

CLIMATE ALERT

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April 2000

St. Lucia Becomes a Green Energy Leader for the World

In an historic statement, just an hour before the opening of the High-Level Segment of COP5 in Bonn in November 1999, St. Lucia announced its intention to green its energy sector and become a sustainable energy demonstration country for the Small Island States and the rest of the world.

St. Lucia, a Small Island State in the Caribbean, is dependent on expensive fossil fuel imports. "By taking leadership, we want to send a positive message to the Conference of the Parties and urge the world community to work toward laying the groundwork for a sustainable energy future," said Mr. Bishnu Tulsie, head of the St. Lucian Delegation.

He mentioned steps to diversify the country's energy sector and create an environment, encouraging renewable energy and energy

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Nasir Khattak, Bishnu Tulsie, John Topping at COP5 in Bonn

Computer Designers, Modelers, Impacts Managers Trade Views on How to Improve Handling of Disasters

One of the key climate change questions today in the US and Canada is whether we will see many more extreme events in the future and what will be their impact. Despite all the money that has been spent on research, all the work on climate impact assessment, it is still hard to give a constructive answer.

Several colleagues in both countries decided to bring together a group of experts to shape a complementary research agenda listing the pertinent questions and identifying critical gaps in our understanding of the probable frequency and severity and impacts of such happenings as floods, droughts, nor'easters, hurricanes and ice storms. The ultimate aim was to assist policymakers and managers in the vulnerable communities which suffer the impacts and want to improve their ability to handle them.

What do we know about dealing with climate change and how can we use our knowledge to improve our ability to adapt to it? Roger Street of Environment Canada asked. Bill Bolhofer of the National Oceanic and Atmospheric Administration suggested trying something that had not been done before, bringing together in one place the three science and policy "communities"

most directly involved to get them to bridge the boundaries of their disciplines and find more effective ways of dealing with extreme weather events. Joel Scheraga of USEPA proposed setting priorities for research with a time limit of three, five or ten years.

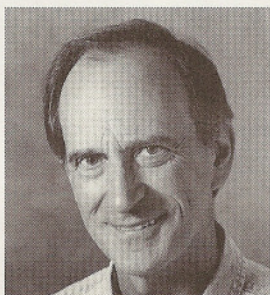
The three officials enlisted the Climate Institute to organize a symposium of about 100 representatives of the computer architecture, climate modeling and climate impact communities to draw up an agenda examining how to supply more effective assistance to the people dealing with the impacts of climate change at the local, national and international level. A major issue is how to deal with risk and uncertainty. The meeting was sponsored by Environment Canada, Climate Change Action Fund (Canada), USEPA, the National Oceanic and Atmospheric Administration and the National Weather Service.

Meeting in Atlanta in October 1999, symposium members were in agreement that not only is there no accepted definition of an extreme event or disaster in climate terms, but also that new, expanded perspectives should be used in seeking causes.

"There are as many ways of defining extreme climate events
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Year 2000 Climate Institute Clean Energy Award Winners

The Climate Institute honors three who have shown excellent leadership in advancing a clean energy revolution, a central theme of the Seattle Summit and of Earth Day 2000 celebrations worldwide.



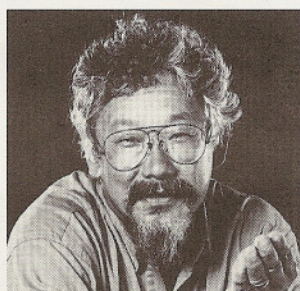
Denis Hayes
Earth Day Network

Denis Hayes is chair and CEO of Earth Day Network, the organizing body behind Earth Day 2000. He is also president and CEO of the Bullitt Foundation, an environmental organization based in Seattle.

In 1970 Hayes was national coordinator of the first Earth Day, an event often credited with launching the modern environmental movement. Twenty years later he was international chairman of Earth Day 1990 which enlisted 200 million participants in 141 countries.

An environmental lawyer by training, he headed the federal government's Solar Energy Research Institute during the Carter Administration. He has been a professor at Stanford University and the University of California. His solar energy book, *Rays of Hope*, is available in six languages.

Hayes is chairman of the Board of the Energy Foundation which is underwritten by the Rockefeller Foundation, MacArthur Foundation, Packard Foundation, Joyce Mertz Gilmore Foundation and Pew Charitable Trusts.



David Suzuki
David Suzuki Foundation

The Institute has cited Dr. David Suzuki particularly for the imaginative Climate Change Campaign he has led in Canada. The Campaign has focused climate change discussions in Canada on the potential air quality benefits from reducing fossil fuel burning. The David Suzuki Foundation, alerted by the publication in *Lancet* of a study led by Dr. Devra Davis of WRI, covering lives saved from air pollution deaths by the limitation of greenhouse gases, commissioned several Canadian health scientists to examine the implications of climate change and air pollution for human health in Canada, resulting in a report, "Taking Our Breath Away."

The Campaign also sponsored a series of lectures in Canadian cities to accompany the release of a Suzuki Foundation film, "It's a Matter of Survival" about climate change and clean energy responses that could limit greenhouse gas emissions.

Dr. Suzuki, of course, is well known for his broad overall record in science broadcasting and two documentaries, "From Naked Ape to Superspecies" and "It's a Matter of Survival."



Sam Wyly
GreenMountain.com

A pioneer in computers and telecommunications, Sam Wyly has invested more than any individual in human history in renewable energy development.

Three years ago, Green Mountain Energy Resources, a small Vermont-based energy firm, invited Sam Wyly to support its effort to become a nationwide green power marketer. Wyly plunged into this opportunity

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Wyly

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wholeheartedly and with his own funds and some from his family invested \$100 million in the new venture. The firm is now renamed GreenMountain.com, and Wyly has become chairman. He has shifted the focus into states with deregulated electric power markets such as Pennsylvania and California and has signed up over 100,000 customers for the firm's green power offering. Recently the firm persuaded Texas to deregulate its electric markets.

In the early 1960s, Wyly, only a few years out of business school, founded with his brother a firm named DATRAN to construct an alternative digital transmission of computer data over phone lines. Over the next few years, he and his family invested in a number of computer software, energy, and retailing ventures, building a diverse financial and business empire. He is now focusing his energies on producing a global clean energy revolution as profound as what we have seen in telecommunications. He has also invested in Amory Lovins' efforts to build a "hypercar," designed to get 100 mpg.

Atlanta Symposium

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as there are investigators" of the events, said W.D. Hogg of Atmospheric Environment Service, Canada. The public, the impact scientists, climatologists, regional experts each have their own interpretations.

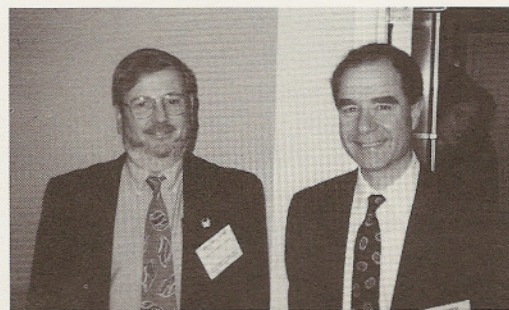
To an emergency management official, a description of a disaster is framed in the number of lives lost, houses destroyed, people in need of food, clothing, temporary shelter. To an insurance official a disaster is finally measured in monetary terms, with Hurricane Andrew classified as the "worst" because it caused the greatest financial loss while Hurricane Mitch inflicted much greater hardship and long-term ecological damage to Nica-

ragua and Honduras.

What aspects of extreme events are essential criteria: the size of the area involved? the rarity of the event (50-year flood, 100-year ice storm)? the effect on the quality of life and estimated time for recovery? historical deviation from trends for annual minimums or maximums in: temperature, rain, wind, snow, waves? quantified in past, present or future terms?

Furthermore, a disaster is not entirely due to natural causes, many participants pointed out, but may result from the zoning that allows roads and hotels and power plants to be built too close to the shore, the design of houses whose roofs blow off too easily, the agricultural workers who are pushed off flatlands by developers of large plantations and forced to farm on steep hillsides which erode into landslides.

Not only are disasters the result of much more than unexpected weather events, they hinge on interactions among the physical environment, the social and demographic characteristics of communities, and the infrastructure built up by the residents. The topography, the growth in population and its movement to more exposed locations, the poverty that restricts people's ability to live in safe locales, occupy sturdy buildings or buy insurance have an effect. The condition of public utilities, transportation systems, communications and home and office buildings which may be growing in age and density, all have an influence on disaster impacts. And of course climate change, with more frequent and severe extreme weather, heat waves,



Bill Hogg, Environment Canada, and Bill Bolhofer, NOAA, a Symposium organizer

thunderstorms, sea level rise and drought exacerbate the effects of disasters.

Roger Pulwarty of NOAA reported on development of water resources which are currently the most advanced system at replicating impacts and vulnerability. He emphasized that different extremes require different responses. We should divide floods and droughts into several categories and find the very different ways each evolves, he said.

Our present hazard management focuses on short-term gains, on simple loss reduction instead of long-term implications, said Mary Fran Myers of the National Center for Atmospheric Research. It does not take into account how society fits into its natural environment, and it separates hazard issues from other community concerns instead of solving problems according to local conditions.

Despite our efforts to mitigate natural disaster, "our approach hasn't gotten us very far," she noted. Losses due to natural hazards, including extreme events, have been continually rising. Much flood disaster relief simply rebuilds and replaces what is lost and will be lost again in the next flood. Better advance warning of severe storms encourages more people to build along fragile coasts, destroying dunes and wetlands and making the areas more vulnerable. Risks of extreme events are not incorporated into cost-benefit analysis. A design to protect so-

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Atlanta Symposium

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ciety up to a specified level of risk, such as a 100-year flood, gives us a false sense of security. Long-term vulnerability is actually increased when development is forbidden within the 100-year flood plain, but does not stipulate flood-proofing outside that area. Roofs of buildings are designed to stand up under specified snow loads but no provision is made for loads exceeding design. The worst that is anticipated is rarely a "worst-case scenario," said David Etkin of Environment Canada, and then we are totally unprepared for such events as the 1993 Mississippi flood.

Our mitigation strategies for coping with hazards are based on the fantasy that we can use technology to control nature and make ourselves totally safe, said Myers. We think we can prevent disasters through technology, Etkin added, and when technology fails we blame it on nature.

Myers, Etkin and Pulwarty all recommended a different approach, a change in culture, recognizing that human choices may be responsible for disasters and determining how these choices can be modified. Natural disasters are primarily a social issue, said Etkin; society by its actions and decisions designs its own disasters. Pulwarty agreed; society needs to devise new ways of making environmental decisions to prevent natural calamities from becoming full-fledged catastrophes.

We should push to make human society more resilient, putting less emphasis on resistance,



Mary Fran Myers,
NCAR

noted Myers. Resiliency is the ability to bounce back from extreme natural events without permanent and intolerable damage, and without massive outside assistance, she said. It means building a society in which we buffer ourselves against the risks from future disasters, exacerbated by changing climate, placing more emphasis on moving out of harm's way. Instead of building a wall to hold back water, could buildings be designed to float? Resiliency would involve building consensus on how to cope with hazards, how to use hazard-prone lands, how to pay for and recover from disasters.

Pulwarty took a penetrating look at adaptive management as a basis for decisions. Communities must make their own assessment of what they think is important and the members must interact to develop plans, reconciling the different ways of framing the issues. They have to consider the differing viewpoints of the conservationists, the habitat people, the industry and utilities group, the regulators and native stakeholders. They should assess the capability to deal with potential loss, and project results of alternative mitigation decisions. They should also develop baselines for measuring sustainability. Policymakers now have no empirical data for judging whether programs achieve their goal of reducing losses. Local communities should evaluate their own programs to see what works.

Decision-making is a process, not an event, Pulwarty asserted, and we must develop an interactive way of carrying out the process. There are many barriers to adaptive management. We need to understand the past and its lessons in shaping what we do in the future. The decision stakes are large, the actions taken have great consequences. And the uncertainties are also large; we are not sure of what we are doing.

In many respects we are: "data rich and knowledge poor," Scheraga remarked. And in some cases we are also data poor, he added.

Decisions on data gathering present many difficulties: deciding what data emergency managers need to be more effective and what data modelers need to improve their models. There was agreement that wider collection of data would be helpful — from networks of observation stations, including satellites, and from more powerful computers providing finer resolution.

To help reach informed decisions, policymakers need to develop a sharply articulated sense of the data they need, said Michael Schlesinger of the University of Illinois. While they have some quali-



Michael Schlesinger, U. of Illinois,
Francis Zwiers,
Environment Canada

tative understanding of their data needs they could get much more help from modelers in predicting the impacts of climate change on their communities if they could spell out in quantitative terms what they want. (This statement led to an exchange between Schlesinger and Patz of Johns Hopkins, with Schlesinger saying the policymakers' demands must be in reasonable dimensions, not down to predicting the smallest puddle resulting from a flood, and Patz replying that a tiny mosquito in a puddle can have a large impact on the spread of malaria.) With ad-

equate quantitative data, Schlesinger stressed, modelers could define parameters and come up with more useful predictions.

The insurance industry, somewhat like the impacts community, has no consistent set of data requirements, according to Richard Murnane of the Bermuda Risk Prediction Institute, and relies on descriptive language, slipping into jargon which is not useful for modelers.

Data on human health are "most unreliable," according to Jonathan Patz of Johns Hopkins Schools of Public Health; we have both bias in reporting and variations in methods of detection.

Extreme weather events will lead to increased illnesses from heat, air pollution, contaminated water, red tides, or by vectors as in malaria and hantavirus. Improved surveillance would help but it will not be enough to prevent illness.

A top priority, said Patz, is development of predictive models. These will work best if health scientists, climatologists, biologists, ecologists and social scientists cooperate to develop scenarios for communities taking into account their past experiences with extreme events and the future risks they face. Understanding the links between climate and ecological changes as sources of disease will help to construct models that can predict consequences and guide programs that prevent disease.

Patz cited environmental refugees as potentially the most serious health consequence of climate change. Overcrowding, poor sanitation, lack of shelter, food, fuel and water, and heightened tensions all could lead to enormous disaster, even war.



Jonathan Patz,
Johns Hopkins
University

Luis Roberto Acosta, program director of SIMA, described Mexico City's serious urban air pollution problems and high UV-B levels and called for extended research on these topics. He recommended putting all environmental variables (including climate change) in a single Mexico City monitoring system and incorporating data from a number of different sites. He specifically urged higher spectral resolution (to measure absorption of UV-B more accurately) and radiometers for health studies.

Data are gathered in a spotty way, with inconsistent procedures and on inconsistent scales, several participants noted. While there is a warming trend over most of the US since 1978, the Southeast is cooling, David Easterling of the National Climate Data Center (NOAA) noted. An increase in sulfate aerosols from the TVA and other plants may be partially responsible, but we need more information before drawing cause/effect conclusions, he said.

Landfalling hurricanes have shown a downward trend, but with only 2-3 a year it is hard to pinpoint tendencies. Extreme events have not happened that often, and the perspectives of paleoclimate findings may be needed. For instance, Jonathan Overpeck's research shows that megadroughts occur every 200-300 years, beyond our present records. Even the trail of 16 successive months breaking the temperature record recently falls within the realm of probability, Easterling declared.

We need to understand not only the causes of climate extremes such as hurricanes but the forces that cause structures to fail under hurricane pressure. The failure of a structure is the foundation of natural disaster, and the reason may be quite unexpected, said Alan Davenport of the University of Western Ontario. It was not entirely the ice load that

brought down the transmission towers in the phenomenal 1998 Quebec ice storm. The ice on the heavy cables changed their aerodynamic properties when they swayed in the wind causing them to oscillate unstably and pull down the towers. In calculating key loads on a structure, we have to consider coupled events. The towers might have been able to withstand the ice alone or the wind alone, but the combination was too much for them.

Davenport urged particular concentration on the wind climate or wind profile. To calculate the probability distribution of hurricane wind would include incorporating in a model the hurricane's central pressure, the sea temperature, the forward speed, the angle of the track and archived data. The model could reproduce an historical hurricane which would give designers some idea of the wind forces which they must contend with.

There is what Davenport calls a "culture of construction." For example, formerly many homes in Jamaica were built with hip roofs which spread the force of the wind. Under a different culture, newer houses abandoned that style and are much more vulnerable to cyclone-type winds.

The very complex, composite interactions in climate phenomena require long experience to understand. We have good data on temperature and precipitation, but our weakest evidence is on the interaction between the atmosphere and surface (land or ocean). We need a better understanding of such interactions as well as the perplexing role of wind, the uncertain effect of clouds. Modeling such interactions is extremely difficult.

Modelers stressed the need for more support of the development of regional models which can better predict area impacts than the

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commonly used General Circulation Models (GCMs) which are too broad to yield more than crude estimates.

While admitting that this would sacrifice generalization for finer resolution, Eric Barron of Pennsylvania State University, favored development of regional models covering a limited area or ecosystem because they could be treated as interdisciplinary laboratories to help develop understanding of how topography and other local conditions influence climate change.

Users would gradually fit more and more components into the particular system, beginning to bring the discipline of forecasting into environmental prediction. It is a method



**Eric Barron,
Pennsylvania
State U.**



**David Easterling, National
Climate Data Center and Joel
Scheraga, USEPA, Symposium
organizer**

Barron has used in intensive study of natural regions such as the Chesapeake Bay and the Great Lakes. With what he calls "sensor webs," bit by bit from a data collection network he brings in observations of meteorological variables: How much rain, snow, hail, flooding is there? How many blizzards and avalanches? What is the duration of the dry spells? What are the extremes of cold and heat? How much evaporation takes

place? How much wind advection and convection is there? How many miles per hour does the wind blow? How many tornadoes are there? How much cloudiness is there and of what type? The structure of the atmosphere including the humidity, water and its oxygen level, biology, characteristics of the surface including vegetation, soil, soil moisture, and impervious conditions are added. The effects of phenomena such as El Niño and the North Atlantic Oscillation should be properly fitted in as well as observations from the social sciences on such phenomena as population growth. He agreed with Pulwarty who specified including economic development and land-use patterns, water management development, political evolution, ecological trends.

Following this procedure, you can find what prediction you are capable of, where you fail, then change your design and make a new prediction, building a consistent, ever more reliable path. Gradually the area covered could be extended,

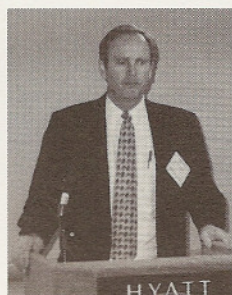
eventually reaching a national exercise. He made a plea for major emphasis on future research in this area, concentrating on factors such as wind.

The regional models would be self sufficient units, well defined and built to stand alone, but also able to be nested, integrated into GCMs so that phenomena such as tropical cyclones or other complex and overlapping zones of vulnerability could be analyzed more thoroughly. Coordinating perceptions across disciplines would lead the process toward an integrated assessment.

Major savings could be gained in replacing utility plants, highways, sewage systems and the many other installations communities must periodically renew, Roger Street pointed out, as we achieve greater certainty over future climate change and its extremes. Greater understanding among decision-makers will lead to more flexible planning and wiser expenditures on systems that are sensitive to weather.

Most Symposium papers are available on the Institute web site: www.climate.org.

Photos of Symposium participants were taken by Institute President John Topping.



**Roger Street,
Environment
Canada,
Symposium**



Janet Gamble, Annette Goessl, Roger Street, Joel Scheraga, Bill Bolhofer, John Topping, Luis Roberto Acosta, Michele Pena

St. Lucia

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efficiency. The St. Lucian Government will eliminate duties and taxes on renewable energy systems.

"In addition to reducing greenhouse gas emissions, this initiative will also help reduce energy bills and insulate the island from the impacts of unpredictable increases in oil prices," Mr. Tulsie added. "We call on developed countries to assist St. Lucia and other Small Island States in their energy transformation plans and show similar initiatives in their own countries."

"The Climate Institute's role is that of a catalyst," said Nasir Khattak, program leader, "to facilitate the development and implementation of a comprehensive sustainable energy plan for St. Lucia. We hope this will catalyze a global green energy revolution." John Topping, Climate Institute President, added, "We believe this historic step can help to jump start badly stalled climate negotiations." He invited the international community to take this as a challenge and show maximum progress by 2008-2012.

A press release giving further details can be found on www.climate.org.

Climate Institute News

Devra Davis Organizes AAAS Symposium on China

Institute Board member Devra Davis of WRI and Dr. Shouzheng Xue of Shanghai Medical University organized a symposium, "Environmental Health Challenges Facing China," at the AAAS annual meeting in Washington in February. The symposium was supported by a grant from the Wallace Global Fund to the Climate Institute.

On a panel along with representatives from the World Bank, the US Geological Survey, and Carnegie Mellon and Johns Hopkins Universities, the panel members showed that: despite progress in control in China, air pollution is still a significant cause of ill health and death (contributing up to 17 percent of excess mortality in Shenyang); air pollution accounts for nearly one-third of the world's cases of lung cancer among women (possibly because of dirty cooking and heating fuels); arsenic and fluoride are principal causes of health problems attributable to coal production in some areas.

Further details can be found on the Institute's web site: www.climate.org.

Former Award Winner Senator Chafee Dies

The Institute sadly reports the death of Sen. John Chafee of Rhode Island on Oct. 24, 1999. He had served 23 years in the Senate and had been chairman of the Environment and Public Works Committee since 1995. Senator Chafee was recipient with Roger Revelle of the Climate Institute's first environmental award.



Sir Crispin Appointed to Panel on Risk from Asteroid Collision

UK Science Minister Lord Sainsbury has appointed Sir Crispin Tickell, Institute Board chairman, to be part of a three-person task force to examine the risk of human vulnerability from an object from outer space. Sir Crispin was in Washington in early March for meetings at NASA and the White House related to the task force's effort which will culminate in a report by the middle of 2000.

For further information, see: http://news.bbc.co.uk/hi/english/sci/tech/newsid_590000/590668.stm

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Climate Institute News

Devra Davis Reports on Urban Air Pollution and Children's Health

Dr. Devra Davis of WRI released a report on a major international study of air pollution and children's health in megacities of the world at a press conference which attracted a great deal of public attention at a symposium in Mexico City in September 1999. She was lead author of the study which was supported by the World Resources Institute. "The North American Symposium on Coordinated Strategies for Climate and Air Quality Protection" was convened by the Climate Institute and a Mexico City NGO, Instituto Autonomo de Investigaciones Ecologicas (INAIINE).



Devra Davis at press conference

Joining her at the press conference were three Mexican environmental officials including Diana Ponce Nava who leads Mexico City's air quality program, Institute Chairman Sir Crispin Tickell, Nobel Laureate Mario Molina, Luis Manuel Guerra, President of INAIINE, Institute President John Topping, and a World Bank representative. The symposium brought together air quality and health experts to consider some cutting edge work that could help the City deal with one of the greatest air pollution problems in the world. The participants discussed

cussed potential means for limiting greenhouse emissions and reducing air pollution which results from rapid population growth, heavy auto use and the atmospheric inversion that traps air in the valley surrounded by mountains where the city lies. For more details, please see the Institute's web site, www.climate.org.



Alejandro Encinas, Environmental Secretary, Mexico City, Award Winners Mario Molina and Luis Manuel Guerra, and Sir Crispin Tickell at Mexico City Symposium

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