Track I: Effects of Urbanization and Land Use on Human and Ecological Health

Regency Ballroom A

Panelists: Panos Diplas, Ph.D., Hydrologist, Virginia Tech University
Morgan Grove, Ph.D., Research Scientist, USDA Forest Service
Barbara Sattler, Ph.D., Director, Environmental Health Education Center, University of Maryland Medical Center
Pietro Nivola, Ph.D., Senior Fellow, Brookings Institute

Facilitators: *Janet Gamble, Ph.D., National Center for Environmental Assessment, USEPA/ORD*
Steve James National Risk Management Research Laboratory, USEPA/ORD

Introduction

Over the last several years there has been a steady migration of residents from urban to suburban areas. There are numerous and complex reasons for this trend. Some of these reasons may include: real or perceived better quality of schools in the suburbs or exurbs; an increase in violent crime in cities; lower cost of real estate, services, and utilities outside of the city; high city taxes; inexpensive commutes; a desire for open space, privacy, and nature; and others. For the most part, those people leaving the cities are members of the middle or upper classes. What are the results of this large-scale migration to the fringes of the cities?

Seeing these human migration patterns, local governments in suburban and exurb areas, eager to attract tax dollars, are quick to cooperate with developers to erect housing and build roads, often for high-density developments such as town houses. What are the results of this phenomenon? There are some obvious ones: clear cutting of forests and resulting destruction of wildlife habitat, increased silting of watersheds due to run-off of top soil, and skewed drainage patterns.

There are other changes as well, some not so obvious, but potentially even more serious. For example, cars and trucks are the single greatest cause of air pollution. As populations in these outlying areas increase, the cars sit on the road in longer and longer traffic back-ups emitting particles, metals, and volatile organic compounds into the air every day. Those same cars are leaking small amounts of oil, transmission fluid, gasoline, and other organics that are washed into the watershed each time it rains. As habitats become disturbed, the predator-prey relationships also change in ways that are often negative. For instance, when the green space is too small, foxes, owls, and other predators move out, leaving humans vulnerable to high populations of mice, rats, voles, and other rodents. Consequently, homeowners kill rodents using rodenticides that seep into the ecosystem. Additionally, the liberal use of pesticides, herbicides, and fungicides that keep our lawns manicured, compromises the livelihood of birds and their offspring, who eat the seeds or eat the bugs that ate various parts of the contaminated plants.

Finally, where there were cooling and humidifying forests, there are now asphalt roads and concrete buildings that may be raising temperatures locally, and disturbing weather patterns. The increased demand for water — to water all those lawns, flowers, and golf courses, fill all those pools, and flush the three or more toilets per home — have strained supplies and distribution systems to the maximum. Subsequently, every time those toilets flush, the resulting sewage must be treated. Respiratory and waterborne disease are on the rise and these are thought in some quarters to result from land cover changes in suburban areas. When people lived in cities and walked to markets, they tended to buy less because they had to carry it by hand. Suburbanites can drive their gas guzzling sport utility vehicles and vans to the strip malls and load up. Landfills are at capacity and most packaging material still is not recyclable. What are the lasting impacts on human health and ecosystems in these areas?

Meanwhile, let's take a look at the cities. As the people with the money move out, the inner city becomes increasingly poor. In large part, these poor people who remain tend to be minorities or non-English-speaking immigrants, who are additionally hampered by prejudice and inadequate education. They are not always equipped to organize and act on their own behalf, so as time passes, it is they who tend to bear the greatest environmental burdens. With no tax support, the schools and services that depend on taxes only get worse. Children are not being taught what they need to learn, overworked parents cannot be home to supervise and guide them. Poverty and desperation stimulate crime that a diminished police force cannot fight. Businesses tire of the increased costs for insurance, security, and incentive pay, so they emigrate out of the inner city, taking their jobs with them. Housing deteriorates. Polluted sites fester and no one wants to bear the cost and risk of redeveloping them. As trash goes uncollected by a bankrupt public works department, pest populations increase until they pose serious health risks. What are the consequences for humans and all others in this urban ecosystem?

Discussion

Unfortunately, we are hampered by a limited knowledge of how urban and suburban areas function as ecological

systems. We must gain better insight into how land cover change and land use practices impact the environment and constrain our ability to assess management and restoration options. In the meantime, this lack of knowledge may be compromising the quality of both ecosystems and public health.

Research has only recently been conducted to assess, monitor, and model patterns of land use, and the disturbance of ecosystems. Possible links between human physical and mental health and environmental health must also be assessed. Development that is providing much needed housing is destroying ecosystems and habitats, and endangering public health. An optimum balance between sustaining natural ecosystems and pursuing technological and economic development is imperative.

We need a better understanding of people's motivators for change and how they perceive and value environmental quality in relation to other quality of life issues. We must learn how to balance economic and social development.

Questions

What biological and socio-economic indicators would be useful to evaluate ecological sustainability in human dominated environments?

What are the criteria for determining the population-density threshold for a given community necessary to maintain or restore ecological sustainability?

What ecological and human indicators provide evidence of a negatively altered biologic condition?

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An Ecological Assessment of the United States Mid-Atlantic Region: A Landscape Atlas. *http://www.epa.gov/emap/html/ma_atlas.html*

Biographies

Dr. Panos Diplas is an Associate Professor in the Department of Civil and Environmental Engineering at Virginia Tech. He received his undergraduate education in Civil Engineering at the National Technical University of Athens, Greece, and his M.S. and Ph.D. degrees from the University of Minessota. Prior to coming to Virginia, he spent a year at the University of Canterbury in New Zealand and eighteen months at the University of Iowa. He has extensive research experience in the areas of environmental and fluvial hydraulics. His research efforts have been supported by the National Science Foundation (NSF), Environmental protection Agency (EPA), National Aeronautics and Space Administration (NASA), U.S. Geological Survey (USGS), U.S. Army Research Office, Pacific Gas & Electric Co., and several more state agencies and private companies. He research activities have resulted in more than 120 refereed and other technical publications. He has given invited lectures and presentations in Italy, Switzerland, Japan, Israel, China, Greece, Germany, and USA. In 1992, he received the NSF Young Investigator Award. Currently, he is an associate editor of the Journal of Hydraulic Engineering of the American Society of Civil Engineers (ASCE). He is a member of the Environmental Hydraulics Technical Committee and a past Chairman of the Hydromechanics Technical Committee of ASCE.

Dr. Morgan Grove has worked for the U.S. Forest Service's Northeastern Research Station since 1996 as a Research Forester in Burlington, Vt., Durham, N.H., and Baltimore, Md. He is a Principal Investigator in the National Science Foundation, Long Term Ecological Research Program's Baltimore Ecosystem Study (particularly as the co-team leader of the demographic and socioeconomic working group) and a developer of the NED set of decision-support tools for forest and landscape management. Additional long term social ecological research centers on the Adirondack Park Region. His research activities focus on human ecosystem and landscape studies of forested areas, participatory action research approaches, and the development of technology transfer tools. He has a B.A. in Architecture and Environmental Studies from Yale College, a M.F.S. in Community Forestry from Yale University, and a Ph.D. in Social Ecology from Yale University.

Dr. Barbara Sattler is the Director of the Environmental Health Education Center at the University of Maryland Schools of Medicine and Nursing where she is on the faculty. The Environmental Health Center, a multi-disciplinary, community-oriented center in Baltimore, is engaged in training, education, and research related to environmental health. Dr. Sattler is the principle investigator and co-investigator on several projects including an Environmental Justice project funded by the National Institute for Environmental Health Science and a Centers for Disease Control intervention research project for childhood lead poisoning prevention. Dr. Sattler has also directed the EPA-sponsored Regional Lead Training Center, one of the training programs within the Environmental Health Education Center.

Dr. Sattler is the Chair of the Education Committee of the Children's Environmental Health Network that has developed a train-the-trainer program for medical and nursing faculty on children's environmental health. During the summer, Dr. Sattler organizes a summer institute for school-based nurses on environmental health. She has provided faculty development programs for medical and nursing faculty on environmental health. Dr. Sattler's particular areas of interest are community-based environmental health assessments and interventions and risk communication. Dr. Sattler authored a report for the international harmonization process sponsored by the World Health Organization and the International Labor Organization on the communication of hazards associated with chemical exposures.

Dr. Sattler's positions in the past have included Director of the National Center for Hazard Communication, Health and Safety Staff to the United Steelworkers of America, and Director of the Maryland Committee on Occupational Safety and Health. Dr. Sattler is a Registered Nurse with both a Master and Doctorate in Public Health from the John Hopkins University School of Hygiene and Public Health.

Dr. Pietro Nivola is a senior fellow in the Governmental Studies Program at the Brookings Institution where his principal fields of research have been trade policy, energy policy, regulatory politics, and urban problems. Dr. Nivola was formerly a tenured professor of political science at the University of Vermont where he taught courses in American government, public policy, and urban politics. Prior to that Nivola had been a lecturer in the Department of Government at Harvard University. Since coming to Brookings he has held adjunct appointments at Georgetown University, and in the Washington programs of UCLA and Stanford University. Earlier in the 1980s he had been a research associate, guest scholar, and visiting fellow at Brookings.

Nivola has published a large number of books and articles on subjects ranging from trade and industrial policy to energy taxation, social regulation, and urban affairs. He is the author of *Regulating Unfair Trade* (Brookings, 1993) and, with Robert W. Crandall, *The Extra Mile: Rethinking Energy Policy for Automotive Transportation*, a Twentieth Century Fund book published by Brookings in 1995. Two of his earlier works were *The Politics of Energy Conservation* (Brookings, 1986) and *The Urban Service Problem* (D.C. Heath, 1979). With David H. Rosenbloom, Nivola is also co-editor of the widely adopted text *Classic Readings in American Politics*, first published by St. Martin's Press in 1986 and now entering its third edition. In 1997 Nivola produced the Brookings conference volume *Comparative Disadvantages? Social Regulations and the Global Economy* (Brookings, 1997). His latest book is titled *Laws of the Landscape: How Policies Shape Cities in Europe and America* published by Brookings in April 1999.

Pietro Nivola received his A.B. (1966) and Ph.D. (1976) from Harvard University. He also holds an M.C.P. (1969) from the Harvard Graduate School of Design. Nivola was awarded Harvard's Frederick Sheldon Traveling Fellowship (1970) and was a Samuel Andrew Stouffer Fellow at the Joint Center for Urban Studies of Harvard and M.I.T. (1973). His work has been supported by grants or fellowships from the Ford Foundation, the Earhart Foundation, the Smith Richardson Foundation, the Lynde and Harry Bradley Foundation, the Alex C. Walker Foundation, and the Twentieth Century Fund.

Track II: Integrated Risk Assessment and Environmental Decision Making

Regency Ballroom B

Panelists: Jonathan Patz, M.D., Director, Program on Health Effect of Global Change, Johns Hopkins School of Hygiene and Public Health
William Farland, Ph.D., Director, National Center for Environmental Assessment, USEPA/ORD

Moderator: *Michael Slimak* *Associate Director, National Center for Environmental Assessment, USEPA/ORD*

Facilitator: *Robert Menzer, Ph.D., National Center for Environmental Research and Quality* Assurance, *USEPA/ORD*

Introduction

Traditionally, "risk assessment" in the Environmental Protection Agency (EPA) referred mostly to human health risk and focused on the potential of one chemical compound in a single exposure medium (such as air or water) to cause a disease effect (usually cancer) in individuals who represented humans with certain characteristics (for example, healthy young non-smoking adult white males or "sensitive subpopulations", such as children or people with cardiopulmonary disease). The Agency also performed "ecological risk assessments" which largely took an opposite approach. While they often focused on single pollutants or causes for an effect, these assessments generally looked at whole populations of organisms or at even larger scales such as habitats or entire ecosystem effects. The two types of assessment had little or no intersection and the implied notion was that humans somehow existed outside of the ecosystems whose health we were assessing.

All along, risk assessors knew that such practices did not provide a real picture of what actually happens in the world or of the necessary relationships among humans and all other residents of a given ecosystem. However, no one knew how to go about assessing real world exposures — multiple route exposures to real world doses of the complex soup of pollutants we encounter daily. And, how were we supposed to integrate human and ecological data in a meaningful way?

TRADITIONAL ASSESSMENTS	INTEGRATED ASSESSMENTS
Single Endpoint	Multiple Endpoints
Single Source	Multiple Sources
Single Pathway	Multiple Pathways
Single Exposure Route	Multiple Exposure Routes
Central Decision-making	Community Decision-making
Command and Control	Flexibility in Achieving Goals
One-Size-Fits-All Response	Case-Specific Responses
Single Media-Focused	Multi-media Focused
Single Stressor Risk Reduction	Holistic Risk Reduction

The Current Situation

We still don't know how to do it and there are rousing arguments over even the most basic questions of where to begin. In recent years, however, there has been general agreement that such "integrated risk assessments" must be accomplished somehow. There is general agreement about what things must change (see chart below). It is the "how" that is the stopper. EPA's Science Advisory Board undertook an "Integrated Risk Project" in which they called in numerous experts in December, 1996 to attempt to outline how such assessments should be done. It was a valiant effort and provided a good starting place, but it by no means wrote the new recipe book for integrated assessments.

One thing that did come from that effort was a formal validation of the notion of "effects backward" approaches. As the name implies, in this scenario, one examines real world effects first, then works backwards along the various exposure routes to elucidate a cause or causes. But, what effects do you look for? In what organisms? What are your guideposts for successful deduction of the causes? How do you apply them and what do you do about them?

Since the SAB meeting, much has been written about Integrated Risk Assessment (also known as "Cumulative Risk Assessment" or "Holistic Risk Assessment"), including a Guidance Document by EPA's Office of Research and Development's Science Policy Council. While these documents often do a good job of reiterating what we know and what must be done, they do not seem able to make the jump in a practical way to how we must do it.

It may be impossible for the current generation of risk assessors to make that jump. After all, they were born and bred into the Aold@ school of toxicology and risk quantification. These fields may very well need to be completely overhauled if they are to accommodate the complex needs of integrated risk assessments. It may easily fall to the new generation of scientists to re-examine the entire process without nostalgia and see the way to future success.

When researchers attempt to address problems of integrated risk, there are some questions which continually plague them. One such issue is that of scale. Scale, in

this case, can refer to many things. In studying ecosystem effects, it can refer to space, time, or complexity. In each case, there are questions one must ask about what to look for and the validity of the information gained. Also, how do you extrapolate your findings at one scale to others? Scale is also a factor in human toxicology. At the gross organ level, you see no damage in humans or animals from a given pollutant or mix, but there are indications that there could be cellular or subcellular level changes. Is that significant?

Another issue involves setting priorities (deliberately or inadvertently) among species or subspecies in an ecosystem. Should you prioritize them? If so, what criteria should you use? Are they all intrinsically equal? Are they all necessary to maintain the health of the system? And, by the way, how do you know when an ecosystem is healthy? It may change dramatically, due to natural or anthropogenic manipulation, but how do you know if it still healthy? Is a constructed wetland as healthy B or as valuable B as a natural one? Again, the same questions apply when dealing only with humans. Say that a short-term exposure to a given pollutant causes no effects in healthy people, but may cause serious risks in a very small percentage of people with, for instance, compromised immune systems, what is the overall risk? How do you weigh the two? Or, ambient exposures to several airborne agents individually cause no noticeable effect in anyone, but seem to cause increased disease in a significant number of people in combination. What do you do about it? What is the risk? And finally, what if a suite of pollutants appears to cause no noticeable harm in humans, but seems to pose significant risk to other organisms in a system. What is the overall risk from exposure to those pollutants?

Case Studies

1. You have been hired by a resort community to do an integrated risk assessment on the lake around which the community is built. On the hills above the lake are numerous fruit orchards and residents are concerned about pesticide run-off. There is an abandoned sulfur mine and mercury has leached into the water from the mine. At times during the year, there are blooms of introduced algae that choke large portions of the lake, smell bad, and may possibly be interfering with the reproductive patterns of some of the sport fishing species in the lake. What would you do?

2. Organophosphate pesticides are used on the small scale to control residential and garden pests. They are also used commercially by farmers on food crops, either through localized application or wide-area spraying. EPA has been asked by Congress to coordinate with local and state governments and the chemical industry to conduct an integrated assessment of the risks posed to people, wildlife, and natural plant life from the use of these pesticides. What questions must you investigate to determine the risks from this class of pesticides and to set tolerances for environmental concentration?

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Biographies

Dr. Pataz is Assistant Scientist and Director of the Program on Health Effects of Global Environmental Change at the Johns Hopkins School of Hygiene and Public Health. He is double board-certified in Occupational & Environmental Medicine and in Family Medicine. He obtained his MD degree from Case Western Reserve, his Masters in Public Health and his Occupational Medicine training at Johns Hopkins, and his Family Medicine training at the University of South Carolina in Charleston. He served as a Principle Lead Author on assessments of climate change for the World Health Organization and for the United Nations Intergovernmental Panel on Climate Change (IPCC). He is co-chair for the health sector of the US Global Change Research Program (USGCRP) National Assessment on Climate Change and is Principal Investigator for an EPA funded multi-institutional study on climate change health risks in the United States. He has co-chaired conferences on the subject for the American Society of Microbiology, and for the Society of Occupational and Environmental Health and has been called upon to brief both Congress and the Administration on these matters.

Dr. William H. Farland is the Director of the U.S. Environmental Protection Agency's (EPA) National Center for Environmental Assessment (NCEA) which has major responsibility for the conduct of chemical-specific risk assessments in support of EPA regulatory programs, the development of Agency-wide guidance on risk assessment, and the conduct of research to improve risk assessment. Dr. Farland's 20 year federal career has been characterized by a commitment to the development of national and international approaches to the testing and assessment of the fate and effects of environmental agents. Dr. Farland holds a Ph.D. (1976) from UCLA in Cell Biology and Biochemistry. Dr. Farland serves on a number of executive-level committees and advisory boards within the Federal government. He is also a member of the Scientific Advisory Council of the Risk Sciences and Public Policy Institute, Johns Hopkins University School of Hygiene and Public Health, and several other industry- and university-based Science Advisory Panels. He continues to teach and publish and has been a member of the Editorial Board for Risk Analysis since 1987 and for Environmental Health Perspectives since 1997.

TRACK III: Emerging Issues in Environmental Justice

Regency Ballroom C

Panelist:	Hal Zenick, Ph.D.,	Associate Director, National Health and Environmental Effects Research Laboratory, USEPA/ORD
	Charles Lee	Associate Director for Policy, Office of Enforcement and Compliance Assurance, USEPA
Moderator:	*Michael Callahan*	*Director, National Center for Environmental Assessment, Washington Office, USEPA/ORD*
Facilitator:	*Steve Smith*	*Office of Administration and Resource Management, USEPA/ORD*

Introduction

Environmental justice in the United States is a movement which calls to question the extent to which economically and politically disadvantaged communities bear a disproportionate burden of environmental hazards; the fairness of past environmental practices, policies, and management decisions; and the impact of environmental neglect or mismanagement upon the health of those affected citizens.

The idea of environmental justice originated in the early 1970's when the White House Council on Environmental Quality first cited evidence that race-based discrimination adversely affected some minority communities' ability to improve their environmental quality. But the idea transformed into a community-based, southern spun movement in 1982 when members of a low-income, predominantly black community in Warren County, North Carolina, protested against the proposed siting of a large polychlorinated biphenyl (PCB) landfill in their county. As many as 500 arrests were made garnering national attention. As the confrontation evolved, many began to view the proposed landfill siting not only as a threat to human health and well being, but also as a violation of civil rights. Ultimately the protest was not successful in barring the new facility, but is acknowledged as the first time that a community opposed an environment hazard not just on the basis of environmental concerns, but also as a means of preserving civil rights (Bullard, 1990)

One year later the issue gained further national attention when the General Accounting Office (GAO) reported that three of four hazardous waste sites investigated in the southern United States were located in communities that were predominately black. Several reports and environmental concern studies followed which supported the belief that the racial makeup of an area and the location of hazardous waste sites were closely tied, and that regulators were significantly more aggressive in enforcement of environmental statues in white communities than in minority neighborhoods. For example, in 1987, the United Church of Christ's (UCC's) Commission for Racial Justice released the landmark nationwide study, *Toxic Wastes and Race in the United States*, on the demographics of populations living near waste sites. The report found that in communities with one or more commercial hazardous waste facilities, the proportion of racial minorities was significantly greater than in communities without such facilities. (UCC, 1987).

In the early 1990s other major publications discussing the nature of the problem followed, including, *Dumping in Dixie: Race, Class and Environmental Quality* (Bullard, 1990), *The Truth about Where You Live* (Goldman, 1991) and *Environmental Equity: Reducing Risk for All Communities* (EPA, 1992). These concerns were brought to the forefront of academia, government, and communities, by the Conference on Race and the Incidence of Environmental Hazards (Bryant and Mohai, 1992), the National Minority Health Conference: Focus on Environmental Contamination (ATSDR, 1992) and the First National People of Color Environmental Leadership Summit (Lee, 1992).

As the movement gained momentum, EPA and other federal agencies were approached by advocacy groups that traveled to the nation's capital to stress their concerns about disproportional environmental hazards in their communities. Many identified "environmental racism," discrimination, and neglect as the cause of this injustice. In 1994, President Clinton issued Executive Order No.12898 on February 11, 1994 that required 17 federal agencies to ensure that no federal funds are used in any program that results in violation of Title VI of the 1964 Civil Rights Act*, thus formally acknowledging a federal government concern for the goal of environmental justice.

Discussion

Considerable progress has been made in bringing these issues to the forefront of the national agenda. Since the movement began in the 1970's as a grassroots health and politically focused effort, many communities have become educated and empowered about decision-making processes and community-based research. Since 1994 community activists, advocacy groups, churches and local leaders have filed 27 acceptable complaints to EPA's Office of Civil Rights.

The environmental justice movement has stimulated some research that has helped to define the current situation. Although scientific evidence is fragmented and sparse, there is general agreement that low-income communities and minority populations are generally more exposed to pollution and environmental hazards than the general public. And that minority

populations experience certain diseases in greater numbers than more affluent white communities. (IOM, 1999) Also due to the documented links between poverty, nutritional deficiencies, and poorer health status, exposed low-income populations may potentially be more susceptible to adverse health outcomes from environmental hazards.

Yet for health scientists, being "overburdened" with environmental hazards has proven difficult to quantify, not to mention assessing the health impacts of being "overburdened." Where are the connections between multiple exposure and adverse health outcomes? What is and is not known about the potential adverse health effects resulting from a number of environmental stressors? What current innovative technologies (molecular tools, biomarkers) can be used to dissect these complicated paths from exposure to disease?

Other questions pose equally tough questions for sociologists and economists. Why did it happen? What were the sociological, political, economic, psychological, and education forces at work? What do we do to make it better and to keep these disproportionate burdens from continuing. How do we ensure that environmental justice focused decision-making is not a threat to industry nor offer further disenfranchisement to economically disadvantaged communities? Up until this point, anecdotal testimonies have been the driving force behind the movement in most cases. We need more hard data, both about site-specific cases and about generalizable principles of knowledge and practice. All we know about those answers to date are that they won't be simple. There is no single "bad guy" but instead an intricate web of causes. To what extent is environmental justice dependent on national policy or law rather than local empowerment and action? What role should be played by environmental health scientists, clinical medical practitioners, industry, national and state policy makers, and local citizenry?

Case Studies:

a) In Major City, U.S., a consortium of 13 churches and 3 major community groups are concerned that 35 garbage transfer stations, "dozens of other waste facilities" and four of the city's 7 bus depots are located within their part of town. They suspect that the community's high asthma morbidity/mortality, low birth-weight, low life expectancy, high prostate and breast cancer rate, lower school age test scores may all be environmentally related. The city reports that there are many confounding factors in the areas' health outcome stats, and that the area experiences average to below average incidence of leukemia, lung, liver, and kidney cancers. The state says that 68% of the areas' workforce is employed by these same facilities and that they all continue to meet federal compliance standards. A state senator agrees to help the consortium file a complaint if they first seek an independent, non-advocate characterization and assessment of the situation. They come to you. You take the case, but you have a limited amount of time and a tight budget. Where do you begin?

b) It's the year 2001 and there is currently no environmental justice legislation. 13 of the 27 acceptable environmental justice complaints filed at EPA three years before have failed to prove blatant discriminatory practice by the state or local authorities. 9 of the 13 fail to scientifically link the complaint of being "overburdened by hazardous substances" with present health outcomes. Thus the newly elected president of the Unites States decides not to continue enforcement of E.O. #12898. She feels that environmental justice is a practice of values and that the values of some are not to be enforced upon all. Community activists, sociologists, and a number of health scientists push hard for legislation to protect the notion of environmental justice and to continue efforts to look for answers to the other 14 (or more) complaints. Should there be legislation? If not, why? And who will you appoint to handle these citizens complaints? If so, why? And what quantitative and qualitative data will you need to draft the language?

For more information:

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Institute of Medicine (1999). *Towards Environmental Justice: Research, Education, and Health Policy Needs*. National Academy Press. *www.nap.edu*.

Visit the EPA Office of Environmental Justice at: *www.es.epa.gov/oeca/oejbut.html*

Visit a selection of Dr. Christopher H. Foreman Jr's writings at *www.brookings.edu/scholars/CFOREMAN.HTM*

visit Clark Atlanta University's Environmental Justice Research Center at *www.ejrc.cau.edu*

Note: EPA's Office of Environmental Justice definition of Environmental Justice
"The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulation and policies. Fair treatment means that no group of people, including racial ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from execution of federal, state, local, and tribal programs and policies. The goal of this'fair treatment' is not to shift risk among populations, but to identify potential disproportionately high and adverse effects and identify alternatives that may mitigate these impacts."

*Title IV of the Civil Rights Act of 1964 bars discrimination of any individual or group based on race, color, or national origin.

Biographies:

Charles Lee has played a singularly unique pioneering role in creating the field of environmental justice. Mr. Lee created the national program at the United Church of Christ Commission for Racial Justice to explore implications of the protest in 1982 by Warren County, North Carolina residents to the siting of a poly-chlorinated biphenyl (PCB) landfill. This program spearheaded the emergence of a national movement on environmental justice.

Mr. Lee is the architect of the two landmark seminal national events in the emergence of environmental justice as a significant national issue, the landmark 1987 Toxic Wastes and Race in the United States report and the historic 1991 National People of Color Environmental Leadership Summit. Moreover, he has been involved in spearheading most of the significant milestones marking the emergence of federal policy in this area, including the development and implementation of Executive Order 12898.

Mr. Lee is the editor of three books. He has taught at the Hunter College School of Health Sciences and the Rutgers University Department of Urban Studies and Community Health (Environmental and Occupational Health Science Institute).

Dr. Harold Zenick is the Associate Director for Health, National Health and Environmental Effects Research Laboratory (NHEERL) of the U.S. Environmental Protection Agency (EPA). Dr. Zenick earned a Ph.D. in Physiological Psychology/Psychopharmacology from the University of Missouri (Columbia) in 1972. He also completed a Post-Doctoral Fellowship in Toxicology at the University of Cincinnati. Prior to joining NHEERL, he was a Branch Chief in EPA's Office of Health and Environmental Assessment. Before coming to EPA, Dr. Zenick spent 13 years in academia with the Department of Environmental Health in the University of Cincinnati Medical School preceded by an appointment at New Mexico Highlands University. Dr. Zenick serves as EPA's liaison to the National Institute of Environmental Health Sciences (NIEHS), the National Toxicology Program (NTP), and the National Center for Environmental Health/Centers for Disease Control (NCEH/CDC) Advisory Councils.

Currently Dr. Zenick serves as a U.S. Co-Chair of the Environmental Health Workgroup under the binational U.S.-Mexico Border XXI Program. Within the Agency, he is the Chair of ORD's Community Science Team and Health Effects Institute Advisory Board. He has received numerous Agency awards and recently was the recipient of the prestigious Presidential Meritorious Executive Rank Award.

Dr. Zenick has over 100 publications. His current research interests are in noncancer risk assessment methods integrating human health and ecological risk assessment and the role of science in the regulatory decision-making process.

Track IV: Industrial Ecology

Regency Ballroom D

Panelist:	John Ehrenfeld, Ph.D.,	Director of the Technology, Business and Environment Program, Massachusetts Institute of Technology
	Pete Radecki, P.E.,	Michigan Technological Institute
	Derry Allen	Counselor to the Assistant Administrator for Policy, Office for Policy, USEPA
Moderators:	*Barbara Karn*, Ph.D.	Project Officer, National Center for Environmental Research and Quality Assurance, USEPA/ORD
	Stephen Lingle	Division Director, National Center for Environmental Research and Quality Assurance, USEPA/ORD

Introduction

Industrial ecology takes a systems view of the use and environmental implications of materials, energy and products in industrial societies. It exploits the ecological analogy by placing industrial activity in its environmental context and by drawing on nature as a model. Industrial Ecology analyzes materials and energy flows in the economy, including product and material life cycle management through reuse, remanufacturing, and recycling. It operates under the premise that industry and consumers are society's most significant environmental actors-for good or for bad-and therefore deserve more thorough understanding. Industrial ecology has a longer-term focus than most environmental pollution prevention management approaches.

It seeks cooperative and non-adversarial interactions, and has substantively rational aspirations centered on understanding the full picture rather than reductionist parts. While the field is just a decade old, it builds on years of earlier work in systems thinking and environmental sciences.

Industrial Ecology deals not only with materials and their residues but with the economic and human systems associated with them. It's not just a food chain approach ending with top predators, but a food web model with all its concomitant networks that include both materials and energy flows-their thermodynamics and their kinetics.

Why is Industrial Ecology important to EPA?

Pollution prevention (P2) is an Agency goal within EPA's Strategic Plan. Industrial Ecology provides a unifying principle for the P2 work that EPA carries out and a way of focusing and prioritizing future work. It gives a systematic perspective to disparate parts. Problem solving exercises take advantage of differentiated rather than fragmented methodologies. Environmental problems are examined in the context of their total framework including multimedia, multi-disciplinary and multi-office cooperative approaches. Industrial Ecology provides the framework to bring together all parts of the agency to work on problems of global concern. Just as economies are no longer national, serious environmental problems also are no longer limited to a national scope. Industrial Ecology provides a way of dealing with the global commons.

Is Industrial Ecology currently being practiced at EPA?

In September 1998 an *ad hoc* group from Office of Research and Development (ORD), Office of Policy (OP), and Office of Solid Waste (OSW) identified over 30 Industrial Ecology projects at EPA. These projects fell into the areas embodied in the definition used the *Journal of Industrial Ecology:* including

- **$** material and energy flow studies; e.g., Office of Prevention, Pesticides and Toxic Substances' (OPPT) Environmental Accounting Project which tracks materials and cost accounting and reviews best practices in the area of Life Cycle Analysis for materials management; OP's project with World Resources Institute to develop both national and international materials flows studies; Region 2's work in Sustainable Communities tracking materials flows in the region
- **$** design for the environment, e.g., OPPT's DfE project working with industries to develop sustainable practices and products by looking up and down the manufacturing chain, beyond the immediate company;
- **$** extended producer responsibility, e.g., OSW's product stewardship program in battery takeback
- **$** eco-industrial parks, e.g., OP's decision support tool for planning eco-industrial parks
- **$** life cycle planning, design and assessment, e.g., ORD's using Life Cycle Management to evaluate integrated solid waste management; ORD's work in Sustainable Technology research
- **$** dematerialization and decarbonization, e.g., EPA's programs in global warming
- **$** product-oriented environmental policy, e.g., OPPT's DfE work in the garment and textile care program which uses an IE approach to look past professional cleaning back to fiber and textile produc-

tion and garment manufacture;

- **$** eco-efficiency, e.g., OPPT's Green Chemistry which promotes the design of chemical products and processes which reduce or eliminate the use and generation of hazardous substances throughout all aspects of the life cycle of the product or process

Note that the quick survey revealed Industrial Ecology work in 4 offices and 1 region. From the breadth and importance of the projects identified in this initial survey, there are clearly many projects at EPA that use the systems approach of Industrial Ecology.

Industrial Ecology leads to Sustainable Development

Sustainable Development is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." If EPA were successful in preventing pollution and taking an Industrial Ecology, systems approach in its environmental protection, Sustainable Development could become possible without unpredicted or undesirable forcing factors. A goal of Industrial Ecology is to make decisions today that are looked on with favor 50-60 years hence. Using the techniques and perspective of Industrial Ecology can help EPA make the most intelligent decisions today. With this longer term, broader perspective, EPA could begin a change from not only protecting the environment to truly sustaining it.

Questions

If Industrial Ecology is such a good idea, why isn't it practiced by everybody? Is is the way to sustainability?

How can Industrial Ecology be implemented by individuals like STAR Fellows—now and in the future?

If you were the administrator of EPA, how would you implement the ideas embodied in Industrial Ecology?

Or better yet, if you were Earth's benevolent dictator, how would you implement IE?

References:

http://policy.rutgers.edu:8080/IE/
Report of April 1998 Workshop on Industrial Ecology and Policy

http://www.epa.gov/docs/futures/sector/industry/ind-eco/ie-over.txt.html
These 1993 EPA papers are still good material.

http://mitpress.mit.edu/JIE
Home page for Journal of Industrial Ecology

Biographies:

Dr. John Ehrenfeld, Director of the Technology, Business and Environment Program at MIT is also a Senior Research Associate at the MIT Center for Technology, Policy and Industrial Development (CTPID) and has additional appointments as Senior Lecturer in the interdepartmental Technology and Policy Program and in the Departments of Chemical Engineering and Civil and Environmental Engineering. At MIT since 1985, he has directed the MIT Program on Technology, Business, and Environment, a interdisciplinary educational, research, and policy program.

Initially trained as a chemical engineer, Dr. Ehrenfeld has worked more recently at the interface between technology and public policy. He teaches several courses within the theme "Chemicals in the Environment," as part of a series dealing with hazardous substances, as well as a graduate seminar on Technological Society & Technology Policy. He serves as a core faculty member in the MIT Technology and Policy degree program.

Through MIT, Dr. Ehrenfeld directs an ongoing research project examining the way businesses manage environmental concerns, seeking organizational and technological changes to improve their practices. He recently completed an international study examining policy options and implications of a global ban on the use of chlorine. Other research is looking at the idea of industrial ecology, a systematic way of analyzing and developing policy for complex materials flows within and across economies.

In 1977 Dr. Ehrenfeld was appointed by President Carter to serve as Chairman of the New England River Basins Commission (NERBC). There he was responsible for developing regional policies and strategies for surface and ground water, and coastal resources. Dr. Ehrenfeld has also served on the Massachusetts Water Resources Commission, the state's primary water policy organization, and on the Boards of other public and non-profit organizations. He is a member of theAmerican Chemical Society, American Association for the Advancement of Science, Air & Waste Management Association, Society for Risk Analysis, and is listed in American Men and Women of Science. He holds a B. S. and Sc. D. in Chemical Engineering from M.I.T. He is author or co-author of over 70 papers, reports, and other publications.

Derry Allen is Counselor to the Assistant Administrator for Policy at the U.S. Environmental Protection Agency. In this job he is involved in a number of issues concerning environmental planning and information, including Industrial Ecology. He also supervises the EPA Customer Service Staff.

Mr. Allen has served at EPA since 1978, where he has held a variety of positions, principally in the Policy Office. He was Director of the Office of Strategic Planning and Environmental Data from 1992 to 1998. He has also been Senior Policy Advisor to the Assistant Administrator for Policy, Planning and Evaluation, Deputy Director of the Science, Economics and Statistics Division and the Regulatory Integration Division, Associate Director of the Office of Policy Analysis, Acting Director of the Energy Policy Division, Chief of the Energy Development Branch, and Staff Director of the Interagency Resource Conservation Committee. In the course of these assignments he has been involved in a wide range of environmental, management and communications issues for the agency.

Before coming to EPA, Mr. Allen worked on the staff of the Secretary of Labor, at the Federal Energy Administration, the Cost of Living Council and VISTA.

He earned his B.A. with Honors at Yale University and his M.B.A. at the Harvard Business School.