwide. In this assignment, Roger focus is to understand Massachusetts Electrical Restructuring Legislation and implement an energy strategy that utilizes the energy conservation aspects of the law. Also, he is the lead person in developing a competitive energy supply and energy related services to Polaroid. Recently, under his

watch, Polaroid was selected as the EPA's 1999 Energy Star Buildings Corporate Partner of the Year.

Mr. Borghesiani has been employed at Polaroid for more than 29 years holding management and technical positions in the Health Safety and Environmental Affairs, Engineering and Manufacturing divisions. He is active communal affairs serving as a Lexington Town Meeting Member, past Vice Chair of the Town Appropriation Committee and past Chair of the Omega Support Services Board of Directors.

He is a graduate of Tufts University, BS in Mechanical Engineering, earned a MS in Engineering Management from Northeastern University and completed Carnegie-Mellon's Executive Program.

CAROL CARMICHAEL
DIRECTOR, INSTITUTE FOR SUSTAINABLE TECHNOLOGY & DEVELOPMENT, GEORGIA TECH

Ms. Carmichael serves as the Georgia Tech advocate for sustainable development in her capacity as the Director of the Institute for Sustainable Technology and Development, and as the Assistant Vice Provost. She is responsible for activities designed to weave concepts of sustainable technology and development into the curriculum, research programs, and management of the Georgia Tech campus. Their vision is that every graduate of Georgia Tech, the faculty, and their partners in the education and research enterprise will understand their roles in creating a more sustainable society. With degrees in chemistry and technology and science policy, Ms. Carmichael has over ten years of experience in higher education and environmental issues.

THOMAS R. CASTEN
PRESIDENT AND CEO OF TRIGEN ENERGY CORPORATION

From 1986 to the present, Mr. Casten has served as President and CEO of Trigen Energy Corporation, a NYSE-listed company whose mission is to produce electricity, heat and power with one-half the fossil fuel and one-half the pollution of conventional generation. Trigen, the leading thermal sciences company in North America serves more than 1,500 customers with energy produced at 38 plants in 27 locations.

From 1980 to 1986, he was CEO of Trigen's predecessor company, Cogeneration Development Corp. Prior to that, Mr. Casten spent eleven years with Cummins Engine Company where he established a business unit to combine heat and Engine Company where he established a business unit to combine heat and power generation using diesel engine technology.

Mr. Casten served on the Board of Directors and as President of the International District Energy Association. In 1989 he received the Norman R. Taylor Award for distinguished achievement and contributions to the industry. In 1998 he was again recognized by the Association with a special Award for his commitment and visionary leadership to the district energy Engine Company where he established a business unit to combine heat and power generation using diesel engine technology.

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He has authored numerous reports and articles on cogeneration and district heating, and recently published a book, "Turning Off The Heat" (Prometheus Press, October 1998) that analyzes policy issues concerning energy costs, pollution control, and climate change mitigation.

He has given testimony before State Public Service Commissions, State and Federal Legislative Committees and Agencies on topics including restructuring of the electric industry, environmental and tax policy.

Mr. Carsten was the founding Chairman of the Westchester Philharmonic Orchestra, now in its 17th season. In 1997 he was recognized as the Distinguished Eagle Scout in Westchester Putnam County, NY and is currently the Council President. From 1964 to 1968, he was an engineer officer in the U.S. Marine Corps., and spent one year in Vietnam. He is a Magna Cum Laude graduate of the University of Colorado, with a B.S. in Economics, and was class valedictorian of his 1969 Columbia University M.B.A. class.

JON COIFMAN
SENIOR PROGRAM DIRECTOR, ENVIRONMENTAL MEDIA SERVICES

Jon Coifman joined EMS after completing his masters in Public Policy from the University of Texas' LBJ School of Public Affairs, with concentrations in environmental policy, international trade, and economic development. Jon has five years experience as legislative and communications aide to two senior members of Congress and has served as a reporter for both print and broadcast organizations. Jon heads EMS' Rapid Response Program to respond forcefully and immediately to inaccurate press coverage of the environment.

TONY CORTESE
PRESIDENT, SECOND NATURE

Anthony D. Cortese, Sc.D. is President of Second Nature, a nonprofit organization whose mission is to catalyze a worldwide effort to make environmentally just and sustainable action a foundation of learning and practice in higher education. Dr. Cortese was the first Dean of Environmental Programs at Tufts University where he developed and coordinated 13 university-wide environmental programs including the award-winning Tufts Environmental Literacy Institute. He was the Director of the Massachusetts Department of Environmental Protection from 1979-1984. He also worked for the US Environmental Protection Agency and the US Public Health Service from 1969-1976.

Dr. Cortese serves as a member of several boards of directors and advisory committees. He has a BS and MS in Environmental Engineering from Tufts University and a Sc.D. in Environmental Health from the Harvard School of Public Health. Dr. Cortese has been a consultant to UNEP, a member of the Clinton-Gore transition team and the EPA Science Advisory Board and the President's Council on Sustainable Development Task Force on Education. Dr. Cortese was recently elected as a Fellow of the American Association for the Advancement of Science (AAAS).

PATRICIA DALY
EXECUTIVE DIRECTOR, TRI-STATE COALITION FOR RESPONSIBLE INVESTMENT

Patricia Daly, OP is a Dominican Sister of Caldwell, NJ. She's the Executive Director of the TRI-State Coalition for Responsible Investment (NY, NJ, CT) and is a member of the Governing Board of the Interfaith Center on Corporate Responsibility. Pat has worked with

transnational corporations and banks on a variety of human rights, ecological, diversity, health, international debt and peace issues. Representing religious institutional shareholders she has encouraged other stakeholders, consumers and citizens to creatively use the power they have to bring about change on behalf of the earth and her people.

MARK T. ELDRIDGE, AICP
DIRECTOR OF PLANNING AND ZONING, BURLINGTON, VT

Director of Planning and Zoning, Burlington, Vermont since 1985; formerly Assistant Planning Director and Redevelopment Coordinator in Brookline, MA. Mark holds degrees from Dartmouth College and the University of North Carolina, and has previously served as President of the New England Chapter of the American Planning Association and as Vice President of the American Institute of Certified Planners. Mark has been Burlington's liason to the International Council for Local Environmental Initiatives' Cities for Climate Protection Campaign since 1996 and sits on the Mayor's Climate Protection Task Force established in 1998.

DEBORAH GORDON
DIRECTOR OF TRANSPORTATION STRATEGIES PROJECT, YALE CENTER FOR ENVIRONMENTAL LAW & POLICY

Deborah Gordon is a policy analyst specializing in transportation, energy, and environmental issues. She is currently the Director of the Transportation Strategies Project at the Yale Center for Environmental Law & Policy. In this capacity she is serving as the technical advisor to a Coalition of business and environmental groups who are working to reduce travel demand by five percent in Southwestern Connecticut over the next five years. She has also designed and co-taught a graduate seminar at Yale on transportation and the environment. As a consultant, she is also involved in a wide variety of other transportation policy projects ranging from developing policies to deal more effectively with heavy-duty trucks to designing a clean car rebate policy proposal for the Maine Legislature.

From 1989-1996, Deborah was the Director of Energy Programs and the Transportation Program Director for the Union of Concerned Scientists. Previously, from 1982-1987, she was a Chemical Engineer with Chevron, U.S.A. Department of Energy's Lawrence Berkeley Laboratory.

Deborah is the author of Steering a New Course: Transportaion, Energy and the Environment (Island Press, 1991) and has written numerous journal articles and reports on transportation policy. Her Degrees are in Chemical Engineering (B.S.) and Public Policy (M.P.P.).

CATERINA HATCHER
ENVIRONMENTAL PROTECTION SPECIALIST, CLIMATE PROTECTION DIVISION, USEPA

Katy has served in a management capacity for the EPA program, Energy Star Buildings Public Partnerships, for three years. In this role, she helps public participants overcome financing barriers and implements energy efficiency upgrades. She also works on establishing partnerships between the public and industry's product and service providers. Katy holds a degree in City Planning from the University of Virginia, School of Architecture.

GUNNAR HUBBARD
PRINCIPAL AND CO-FOUNDER, MCCOPPIN STUDIOS

Gunnar Hubbard is principal and co-founder of McCoppin Studios, a design and green building consulting firm in San Francisco. Prior to this, he was a Research Scholar in Green Development Services at Rocky Mountain Institute doing consulting and research across the country on environmentally responsible architecture and development. At RMI, he managed a national project on Performance Based Fee Contracting. Before RMI, he was the Executive Director of the Yestermorrow Design/Build School, a distinguished 17-year-old Vermont non-profit institution, offering intensive courses for building industry professionals, as well as for homeowners. Gunnar has been involved with green building projects influencing Habitat for Humanity International, the Navy, the General Services Administration, Gap Inc., and the Greening of the White House. He has been Public Education Organizer for the Union of Concerned Scientists (UCS), an architectural apprentice for several architecture firms, and also a builder. He was visiting professor at Ball State University for two semesters, and has lectured at conferences and Universities throughout the U.S. and Canada, published several articles, and is a contributing author to the UCS book, Renewables are Ready. He holds a B.S. in Environmental Studies from the University of Vermont and a Master of Architecture from the University of Oregon.

NAN JENKS-JAY
PROFESSOR, MIDDLEBURY COLLEGE

Nan Jenks-Jay has been a researcher, educator and administrator involved in environmental programs in higher education for 22 years, from community college and liberal arts colleges to university graduate programs. She has been associated with the two oldest undergraduate environmental studies programs in the country at Williams College in Massachusetts for 15 years and currently with Middlebury College in Vermont. Between them, she took a sojourn to the West Coast to develop new and progressive undergraduate and graduate environmental programs for the University of Redlands in California where she held the Hedco Endowed Chair of Environmental Studies. After returning to New England, she accepted a newly created position with Middlebury College where the President and Board of Trustees have designated the environment as one of the Colleges peaks of excellence. For nearly two decades, Nan Jenks-Jay has been breaking new ground in environmental education at institutions of higher education.

MICHAEL MCATEER
MANAGER, NEW ENGLAND ELECTRIC SYSTEM

Michael McAteer manages the NEES companies commercial and industrial energy services. He is responsible for developing the company's new energy efficiency offerings, managing implementation staff and meeting the company's regulatory approvals. He has had key responsibility for developing Design 2000 into what is nationally recognized as a premier new construction service.

Prior to joining the NEES companies he was with the Massachusetts Executive Office of Energy Resources and held responsibilities for the development of the Commonwealth's commercial and industrial energy conservation policies.

He has a BA in English from the University of Wisconsin and is a member of the Board of Directors of the New Buildings Institute and the LightRight Consortium.

MICHAEL B. MCELROY
HARVARD UNIVERSITY, DEPARTMENT OF EARTH & PLANETARY SCIENCES

Michael B. McElroy received his elementary and graduate education from Queen's University in Belfast, Northern Ireland. After spending a postdoctoral year in the Chemistry Department at the University of Wisconsin, he was appointed staff scientist in 1963 at Kitt Peak National Observatory in Tucson, Arizona.

In 1970, he was named Abbott Lawrence Rotch Professor of Atmospheric Sciences at Harvard University, and in 1975 was appointed Director of the Center for Earth and Planetary Physics. Since 1986 he has been Chairman of the Department of Earth and Planetary Sciences and since 1992 Chairman of the University Committee on Environment at Harvard where he leads an interdisciplinary study on the implications of China's rapid industrial development for the local, regional and global environment. In 1997, he was named the Gilbert Butler Professor of Environmental Studies.

McElroy's research interests range from studies on the origin and evolution of the planets to, more recently, an emphasis on effects of human activity on the global environment of the Earth. He is the author of more than 200 technical papers contributing to our understanding of human induced changes in stratospheric ozone and to the potential for serious disruptions to global and regional climate due to anthropogenically related emissions of greenhouse gases.

He is a Fellow of the American Academy of Arts and Sciences, the International Academy of Aeronautics, the American Geophysical Union and the American Association for the Advancement of Science. He was the recipient of the Macelwane Award of the American Geophysical Union in 1968, the NASA Public Service Medal in 1978 and the Eire Society Gold Medal in 1987. In 1989 he was awarded the George Ledlie Prize at Harvard University for the person who "since the last award of said prize, has by research, discovery, or otherwise made the most valuable contribution to science, or in any way for the benefit of mankind" and received the Research and Development Award from the National Energy Resources Organization. He was honored with award of an honorary degree of Doctor of Science by Queen's University of Belfast in 1991.

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William R. Moomaw is Professor of International Environmental Policy, and has been the Director of the International Environment and Resource Policy Program at the Fletcher School of Law and Diplomacy, Tufts University since 1992. In addition to his work at the Fletcher School, he is also Director of Tufts Institute of the Environment which coordinates a variety of environmental programs in research, education, activism, outreach and service at all of Tufts University's varied schools and colleges. He also co-directs the Global Development and Environment Institute, which explores the relationship among economics, environment and technology. Dr. Moomaw received his undergraduate degree from Williams College, and his Ph.D. in physical chemistry from MIT. He directed the Climate, Energy and Pollution Program at the World Resources Institute in Washington, DC in 1988. While working for Congress, he helped to develop the legislation that eliminated CFCs from aerosol cans, worked on energy research following the oil embargo and on the National Forest Management Act. He is currently coordinating the emissions reduction chapter for the Intergovernmental Panel on Climate Change 2000 Assessment. He is developing new strategies for meeting the goals of the climate

convention, and was a facilitator in 1997 and 1998 for a group of negotiators, industrial and NGO representatives addressing the Kyoto Protocol. He currently serves on the Board of Trustees of Earthwatch and the Consensus Building Institute.

BERRIEN MOORE III
PROFESSOR, UNIVERSITY OF NEW HAMPSHIRE

Berrien Moore III joined the University of New Hampshire faculty in 1969, soon after receiving his Ph.D. in mathematics from the University of Virginia. A professor of systems research, he received the University's 1993 Excellence in Research Award and was named one of UNH's first two University Distinguished Professors in 1997. He has led the Institute for the Study of Earth, Oceans and Space at UNH as Director since 1987. Professor Moore has served on numerous National Aeronautics and Space Administration (NASA) committees and was appointed chairman of NASA's senior science advisory panel in 1987. Upon completion of his term in 1992 he was awarded the Distinguished Public Service Medal, NASA's highest civilian award. Most recently he was appointed to NASA's Earth System Science and Applications Advisory Committee. Actively involved on committees at the National Academy of Science, he ended his Chairmanship of the National Academy's Committee on Global Change Research with the publication of "Global Environmental Change: Research Pathways for the Next Decade" at the conclusion of 1998 and completed his Chairmanship of the Academy's Committee on International Space Programs of the Space Studies Board. In January of 1998 Professor Moore assumed the Chair of the overarching Scientific Committee of the International Geosphere-Biosphere Programme (IGBP) and serves as lead author within the Intergovernmental Panel on Climate Change (IPCC).

DAVID ORR
PROFESSOR, OBERLIN COLLEGE

David W. Orr was born in Des Moines, Iowa and was raised in New Wilmington, Pennsylvania. He holds a B.A. from Westminster College (1965), a M.A. from Michigan State University (1966), and aPh.D. in International Relations from the University of Pennsylvania (1973). He and his wife have two sons. David Orr is currently Professor and chair of the Environmental Studies Program at Oberlin College.

He is perhaps best known as an environmental educator and for his pioneering work on environmental literacy and campus ecology. His present work is focused on ecological design. During the past three years he spearheaded the effort to design and build a $7 million environmental Studies Center at Oberlin College.

He was awarded a National Conservation Achievement Award by the National Wildlife Federation in 1993, a Lyndhurst Prize in 1992 awarded by the Lyndhurst Foundation "to recognize the educational, cultural, and charitable activities particular individuals of exceptional talent, character, and moral vision," the Benton Box Award from Clemson University for his work in Environmental Education (1995), and an Honorary Doctorate in Humane Letters from Arkansas College in May, 1990. He has been a distinguished scholar in residence at Ball State University (1995) and Westminster College in Salt Lake City (1996).

David Orr is the author of Earth and Mind (1994) and Ecological Literacy (1992) and over 100 published articles. He is also the co-editor of The Campus and Environmental Responsibility co-edited with David Eagan (Jossey-Bass, 1992), and The Global Predicament co-edited with Marvin Soroos (University of North Carolina Press, 1979). He is presently working on a book

on that project and another on the larger topic of ecological design.

Dr. Orr is the Education Editor for Conservation Biology, a member of the editorial advisory board of Orion Nature Quarterly. He is a Trustee of the Compton Foundation (CA) and the JED Fund and the Educational Foundation of America. He is a member of: the Education Visiting Committee of the New England Aquarium in Boston, the Board of the Center for Ecoliteracy Berkeley, the Center for Respect of Life and Environment in Washington, D.C., Urban Ecology (Berkeley), and the School for Field Studies.

DR. KILAPARTI RAMAKRISHNA
DEPUTY DIRECTOR, WOODS HOLE RESEARCH CENTER

Dr. Kilaparti Ramakrishna, an Indian national, obtained his Ph.D. in International Environmental Law from Jawaharlal Nehru University, New Delhi, India. He worked as Assistant Professor at the Indian Academy of International Law and Diplomacy and at the Indian Society of International Law (1980-85) prior to attending Harvard Law School in

1985 as a Fulbright Visiting Scholar. He has held teaching and research positions at the Woods Hole Oceanographic Institution (1986-88), the East-West Center (1988), Boston University (1987-88, 1991, 1993-94), and Boston College (1993-94).

He served as a Special Advisor to the United Nations in drafting the Framework Convention on Climate Change. In addition to global warming and climate change issues, he has contributed extensively in a variety of fields including: trends in national and international decision making, legal and institutional framework for alternative dispute resolution mechanisms, creation and management of marine sanctuaries, and conservation and utilization of world forests and biodiversity. He was instrumental in helping establish an independent World Commission on Forests and Sustainable Development, and served as its Coordinator from 1992-95. This past Summer he served as Chief, Division of Implementation and Communication at the Secretariat for the Convention on Biological Diversity.

He was appointed Deputy Director of the Woods Hole Research Center by its Board of Trustees in 1995. He also has been an Adjunct Professor of International Law at the Fletcher School of Law and Diplomacy of Tufts University since 1993.

Dr. Ramakrishna is currently President of the Woods Hole Chapter of Sigma Xi, The Scientific Research Society. He also serves on the Editorial Boards of the Review of European Community & International Environmental Law (RECIEL), London, U.K., Global Change, Oakland, California, and /linkages/journal/, Winnipeg, Canada. In 1997 he was named to the Board of Directors of the Consensus Building Institute in Cambridge, Massachusetts.

JOSEPH ROMM
DIRECTOR, CENTER FOR ENERGY AND CLIMATE SOLUTIONS

Dr. Joseph Romm is director of the nonprofit Center for Energy and Climate Solutions-a one-stop shop devoted to helping businesses design customized greenhouse gas mitigation plans. He is author of the first book to benchmark corporate best practices in climate mitigation: Cool Companies: How the Best Businesses Boost Profits and Productivity By Cutting Greenhouse Gas Emissions. In 1997, Romm served as Assistant Secretary at DOE's Office of Energy Efficiency and Renewable Energy, the largest program in the country for helping businesses develop and use technologies that reduce greenhouse gas emissions and other pollutants.

DEBRA L. SACHS
PLANNER, TOWN OF ESSEX

Debra Sachs has over ten years experience as a professional planner. She has worked with communities and counties in a variety of land-use, energy and transportation planning areas. As the Planner for the Town of Essex for five years, Debra is knowledgable of Vermont planning and zoning laws and is equipped with the skills on how to address the issues related to new development.

Ms. Sachs is a planning consultant, and has provided assistance in several areas, including: policy development, and public education professional development seminars. She also has experience in grant writing for public and non-profit organizations to federal and state agencies and foundations for planning, design , and local infrastructure improvements, non-motorized travel, energy efficiency, and environmental protection.

Ms. Sachs has special skills in research, grant writing, team building, facilitation, conference and workshop planning, public education and outreach, and in working as part of a team to advance local initiatives.

KELLY SIMS
TUFTS INSTITUTE OF THE ENVIRONMENT, TUFTS UNIVERSITY

Kelly Sims is presently studying international energy and environmental policy at the Fletcher School of Law and Diplomacy at Tufts University. Previously, she was the Science Policy Director at Ozone Action, a public interest organization based in Washington, DC, and she continues represent Ozone Action at most international negotiations on atmospheric protection. She has attended the last dozen rounds of the international negotiations on global climate change. She has also organized numerous scientific roundtables, lectured extensively and written on atmospheric protection. Before that, she was a Truman Scholar in the Domestic Policy Office of Vice President Gore and she worked for two years in strategic planning at Fluor Daniel Environmental Services in California.

NANCY SKINNER
EXECUTIVE DIRECTOR, INTERNATIONAL COUNCIL FOR LOCAL ENVIRONMENTAL INITIATIVES

Nancy Skinner is the Executive Director of the US Office of the International Council for Local Environmental Initiatives (ICLEI), an international association of local governments dedicated to the prevention and solution of environmental problems. Ms. Skinner oversees ICLEI's Cities for Climate Protection Campaign (CPC) engaging local governments to reduce greenhouse gas emissions and ICLEI's Local Agenda 21 Project promoting local government adoption of policies and practices to achieve sustainability. Ms. Skinner has an extensive background in local government and municipal environmental policy. She has served on the Berkeley City Council from 1984 to 1992 and the Alameda County Waste Management Authority from 1987 to 1994.

SUSAN F. TIERNEY
PARTNER, THE ECONOMICS RESOURCE GROUP

Dr. Tierney brings an exceptional depth of experience to The Economics Resource Group, where she provides business consulting, litigation support, and economic, environmental and

policy advice and analysis to clients in the electricity, natural gas, and telecommunications businesses. She focuses on industry restructuring policy, market structure and analysis, strategy for supply and delivery businesses, and environmental and reliability issues. She serves on the DOE Electric Reliability Task Force; is a director of the Electric Power Research Institute, the Energy Foundation, and Thermo Ecotek Corporation; and is on the Advisory Council of the Independent System Operator-New England.

Before coming to ERG, Dr. Tierney served as Assistant Secretary for Policy in the U.S. Department of Energy. At DOE, she was responsible for strategic planning and for policy analysis, development, and advice on domestic and international energy policy, environmental policy, international trade policy, science and technology policy, and global climate change policy. She has considerable experience testifying before congressional committees and federal and state regulatory agencies, and negotiating with federal and international agencies.

Prior to her work at the DOE, Dr. Tierney served as Secretary of Environmental Affairs for the Commonwealth of Massachusetts, overseeing five agencies. She was specifically involved in the Boston Harbor Clean Up, Clean Air Act implementation, emissions trading regulations, environmental impact reviews, and energy facility siting. Dr. Tierney was also Commissioner for the Massachusetts Department of Public Utilities, where she regulated electric, gas, telecommunications, and water companies, and Executive Director of the Massachusetts Energy Facilities Siting Council. Previously, she was an assistant professor at the University of California, Irvine. Dr. Tierney has made presentations at hundreds of national, international, and regional conferences. She has authored articles on electric transmission, electric industry competition and restructuring, energy R&D, alternative fuel vehicle policy, and energy facilities siting.

RALPH TORRIE
DIRECTOR, TORRIE SMITH ASSOCIATES

Ralph Torrie is one of Canada's leading energy and environmental experts and proponents of sustainable development. He is a principal in the Ottawa-based environmental research and software firm Torrie Smith Associates, Inc. and also serves as Deputy Director of the Cities for Climate Protection Campaign of the International Council for Environmental Initiatives. His entrepreneurial and consulting experience covers a wide range of initiatives in research, business development, and facilitation of national and international projects and ventures. He is the former deputy director of the Energy Research Group of the United Nations University and the International Development Research Centre. He represented Canadian environment, development and peace organizations before the hearings of the World Commission on Environment and Development and was one of the founders of Friends of the Earth in Canada. He is responsible for the development of a standardized method for local government strategic analysis of greenhouse gas mitigation analysis that is emerging as the world standard. He is also the inventor of a suite of greenhouse gas emission software products that are being used by cities, institutions and corporations throughout the world.

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