



Global Climate Change: Impacts for the Southeast

A report on the September 16, 1997 EPA Regional Conference sponsored by the EPA Office of Policy, Planning and Evaluation, Office of Economy and Environment

● Southeast Seen as Vulnerable to Climate Change



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Inside

- Insurance Premiums At Risk 4
- Climate Change Is Now 5
- Heading Toward Kyoto .. 6
- Meeting the Energy Challenge 9
- Looking Ahead 12
- And more . . .

The 44 million citizens of the southeastern United States are “particularly vulnerable” to the effects of global warming, according to A. Stanley Meiburg, deputy administrator of the U.S. Environmental Protection Agency’s Region 4.

Meiburg was the opening speaker at an EPA-sponsored public conference on global climate change, held in Atlanta on September 16, 1997.

The meeting was co-sponsored by 15 organizations and attended by more than 100 people from the eight states—Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee—that comprise EPA’s Region 4.

Conference participants included corporate and government officials, utility executives, scientists, physicians, policy analysts, and representatives from a wide range of environmental, industry, and private interest groups. The *Atlanta Constitution* and the ABC, NBC, and Fox affiliates in Atlanta covered the event.

Real and Tangible

Sixteen million people in Region 4 live on the coast, Meiburg said, where sea level rise will be a “real and tangible threat.” A 20-inch rise in sea level in the Southeast would result in 35 to 50 percent loss of coastal wetlands and would harm fragile ecosystems such as the Everglades and Florida Keys.

Although scientists are unsure how global warming would affect the frequency and severity of violent storms such as hurricanes, Meiburg noted that any risk of more hurricanes should be a serious concern for Region 4. “Imagine,” he said, “more storms such as Hurricanes Andrew, Fran, Hugo, or Opal, all of which occurred in the last 10 years.”

Global warming also would make it harder for Atlanta to improve its air quality, because higher temperatures will make the conditions that favor ground-level ozone more common. “Even the tough controls that we’re now looking at would not be enough to give us the healthy air that we all want to breathe,” Meiburg said.

Solutions Take Shape

In response to the risks, the Southeast already has begun taking steps to reduce the greenhouse gas emissions that lead to global warming.



Harold Reheis, of the Georgia Department of Natural Resources, warned that “we need to be careful as we move forward” in addressing climate change and not slow the economy.



← EPA Deputy Regional Administrator A. Stanley Meiburg told the conference that sea level rise will pose a “real and tangible threat” to 16 million coastal residents in the Southeast.

For example, Region 4 partners in EPA’s Green Lights program have eliminated 400,000 tons per year of CO₂ since 1991, according to Meiburg. The City of Atlanta is an Energy Star Buildings partner and has joined the Cities for Climate Protection program. Dade County, Florida, in partnership with Habitat for Humanity, is developing a residential community that uses 50 percent less energy than conventional Florida subdivisions.

Concern Over Commitments

Harold Reheis, director of the Environmental Protection Division of the Georgia Department of Natural Resources, warned that “we need to be careful as we move forward” in addressing climate change. “Any U.S. effort to limit near-term greenhouse gas emissions significantly

Continued on page 2

● Southeast Seen as Vulnerable to Climate Change - cont.

could result in the slowing of economic growth and could cost hundreds of thousands of American jobs.”

If policies are not well constructed, Reheis said, they could be particularly harmful to people living on fixed incomes and those in rural areas who depend on private vehicles for transportation. Policies also could have a “big impact” on American businesses that might no longer be able to compete effectively in the global marketplace.

In the conference’s keynote address, EPA Assistant Administrator David Gardiner assured the audience that the United States is working to forge an international agreement on global warming that is flexible, cost-effective, and includes all nations.

“It’s clear that we can do a lot to limit climate change and benefit the economy at the same time,” Gardiner said.

Other speakers discussed the science of climate change; potential impacts on health, business, and ecosystems; and opportunities for reducing emissions while saving money and creating jobs.

The meeting was followed the next day by a special session for policy and planning professionals from the Southeast. The participants identified critical issues raised by global warming for public health, ecosystems, and the economy, and proposed a number of strategies and tools, including geographic information systems, to deal with those issues. ●

Global Climate Change reports the results of a conference sponsored by the U.S. Environmental Protection Agency entitled, “Global Climate Change: Impacts for the Southeast.” The conference took place on September 16, 1997, in Atlanta, Georgia.

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For more information about the conferences, visit the U.S. Environmental Protection Agency’s global warming conference Web site at: <http://www.eis.wpi.org/epaworkshops/>.

In addition, EPA publishes a number of fact sheets about global warming and energy conservation. Call EPA’s Fax-On-Demand Service (202-260-2860), or access EPA’s global warming Internet site at <http://www.epa.gov/globalwarming>.

● Good “Followership”

Just as a bird needs two wings to fly, an effective response to global warming requires both sound science and responsible leadership, said Bill Campbell, mayor of Atlanta. An effective response also needs something more: a supportive, informed, and environmentally committed public. To Campbell, public support is like the wind beneath the bird’s wings: Without it, no policy—no matter how well crafted—can ever leave the ground.

“Sometimes,” he said, “the challenge is in good followership rather than good leadership.”

Atlanta ranks as one of the nation’s fastest-growing metropolitan areas and already faces a number of pressing environmental and social challenges. Raising public awareness about these problems, and building public support for solutions, are priorities for Campbell.

“Atlanta is a textbook example of urban sprawl,” the mayor said. “By 2005, our 20-county metro area is expected to grow by three-quarters of a million people, mostly in the suburbs.”

Sprawl has contributed to the region’s poor air quality, chiefly through heavy reliance on single-occupancy vehicles. Even Los Angeles commuters, Campbell said, drive less than metropolitan Atlanta’s daily average of 84 miles per person.

The incidence of asthma and other respiratory diseases in Atlanta, especially among African-American and Hispanic children, is “skyrocketing,” according to Campbell. Farms, forests, and wetlands have been lost to urban sprawl, air and water pollution have increased, and ecosystems have been disrupted.

“We know all these things,” Campbell said, “but the knowledge is almost meaningless unless we can get the community at large to know what is happening and to understand the urgency of change.”

The solution? “We need to focus on how to get better, not merely bigger,” Campbell said. Scientists and public servants need to educate the public, and political leaders must truly lead. “We need to be willing to make tough decisions, make partnerships, and have a thick skin for criticism.”

Campbell acknowledged that it won’t be easy. Americans are notoriously unwilling to pay the price for their convenient and modern way of life. “Everybody wants a better, cleaner, purer environment,” he said. “Nobody wants to stop throwing away their waste.”

Still, the time for difficult choices, for bold vision, and for good leadership is now. “And the task and the challenge of getting good followership—an informed public—is a critical component.” ●



Atlanta Mayor Bill Campbell said that an effective response to global warming requires an informed public.

● Causes and Consequences

It is a “dangerous thing” to change the atmosphere when we don’t know what the end result will be, said Robert G. Quayle, chief of the National Climatic Data Center’s Global Climate Laboratory.

Quayle explained that society has designed infrastructures to accommodate extremes that now occur about 1 percent of the time. If the climate changes, he said, conditions that once were observed as extreme may become fairly common.

Already, Quayle noted, extreme rainfall events have increased over much of the United States. This trend seems consistent with the predictions of most climate models.

Even the regional cooling that has occurred over the Southeast this century is “not totally inconsistent” with computer model predictions, Quayle added. Models predict little in the way of warming for the Southeast due to the short-term cooling effect of sulfate aerosols, tiny particles emitted by the burning of fossil fuels that reflect heat back to space. “We’re probably seeing a large sulfate aerosol effect that’s been dampening the effect of the overall global warming signal,” Quayle said.

Quayle cautioned that the observed trends are not conclusively linked to global warming, “but they are



Robert Quayle, chief of the Global Climate Laboratory, said that rainfall already has increased over much of the United States.



Mike Farrell, director of the Center for Global Environmental Studies at Oak Ridge National Laboratory, talks with one of the conference participants.

very definitely consistent with the changes that could be expected from an enhanced greenhouse effect.”

There is little doubt that emissions of greenhouse gases have risen dramatically, and that the rise has been “even more dramatic” over the last 50-60 years, said Mike P. Farrell, director of the Center for Global Environmental Studies at Oak Ridge National Laboratory. Farrell pointed out that the concentration of CO₂ in the atmosphere will continue to rise even if we reduce emissions.

To stabilize the concentration, global emissions would have to be reduced by 80 percent. “That’s like saying only the U.S. would be allowed to emit any CO₂,” he said.

In response to a question from the audience regarding climate variability and the uncertainties in the science, Farrell remarked that uncertainty does not preclude national decisions. “Sometimes uncertainty is overwhelming, but we still may see enough of a trend that policies are warranted,” he said.

Farrell noted, however, that “credible studies” suggest there would be little impact on climate if emissions reductions were delayed by 10-20 years. Still, he said, this conclusion must be counterbalanced with the market penetration time for new technologies that would be required to cut emissions. “You can’t start in 2008 to roll out technologies that you’ll need in 2010,” he said. ●

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Mike P. Farrell
Director, Center for
Global Environmental
Studies
Oak Ridge National
Laboratory

Other Conferences

A regional conference sponsored by the U.S. EPA, “Climate Change: What Does It Mean for the Central South-west?” was held October 30, 1997, at The Fairmont Hotel in Dallas, Texas.

Additional conferences will be held in the spring in Pennsylvania, New York, and California.

For more information, contact Monica Duda, Waste Policy Institute, 703-247-2410.

"The [insurance] industry is in the forefront in terms of integrating climate change into the economics of its business."

Frank Nutter
President
Reinsurance Association
of America

● Insurance Premiums At Risk

Hurricane Andrew caused a paradigm shift in the insurance industry, causing it to look at the future, not just the past. Today, that future includes climate change.

Frank Nutter, president of the Reinsurance Association of America, told the conference that the viability of insurance companies today depends on "economic estimates of the consequences of future events." Until recently, companies based these estimates on historical data.

Although we cannot be certain whether climate change is causing more hurricanes and other storms, Nutter said that insurance losses associated with climate and weather have increased. State Farm's property and casualty subsidiary, for example, was in danger of going bankrupt from a two-hour storm in Homestead, Florida. Other financial holdings were able to bail State Farm's subsidiary out.

Four times as many natural catastrophes occurred in the 1990s as there were in the 1960s. Economic losses, even adjusted for inflation, are eight times greater, and insured losses are 15 times higher than they were in the 1960s. The total paid out in claims is 50 percent greater than what was paid over the last 40 years combined.

One reason is that people often act in ways that increase risk, Nutter explained. They are moving into high-risk areas like Florida at the rate of 1,000 people per day.

In some cases, insurance companies are canceling policies or refusing to write new ones. Premiums



Frank Nutter, president of the Reinsurance Association of America, and Philip Edelman, chief of occupational and environmental medicine at Vanderbilt University, described the insurance and health risks from climate change.

need to be brought in line with risks, Nutter added. To mitigate future insurance disasters, the industry is basing a major part of premiums on science-based risk factors such as climate change.

In addition, the industry is building the science of climate change into its catastrophe models, evaluating U.S. communities for building codes and enforcement, and lobbying for support for climate change research.

Of all businesses, Mr. Nutter concluded, "the insurance industry is probably the most dependent on climate and weather. It drives the demand for our products and threatens our solvency, at the same time." This is why "the industry is in the forefront in terms of integrating climate change into the economics of its business."

All of us, he said, will be affected. Insurance premiums, he said, "send messages to people." ●

● Prescription: Databases

"I would challenge anyone to find a death certificate that lists the cause of death as climate variability," said Philip Edelman, chief of occupational and environmental medicine at Vanderbilt University. "Whether we're talking about hantavirus or other vector-borne diseases, no one's going to say, 'Aha, this occurred because of [climate change]. We don't make those linkages.'"

One reason is that no one has made a coordinated effort to collect climate-related health information and organize it on the public health databases.

Data needed by public health and emergency services professionals include the primary, secondary, and tertiary health impacts of climate change.

Primary data from a snowstorm, for example, might include heart attacks from shoveling snow or broken hips from falls. Secondary and tertiary effects might happen much later when the snow melts and causes flooding that leads to gastrointestinal problems related to ingesting bad water.

The hardest thinking, and the most important at the policy level, said Edelman, is necessary to resolve the tertiary problems. Where will our food supply come from if the usual source is wiped out because of drought or polluted because of flooding?

Edelman concluded by stressing the need for the health care community to take climate variability seriously and develop systems for addressing it. ●

● *Climate Change is Now*

“The future is today” was the central message of Thomas H. Sinks, associate director for science at the National Center for Environmental Health at the Centers for Disease Control and Prevention. We don’t have to look at the future, he said, to see global climate change.

The science of climate change predicts that heat-related deaths will become worse. In fact, heat waves already are killing people. Sinks pointed to the 1993 Philadelphia heat wave, during which 116 people died. Hundreds more died in Chicago in 1995, and the Chicago Heat Emergency Plan grew out of a CDC study of this disaster.

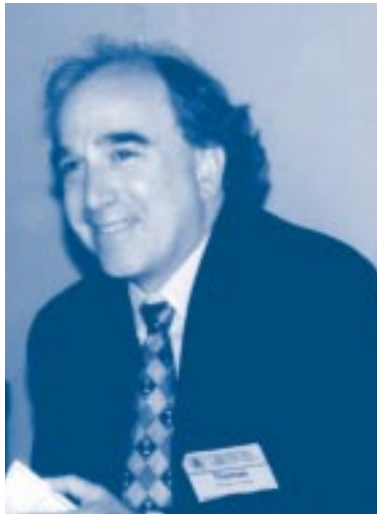
Since the future is here, Sinks added, the remedy—public health intervention—must be applied today.

Harold Frumkin, associate professor and chair of environmental and occupational health at Emory University’s Rollins School of Public Health, agreed that a look at four potential health effects of climate change makes “a compelling case for preventive action now.”

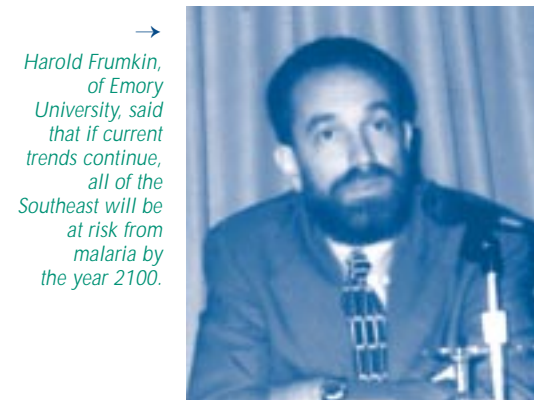
With respect to infectious diseases, malaria is on the rise worldwide, and climate plays a part. “Warmer temperatures encourage the northward migration of malaria,” said Frumkin. Today, in the United States, only Florida has a climate that renders it a high risk area for malaria. But if current trends continue, by the year 2100 all of the Southeast and the Gulf region will be at risk.

In parts of the world where nutrition is marginal, climate change “could be catastrophic,” in Frumkin’s words. Although the United States would see little change in overall cereal production and Canada’s production would rise as northern lands become more temperate, “large areas of Africa, South America, and India would see substantial declines in grain production,” potentially resulting in widespread starvation.

Regarding pollution, Frumkin said that rising temperatures lead to the increased production of ozone, pollen, and spores. In Atlanta, “the allergist’s dream,” nobody needs to be reminded how unpleasant that would be.



←
CDC’s Thomas Sinks pointed out that we don’t have to look at the future to see climate change—heat waves already are killing people.



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Harold Frumkin, of Emory University, said that if current trends continue, all of the Southeast will be at risk from malaria by the year 2100.

Finally, half the world’s population lives within 36 miles of the sea, according to Frumkin. Under current predictions of sea level rise, some of the land where those people live would be inundated. Those who are forced to relocate would suffer a variety of adverse health effects from contaminated drinking water to increases in infectious diseases.

“The costs of acting are bearable,” Frumkin concluded. “The risks of not acting are unbearable.” ●

● *Cities and Climate Change*

“How can we make cities more habitable,” asked Dale Quattrochi, research scientist in NASA’s Global Hydrology and Climate Center, “and mitigate the effects of global climate change? And how can we deal with the urban heat island effect?”

These are some of the difficult questions Quattrochi and others are trying to answer using models derived

from thermal remote sensing coupled with tools such as geographic information systems.

Candidate actions for dealing with the urban heat island and global warming include planting more trees and changing the albedo (radiation reflected by a surface) by making streets and roofs white instead of black. ●

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“The costs of acting are bearable. The risks of not acting are unbearable.”

Harold Frumkin
Chair of Environmental and Occupational Health Rollins School of Public Health, Emory University

"I see signs that more and more Americans are coming to understand the enormous human health and environmental implications of climate change."

David Gardiner
Assistant Administrator
U.S. Environmental
Protection Agency

● Heading Toward Kyoto

As nations of the world prepare to gather in Kyoto, Japan, this December to negotiate legally binding reductions in greenhouse gas emissions, EPA Assistant Administrator David Gardiner described where the United States stands on global warming.

"Despite the complexity of the issue, and the international and domestic disagreements, I want to be clear that President Clinton is committed to a national and international response to global climate change," Gardiner said. Given the scientific data now available on future risks to public health, ecosystems, and the economy, he added, "we really don't have any other choice" but to act.

Gardiner explained that U.S. policy is being driven by three principles: sound science, sound economics, and a global approach.

Solid Science

"Our climate change policy must be constructed on the solid bedrock of the best available science," Gardiner said. "And I must tell you that from our standpoint, the science of climate change is virtually beyond dispute and is truly compelling."

Indeed, he added, "we believe it would be irresponsible to ignore the facts as we now understand them" and to put off action until sometime in the future.

Global warming could have significant impacts on the Southeast, Gardiner warned. According to one study, heat-related deaths in Atlanta could more than double by the year 2050, rising from 25 to 60 deaths per year. Along the Florida coast, he said, sea level could rise 18 to 20 inches over the next century, inundating coastal areas and leading to erosion, loss of land structures, loss of wildlife habitat, exacerbated flooding, and increased vulnerability to storm damage.

While cautioning that scientists are unsure whether global warming will affect the frequency and severity of hurricanes, Gardiner noted that storm surges and related damage associated with hurricanes will undoubtedly become worse as the oceans rise.

Changes in the atmosphere and climate are underway already, Gardiner said. Since pre-industrial times, CO₂ concentrations have gone up by 30 percent, methane concentrations have doubled, and nitrous oxide has climbed by 15 percent. The average temperature over the past century has increased between 0.5 and 1 degree Fahrenheit. The nine warmest years in this century all have occurred in the past 14 years, and sea levels have risen between 4 and 10 inches over the past century. The frequency of extreme rainfall events—both floods and droughts—has increased over much of the nation.

By the year 2100, concentrations of CO₂ are expected to be higher than at any point in the last 160,000

years. The average global temperature may increase by 2 to 6 degrees Fahrenheit, and global sea levels could rise by 20 inches. "If current projections of greenhouse gas emissions, atmospheric concentrations, and global temperature increases come close to what actually happens," Gardiner said, "the related effects will border on the catastrophic."

Strong Economy

Global warming policy must be structured not only to minimize costs, he said, but to strengthen the overall economy wherever possible.

Gardiner explained that if we can improve the efficiency of fossil fuel combustion, which accounts for 85 percent of U.S. greenhouse gas emissions, consumers can save money now while reducing emissions. "That's a win-win situation that we should embrace with open arms."

Under the Clinton administration's Climate Change Action Plan, EPA and other government agencies

Barbara Miller (right), president of Rankin International, attorney Deb Swim (below right), and Georgia Tech graduate student Shane Robinson (below) were among the audience members who raised questions about issues such as the impacts of climate change on the insurance industry.



● Heading Toward Kyoto - cont.

encourage corporations, communities, schools, hospitals, and other institutions to invest in more energy-efficient lighting, computers, refrigerators, office equipment, and other products. "And they have, to the tune of more than \$1 billion," Gardiner said.

The results so far: annual greenhouse gas emission reductions of 76 million metric tons of carbon equivalent, equal to the emissions of 60 million cars; \$10 billion in annual energy savings for consumers and businesses; and 2 quadrillion BTUs of energy saved every year, equal to 100 million tons of coal. Gardiner added that there also have been "huge reductions" in other pollutants, such as nitrogen oxides (NO_x).

"It's clear that we can do a lot to limit climate change and benefit the economy at the same time," Gardiner concluded.

A Global Solution

Because global warming's causes and effects are global, the solutions also must be global, Gardiner said.

He added that not all countries bear the same responsibilities. The United States is the world's richest nation and the single largest emitter of greenhouse gases, giving us an "important responsibility" to lead toward a solution. At present, developing countries emit only one-tenth as much greenhouse gases as the United States on a per capita basis.

Gardiner noted, however, that most of the world's growth over the next several decades is expected to occur in developing countries. "Because of population and economic growth, by 2050 today's developing countries may well emit a larger share of global greenhouse gases than developed countries."

Critical Elements

Based on the principles outlined above, the Clinton administration's proposal for the Kyoto agreement includes three key elements: legally binding targets and timetables; flexible measures, such as interna-



David Gardiner, assistant administrator of EPA, chats with participants at the conference.

national emissions trading, that will allow countries to meet targets in cost-effective ways; and a strong role for developing countries.

"We think all of these measures are critical to the overall architecture of an international agreement," Gardiner said.

Some elements of the U.S. proposal have met with resistance from other countries, Gardiner noted. Particularly under fire are the proposed requirements for developing nations, which he said are "the most aggressive on the table."

Even if nations succeed in negotiating an agreement in Kyoto, Gardiner warned that there will be "many unresolved and difficult issues" ahead. Ratification of the treaty by the U.S. Senate is likely to be "front page news for months, if not years," he said, and might make the rancorous debate over the North American Free Trade Agreement "look like a grade school food fight" in comparison.

Still, he feels hopeful. "I see signs that more and more Americans are coming to understand the enormous human health and environmental implications of climate change." He also sees indications that U.S. businesses are coming to understand the economic opportunities presented by our national response to global warming, and that "many sources of greenhouse gases are beginning to spend less time fighting the future and more time preparing for it."

Gardiner also sees hope in workshops and conferences where people who are concerned about the future sit down together to learn more about what's at stake as the climate changes. "I'm convinced that the more we understand about the problem," he said, "the more likely we are to arrive at common sense and cost-effective solutions." ●



Protesters from the Citizens for a Sound Economy held a demonstration on the street outside the conference.

"Imagine more storms such as Hurricanes Andrew, Fran, Hugo, or Opal, all of which occurred in the last 10 years."

A. Stanley Meiburg
Deputy Administrator,
Region 5
U.S. Environmental
Protection Agency

“The future is my business. That’s why I’m here.”

Robert Hamrick
Lead Engineer
South Florida Water
Management District

● *Dysfunctional Ecosystems*

Ecosystems become dysfunctional, said University of Georgia Institute of Ecology Director C. Ronald Carroll, when changes are too rapid for species to adapt. Climate change, he said, “will continually impose such changes.” A very small change in temperature, he added, can be associated with striking changes in large-scale ecosystems.

Carroll was one of two speakers who addressed the potential impacts of climate change on natural ecosystems.

Thomas M. Baugh, urban ecologist with the Southeast Region of the U.S. Fish and Wildlife Service, told the conference that his agency is “still in a time of wondering” about the effects of climate change on refuges, but they

do know that “spring is coming earlier, and birds are nesting earlier.”



Ronald Carroll, of the University of Georgia, described the difficulty that ecosystems have in adapting to rapid change.

The Southeast has three million acres in 115 reserves, the largest being Georgia’s 391,000 acre Okefenokee Swamp. Climate change could affect the size of refuges near oceans, the nature and location of the vegetation mosaic, and the distribution and density of wildlife. Hardest hit would be species that are already threatened and endangered.

Baugh concluded that, with the advent of accelerating change, weather may again take on the personal and immediate nature that it had when Morris Longstreth wrote that it was “a matter of life and death to the sailor, the hunter, the herdsman, who had to read the skies aright or perish.” ●

● *Alabama Takes Action*

Although Alabama’s average temperature has *decreased* slightly over the last century, and the increase in precipitation has been small, William J. Herz, assistant director of the Southeast Regional Center of the University of Alabama’s National Institute for Global Environmental Change, looks at his state’s greenhouse gas budget and wants to take action.

Of Alabama’s greenhouse gas emissions, 77 percent is CO₂ from the combustion of fossil fuels; 22 percent is methane; and the remaining 1 percent is nitrous oxide. As Herz reminded his listeners, methane has a greenhouse warming potential 22 times that of CO₂, and the factor for nitrous oxide is 270.

A state advisory board of stakeholders concerned about climate change has devised a number of mitigation options in five categories:

Energy efficiency: improve building design and industrial processes.

Methane and natural gas: recover and capture methane and leaking gas before and during mining.

Waste reduction and recycling: buy and use more recycled materials, and develop a state recycling and waste reduction plan.

Transportation: improve auto maintenance; develop electric and natural gas vehicles; coordinate traffic lights; and make greater use of public transportation, car pools, and barge and rail transportation.

Sequestration: expand new tree planting by utilities and improve management of existing forest stands.

By way of conclusion, Herz quoted the recent words of British Petroleum CEO John Browne: “The time to consider the policy dimensions of climate change is not when the link is conclusively proven, but when the possibility cannot be discounted.” ●



(L-R) Thomas Baugh, Dale Quattrochi, and William Herz spoke about impacts on wildlife refuges, the urban heat island effect, and state-level activities to address climate change.

● Meeting the Energy Challenge

Policy responses to global warming could have a major impact on the production and use of energy in the United States, according to L. Ray Harry, manager of environmental issues and government affairs at The Southern Company. "It's a vitally important issue," he said, "not only for my company, but for the energy business and the American economy."

Harry noted that more than half the nation's electricity is produced by coal. "The wrong climate policy could lead to a dramatic, mandated reduction in the amount of coal we can use," he said. This would increase demand for natural gas, driving up its price and increasing the cost of electricity. In the face of utility deregulation, which promises lower electricity prices, Harry expressed concern that "we may not be able to deliver what the customers want."

Ray Ganga, who is with the McBurney Company and is the chair of the International Committee of the National Bio-Energy Industries Association, discussed a number of renewable energy technologies that could provide a growing share of the future power mix for electricity.

Ganga said that renewables have low life-cycle costs and none of the price risks associated with fuels such as oil or natural gas. They generate power with indigenous renewable resources, can be installed quickly, and have significant environmental benefits.

Unfortunately, Ganga noted, renewables are still not competitive in most commercial situations. Aside from cost, barriers to the use of renewables include a lack of technology awareness on the part of consumers and utilities, a higher perceived financial risk, and policies that favor conventional fossil energy sources.

Moving from the national to the local perspective, Mike Barcik, a research engineer with Southface Energy Institute, said that cities can do a lot to reduce their greenhouse gas emissions. In a study for an Energy Smart Atlanta project, Southface found that energy use in Atlanta's city-owned facilities could be cut by 25 percent simply by upgrading lighting, heating, and air conditioning, and other equipment.

According to Barcik, the city would save \$5.6 million annually in energy bills if retrofits were undertaken in all 250 municipal facilities. The improvements would reduce CO₂ emissions by 47,000 tons a year. Barcik said that Atlanta has now hired an energy manager to begin implementing some of the savings identified in the study.

Gary Moll, a vice president at American Forests, described the use of geographic information systems to determine the energy-saving value of trees. According to Moll, shade trees in one midtown Atlanta neighborhood are saving \$257 to \$1,600 per block in direct summer cooling costs. These savings might be doubled, by taking into account the cooling effect that occurs when trees release moisture into the air. ●

"I'm here to learn enough so that when new policy and rules come out, I'll be able to explain them to my colleagues."

Cala J. Obenauf
Environmental Scientist
Alabama Department
of Environmental
Management

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Ray Harry, of The Southern Company, told the conference that the wrong climate policy could lead to a dramatic, mandated reduction in the amount of coal we can use.



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Mike Barcik said that the Southface Energy Institute found that energy use in Atlanta's city-owned facilities could be cut by 25 percent simply by upgrading equipment such as lighting, heating, and air conditioning.



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Gary Moll, of American Forests, talks with a participant about the use of GIS technology to compute the energy-saving value of trees.



Ray Ganga, of the McBurney Company, said that renewables have low life-cycle costs and none of the price swings associated with fuels such as oil or natural gas.

“As a practicing pediatrician, I came to the conference so that I can spread the word at my association’s upcoming conference.”

David W. Reynolds, M.D.
Birmingham, Alabama

● Experts Identify Key Impacts and Responses



EPA’s Rick Durbrow played a major role in organizing the conference.

Sixty policy and planning professionals from throughout the Southeast gathered in Atlanta the day after the regional conference in a special follow-up session. They participated in work groups with a goal of identifying critical issues related to global warming in three sectors: public

health, ecosystems, and the economy. Each work group identified strategies to reduce the region’s vulnerability in its sector.

The meeting built on work begun earlier this year at the U.S. Global Change Research Program’s Southeast Regional Workshop on Climate Variability and Water Resources, held on June 25-27 at Vanderbilt University in Nashville.

Rick Durbrow, program analyst for EPA’s Region 4, said the Atlanta meeting’s findings will be disseminated to the conference co-sponsors and may be used to help identify and develop projects for potential funding. ●

● Managing Ecosystems Under Stress



Mary Rountree, of the National Park Service, helped out as one of the facilitators of the ecosystem workgroup.

One issue discussed by the ecosystem work group is the problem of managing dynamic systems in the face of increasing uncertainty. Closely related is the growing fragmentation of ecosystems, which limits their adaptability to change.

The group, which was facilitated by Barbara Miller, president of Rankin International, Inc., and Mary Rountree, of the National Park

Service, also discussed the potential economic impact of shifts in species caused by climate change. If commercially important species disappear from some regions, the impacts on certain economic sectors could be considerable.

To address these issues, migration corridors need to be developed to allow threatened species to move to new areas. Reducing other environmental stresses, reintroducing species to their native habitats, and encouraging habitat banking analogous to range banking in Texas also would be helpful.

The group concluded its work by identifying tools, models, and data needed to implement these strategies. Some of the needs: key ecosystem health indicators for monitoring change, improvement of climate models to increase their accuracy for short one- to four-year time periods, and pilot projects for species reintroduction to help us gain the knowledge that will be required as habitat disappears.

Southern Appalachians

A dramatic picture of the potential impacts on biota and people from climate change was presented by John Peine, of the U.S. Geological Survey’s

Southern Appalachian Field Laboratory. He told participants that we need not conjecture about the impacts of extremes in the climatic cycle. We can look at recent history.

Consider the extreme weather events of the past 10 years in the Great Smoky Mountains National Park.

A hallmark year of drought in 1988 caused a record 41 wildfires. Brook trout failed to reproduce that year because of the warm water temperatures. Increased ozone caused intense impairment of visibility, one of the park’s main problems.

In 1993 a severe snowstorm closed the backcountry. Extreme snowfalls are consistent with the increase in winter precipitation predicted by the climate models.

The following year, the southern Appalachians experienced their largest flood on record. A major park road was washed out, and the cost of repairing the damage was equal to the park’s entire budget for the year.

Hurricane Opal and extreme summer heat were the story in 1995. The next year a severe winter closed the park’s main road for 40 days, causing economic hardship for a nearby community. In 1997 after a solid month of rain, an enormous rockslide—perhaps triggered by excess moisture in the soil—closed the interstate that connects Tennessee and North Carolina. Traffic re-routed through the national park.

This surprising number of extreme weather events in the past 10 years, said Peine, provides a glimpse of what might happen in a warmer world. Drought, forest fires, loss of sensitive organisms like salamanders and brook trout, more severe floods (possibly leading to the relocation of mountain communities), worsening air pollution, and more mobile and far-ranging forest pests and pathogens—those are some of the impacts suggested by the past decade of extreme weather. ●

● Better Data Needed on Health Impacts

Poor air quality is a “major concern” in urban areas and would be exacerbated by global warming, according to participants in the work group on public health. The group, which was facilitated by Dale A. Quattrochi, a research scientist with the National Aeronautics and Space Administration, added that urbanization itself can affect climate and in turn may lead to changes in infectious and chronic diseases among humans and animals.

To respond effectively to the public health risks associated with global warming, researchers will need better data, better indicators of climate change, and better risk assessment models, as well as improved software and integrated database systems.

Data also are needed to identify those who will be most affected by climate variability and changes in climate extremes. Examples are individuals with suppressed immune systems who might be susceptible to infectious diseases.

Participants emphasized the importance of communication, education, and training in any effort to respond to the risks of climate change. Public health officials and health care professionals, for example, will need training in order to recognize and report conditions that are caused by climate variability.

Other important health-related issues that need more study include the relationships between population growth and climate impacts. The local and regional costs of the impacts of climate change on urban areas is another research need.

GIS and Disease Outbreaks

In a lunchtime presentation, Ronald Welch, of the University of Alabama in Huntsville, described how geographic information systems can be used to identify likely seasons and locations where disease outbreaks may occur, detect unusual “clusters” of disease, document how they spread, and identify factors responsible for the emergence of outbreaks.

Ideally, according to Welch, GIS tools could be used to permit timely, safe, and environmentally sound interventions. He added, however, that key data are often unavailable. One problem is that some states restrict access to medical data in order to prevent insurance companies from using the information to deny coverage to individuals in high-risk or disease-prone areas.

Welch is working to assemble an Internet-accessible clearinghouse for climatic, health, and other environmental data that can be used by public health officials to improve their ability to predict climate-related health impacts. ●



Dale Quattrochi, of NASA, served as facilitator for the public health work group.



Ronald Welch, of the University of Alabama, described how GIS tools can be invaluable for identifying the locations of disease outbreaks.

● Costs and Benefits of Climate Change

The economic work group raised a number of issues such as El Niño’s impact and the economics of “no regrets” strategies in the manufacturing, electric utility, agriculture, and transportation sectors, as well as potential economic impacts on forest ecosystems.

The group, facilitated by Gerald F. Arkin, associate dean of the College of Agriculture and Environmental Science at the University of Georgia, identified three key issues, along with a strategy to address each of them.

First, current economic practices and policies do not fully consider all costs and benefits. The group recommended that, for any proposed federal climate change policies, methodologies be developed to incorporate costs and benefits for the southeastern United States associated with those policies.

The second issue is the lack of an adequate inventory of southeastern characteristics, such as unique topology, that may help determine the impacts of global climate change. The recommendation is to develop an inventory of climate variations and trends; culture, geography, topology, and natural resources; agriculture; wetlands; population growth and future development; and species diversity.

The final issue identified is a lack of adequate dissemination of information about global climate change and the impacts of decisions about energy use. The group recommended that a national public awareness effort should be initiated and involve both the public and private sectors.

PLACE³S

At a luncheon presentation, Ken Snyder, of the U.S. Department of Energy’s Center of Excellence for Sustainable Development, described the use of a computer program called PLACE³S as an effective planning tool for helping create sustainable communities and reduce CO₂ emissions. Planning officials with the City of Portland, for example, were able to use PLACE³S to simulate various scenarios for urban transportation and the impacts of those strategies on reducing greenhouse gas emissions.

Snyder reported that the PLACE³S planning process allows the user to establish a baseline determination; study a “business as usual” option; analyze other scenarios; determine the preferred alternative; and help ensure adoption of that optimum strategy by sharing the results of the computer model with decisionmakers. ●

“The mother of all losses would be the probable disappearance of the unique spruce-fir forest of the Great Smoky Mountains National Park.”

John Peine
U.S. Geological Survey
Southern Appalachians
Field Laboratory

● Looking Ahead



EPA's Cory Berish reviewed the ways that global warming could damage the Everglades, Big Cypress Swamp, and the spruce-fir forests of the Smokies.

Climate change is a "very serious" issue and must be addressed at many different levels, said Cory Berish, chief of EPA Region 4's Planning and Analysis Branch.

Berish reviewed some of the ways in which global warming could affect the Southeast, including damage to key ecosystems such as the Everglades, Big Cypress Swamp, and the spruce-fir forests of Great Smoky Mountain National Park. He cited "numerous threats" to the 37 percent of Southerners who live along the coast, including the potential contamination of their drinking water as sea level rises. Human health issues, such as infectious diseases and increased heat mortality, also are important considerations.

One recurring theme of the conference, according to Berish, was the need to turn data into useful information and to disseminate that information widely through public education. "We have to take responsibility for our actions and to think about where those actions are leading," Berish concluded. ●

● Conference Speakers

Gerald F. Arkin, Ph.D., Assistant Dean, College of Agriculture and Environmental Science, University of Georgia

Mike Barcik, Research Engineer, Southface Energy Institute

Thomas M. Baugh, Urban Ecologist, U.S. Fish and Wildlife Service, Southeast Region

Cory Berish, Ph.D., Chief, Planning and Analysis Branch, Region 4, U.S. Environmental Protection Agency

The Honorable Bill Campbell, Mayor of Atlanta, Georgia

C. Ronald Carroll, Director, Institute of Ecology, University of Georgia

Rick Durbrow, Program Analyst, U.S. Environmental Protection Agency, Region 4

Tim Eastling, Regional Program Manager for Industrial Programs, U.S. Department of Energy

Philip Edelman, M.D., Chief, Occupational and Environmental Medicine, Vanderbilt University Medical Center

Mike P. Farrell, Director, Center for Global Environmental Studies, Oak Ridge National Laboratory

Howard Frumkin, Ph.D., Associate Professor and Chair of Environmental and Occupational Health, The Rollins School of Public Health, Emory University

Ray Ganga, McBurney Company

David Gardiner, Assistant Administrator for Policy, Planning and Evaluation, U.S. Environmental Protection Agency

L. Ray Harry, Manager, Environmental Issues and Government Affairs, The Southern Company

William J. Herz, Assistant Director, Southeast Regional Center, National Institute for Global Environmental Change, The University of Alabama

A. Stanley Meiburg, Deputy Regional Administrator, Region 4, U.S. Environmental Protection Agency

Barbara Miller, Ph.D., President, Rankin International, Inc.

Gary Moll, Vice President, Urban Forest Center, American Forests

Frank Nutter, President, Reinsurance Association of America

John D. Peine, Research Sociologist, U.S. Geological Survey, Southern Appalachian Field Laboratory

Dale A. Quattrochi, Ph.D., Research Scientist, Global Hydrology and Climate Center, National Aeronautics and Space Administration

Robert G. Quayle, Chief, Global Climate Laboratory, National Climatic Data Center, National Oceanographic and Atmospheric Administration

Mary Rountree, National Park Service

Harold F. Reheis, Director, Environmental Protection Division, Georgia Department of Natural Resources

Thomas H. Sinks, Ph.D., Associate Director for Science, National Center for Environmental Health, Centers for Disease Control and Prevention

Ken Snyder, Project Specialist, Center of Excellence for Sustainable Development, U.S. Department of Energy

Ronald Welch, Ph.D., Chair, Department of Atmospheric Science, University of Alabama in Huntsville

To learn more about global warming, check out this Internet site:

<http://www.epa.gov/globalwarming>.