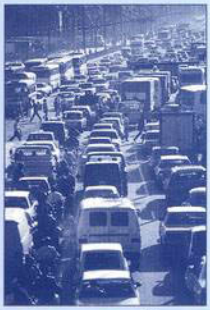
Ensuring Environmental Health in Postindustrial Cities



Workshop Summary

INSTITUTE OF MEDICINE
OF THE NATIONAL ACADEMIES

Ensuring Environmental Health in Postindustrial Cities

Workshop Summary

Bernard D. Goldstein, Baruch Fischhoff, Steven J. Marcus, and
Christine M. Coussens, Editors

Roundtable on Environmental Health Sciences, Research, and Medicine

Board on Health Sciences Policy
INSTITUTE OF MEDICINE
OF THE NATIONAL ACADEMIES

THE NATIONAL ACADEMIES PRESS
Washington, D.C.
www.nap.edu

THE NATIONAL ACADEMIES PRESS • 500 Fifth Street, N.W. • Washington, DC 20001

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Support for this project was provided by National Institute of Environmental Health Sciences, National Institute of Health (Contract No. 282-99-0045, TO#5); National Center for Environmental Health and Agency for Toxic Substances and Disease Registry, Centers for Disease Control and Prevention (Contract No. 200-2000-00629, TO#7); National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention (Contract No. 0000166930); National Health and Environment Effects Research Laboratory and National Center for Environmental Research, Environmental Protection Agency (Contract No. 282-99-0045, TO#5); American Chemistry Council (unnumbered grant); and Exxon-Mobil Corporation (unnumbered grant). The views presented in this report are those of the individual presenters and are not necessarily those of the funding agencies or the Institute of Medicine.

This summary is based on the proceedings of a workshop that was sponsored by the Roundtable on Environmental Health Sciences, Research, and Medicine. It is prepared in the form of a workshop summary by and in the name of the editors, with the assistance of staff and consultants, as an individually authored document.

International Standard Book Number 0-309-09061-X (Book)
International Standard Book Number 0-309-52717-1 (PDF)

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"Knowing is not enough; we must apply.
Willing is not enough; we must do."

—Goethe

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This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the National Research Council's Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. We wish to thank the following individuals for their review of this report:

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Balius Walker, Professor of Environmental and Occupational Medicine, College of Medicine, Howard University, Washington, DC

Although the reviewers listed above have provided many constructive comments and suggestions, they were not asked to endorse the final draft of the report before its release. The review of this report was overseen by **Melvin Worth**, Scholar-in-Residence, Institute of Medicine, who was responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authoring committee and the institution.

Preface

In 1753, George Washington recognized the importance of establishing a post along the Ohio River. Both the French and English began plans to establish a fort critical to trade and expansion at the point where the Allegheny, Monongahela, and Ohio Rivers met. Pittsburgh lived up to these expectations by being dubbed the Gateway to the West, as early nineteenth century immigrants went down the Ohio to start a new life. This port gave rise to two of Pittsburgh's first industries: boat building and outfitting. However, it was in 1811 that a marine engineer from New York, Nicholas Roosevelt, built the first steam-powered boat and established Pittsburgh's role in industrialization.

With its cheap energy sources from water, coal, and oil, nineteenth century Pittsburgh gloried in being the iron foundry of the nation. It welcomed the sight and smell of smoke as signs of leadership and prosperity. Penniless immigrants, such as Andrew Carnegie, made fortunes and were exemplars of the American Dream, inspiring legions of others to believe that the future was boundless. However, there was another side to this prosperity. Poor sanitation, water, air, and working conditions led to many health problems. Even the marble on buildings was stained dark gray to black. Large tracts of land were contaminated with dumped slag and chemical by-products of manufacturing. This environmental contamination was unjustly distributed in minority and disadvantaged communities. Formerly beautiful rivers were dead to fish and inaccessible to city residents. During his American tour, Dickens described midnineteenth century Pittsburgh as "hell with the lid taken off."

For better and worse, the days of intense industrialization have passed for southwestern Pennsylvania. Beginning before World War II and picking up pace afterward, Pittsburghers realized the threat the industrial pollution posed to their physical and economic well-being. In a region known for difficult relations between labor and capital, remarkable collaborations promoted smoke abatement and urban development, converting downtown Pittsburgh's rail yard into park and offices. Manufacturing is now a small part of the region's struggling

economy. The steel barons left a legacy of support for libraries, education, and cultural institutions that contribute to Pittsburgh's being one of the nation's most livable cities.

More recent developments have included stadiums and museums, including architecturally significant buildings. Some, including a new convention center and the headquarters of Alcoa and PNC, are at the forefront of environmentally sound design. A city that once turned its back on the rivers, as grimy highways or worse, is now developing the riverbanks. Almost dead biologically two generations ago, the rivers support good fishing at the Point and expanding populations of river otter upstream. Bicyclists ride along side active railroad lines and atop abandoned ones.

The combination of civic and self interest that brought about those changes was not enough, though, to prevent the collapse of the local steel industry, beginning in the late 1970s. The result has been vastly cleaner air, along with a stagnant regional economy. As might be expected, these overall changes have not affected area residents equally. The good jobs for hard-working laborers, with middle-class pay and benefits, have largely vanished. At the same time, the economic potential of the area's world-class hospitals and universities has increasingly been realized, bringing new opportunities. However, those institutions are both close to some economically challenged communities and far from others that once housed thriving industries.

Allegheny County long had one of the nation's highest African-American infant mortality rates. It took concerted efforts by the health care community, aided by local governments, citizens, and foundations to bring it down some, although by no means enough. Local research similarly showed the difficult way toward identifying and remedying the risks of lead pollution. The complexity of these problems shows the intertwining of health and environment and their social context. Addressing them requires not only good will and coordinated programmatic efforts, but also solid, interdisciplinary science. For example, a simple correlation of pollution and health does not capture the expression of environmental justice issues in this area (or perhaps any other) (Institute of Medicine, 1999). Neighborhoods that excluded minorities when the local mills hummed became low-income housing when the mills closed, taking jobs away and leaving pollution behind. Access to health services, training, and work requires reducing cultural barriers and providing public transportation.

Similarly, complex connections attend the relationship between the region's environmental and economic future. Dickens's image of Pittsburgh is still most nonresidents' association with the area, generations after it is no longer a reality. Thus, the region is paying a pollution tax long after much of the pollution is gone. Both positive and negative images are hard to erase. One can only speculate about the environmental reputations now being created elsewhere and their long-term effects. California's Garden of Eden drew people there long after the area was clogged with traffic and dirty air. The green images that drew people to

Atlanta have been replaced by sprawl, imperiling the greenery and even water supplies (Institute of Medicine, 2002). California has become a leader in the study and control of air pollution, while the southeastern United States has begun imaginative thinking about regional planning. One might wonder whether the current, sadder images will haunt those regions 20 years after they have turned their respective corners.

Of course, the future is not a given. Southwestern Pennsylvania stands at a crossroads. It might become the leader in postindustrial revitalization. It might provide the science needed for effective and efficient cleanup and growth, as well as developing the engineering and institutions needed to realize this potential. The contrast between its new and old images might serve as an inspiration to others facing similar despoliation. One striking image is the ongoing conversion of a giant slagheap from the old Carnegie (and later US Steel) Homestead Works into an upscale housing development. Reflecting a "new urbanist" architecture, its popularity reveals residents' preference for a denser lifestyle (but without the hassles of older homes).

A more complex image lies several hundred feet below this development, in Nine Mile Run. One of many such ribbons of green, created by the region's topography, it is also polluted by runoff from aging sewers. Cleaner in other respects, local waters are threatened by leaky sewers, storm water overflow, and septic systems ill-suited to the heavy local soils. Compliance with an EPA order may require billions of dollars and an unprecedented degree of collaboration among the fractured local governments. It may require a combination of top-down efforts and local initiatives, like those benefiting Nine Mile Run.

As residents reclaim the environment about them, they will confront other threats to it, some coming from outside the region. Pockets of nature created by steep topography provide natural breathing spaces, even in poor neighborhoods. However, a closer look often shows them to be deeply compromised by invasive species: Japanese knotweed along the now-accessible rivers, tree of heaven replacing native forests, and others. Upstream, there are abandoned mines, surges of whose acidic waters periodically destroy aquatic life below them. The success of local efforts to protect and restore these habitats will critically depend on state and federal policies (e.g., mining laws, plant import regulations).

A bit further away, Nine Mile Run's outlet to the Monongahela River may soon be bridged by a highway, running along the riverbank. The Mon-Fayette Freeway's advocates claim that it will bring economic opportunity to the depressed Mon Valley. That could improve regional health care and even provide resources for environmental restoration. It could also bring thoughtless development, increasing air pollution and sedentary lifestyles. It might deplete the central region, leaving its poor and their problems behind. It might undermine the coordination needed to preserve the regional commons and create an area that will attract outsiders and retain its own residents.

Thus, in southwestern Pennsylvania as elsewhere, health, economics, and environment are deeply connected. Central to the connections in this region is a past that has scarred it but has also provided resources. These resources include universities accustomed to integrating research and practice, governmental bodies that have long focused on environmental and occupational health, healthcare institutions with a tradition of community service, firms accustomed to working with other groups, and foundations with activist leadership.

In this context, the Institute of Medicine Roundtable on Environmental Health Science, Research, and Medicine held a regional workshop at the David Lawrence Convention Center, on March 13, 2003. This workshop was a continued outgrowth from the Roundtable's first workshop when its members realized that the challenges facing those in the field of environmental health could not be addressed without a new definition of environmental health—one that incorporates the natural, built, and social environment.

The Roundtable realized that the industrial legacy is not unique to Pittsburgh. Other cities around the world have seen their industries disappear, and it is only a matter of time before some of the Pittsburghs of today, such as Wuhan, China, (a sister city) will need to address similar problems. One goal for this IOM Environmental Health Roundtable Workshop is to extract lessons from Pittsburgh's experience in addressing the post-industrial challenge, distilling lessons that might be useful elsewhere.

Early in the planning process, Roundtable members realized that the process of engaging speakers and developing an agenda for the workshop was an important part of the enterprise. In their efforts to encourage a breadth of participation, Roundtable members sought the input of individuals from diverse fields—industry, health, foundations, environmental groups, engineers, architects, developers, and others. Their input helped to shape the agenda. We would like to thank this group of individuals for their contributions to making this meeting a success.

This workshop summary captures the discussions that occurred during the one-day meeting. Although, environmental health is broadly defined by the Roundtable, not all aspects of environmental health (e.g., social environment) or secondary factors (e.g. budgetary constraints) could be discussed in their entirety during the limited time of the meeting. This workshop summary captures the discussions and presentations by the speakers and participants, who identified areas where additional research was needed, the processes by which changes could occur, and the gaps in our knowledge. The views expressed here do not necessarily reflect the views of the Institute of Medicine, the Roundtable, or its sponsors.

Baruch Fischhoff and Bernard Goldstein
Summer 2003

Contents

Summary*

Bernard D. Goldstein

It is, of course, no coincidence that our symposium on "Ensuring Environmental Health in Post-Industrial Cities" took place in and applies directly to Pittsburgh—a city whose industrial past featured the dirtiest of workplaces but that today boasts a clearer atmosphere, stronger links to its historic rivers, new commercial and residential structures where major industrial facilities once stood, and a more modern designation. No longer the Steel City, Pittsburgh is now thought of as the Knowledge City, given the knowledge-intense, research-and-development orientations of its academic, governmental, and private-sector institutions.

The lessons we draw from this meeting's presentations and discussions naturally apply to other regions that have undergone similar change and that also must contend, as Pittsburgh does, with the legacies of past incarnations. But these lessons apply as well to virtually any region—whether post-industrial, pre-industrial, or just plain industrial—determined to face up to its environmental-health issues and do something about them in order to better serve its people and ensure a viable social and economic future.

Rather than summarize here the symposium's proceedings in a speaker-by-speaker or subject-by-subject fashion—that is the purpose, after all, of the succeeding pages—we thought it more useful in this Summary to briefly characterize the several cross-cutting themes that emerged, from virtually speaker after speaker, and that clearly must be central to regions' strategies for achieving sound environmental health:

Take advantage of the genuine interest and concern of the general public and decision makers. People really do care about the environment and, of course, about their own health and that of their families. And they are willing to act on those concerns, as poll after poll reveals.

*This chapter is an edited transcript of Dr. Bernard Goldstein's remarks at the workshop.

Involve the public and all stakeholders early and often. We must communicate openly and effectively, and ensure that environmental justice is served. Most of us have heard of NIMBY—"not in my backyard" —but a good way to communicate the essence of environmental justice is WIMBY, or "*why* in my backyard?" This is the situation, resulting from powerlessness, imposed by waking up one day to find that a whatever-it-is-that's-questionable is already installed in your backyard without your ever having had a chance to be among the empowered stakeholders, without your being part of the group that participated in this issue. Under the circumstances, there is no reason for the affected party to accept the solution, even if it happens to be seen by some as a good one.

Partnerships are essential. Whether the partnerships are between universities, or between universities and citizen groups, or between citizen groups and industry, or between any combination of sectors one can name, including government, such collaborations are critical—given the inevitably diverse array of stakeholders—for addressing environmental health issues.

Match vision with realism. This idea was phrased throughout the day in different ways, but by whatever name, our approaches should be practical. We must rationally match our visions to who we are and what we are realistically hoping to do.

Reduce fragmentation. As noted in one of the presentations, the 11-countries in the Southwestern Pennsylvania region have 492 individual entities that provide water or sewage service to the population. Such fragmentation can make partnering or establishing any kind of central direction—much less pursuing a common vision—highly elusive. ALCOSAN (the Allegheny County Sanitary Authority, which serves 83 communities, including the City of Pittsburgh) is an example, though an incomplete one, of multiple entities managing to work together. It's progress. Similarly, there has been progress in alleviating federal-level fragmentation. This meeting, for instance, saw the head of the National Institute for Environmental Health Sciences, the head of the Agency for Toxic Substances and Disease Registries, and the head of CDC's Center for Environmental Health all in the same room—an occurrence that would have been highly unlikely 5 or 10 years ago. Instead of competing, they are now cooperating in pursuit of common goals and employing, wherever possible, common approaches.

Integrate our environmental future within goals for economic growth. In other words, we must aim for "sustainable development."

Determine options' true costs. We cannot do cost/benefit analysis if we only—to use one example—price out the cost of asphalt versus the cost of concrete for a road and do not include their respective heat-island effects. Surely the elevated risk of heat stress and its effects on the community have a rightful place in our planning efforts; the environmental costs must be considered along with the economic costs.

We have to understand the consequences of inaction. We could always just

"do nothing"—an option made more likely by excessive fragmentation. But this too has its costs, economic as well as environmental, and should be chosen only if it's the most attractive option among others; it should not merely be the default position resulting from administrative paralysis.

More research is needed. This predictable statement could well be a macro on most researchers' computers, but in the case of environmental health it's exceptionally valid, and not just regarding basic research. It also pertains to the acquisition of pertinent data, the formulation of environmental indicators, and the transcending of mere effluent measurement to assess the effects on the human body—to what is happening in the environmental receptors of concern. We need more research, in effect, to better link decision processes to the end points.

Finally, although regions—and individual people—grow and evolve, and as we shape our present environment to our present needs, it makes sense not to forget where we came from and the things that informed us, enriched us, and made us unique—and that have equipped us to better respond to present challenges. Pittsburgh, being the Knowledge City, will inevitably grow farther and farther from its manufacturing-industry past. Yet can anyone imagine a time when that football team across the river will be called the Pittsburgh Knowledgers? Of course not. It will remain the Pittsburgh Steelers because that is our heritage. It's always going to be part of who we are, something to be reflected—and cherished—even as we go forward.

1

Introduction*

The members of the Roundtable on Environmental Health Sciences, Research, and Medicine hail from academia, industry, and government. Their perspectives range widely and represent the diverse viewpoints of researchers, federal officials, and consumers. They meet, discuss environmental health issues that are of mutual interest (though sometimes the issues are very sensitive) and bring others together to discuss these issues as well. For example, they regularly convene workshops to help facilitate discussion on a specific topic, and one such occasion is the subject of this report, which summarizes the "Ensuring Environmental Health in Post-Industrial Cities," workshop that took place in Pittsburgh, Pennsylvania, on March 19, 2003 (see Box 1.1).

A few years back, when the Roundtable began, it hosted a workshop called "Rebuilding the Unity of Health and the Environment: A New Vision of Environmental Health for the 21st Century." Ever since then, the Roundtable has been promoting a broader definition—a "new vision"—of environmental public health. This definition encompasses not only toxicology—the knowledge of how toxic substances might affect people—but also recognizes the very important roles of the natural environment and our health, the built environment and our health, and the social environment and our health. The Pittsburgh workshop was the second in this series, and its summary has been prepared by the workshop rapporteur to convey the essentials of that day's events. It should not be construed as a statement of the Roundtable—which can illuminate issues but cannot actually resolve them—or as a study of the IOM.

*This chapter was prepared from the transcript of the meeting by Steven J. Marcus as the rapporteur. The discussions were edited and organized around major themes to provide a more readable summary and to eliminate duplication of topics.

Box 1.1. Overview of the Workshop Summary

The Institute of Medicine's Roundtable on Environmental Health Sciences, Research, and Medicine comprises individuals from academia, industry, and government, who meet on a regular basis to discuss areas of mutual concerns. They regularly convene workshops to help facilitate discussion on a particular issue. After their first workshop in June 2000, the Roundtable began to sponsor regional workshops to understand the complex issues in various regions in the United States. Pittsburgh was chosen as a location for one such regional workshop because it exemplifies the challenges facing postindustrial cities.

At this workshop, the Roundtable used its working definition of environmental health—one that incorporates the natural, built, and social environment—to explore the complex issues in postindustrial cities. The Roundtable members environmental health could be discussed. This summary captures the dialog that took place over the course of the day from the presentations by local, regional, and national speakers, who expanded on some of the challenges facing postindustrial cities.

CHARGE TO SPEAKERS AND PARTICIPANTS

Baruch Fischoff

A couple of years after I moved to Pittsburgh, I had the opportunity to accompany a film crew, for a *NOVA* special on risk that went to southern Poland. This was a place where Andrew Carnegie would have felt right at home; actually, we visited some mills that Andrew Carnegie would have wanted to modernize!

The Poles were aware of that need as well. Nobody was interested in my being something of an expert on environment and risk. They were intrigued, however, by my being a Pittsburgher. They kept asking me "How did you do it?"

Some dramatic things had indeed been done here to clean up the air and the water. But these efforts had also incurred some tremendous costs in jobs and economics: a lot of the cleanup had come through deindustrialization.

We are still struggling with that issue. But we're also struggling with the environmental and health consequences of some of the successors to the heavy industries. Though we hear quite a bit today about the environmental problems associated with brownfields—legacies of the steel mills, among other industrial sources—environmental impacts are also associated with institutions such as universities. Academia has come a long way in the past 10 years toward recognizing its role not just in studying the environment but in taking responsibility for its own environmental impacts, though much remains to be done.

For one thing, more people need to see that environment and health must be addressed in an integrated way and that the benefits and costs are fairly shared throughout the community.

If we think back to the origins of public health, 150 years ago, environmental and health issues essentially arose together; but then some separation occurred as the fields specialized and established their own terrains. Now, however, people are increasingly seeing there's a need for the fields to come back together again.

I see this in my own research, which involves risk taking, risk decision making, and risk communication both in health and environmental areas. Much of my health work has to do with adolescents, particularly regarding sexually transmitted diseases, and I realized just a year or so ago that in talking to kids you often find them spontaneously bringing up the environment even if you're talking to them about, say, HIV/AIDS.

Pittsburgh is an unusual kind of place, because despite its environmental degradation there are little pockets of nature scattered throughout the city, and many kids appreciate them. There are spots, they will tell you, "where I can go and it's quiet. I can go there and no one will hassle me. I can go there and it's an escape from my daily environment."

I'd like to know what these kids have to tell us about the kind of environments we are leaving for them. If we're pursuing various policies in their names, we ought to respect their notions—of the kinds of environmental education they desire, of needs they see for preserving wild lands, of their attitudes toward economic notions like discount rates.

But even now they tell me, whether they realize it or not, that for those of us who are concerned with environment or with health there is an opportunity to think through how they fit together. And putting my Pittsburgher hat back on, although this is a region that has a lot to be proud of, I must say that it also needs to hold more conversations between people who specialize in different (though complementary) areas.

We should do this not only for our own good, but also because of the symbolism that is Pittsburgh's. This area has been a pioneer in so many things that people are watching us. If Pittsburgh can do it, other heavily industrialized places can do it as well. If Pittsburghers are successful, then other people will be happy to know about it and find inspiration in our example.

OVERVIEW OF THE WORKSHOP

The protection of the environment *is* protection of health, according to Lynn Goldman, Bloomberg School of Public Health, Johns Hopkins University. Environment and health are so inextricably intertwined, so strongly linked, that we should not even talk about the environment without also talking about health. And conversely, we should not talk about health without recognizing the important role of the environment.

For this meeting today, Goldman said, the Roundtable saw in particular the opportunity to understand the environmental health challenges that face this

country's postindustrial cities—factors such as air quality, water quality, and the quality of our daily lives. The workshop provided an opportunity to have a broader discussion on environment and public health and learn from local, regional, and national participants of the problems to be confronted in these urban environments.

> The protection of the environment is protection of health. Environment and health are so inextricably intertwined.
>
> *Lynn Goldman*

WHAT IS ENVIRONMENTAL HEALTH?

Kenneth Olden

The responsibility of the National Institute for Environmental Health Sciences (NIEHS)—located within the National Institutes of Health (NIH), a research-agency federation comprising 19 institutes and some 7 centers—is to determine the role of the environment in the development of human diseases. Once risk factors are identified, we have the further responsibility of formulating strategies—prevention, intervention, diagnosis, and treatment strategies—to manage those conditions.

That is a huge mandate. It turns out that virtually any human disease one can name—cancer, Alzheimer's, Parkinson's, osteoporosis, rheumatoid arthritis, and diabetes, just to cite a few—has an environmental component.

Human diseases are in fact caused by the interaction of three things—one's genetics, environment, and behavior—as functions of age or stage of development. So, for example, children are more susceptible in most cases to environmental exposures because their organ systems, such as the brain and the heart, are developing very rapidly. And senior citizens are more susceptible as well: their immune systems have been compromised to some extent, and they have likely formed a number of genetic lesions over the course of some 50 to 80 years.

Despite human beings' inherent vulnerabilities, diseases can still be prevented. And that is the emphasis at NIEHS. In addition to its important contributions to diagnosis and treatment, the agency focuses on preventing cancer, preventing Alzheimer's, and preventing Parkinson's, among other diseases—which also means safeguarding the environment.

As Judith Stern once said, "Genetics loads the gun, but environment pulls the trigger." This quotation drives home the point that one can inherit a genetic predisposition to a disease but never express it unless exposed to the environmental "trigger." Therefore it's hard to say which—the genetics or the environment—is more important. Francis Collins, my colleague at the Human Genome Research Institute, likes to say that diseases are 100 percent genetics and 100 percent environmental!

This implies that we have to make research investments across the board if we're to understand the interactions between genetics, the environment, and behavior. It won't do us any good as a nation to clone or sequence the human genome without knowledge of how genetic elements interact with the environment and behavior (which NIEHS regards, actually, as an aspect of environment).

In fact, we define "the environment" as a great deal more than synthetic chemicals and pollutants. It is the natural environment, industrial chemicals, agricultural chemicals, physical agents (e.g., heat, radiation), by-products of combustion and industrial processes (e.g., dioxin), foods and nutrients, pharmaceuticals, lifestyle choices and substance abuse, social and economic factors, and biological agents. In other words, the environment is everything *other* than genetics; it is all the components of the world that interact with our genetics to make us more or less susceptible, and it plays a major role in the development of disease.

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Kenneth Olden

It's fair to say that at NIH in general, and at NIEHS in particular, we put a lot of emphasis on social and economic factors. They are very important components of the environment. Consider the abundant evidence that poor people—especially racial and ethnic minorities—have a disproportionate burden of diseases that are preventable or curable. There is no explanation for why they have these diseases except for lifestyles, behaviors, and socioeconomic factors. In other words, poor people tend to live in the most hazardous environments and work in the most hazardous occupations because they are poor and uneducated and have limited options.

Identifying the risk factors, of course, is a top priority. But once they've been identified, we must formulate strategies to reduce or eliminate exposure to, or the action of, those risk factors. Even that is not enough. By developing the knowledge and technologies to prevent undesirable outcomes, we incur the responsibility of making sure that the knowledge and technologies get translated and transmitted to the public, into public health practice, and into the practice of medicine. This is an area, I believe, in which we have not been as aggressive as we could be. The fruits of science must be properly interpreted and be made widely available.

The same is true for conveying the importance of the environment in the development of human disease. Still, in that regard we have started to come of age; the lay public, and certainly the press, are finally realizing their critical role.

Therefore, the tasks that face us in environmental health are too important to be left to scientists or to federal employees like me. We need partnerships with

the public, with industry, unions, parents and teachers, civic organizations, and state and county health agencies.

And we need to regularly get out of our offices in Research Triangle Park, North Carolina or Bethesda, Maryland, or Washington, DC, or wherever, and meet and talk with—have a dialogue with—the American public. That's what environmental health is all about.

2

Keynote: Ensuring Environmental Health in Pennsylvania*

Kathleen McGinty

Most of this country's environmental progress over the years has been engineering-intensive, as in attending to many of our infrastructural needs that have environmental components—water supply, for example. We have focused far less on the environment's human-health linkages.

This is especially true for *global* environmental issues. It's hard enough to communicate local and immediate environmental concerns to the public, even when there is at least some degree of tangibility to people—in the smoke plume or the dirty water, for instance—that they may experience directly. But the communication problem is magnified in dealing with such abstract things as global warming and climate change, where the health connections are not always so obvious.

Here, we especially rely on experts to come forward and provide leadership, not only in explaining things but to persist—push forward on alerting the rest of us to health-environment linkages—when they meet with the inevitable indifference or outright resistance. Eventually, they help us see the light.

Often the missing link in environmental discussions is health. When health effects are brought to the forefront, the magnitude of the problem or the solution often becomes clear. For example, Sherry Rowland (a chemist at the University of California, Irvine) discovered the phenomenon of stratospheric ozone depletion; he was the first scientist to advance what some wanted to call a wild theory that chlorofluorocarbons might be causing it! But the importance of this work was not recognized until the health connections were made clear—he explained that people will suffer cancers because of the stratospheric ozone loss. That missing link was the health link, and this case certainly underscores just how important the work of people engaged in environmental health really is.

*This chapter is an edited transcript of Secretary Kathleen McGinty's remarks at the workshop.

The health community brings another dimension to the discussion as well. It is a *calming* dimension, in that it speaks to where the highest risks are and where the highest risks aren't, or how risk should be handled and understood. For example, the work that the health community has done in helping to answer the question of "How clean is clean?" has made a big difference in determining where our environmental cleanup dollars should go. The health community's willingness to step up to the plate and help federal, state, and local governments address that question to establish priorities is always very much appreciated, especially in tight budgetary times.

Such involvement has had the effect, for example, of enabling massive efforts such as Pennsylvania's brownfield cleanups—or what we like to call our "industrial-sites recycling effort." Toxic contamination has been cleaned up in this state at more than 1,000 sites, where economic vitality has once again been made possible.

This happened because at the same time that the health community was noting where there was a human health threat, it was also willing to distinguish between what was justified and appropriate and what was less so. This ability to calm concerns and fears by putting things into proper perspective is a very important asset.

Yet we must also acknowledge the vast arena in which we have very little information and where there is so much to do to fill in the details. For instance, we may know something about the impacts of some individual chemicals, but we don't know enough about the potentially synergistic interactions *between* them. Not only is our scientific understanding very rudimentary in that regard, but our regulatory programs have not been designed in ways to even consider those synergistic effects. Even though we do talk about watersheds and airsheds, for example, permitting decisions are usually made on the basis of individual requirements for particular pollutants, one at a time.

Another gap to fill: Theo Colborn points out in her book *Our Stolen Future* (which addresses issues related to endocrine disrupters and hormone-mimicking chemicals) that sometimes it isn't the *volume* of a chemical that might pose the most dangerous threat to a human being but the stage of that person's development when the exposure occurs. So for a small body that's rapidly developing, a small insult may make a vast amount of difference, much more so than if the insult were larger but happened at a later stage. There, again, health research is so important to our understanding of these complex matters, but it also is important because it shines a spotlight on some of the inadequacies of our regulatory structures.

Meanwhile, things are happening on the detection front. By tracking and monitoring acute and chronic illnesses, we are beginning to make linkages to environmental conditions that may be related to those illnesses. And here I must commend Pennsylvania's Department of Environmental Protection (DEP) for what it has been doing in this regard.

We started work several years ago, stimulated by the West Nile virus issue, to develop an innovative information-technology-based tool—a shared interactive database that for the first time brought data together from DEP, the state's agriculture department, and its health department. By including compatible sets of data in one open-architecture system and portal, analysts could see—in a very precise way and in real time—where incidences of West Nile were occurring, factors (such as weather, or the location of specific animal populations) that were contributing, and what actions would be most appropriate—for example, responders could make decisions on where to spray and where not to spray in a much more intelligent fashion.

Building on that West Nile database, the state created PAIRS—the Pennsylvania Incident Response System—which was developed in the aftermath of September 11, when it was realized that a much more effective real-time system was needed to gather data and understand situations that might be evolving. It too is a computerized tool that brings together a variety of Commonwealth agencies that can help us to understand, track, and stay on top of emergency incidents, as well as respond to them.

What we would now like to do is to build on that architecture even further—to make it a robust system that tracks linkages between environmental and health occurrences

3

The Changing Face of Pittsburgh: A Historical Perspective*

Joel Tarr

There is probably no place in the nation that can match Pittsburgh's dramatic changes over the past half-century. It is now a modern, beautiful city, among the most livable in the country, but it was far less livable when it was one of the world's great manufacturing centers. Pittsburgh was a "valley of work"—a place associated with industrial might and power, particularly regarding steel production. Issues of environment and public health did not often command high priority.

During that time, Pittsburgh was also associated with environmental degradation. In 1883, travel writer Willard Glazer wrote: "In truth, Pittsburgh is a smoky, dismal city at her best. At her worst, nothing darker, dingier, or more dispiriting can be imagined." Herbert Spencer, the great British philosopher, who was brought to Pittsburgh by his admirer Andrew Carnegie, put it more succinctly: "Six months' residence in Pittsburgh would justify suicide."

What did Pittsburgh actually look like? R.L. Duffus, writing in the *American Monthly*, said: "From whatever direction one approaches the once-lovely conjunction of the Allegheny and the Monongahela, the devastation of progress is apparent. Quiet valleys have been inundated with slag, defaced with refuse, marred by hideous buildings. Streams have been polluted with sewage and waste from the mills. Life for the majority of the population has been rendered unspeakably pinched and dingy. This is what might be called the technological blight of heavy industry."

To the casual observer, all of this might seem long gone, replaced by a green and gracious Pittsburgh that's a source of pleasure and pride to its residents. Unfortunately, some of the problems remain. The city's degraded water and air, for example, although much improved from the past, still present serious issues. There are environmental legacies of past decisions that this generation of Pittsburghers must now contend with.

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*This chapter is an edited transcript of Dr. Joel Tarr's remarks at the workshop.

GRIME AND THE RIVERS

One of the culprits behind pollution of the rivers, not only in Pittsburgh but other cities throughout the country, was the adoption by many households of the "water closet"—the flush toilet—and its associated sewer system that carried the toilets' charges to the rivers for disposal. These toilets were obviously much more convenient, efficient, and clean than the "on-site disposal" options—privy vaults and cesspools—that preceded them.

In the 1880s and 1890s throughout the United States, many cities made decisions to move toward the building of underground sewer systems, and between 1880 and 1910 or so, the city of Pittsburgh and others across the nation experienced a great wave of sewer-building. There was also a consensus on the type of sewer system to build—in Pittsburgh, as well as other big cities like Chicago, New York, and Boston, the answer was a combined-sewer system. It was "combined" in that it accommodated two basic streams of wastewater: the flow from toilets and other domestic uses; and the voluminous stream of water produced by storms. It's cheaper, obviously, to build one pipe to carry both streams than to build two pipes (one for each of them), and in fact this alternative was hailed as the most economical way to get rid of wastewater and move it out of the city. (Previously, domestic wastewater was disposed of in the preexisting on-site facilities, which were easily overwhelmed.)

The decisions about combined-sewer systems still haunt us today—they remain in place together with their major shortcoming—in a wet-weather situation, the sewage-treatment plants now installed at the end of the line cannot handle the volume. So the stormwater, together with the raw (untreated) domestic wastes it carries, is diverted to other places. In Pittsburgh, those places are its rivers.

At the turn of the century, the city built hundreds of sewer outlets that discharged raw sewage directly into all three of its rivers. Pittsburgh was by no means unique in this regard, but the result was that here, as elsewhere, people put their raw sewage into the water bodies that went right by their door, which often meant that populations downstreams were drinking water polluted with sewage. In a few cases, those "others" were us, since there were two Pittsburgh sewage outlets above the city water-intake pipes on the Allegheny River. In addition, a population of approximately 35,000 located upstream from Pittsburgh on the Allegheny was discharging their raw sewage into the river. Since sewage treatment would not be implemented in Pittsburgh for another 50 years, it was the rivers where untreated wastewater inevitably wound up, whether during a storm or not.

Agitation to remedy this problem began in the early 1890s. Physicians, public-health officials, sanitarians, and especially women's groups recommended that Pittsburgh begin to filter its water. The city council appointed a commission in 1897—led by Allen Hazen, a famous MIT engineer—which in 1899 recom-

mended that Pittsburgh build a slow sand-filtration system. This decision was not implemented until 1907, owing largely to political wrangling, as typical to those times as it is today. Chlorination followed in 1911, and by 1912 the system's beneficial effects were clear: Pittsburgh's death rates from typhoid fever were down to the national average, whereas for years before it had led the nation by a wide margin.

The problem seemed to have been solved. But not quite. Raw sewage continued to go into the rivers, in spite of the fact that in 1910 the commissioner of health of the state of Pennsylvania, Samuel Dixon, tried to get Pittsburgh to stop. Invoking his authority under the Purity of Waters Act of 1905, he requested that the city begin treating its sewage and also consider getting rid of its combined-sewer system altogether—that is, replacing it with two separate systems.

Pittsburgh again called in the famous MIT engineers—Allen Hazen and colleagues—who responded with an emphatic "no." Noting that there wasn't any precedent for a large city to build a sewage-treatment plant for the benefit of downstream cities' water supplies, they concluded that those cities should have to treat their water themselves—filter and chlorinate it—and that Pittsburgh's rivers could continue to be used for purposes of "dilution"—i.e., getting rid of the sewage.

The inability of the state to force Pittsburgh to treat its sewage at that time meant that the city disgorged its raw sewage into the rivers until 1958. At that time ALCOSAN (the Allegheny County Sanitary Authority), developed in the period after World War II, brought on line its sewage treatment plant. Nevertheless, the legacy of the combined-sewer-system decision continues to affect us very much today: during a rainstorm the untreated domestic wastewater, together with the stormwater, bypasses the treatment plant and goes into the river, frequently causing the county health department to issue warning of fecal contamination.

CLEARING THE AIR

Pittsburgh has a tremendous natural resource, and that resource is bituminous coal. Some people say that more money has been made out of the Pittsburgh coal seam than any other mineral deposit in the history of the world. For more than 150 years, it provided an inexpensive fuel that was heavily used locally—by industry, homes, railroads, and riverboats. But it is also a very dirty fuel, and its consumption resulted in the air-quality problems of smoke.

The issue of burning coal and producing smoke has long been a complex matter here because, for many people, smoke meant progress. When were the steel mills not smoking? They were not smoking during economic depressions. Similarly, to the smoke-spewing transporter of choice in the 1940s, "The Pennsylvania Railroad looks ahead" was a slogan linked to coal.

FIGURE 3–1 As late as the 1940s, city lights had to be turned on in the daytime because of darkness caused by pollution. At the time, people recognized the quality of life and "nuisance" issues; however, today we have a better understanding of the relationship between air pollution and human health. SOURCE: From the pictorial archives of The Historical Society of Western Pennsylvania. Reprinted with permission.

Of course, the smoke had many devastating effects on the city and the way people lived. Some of the most famous were the conditions downtown at midday when street lights had to be turned on (Figure 3–1). The vegetation around the city was also affected; in contrast to the very green city of today, before smoke-control many of the hills were completely denuded by the fumes (Figure 3–2). We had acid rain before they even invented the term.

Not until recently was the relationship between smoke and air pollution and human health directly addressed. Most smoke-related questions revolved around the issue of "nuisance." It made homes dirtier, it increased the price of cleaning, and department stores couldn't keep goods clean. The city had to turn the street lights on, and so on.

Some even insisted that smoke was *beneficial* to people's health. In 1866, travel writer James Parton said: "The Pittsburgher insists that the smoke of bituminous coal kills malaria and saves the eyesight. The smoke, so far from being an evil, is a blessing, and it destroys every property of the atmosphere that is hostile to life." Fortunately, not everyone believed that. Again, a women's group,

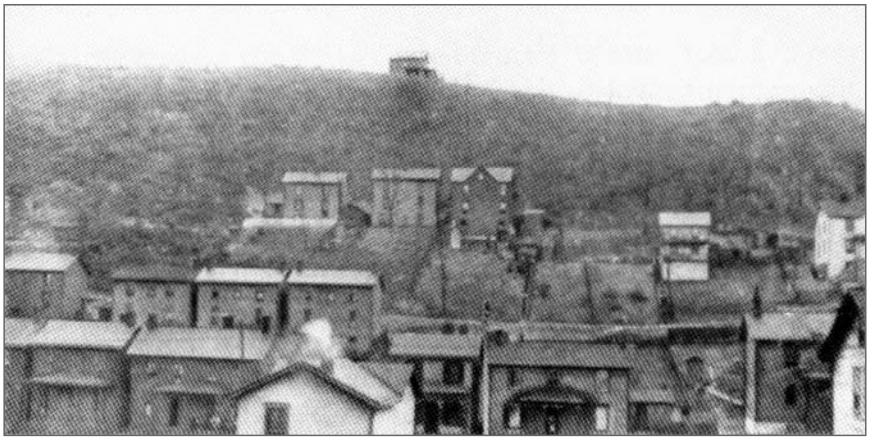

FIGURE 3–2 This picture circa 1910 on the outskirts of Pittsburgh illustrates the effect that air pollution had on the growth of vegetation. At this time, it was common to have trees denuded by the fumes. SOURCE: Byington, 1910.

the Ladies Health Protective Association, was organized in 1889 to try to do something about the smoke problem, but they were far less successful than with water filtration.

For one thing, some major investigations came up empty with regard to the impact of smoke on health. A report of the Mellon Institute—a six-volume study done between 1910 and 1914—focused on the *economic* costs of smoke; researchers had to downplay its health costs because they could not determine any of air pollution's relationships to various diseases. They concluded that although Pittsburghers had mottled lungs, this was not dangerous to their health because of what they called "pulmonary anthacosis," or formation of lesions that allegedly warded off bacteria and promoted healing in the case of tuberculosis.

After years of ineffective attempts at smoke control, Pittsburgh finally took action to reduce its smoke burden (see Figure 3–3). Pittsburgh, in fact, followed the lead of St. Louis, which in 1940 passed a very strong act to regulate fuel type and fuel-burning technology. Pittsburgh did much the same in 1941. The war interfered with the implementation of this law, but there was a strong push in the postwar period led by the Allegheny Committee on Community Development, to pick up the pace with the media and women's clubs driving home the lesson of the ill effects of smoke.

The law was implemented, the air got cleaner, buildings were cleaned up, the hills became greener, and many people were very satisfied with themselves.

FIGURE 3–3 Post-World War II, there was a strong public health campaign in Pittsburgh to link health to air pollution, 1941. SOURCE: The Historical Society of Western Pennsylvania. Reprinted with permission.

Legislation appeared to have done the trick. But the fact is, the legislation alone *didn't* do it. What really dealt effectively with the city's smoke problem was an unexpected development—the German submarine fleet! During World War II, U-boats were sinking oil tankers off the Gulf coast just about as quickly as they could leave their ports, and the United States was faced with the problem of getting oil up to northern industrial areas like Pittsburgh. So it built two large pipelines: Big Inch and Little Inch. At the end of the war, these pipelines were bought by private interests and converted for transporting natural gas, which had heretofore been flared off uselessly in the oil fields of Texas and Oklahoma. At the same time as the smoke-control act was being implemented, clean and inexpensive natural gas was flowing into the Pittsburgh area, as well as into other cities. And it provoked a rapid changeover: between 1945 and 1950, more than half of Pittsburgh's households switched from coal to natural gas. The clean-air legislation wasn't irrelevant, however, and the strong smoke-control law helped hasten the changeover.

Another major technological change that occurred around this time was the shift from coal-burning locomotives to diesel-electric. In 1950, the United States had 35,000 coal-burning locomotives; by 1954, there were 350. This was one of

the most rapid technological transformations in United States history, and of course it too made a big difference in Pittsburgh and around the nation in regard to air quality.

BEYOND CELEBRATION

It's clear that the definition of progress held by many people in the nineteenth century and early twentieth century did not include environmental values, and certainly the relationship between health and environment was not acknowledged or much understood. But substantial changes have been made since then.

Citizens groups have continually been important in that regard, certainly in Pittsburgh. Much of the pressure on local industry for air-pollution reduction—for instance, in pushing for enforcement of the laws—was applied by a group called GASP (Group Against Smog and Pollution), again with women dominating.

All in all, Pittsburgh—once a city of great environmental degradation—has made dramatic advances in addressing its inherited problems. Nevertheless, we still have a long way to go, which requires that we look beyond all the accomplishments of the past to focus on problems of the present and the future. As the environmental historian Samuel P. Hays has said, we must go "beyond celebration."

4

Special Issue for Pittsburgh: Our Rivers*

CRADLE OF THE AMERICAN INDUSTRIAL REVOLUTION

Mark Twain once compared a river to a book with endless stories to tell: "The face of the water, in time, became a wonderful book, a book that was a dead language to the uneducated passenger but which told its mind to me without reserve, delivering its most cherished secrets as clearly as if it uttered them with a voice, and it was not a book to be read once and thrown aside, for it had a new story to tell every day."

If one river can be the source of a thousand stories, said Mark Nordenberg, chancellor of the University of Pittsburgh, just imagine how many might be told in this city, where the Allegheny and the Monongahela converge to form the Ohio. In many respects, he suggested, the story of Pittsburgh *is* the story of its rivers.

Hugh Henry Brackenridge, also a man of letters—generally credited with writing the first American novel, though he was better known in this community for his service as a legislator, member of the state supreme court, and founder of the University of Pittsburgh—beheld the settlement at the confluence of the Allegheny and Monongahela Rivers and was transfixed by a powerful and prescient vision of its future. "This town," he said in the 1780s, "must be a place of great manufactory—indeed, the greatest on the continent or in the world."

Pittsburgh did become the cradle of the American industrial revolution, Nordenberg said, and its rivers played a huge role in its growth. By the early 1800s, boat making was the city's most important industry; the world's first steamboat, in fact, was built here to make river travel easier.

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*This chapter was prepared from the transcript of the meeting by Steven J. Marcus as the rapporteur. The discussions were edited and organized around major themes to provide a more readable summary and to eliminate duplication of topics.

The growth of other industries followed. As Franklin Toker noted in his book *Pittsburgh: An Urban Portrait* the city gave (or rather, sold) the world its first mass-produced oil, steel, aluminum, and glass. It created, through Heinz, the world's first hygienically packaged food, and Westinghouse pioneered the generation of AC electricity to supplement Edison's DC.

> If one river can be the source of a thousand stories, just imagine how many might be told in this city, where the Allegheny and the Monongahela converge to form the Ohio. In many respects, the story of Pittsburgh is the story of its rivers
>
> *Mark Nordenberg*

There was another side, of course, to Pittsburgh's industrial might—the high ecological price it paid as the capital of American manufacturing. Though long-time residents might still remember the city's street lights having to be lit in the middle of the day, Pittsburgh has made significant progress in overcoming that part of its legacy. Focused attention also has been paid to water quality and to river use.

To some extent, those changes are tied to the transformation of the regional economy. In traveling Pittsburgh's riverbanks today, one sees high-technology developments of the University of Pittsburgh, University of Pittsburgh Medical Center, and Carnegie Mellon University where steel mills used to be.

"It has been said that rivers are highways that move on, and bear us wither we wish to go," said Nordenberg. Today, the Pittsburgh community is charting a new course that it hopes will be not only be economically productive but ecologically responsible and environmentally healthful. "Success will depend in no small measure," he concluded, "on clean rivers used in ways that make them one of our most important regional assets and amenities."

After Nordenberg's introduction, a panel of speakers discussed the pollution of Pittsburgh's rivers, the causes, and specific ways to clean them up, as well as plans for the reclamation and revitalization of the city's riverfronts to better serve its people.

POLLUTED RIVERS, SEWAGE OVERFLOWS

In the spirit of Joel Tarr's earlier point that Pittsburghers should get "beyond celebration," Jared Cohon, president of Carnegie Mellon University, noted the need for major action to improve the water quality of the city's rivers. While they are cleaner than they used to be, he observed, they're "not as clean as we think they are." Indeed, there is still a long way to go.

For example "river advisories" (official notices that the water is unsafe for human contact) have been in effect since 1994 for an average of 37 percent of the summer recreational season. In the most recent two years for which data are available (2000 and 2001), the seasonal average has been 50 percent—that is,

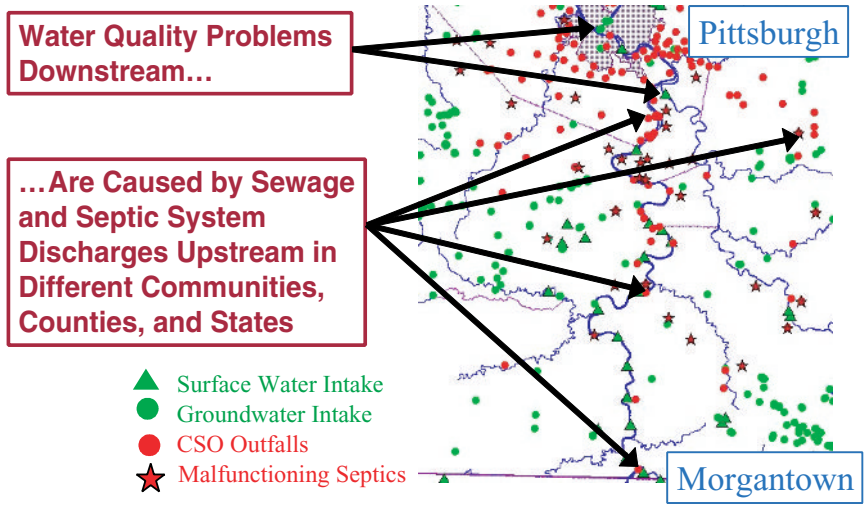


FIGURE 4–1 Water quality problems are caused by a number of sources, including: combined sewer overflows (CSOs), malfunctioning on-lot septic systems, and homes without sewage treatment of any kind. Contamination from these sources flow downstream and across jurisdictional boundaries. SOURCE: Southwestern Pennsylvania Water and Sewer Infrastructure Project Steering Committee, 2002. Reprinted with permission.

river advisories were issued on half of the days between mid-May and mid-September.

The pollution of Pittsburgh's rivers has three basic causes (see Figure 4–1), Cohon said, and the leader by far is overflow from combined-sewer systems (which carry sewage and storm water runoff alike). During rainstorms the flow into the system increases enormously, overwhelming the capacity of the pipes to carry it or the treatment plants to treat it. Consequently, much of the system's load, including raw (untreated) sewage, is dumped into the rivers.

With 414 outfalls, Pittsburgh's Allegheny County leads all of the nation's other counties in combined-sewer overflows (CSOs; see Figure 4–2). The state of Pennsylvania is a "leader" as well, topping out at 1,671—Michigan, by contrast, has 725, and New Jersey has 307.

Pittsburgh's CSOs, moreover, are often activated even under dry conditions; because this urban sewage system is old and degraded, water seeping into the pipes increases flow beyond the level for which the system was designed, creating "uncontrolled overflows."

The second reason for Pittsburgh's polluted rivers is failing septic systems. This is a particular problem here, Cohon said, because the region is cursed with bad soil with regard to its suitability for septic systems. By federal standards, in

States with the Most Combined Sewer Overflows

Rank	State	CSOs
1	**Pennsylvania**	**1,671**
2	Ohio	1,507
3	New York	1,075
4	Indiana	944
5	Illinois	773
6	Michigan	725
7	Massachusetts	417
8	Kentucky	369
9	New Jersey	307
10	Maine	277

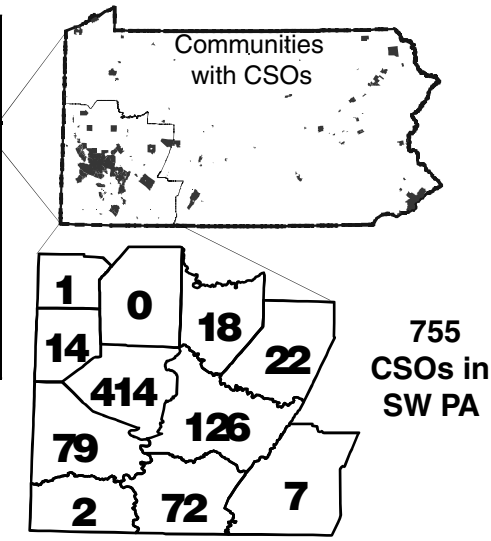


FIGURE 4–2 Pennsylvania ranks number one in the United States for the most combined sewage overflows (CSO). These overflows are predominantly concentrated in southwestern Pennsylvania. State level CSO information based in part on unofficial EPA estimates, 1998. SOURCE: Southwestern Pennsylvania Water and Sewer Infrastructure Project Steering Committee, 2002. Reprinted with permission.

fact, a very small fraction of the land is suitable for septic systems. Furthermore, it is estimated that about half of the existing septic systems are "failed"—and there are some 300,000 of them.

Finally, the third reason: 27,000 local homes have no sewage connection whatsoever! Strictly speaking, this has been illegal for 33 years, and it should simply not exist anywhere in America today, especially not in an urbanized area that considers itself sophisticated, Cohon said.

These three major sources—especially the first two—present a complicated regional problem. For one thing, the locations of CSO outfalls, failing septic tanks, and drinking-water intakes are all interspersed.

It is also a problem with high stakes: expensive to fix yet expensive *not* to fix. It bears directly on the Pittsburgh area's ability to develop economically—a very high priority in this region. Within many local jurisdictions, there are "tap-in restrictions"—additional main sewer lines or laterals (the pipes that run from buildings to the main line) are forbidden because the system is already overtaxed. The result is that nothing new can be built in these locales.

Solving this problem will be a major undertaking in terms of regional intergovernmental cooperation, not only because this region has never attempted such an effort before but because it faces a particular challenge in doing so. The Pittsburgh area's fragmentation is renowned; locals acknowledge that the numbers of police departments, school districts, and so on, usually exceed those of any other region of this size. The same is true, perhaps by even greater margins, when it comes to water and sewage. The 11-county Southwest Pennsylvania region has 492 individual entities that provide water or sewage service to the population. These entities, together with the almost 600 local political jurisdictions and more than one million households, will need to cooperate on an unprecedented scale.

It is also going to be expensive, said Cohon. He and his colleagues in the Allegheny Conference on Community Development (self-described as "a private leadership group dedicated to improving the quality of life and economy of the southwestern Pennsylvania region") have estimated a total cost of $10 billion, with the biggest part being some $8 billion to repair and expand the existing sewer and sewage-treatment system. For example, storage needs to be designed into the system so that when it rains there is a way to hold the water—together with the raw sewage—rather than discharging it, and then treat it (with the aid of enhanced capacity) after the storm surge passes.

These costs can be reduced in several ways, he said, beginning with regional cooperation—there are substantial economies of scale in sewage collection and treatment. Building one big treatment plant instead of two smaller ones, for example, can save a great deal of money.

Savings are also possible through use of the latest technology. Typical costs to install a lateral—and roughly half of the region's existing laterals are broken and need to be replaced—run from $5,000 to $10,000. But new so-called "trenchless" technology obviates the need to dig up a lawn—it is faster, less disruptive, and relatively inexpensive (on the order of $1,000).

Another approach is to increase the revenues generated by Pittsburghers' sewage bills—certainly an unpopular message that no politician would wish to convey. Cohon maintained, however, that the region's homeowners actually pay less for sewage services at present than do their counterparts in most others parts of the country.

But even if the Pittsburgh area does reduce costs through regional cooperation and the latest technology, and it increases revenues through higher rates, a major gap will still remain that can only be filled by funds from the federal and state governments.

To coordinate these three approaches and deal with the remaining shortfall, the Allegheny Conference on Community Development has been working to create a virtual regional body—the Watershed Alliance for the Three Rivers Region (WATRR)—that would provide critical services from three existing organizations:

- *Education and technical assistance* through 3 Rivers Wet Weather, Inc., a pilot project funded by the state and the U.S. Environmental Protection Agency.
- *Goal- and priority-setting* through the Southwest Pennsylvania Commission, which is representative of the entire region, as its board consists primarily of the commissioners or county executives of each of the counties.
- *Advocacy*—that is, strong representation in Harrisburg and Washington—through the Greater Pittsburgh Chamber of Commerce/Southwest Pennsylvania Growth Alliance.

The Conference has also convinced the National Research Council to undertake a national study, using Pittsburgh as the focal point, on the issue of combined-sewer overflows and how to address it regionally. The NRC accepted the challenge and created a committee of national experts that has been meeting now for about a year, with one year left to go.

The resulting report will be very important not just for this region but for the entire nation, Cohon said, as will the efforts of the region's organizations, experts, and citizens.

In the near term, he suggested that a number of steps could be implemented. These include:

- help regional organizations take responsibility for implementation,
- launch a long-term program of public education and outreach,
- demonstrate how to apply best technologies and approaches to address specific problems,
- get key studies underway,
- seek public and private assistance (e.g., funding and policy change, regulatory support).

"If you can solve the problem in Pittsburgh," he concluded, "you can do it anywhere."

RIVERS AS OUR FUTURE

The charge of the Riverlife Task Force, according to Executive Director Lisa Schroeder, is to create a master plan and vision for Pittsburgh's rivers, coordinate what has been a series of individual development projects, and "make Pittsburgh's riverfronts among the most spectacular in the world."

In pursuit of these goals, the mayorally appointed Task Force—consisting of 46 civic leaders from the public, private, and nonprofit sectors—is taking two mutually reinforcing approaches. First, in trying to set a new paradigm for involving the public in the planning process, it has held over 120 meetings ranging in size from get-togethers in community-halls or church basements to

full-scale regional sessions in the convention center. Second, the Task Force has convened the owners of riverfront property; remarkably, there are but six major riverfront-land owners within the study area. Engaging them is critical, Schroeder pointed out, "because we are working to create a public domain on land that is not in all instances public."

Basically, the Riverlife Task Force is working to ensure that the coming together of Pittsburgh's three rivers—their confluence—functions as the center of the region, she said. "This river joins our communities. It can become the thread of our public space and the way in which we tie all amenities and all of our public domain together."

In our public-meeting process, Schroeder noted, "there was no more consistent and powerful message than that people want connections to the rivers. They want to get to the rivers, they want to move along the rivers, they want to touch the rivers."

But trying to eliminate impediments to the riverfronts, given the city's topography, is no mean challenge. The simple fact that much of this region's flatland lies alongside the rivers means that it is layered over by a complex web of elevated highways, railroad tracks, and parking lots. In effect, Pittsburgh's best and most valuable real estate is populated by vehicles.

The crux of the Task Force's proposal is to create a public park, Three Rivers Park, where community life could be centered—in the heart of the confluence at the heart of the basin—with a continuous rim of green, open, public space around the edges, and commercial development flanking the sides that contribute to the creation of that public domain. Working within, at a minimum, the 50-foot setback that exists under current zoning regulations, the space would be linked along the shoreline, across the bridges, and—through water landings—across the water. The existing Point Park, at the rivers' confluence, would be the center of the extended park, which of course would include the water itself.

Schroeder cited the Task Force's nine guiding principles that underlie its plan:

- Organize riverfront investment in relationship to the shared vision of Three Rivers Park as Pittsburgh's premier public domain.
- Reinforce the power of place by revealing and seeking inspiration in history.
- Enhance the shoreline experience and the range of uses encouraged to locate along the riverbanks.
- Increase connections to the rivers, especially from the neighborhoods, and endeavor to create new neighborhoods near the rivers.
- Activate the water sheet itself by incorporating diverse uses while remaining cognizant of potential conflicts among them.
- Celebrate the City of Bridges through lighting and pedestrian amenities and by incorporating them into the river trail system.

- Improve regional connections and the continuity of public green space along the rivers' edges.
- Consolidate transportation and minimize industrial impediments at the rivers' edges.
- Incorporate the values of urban ecology and sustainability into the implementation of the plan.

"We are now working to define what that public edge can and should look like, what the landscaping framework can be, what kind of connections can pass through private development to link the public realm to the private, and what kind of connections can become public links from the landscape into the rivers and the park (see Figure 4–3)," said Schroeder. The idea is to "create, at the end of the day, a place that is unforgettable, that is Pittsburgh, and that contributes to the human health of our environment."

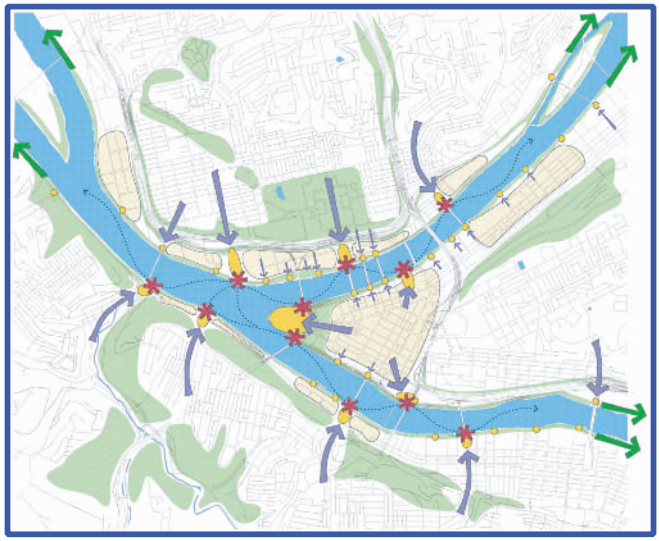


FIGURE 4–3 The map reflects topography, natural landscape, waterscape, and public connections to the water. The arrows show important public byways and entries into the park system, and the asterisks denote a series of water landings the edge—places where public uses may reinforce each other. SOURCE: Riverlife Task Force. Reprinted with permission.

5

Improving Health in the Built Environment: A Daunting but Doable Challenge*

Richard J. Jackson

Our behavior and well-being are influenced by the physical environments in which we live. These environments, however, particularly in the United States, are steadily becoming more detached from the natural world, chemically contaminated, psychologically oppressive, and hazardous to our health.

Such trends in the built environment will only be exacerbated by an ever-growing population. In the lifetime of a contemporary middle-aged person, this country's population has doubled. We have added some 140 million people. And in the lifetime of a child born today, the population will double again. By the time that child reaches old age, the nation will have close to 600 million people. To avoid environmental health catastrophe at that level, and even well below it—we already face some serious issues under present conditions—we must reconsider the ways in which we design our daily landscape so as to reduce and hopefully even reverse the environmental public health trends we face today.

In modern science, we are good at isolating problems and solving them, and this focused method has worked very well for us. We cure and prevent disease in ways that were just a dream one or two generations ago. Yet, we pay a price for this because our approach to each challenge is very, very narrow—we are often unaware that the failures we encounter have system causes, rather than just individual. But we cannot address specific issues such as climate change, and epidemics of asthma, obesity, and diabetes just with piecemeal fixes. The problems and challenges are networked, not isolated.

A useful term in this regard is "syndemic"—two or more epidemics that interact synergistically, thereby contributing to an excess burden of disease in a population. The environmental health challenges we are looking at—the outcomes of how we build our environments—are in many ways syndemic.

*This chapter is an edited transcript of Dr. Richard Jackson's remarks at the workshop.

"LANDSCRAPING" DEGRADES ENVIRONMENTAL HEALTH

In the first half of the twentieth century, we built skyscrapers and, in the second half of the twentieth century, we built landscrapers—"improvements" such as huge expanses of highways, interchanges, parking lots, and strip malls. Among other things, they adversely affect the quality of our drinking water, our air, our stress levels, and therefore our health.

The best thing we can do for water is to have it infiltrate past trees, which slows it down and allows it to percolate into the soil. The more infiltration of water through the soil, the better it is for health.

But in the Atlanta metropolitan area, for example, an average of about 58 acres of these remarkable green objects called trees—which not only slow down the rain and prevent runoff but reduce greenhouse gases and release oxygen—are cut down every day. At present development rates, New Jersey is about a generation from being built out—right to left, top to bottom—and California is losing about 500 acres a day. The United States has now paved over the equivalent area of the state of Georgia and the resulting impervious surfaces interrupt the cycle of water returning through the soil and thereby degrade the quality of the water we ultimately use.

Another issue related to paving things over is the generation of heat. Surfaces such as asphalt or tar are much hotter, all else being equal, than areas that are green with plants. Thus, cities create their own "heat islands"; the downtown areas of most cities run about seven degrees hotter in summer than the surrounding countryside—not only because of the surface itself but also from the obligatory use of air conditioners in the absence of cooling tree cover.

As it gets hotter, more ozone and other air pollutants are produced in the atmosphere. So, urban heat is a health threat in several ways—directly from heat stroke, and indirectly from much higher levels of airborne irritants. The risk of asthma has been growing in a stepwise fashion in the United States. Just about any school nurse will attest that while asthma in school kids was relatively uncommon 25 years ago, it's now a virtual epidemic, with typically a third of the kids who come in for medical attention suffering from asthma or a related condition.

Consider a Los Angeles study that compared six high schools in low-pollution areas with six high schools in high-pollution areas. Researchers looked at young athletes when they entered high school and then again four years later. The kids from the high-pollution areas had twice the asthma rate as compared to their low-pollution-area counterparts.

Another illustration: during the Atlanta Olympic Games in 1996, there was a dramatic reduction—a 30 percent decrease—in the city's car and truck traffic, with a consequent 30 percent improvement in air quality. When researchers from CDC and other local health-research institutions looked at pediatric Medicaid claims, Kaiser HMO visits, emergency-room cases, and hospital admissions for asthma, they observed that all had dropped during the Olympic period. Afterward, the rates went right back up to what they had been before.

Some have alleged that these results are inconclusive—that people may have been diverted by the Olympics and simply didn't have the time or inclination to go to the doctor. But no comparable decreases were observed during that period for nonrespiratory diseases.

DRIVEN TO DEPRESSION, OR WORSE

The "landscraping" trend cited above—largely to serve cars, of course—has effects that go well beyond degradation of the water and air and the increased incidences of related diseases. We spend more and more time in our cars—commuting time to work, for example, has gone up 14 percent in just the past 10 years—and this is not merely tedious and fuel-consuming. The more time spent in one's car, the greater are the actuarial risks of automotive-related death.

Every 66 miles driven confers upon us a lottery ticket—a one-in-a-million chance of dying in a car crash. It isn't much better being a pedestrian (see Figure 5–1). We have not designed our cities for pedestrians in general, and it

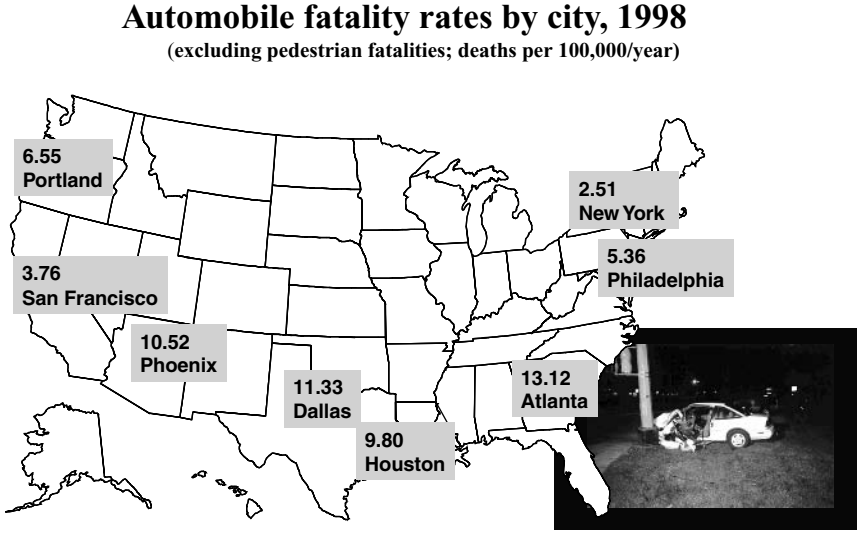


FIGURE 5–1 Sprawl cities, where people spend more time driving, have higher rates than cities with greater density (fatality rates per 100,000 people per year). New York and Philadelphia, both of which are "walking" cities, have rates of about 2.5 and 5, respectively; while heavily "freewayed" Dallas and Atlanta have much higher rates at approximately 11 and 13. SOURCE: Chart created from National Highway Traffic Safety Administration, 2002.

has gotten considerably worse with the spreading reign of the automobile. As shown in Figure 5–2, pedestrian fatality rates are higher in sprawl cities than they are in denser cities. When we build with low density, the amount that people walk goes down and the amount that they drive goes up. For example, parents spend more time chauffeuring their children around, children who most often would rather walk in the first place, if only they had the option.

I believe that this removal of autonomy from a child's environment actually has adverse developmental effects. Children need to be presented with tasks that are reasonable, ones that they can overcome and build on. As renowned pediatrician/child psychiatrist Herbert Needleman has said about young children, "It is the job of a child to taste, touch, and feel its environment, to immerse itself in its environment." School age children need continuing challenges of mastery. Every parent and teacher knows that it is important to present to the learning child tasks that are doable, where they can succeed, but not too easily. I worry about the infantilization of the school age child that occurs when he must be driven to the library, to sports games, to the store, or to everything else. It cannot be good for

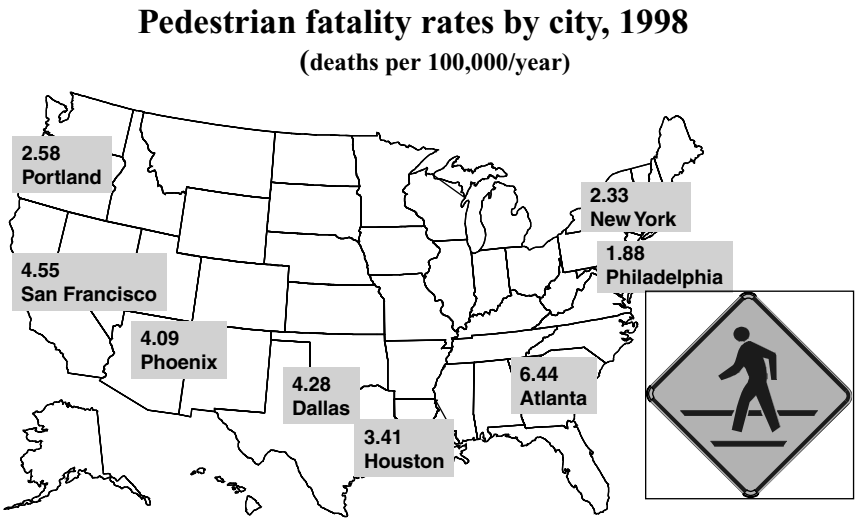


FIGURE 5–2 How we build our cities and the lack of walkable environments may contribute to pedestrian fatalities. Sprawl cities, where people spend more time driving, have higher rates than cities with greater density (fatality rates per 100,000 people per year). New York and Philadelphia, both of which are "walking" cities, have rates of about 2.33 and 1.88, respectively; while heavily "freewayed" Dallas and Atlanta have much higher rates at approximately 4.28 and 6.44 respectively. SOURCE: National Highway Traffic Safety Administration, 2002.

children to lose the ability to actually carry out the basic tasks of their lives themselves and to do so at their own pace, to have space and time for reverie, talking, and increasing independence.

Children are taken to school. In many places, they no longer have phys-ed classes. Children are expected to stay in the cafeteria during lunchtime, oftentimes not allowed to run around because of one modern security problem or another. At the end of the day they get back on the school bus or in a car to go home, where parents—also concerned with security—may place further limits on their autonomy. It's probably no coincidence, then, that we are looking at an epidemic of methylphenidate (Ritalin) consumption (see Figure 5–3) or that three million children in the United States suffer from depression.

Of course, not all these prescriptions or cases of depression come only from how we design and build our communities—that is, for automobiles rather than for human beings—but even if it affects, say, only 5 to 10 percent of children in such ways, that is still an enormous number of kids. Clearly, this is an important area for further research.

THE HAZARDS OF OBESITY

The limited freedom to walk also bears some responsibility for our epidemic of overweight. In 1991, the percentage of obese adults (with Body Mass Indexes

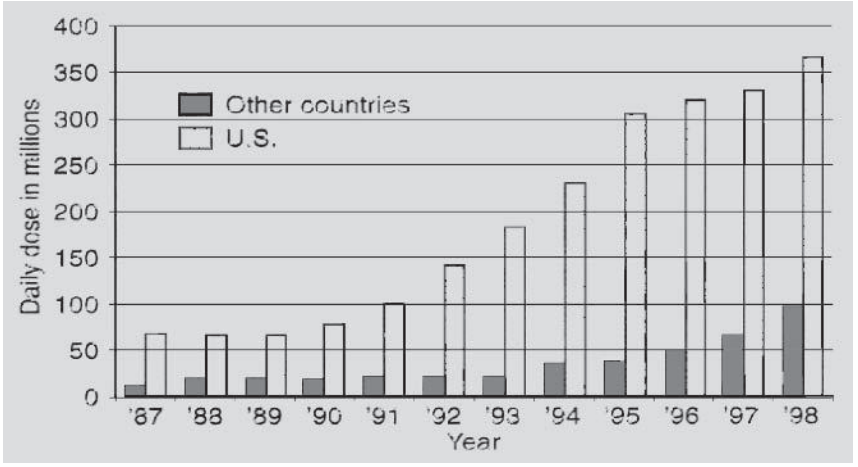


FIGURE 5–3 The number of doses of methylphenidate (Ritalin) dramatically increased from 1987 to 1998 in the United States. This is, in contrast to the small increase in other countries, on the rise in the United States. Source: U.S. Drug Enforcement Agency (DEA), 2000. Reprinted with permission.

[BMIs] greater than or equal to 30) was no higher than 14 percent in any state; in 1995, the populations of about half of the states were 15–19 percent obese; and by 2001, half were at 20–24 percent and a few had hit 25 percent or beyond.

Obesity is a lot more than cosmetic. It's a risk factor for heart disease, cancer, gallbladder disease, and a long list of other disorders. And in addition to all the suffering and premature death, there are substantial economic costs that are mostly, though not entirely, medical. For example, my colleagues and I calculate that the obesification of the American public raises the airlines' jet-fuel costs some $200 million per year just in the United States alone.

Most notably, being obese is a risk factor for type II diabetes—a very serious problem that can cause the loss of eyes, kidneys, feet, and ultimately life itself. It used to be rare for a pediatrician to see a child with type II diabetes. Now, it is up to 30 to 40 percent of the pediatric diabetes practice. It has become very common (Figure 5–4). Among adults, one is 20 times more likely to get type II diabetes if he or she is obese. For the very obese, it is about 40 times.

Ironically, the best treatment for type II diabetes is not insulin or other drugs. The best treatment, which has fewer complications and works better than any drug in existence, is weight loss and physical exercise. Designing environments in which people can move around is not only a treatment (and prevention) for diabetes; there are numerous other health benefits. For example, better environments raise one's serotonin level and they are effective in reducing depression. Better environments are as good as certain antidepressant drugs.

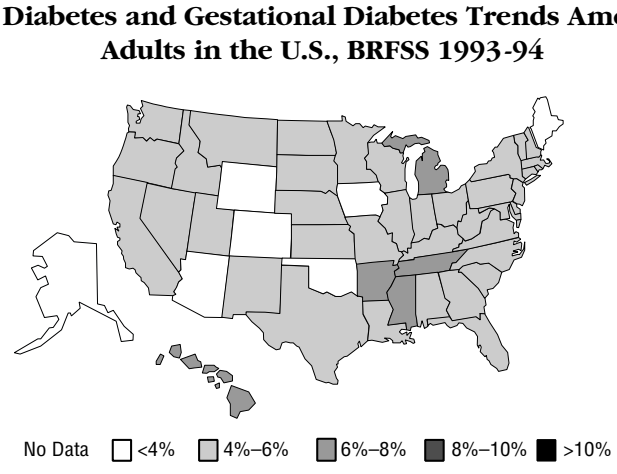
WHERE PEOPLE WANT TO BE

The bottom line is that we in public health need to reach out to the people who do the urban planning and architecture and to those who govern our communities. Professionals who deal with issues of community design have just as much relevance, and probably more relevance, in addressing the diseases of the twenty-first century than those of us who are sealed off in the medical community fighting the adverse effects, after the fact, of the diseases made more common or more severe by the way we build our environments.

The proper vision—which directly applies to Pittsburgh—is that just as our rivers ought to be swimmable, drinkable, and fishable. Riversides (and their neighborhoods) ought to be walkable, bikable, and runnable. You don't have to tell children to go outside and get some exercise if there are safe and attractive places to run around with their friends: parks, trails, basketball courts, watercourses, and playing fields.

We all want to be in places like that. Creating safe and attractive environments for people to make themselves healthy will do a whole lot more than our waving our fingers at them and lecturing them to shape up.

This is a daunting but doable challenge. When I was a young medical student, it seemed that the problem of lead poisoning was insurmountable; lead



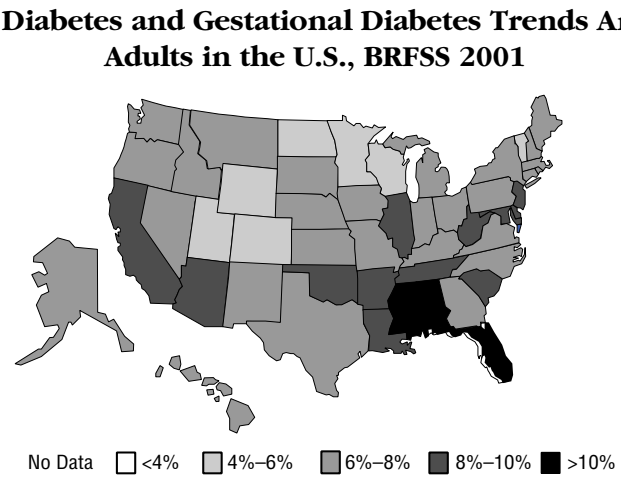


FIGURE 5–4 The incidence rates of diabetes in the United States have been rapidly growing in recent years. In 1993, only 4 states reported diabetic rates between 8 and 10 percent of their population. In contrast, by 2001, 25 states reported a diabetic rate between 8 and 10 percent, while 15 states reported an incidence rate greater than 10 percent of the population. SOURCE: Mokdad et al, 2003.

was everywhere—in the food, in the paint, in the gasoline. Yet over time we removed lead from our environment, and as a result we have seen a dramatic drop in the average blood-lead levels in the United States.

Similarly, whenever any major environmental issue comes up—such as the landscraping/polluting/disease-causing network of problems noted above—many people will say it is insurmountable, that it's just too big. Yet while the lead-poisoning problem was also "just too big," we have made wonderful progress.

The same can be true of environmental health in Pittsburgh and the nation if we reclaim the land and water and air for human habitability, fitness, and fulfillment.

6

Community—Past, Present, and Future*

Pittsburgh's economy has lately been benefiting from a great deal of brownfield redevelopment. One can travel up and down the river and see new signs of life where old steel mills once stood. A paradigm shift among regulators—from focusing on contamination to remediation to redevelopment—has been proceeding at such a rapid pace that the public might well ask if the quality of the environment for the long term is at times being compromised for the sake of the economy in the near term.

In some cases, however, environmental contamination has turned out to be relatively modest, even though opponents of the development project fought it on environmental grounds. This suggests a certain degree of chronic tension between the public and developers that needs to be respected, and tapped, for the common good.

Education and knowledge sharing—avenues for communication—are essential for trust and acceptance. This applies in both directions—all stakeholders have not always been represented at the table, yet they've been expected to live with the consequences of the decisions. A related concern is that decision-making groups not lose sight of old communities while building new communities—it's best to find ways to achieve integration and continuity between the two as brownfields are put back into productive use.

In addition to satisfying economic, environmental, and social concerns, it's important that communities be conducive to individuals' good-health practices. Redevelopment plans and land-use strategies must consciously incorporate features for "active living"—for example, by providing numerous opportunities for exercise and an environment that's attractive for that purpose. The layout of

* This chapter was prepared from the transcript of the meeting by Steven J. Marcus as the rapporteur. The discussions were edited and organized around major themes to provide a more readable summary and to eliminate duplication of topics.

communities, especially created communities, should allow for a healthier population.

A panel of speakers discussed strategies to secure active-living communities; redevelop brownfields with quality environment, quality of life, sound engineering, and economic viability (and affordability) in mind; inspire regulators' efforts to balance redevelopment and environmental-safety objectives; obtain environmental justice (in essence, "ensure that the people who are most affected by a problem are at the table"); and ensure people's comfort and safety in their own homes.

"ACTIVE LIVING" IN WALKABLE COMMUNITIES

A strong relationship exists between physical activity (or the lack of it) and the prevention (or development) of disease, according to Andrea Kriska, an associate professor at the University of Pittsburgh's Graduate School of Public Health. Indeed, the 1996 Surgeon General's Report on Physical Activity and Health concluded that "Regular physical activity that is performed on most days of the week reduces the risk of developing or dying from some of the leading causes of illness and death in the United States"—for example, cardiovascular disease, type II diabetes, osteoporosis, osteoarthritis, and cancer.

Thirty minutes a day of moderately intensive exercise—such as walking—can greatly impact on both physical and mental health. But the challenge, Kriska noted, is how to get people to actually do those 30 minutes, how to put activity into their day on a regular basis. The solution, she said, is "to take it to the community—to go into the environment, remove the barriers, and create the opportunities for a person to be more active." Specifically, the public health literature suggests things like "purposeful walking"—"many individuals are not going to get out there and just walk for the sake of walking. They want a reason to get there," Kriska said. There need to be attractive places they wish to go to.

The actual number of places within walking distance of people's homes is strongly related to how much walking they do. Likewise, the safety of the neighborhood. One major reason why some parents keep their children in the home is safety. If they're sitting in front of the TV, at least they're not out on the street, vulnerable to crime, traffic, and infrastructure—such as sidewalks—in deteriorated and hazardous condition.

"The thing that put my field back 30 years," Kriska noted, "was [that misguided notion of] 'no pain, no gain.' People don't do things if they're unpleasant. Whether the sidewalks, the architecture, the green spaces are pleasant is very important to walking and physical activity."

She cited the work of her doctoral student Wendy King, who investigated walking habits of a cohort of postmenopausal women as functions of their neighborhood environments. The results, some of which are shown in Figure 6–1, indicate that the number of locations within walking distance from the home had

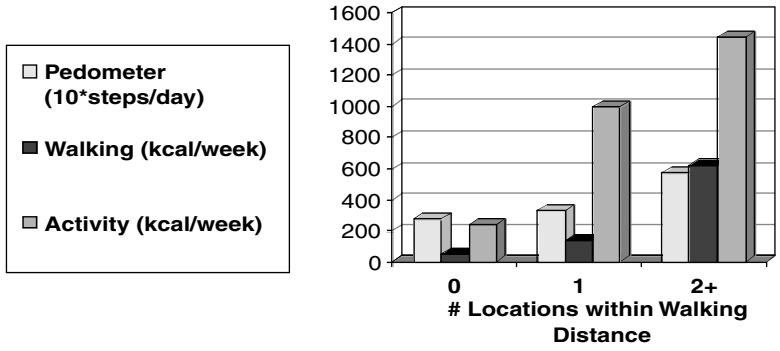


FIGURE 6–1 People who have more locations to walk to, walk more each week than those who don't have locations within walking distance. SOURCE: King, et al. In press. Reprinted with permission.

a significant impact on physical activity levels. "The more locations there are for you to walk to," Kriska observed, "the more you will walk." Likewise the neighborhood rating, as shown in Figure 6–2—"the better you rate your neighborhood, the more you are going to be getting out there and walking." In other words, she concluded, "the convenience of locations and quality of the neighborhood surroundings will impact physical activity." This relationship has not been lost on community leaders, and many are now actively trying to make their neighborhoods, towns, and cities more walkable.

REDEVELOPING BROWNFIELDS: DEVELOPER

Because many home buyers now demand planned, pedestrian-oriented communities with a great deal of open space, they're receptive to redeveloped brownfield sites that offer these attributes, according to Mark C. Schneider, president of the Rubinoff Company. On this issue, "the market is out in front of us developers and public health officials. Some 35 percent of the new-housing market would live in communities like this, which makes these sites worth pursuing."

Schneider is managing general partner of Summerset at Frick Park—a redeveloped slag site in Pittsburgh previously called Nine Mile Run—and he noted the irony that such former industrial locations, perennially thought to present serious environmental problems, can actually offer healthful, high-quality living for their residents or users. For one thing, a 230-acre parcel like Nine Mile Run, not often found in most cities, presents intriguing possibilities. For another, the problems for the developer at that specific site "were not environmental,"

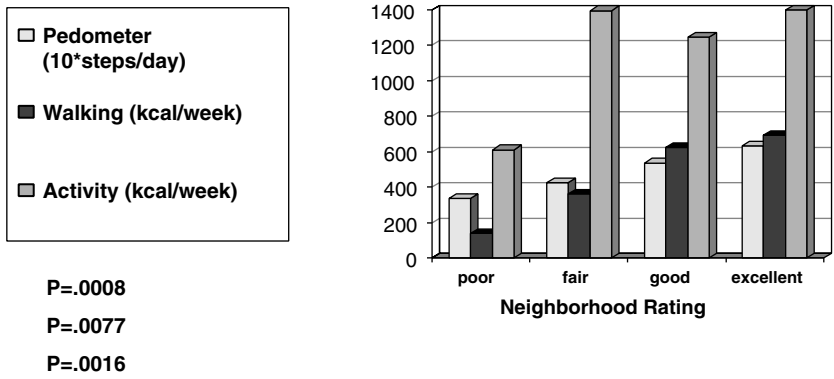


FIGURE 6–2 Individuals who rate their neighborhood good or excellent walk more than those who rate their neighborhood as poor. SOURCE: King et al. In press. Reprinted with permission.

Schneider maintained. "They were engineering, and continue to be engineering." Because slag was dumped at a steep slope, the company has had to regrade to ensure stable hillsides, vegetation growth, and sustainability.

Nevertheless, "when you are working on a brownfield," he emphasized, "the environmental issue can become 'a wedge issue and a scare tactic' for people attempting to stop the project." Ultimately, they couldn't stop it, though they did substantially increase the amount of money that had to be spent and the time it took to get the site entitled. "We spent half a million dollars doing air monitoring, basically demonstrating that there was no problem with the grading of the slag or the moving of the slag," Schneider said.

Environmental quality, fundamentally, is a legitimate concern, and developers and public regulators must of course be careful that a project is safe. But to succeed, whether financially or environmentally, developers also need certainty and predictability. Schneider cited multiple levels of uncoordinated, redundant review for Summerset at Frick Park that he alleged made the project far more complex than it needed to be: "We had our own environmental experts. Our lenders had their own environmental experts. We had DEP (the Pennsylvania Department of Environmental Protection) opining on this for Act II of the consent order. URA (the Urban Redevelopment Authority of Pittsburgh), which was the landowner, had its own consultants. The Allegheny County Health Department reviewed this. The state health department was brought in by ATSDR (the U.S. Agency for Toxic Substances and Disease Registries) because EPA (the U.S. Environmental Protection Agency) got a complaint from somebody who wanted to stop the project. We had seven ATSDR public health advisories, and

also the URA ended up paying for a separate consultant to work with the community group to overview all this work."

In place of such an ad hoc, seemingly open-ended procedure, he suggested, should be leadership, partnership, and clear policies with agreed-upon and unambiguous rules by which developer, regulator, and the public can make their respective contributions—thoroughly, yet fairly—to livable, health-promoting communities.

REDEVELOPING BROWNFIELDS: REGULATOR

The terms "Superfund site" and "brownfield" may sometimes appear synonymous, but the ATSDR makes an important operational distinction. According to Henry Falk, assistant administrator of ATSDR, the Superfund program focuses on hazardous-waste contamination and how sites can be remediated, while the brownfields program deals largely with moving sites toward redevelopment, or redeveloping sites that were contaminated in one way or another but not to a degree that they'd be considered Superfund sites.

The Superfund program—created by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, generally referred to as the "Superfund law"—was prompted by the events at Love Canal. Putting first things first, the law addressed environmental issues such as criteria for prioritizing sites, looking especially at populations at risk. Next, it addressed the potential for contamination of drinking water, for direct human contact, and for destruction of sensitive ecosystems.

Thus, ATSDR, an agency that also was created by the Superfund law, does environmental public health evaluations, exposure assessments, health investigations, and toxicology profiles to evaluate the health aspects of Superfund sites in a very systematic way. It also issues public health advisories when substances from the site are present at levels that may threaten human health.

Occasionally, these threats prove highly significant. In Libby, Montana, which used to host the country's largest vermiculite mine, the agency examined 7,300 people, almost 20 percent of whom had chest X rays showing pleural abnormalities related to asbestos (the mined vermiculite had contained a certain amount of tremolite asbestos). Of the former W.R. Grace workers who ran the mine in its final decades and participated in the examinations, 51 percent showed pleural abnormalities. Moreover, even the people who didn't have abnormalities are at risk of developing them in years to come.

Such sites are under prolonged remediation, of course. But some Superfund sites do get redeveloped. The Rocky Mountain Arsenal is now a very enchanting nature preserve, Falk observed. The Presidio of San Francisco has been the site of a "Star Wars" movie studio, and the Memphis Defense Depot is multiuse commercial region. So it does happen, but it takes a very long time, and in any case redevelopment has not been the focus of the Superfund program.

By contrast, numerous brownfield sites do get redeveloped, often with ATSDR's assistance. In 2002, some 428 of them (former industrial, military, or public-facility sites, for the most part) were cited in business journals and newspapers as redevelopments completed or in progress. The most common type is called "mixed use"—combining office, retail, and residential. Other redevelopments are cultural, recreational, or even industrial, though roughly 80 percent or more of these sites do not go back into any type of industrial use.

The legislation that relates to brownfields is quite different from that of Superfund, Falk observed. The EPA Brownfields Program, very heavily focused on redevelopment, provides states and local areas with help in assessing specific sites and evaluating the viability of proposed uses there. Summary descriptions of the program in fact convey the number of property assessments, how much redevelopment they have leveraged, and how many jobs they've created. Specifically, EPA maintains a revolving loan fund and provides "smart growth" grants, "blighted community" grants, and job-training grants, among other things.

A prominent local example of a redeveloped brownfield site is the abovementioned Nine Mile Run slag site, the subject of numerous health consultations by the Pennsylvania Department of Health over the years, with assistance from ATSDR (see Figure 6–3).

A variety of health problems had to be dealt with at this former site of steel-related slag, Falk said. They included potential for exposure to manganese and other metals in soil; grading, sloping, and physical hazards; CO_2 venting; and the suppression of airborne particulates and dust during construction.

But the result of redeveloping this very large site was a community of hundreds of homes of different scales and types.

Not all brownfield redevelopments have happy endings. After condominiums were built on the Grant Street site in Hoboken, New Jersey—a building once used for the production of electric vapor lamps—residents started seeing drops of mercury on their oven ranges and tabletops. Subsequent medical investigations found high levels of mercury in their bodies, which led to a public health advisory and medical intervention for residents provided by Robert Wood Johnson Medical School. They had to be permanently relocated, as the building was declared uncleanable and therefore unfit for habitation.

Practices for brownfield environmental evaluation, including sensitive analytic methods, more and better sampling (including all contaminants of concern), and thorough consideration of the historical uses of the property, have improved since the Grant Street episode. Nevertheless, "as we work with redeveloping brownfields," Falk said, "one needs to retain a healthy measure of inquiry—to focus on what these properties have been used for and on what can be done for them in the future."

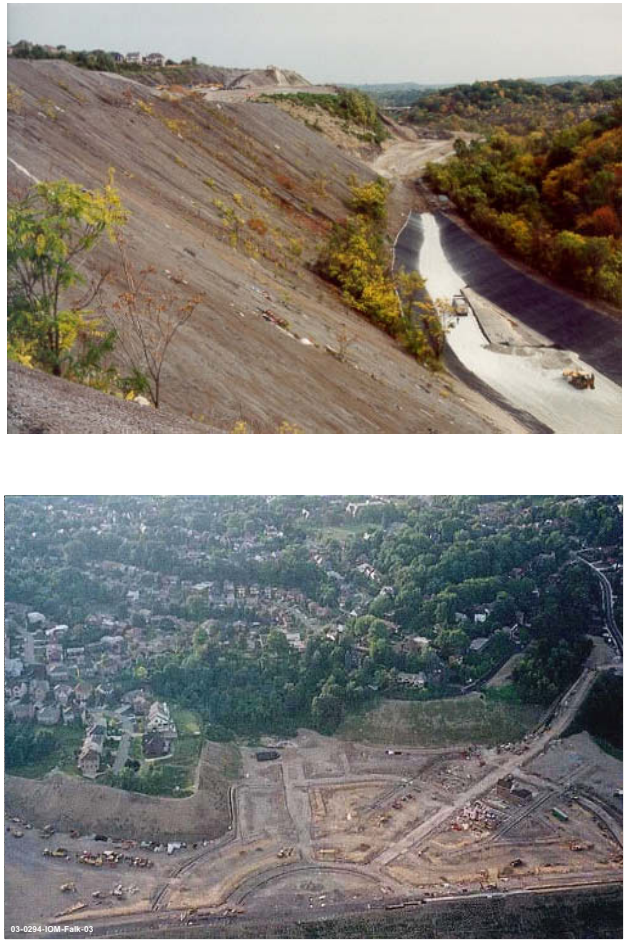


FIGURE 6–3 Through active monitoring, numerous brownfield sites can be redeveloped. Often they are developed into mixed uses—combining office, retail, and residential. SOURCE: ATSDR (brownfield site); Summerset Land Development Associates (developed site). Reprinted with permission.

ENVIRONMENTAL JUSTICE

According to EPA, "Environmental justice is achieved when everyone, regardless of race, culture, or income, enjoys the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work."

While Leon Haynes, executive director of Hosanna House, endorsed this definition, he stressed an essential prerequisite. "Our success in addressing environmental justice depends on our ability to collaborate with all stakeholders," he said. "We have got to make sure that the people who are most affected by a problem are at the table. Anything less than that is not justice." Moreover, Haynes added, "we must acknowledge that there is no one answer in solving environmental-justice problems. We must consider a holistic approach that includes every sector."

He cited the federal Interagency Working Group on Environmental Justice, and particularly its Revitalization Demonstration Projects in some 15 different communities. The goal of these projects is to improve the quality of life of minority and low-income people who suffer disproportionate environmental impacts—and who traditionally have had limited access to environmental services. The program recognizes that many environmental issues cannot be adequately addressed without the combined resources of federal, state, and local government, along with capacity building at the community level, Haynes said. In that way, long-term solutions can be developed through a bottom-up approach that "involves community folks in making good decisions."

An example of such a process, he suggested, is his own Hosanna House, a nonprofit that took over an abandoned 1916-vintage school building rife with environmental problems such as lead and asbestos. "We had to educate ourselves on what it means to remove or encapsulate. But we pressed on. We got information. We gathered people to work with us in order to do that. And today we have renovated 126,000 square feet of facility that is providing services to over 17,000 people. These are some of the things that I think the community can do if we give it a chance."

Another example, pending in the East End of Pittsburgh, is toxic fumes from the buses that the residents of this high-density community depend on to go to work. These people need to be educated to look at bus transportation from an environmental viewpoint, Haynes said. And they should be empowered with information on alternatives to diesel-fueled buses—e.g., natural-gas buses or electric buses.

"My concerns," he said, "are with the things that affect what I think my community folks would see and pay more attention to if they had more information—things like lead poisoning, asbestos, and even violence among young African-American males. These, along with undesirable land use, lack of green space, and toxins from automobiles, are environmental injustices" that are not dealt with properly, in large part because of inadequate information.

We thus need "to take the time to make sure that they have the information necessary—in front of them—to make the best decisions for themselves and their families," Haynes said. "I don't think we've done a good enough job on that. We also need to understand that people don't care how much we know until they know how much we care."

TOWARD HEALTHY HOMES

"Our homes should be our safe places—the places where our children are tucked in at night, but we know that this is not always the case," said Samantha Roth, executive director of Healthy Home Resources. "Our homes may be dangerous, mysterious places that can cause multiple problems, especially for young children who are unwittingly exposed to in-home environmental hazards."

For example, residents can come into contact with lead—via lead-paint dust and lead dust—as well as pesticides, molds, and various solvents. Among the more vulnerable—i.e., the youngest occupants—some of these agents are known to cause physical and learning disabilities, developmental delays in fine and gross motor skills, and recent research by Dr. Herbert Needleman from the University of Pittsburgh suggests that with even low levels of lead exposure, our children may develop behavioral issues such as ADHD (attention-deficit/hyperactivity disorder) and oppositional defiance disorder

Living in a healthy home is obviously a desirable goal. But barriers often prevent its realization.

- *General lack of knowledge*. Shelter, safe neighborhoods, and home ownership are justly each resident's top priority. But fully understanding the structural issues of a home, the materials used within it, and a home's potential impact on our health has not yet risen to the top of our minds—even as a secondary priority. Research findings are starting to proliferate, but they must be put into language that can commonly be understood and supported by state and federal housing inspection regulations.
- *Low home-ownership rates.* People are empowered to make changes by their ability to control the environment around them as well as having good information. If they are renters, that ability is compromised because they can't readily contract services to have work done in their home. Oftentimes they find themselves in an adversarial relationship with their landlord if such requests are made.
- *Inaccessibility to services and products.* The cost of remediation is high. Even with the knowledge of potentially hazardous conditions in their homes, low-income homeowners find maintenance and remediation cost-prohibitive. Lead abatement as well as mold mitigation can exceed $10,000 per unit.
- *Inadequate regulatory and enforcement policies and data collection systems.* This may be seen at the local, state, and federal departments of environment, public health, housing and urban development, and health and human services—the very systems that we rely upon to provide the general public with accurate and timely information. For example, 90 percent of Pittsburgh's housing stock was built prior to 1978, the year in which lead paint was banned. Thus, lead paint may be present in 90 percent of our city's homes. Even though the State of Pennsylvania man-

> dates that all Medicaid children be screened for lead poisoning at 12 and 24 months of age as part of the EPDST [Early and Periodic Screening, Diagnosis, and Treatment program], "the percentage of Medicaid children being screened in Allegheny County is abysmal," Roth said. According to the Allegheny County Health Department, only 6 percent of Medicaid children were screened in 1999 and screening rates continue to fall each year. "This is only one cross-section of our child population. How can we know the extent of the problem and aptly make choices about programming if the data are not readily available nor being collected?" "In the absence of good local data, we are gravely concerned that lead poisoning prevention resources will diminish.

These barriers may be lower with the help of "community action models" that reflect creative program design and multiple approaches. Three programmatic models, two of them currently focused on lead and the third on multiple in-home environmental issues, are:

- *Lead Safe Pittsburgh,* recognized by the Alliance to End Childhood Lead Poisoning as an excellent example of community collaboration, is a coalition of more than 65 institutional and community-based stakeholders in southwestern Pennsylvania. It is addressing the systemic barriers in place—policy and data systems as well as physician practice—that allow lead exposure in the home to go undetected.
- *CLEARCorps,* The Community Lead Education and Reduction Corps is a national AmeriCorps program. It works within communities to educate residents, in part by nurturing local champions and neighborhood stewards, on the prevention of lead poisoning. "Our CLEARCorps program is currently focusing its educational efforts in partnership with local early childhood development centers and parents," said Roth, "in an effort to express a simple concept: with engaged educators and parents who understand the link between health and a child's ability to learn, and a home free of developmentally devastating hazards, our children have a better chance of success in life."
- *The American Respiratory Alliance* of southwestern Pennsylvania is partnering for the first time ever with an environmental organization in an effort to answer the following questions: (1) What is the local prevalence of environmental irritants or poor indoor air quality in the homes of asthmatic children and does this prevalence align with national findings? (2) What would it cost, on average, to remediate affected homes and are there creative means to finance these costs? (3) Can varying degrees of remediation and in-home environmental education for parents of children with asthma reduce school absenteeism and health care expenditures (such as the cost of frequent emergency room visits)?

"This approach is exciting because it's expanding the traditional medical management approach of asthma into comprehensive approach that includes an environmental perspective of the home," Roth said.

Still, she cited areas for further expansion, such as the advocacy of health standards both for the home itself and the products that enter it, and the mobilization of already-served families to help form parent-action groups and communicate the problem (and solutions) to the public.

"Sustained change in this area," Roth emphasized, "really does mean working along side the community and its residents to address these issues and help everyone understand that the healthiness of our homes does impact our health, especially that of our children."

7

Systems, Built Environment—Past, Present, Future*

Few areas of technological application are as ancient as "the built environment"—the structures and communities in which most of us spend our lives—and its relationship to our well-being. This area of human knowledge has nevertheless been neglected in important ways. Although occupants of numerous buildings and residents of manifold communities have attested to the adverse environmental health impacts that chronically occur under present policies, and although dedicated organizations have been forming—in the Pittsburgh area as elsewhere—to pursue agendas for more healthful ways of designing and maintaining built environments, the field has not been the object of serious inquiry and has not seen advances on a grand scale.

To remedy this situation, new partnerships have been forged between those who erect the built environment and those concerned about its health impact—including the people who live in it.

Another set of environmental health partnerships needs to be established between the country's government, research universities, and communities in diverse socioeconomic and geographic settings. There is no federal research policy, much less a coherent federal research program, that addresses environmental health problems raised by built-environment practices. Such partnerships not only could help in financing environmental health research but also could ensure that the human capabilities for fruitfully directing such funds are available. Research programs tend to produce professionals trained in the problems at hand, and especially in the case of built-environment issues such training must be tempered in experience.

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*This chapter was prepared from the transcript of the meeting by Steven J. Marcus as the rapporteur. The discussions were edited and organized around major themes to provide a more readable summary and to eliminate duplication of topics.

Federal and state government involvement can also help to modernize building practices by providing advanced standards and streamlining regulatory regimens.

Ultimately, however, it is the interface between the higher-level and community leaderships, and decision-making mechanisms within communities themselves, where the main action must lie. The specific natures of regional climates, land use, neighborhoods, building design, transportation modes, energy systems, and extent and types of preserved natural environments are, in their combinations, as varied as the needs and preferences of diverse human communities themselves. Members of those communities should be environmentally informed and empowered to manage their civic affairs in pursuit of universal human goals.

A panel of speakers discussed the broad parameters of sustainable built environments—the need to reduce sprawl and incorporate walkable communities, for example, and the desirable characteristics of healthy structures—as well as approaches to critical decisions such as "smart-growth" communities, transportation alternatives, the specific criteria for "green buildings," and sustainable energy strategies for serving communities efficiently while guarding against global climate change.

HEALTH AND THE BUILT ENVIRONMENT

New principles of architecture and land-use planning must be applied, according to Vivian Loftness, professor and head of Carnegie Mellon University's School of Architecture, if we are to get beyond the obsolete industrial revolution paradigm and adopt the "human-ecological" approaches that produce healthful buildings and communities.

First and most critically, she said, we must move away from single-use zoning—i.e., sprawl—which is harmful to human environments and human well-being, and move toward "live, work, walk communities" that are less dependent on the automobile and more amenable to social interaction and physical fitness. In a landmark study that has much impressed the design community, the CDC recently published relationships between obesity and land-use policy, recognizing that neighborhoods with significant walking and bicycling have much lower obesity rates, as well as lower rates of depression and Ritalin usage!

"We unfortunately only have two viable modes of transportation left in this country—cars and airplanes—even though almost all other forms of transportation are far more energy- and environment-effective," Loftness said. "They use much less fuel and they put out much less pollution, they require less land and create less runoff and erosion." (See Figure 7–1.)

Sprawl communities have higher infrastructural costs virtually across the board—for water, electricity, even postal delivery, among others—in comparison to higher-density living environments (see Table 7–1).

Human-ecological design should prevail in the design and renovation of individual buildings as well. Here too, waste, inefficiency, relative neglect, and

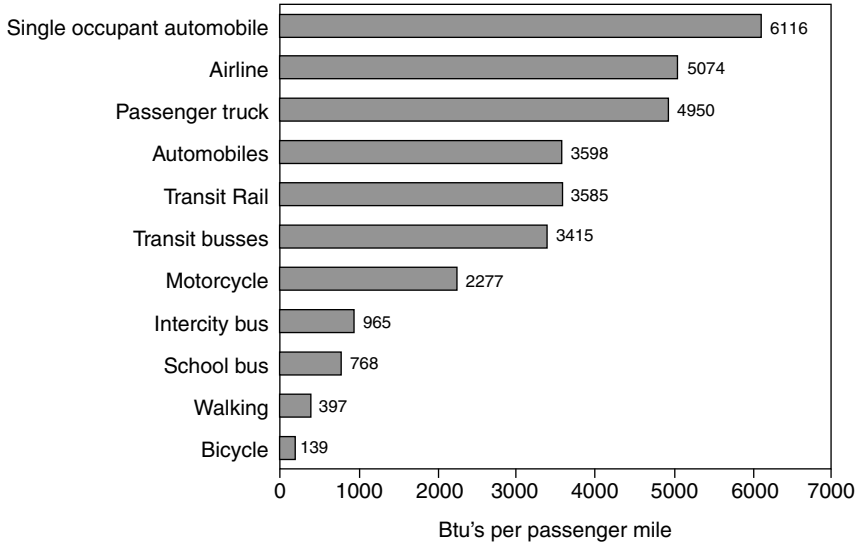

FIGURE 7–1 Single occupancy vehicles and airplanes are the most viable modes of transportation in the United States and are the least safe energy-effective and environmentally safe. SOURCE: Lowe, 1989. Worldwatch Institute © 1986. Reprinted with permission.

TABLE 7–1 Cost of Sprawl in the Suburbs vs. Infilled Areas of a City

	Suburbs (in dollars)	Infill (in dollars)
Streets/roads	3,000	800
Utility extensions	5,000	950
Gallons H_2O/day	400	200
Therms natural gas	150	60
Kilowatt hr/ year	10,000	6,000
Postal delivery	(300 times the cost of infill—estimate was only supplied)	

SOURCE: Wilson, 2002. Urban Ecology © 1996. Reprinted with permission.

threatened health are the norm rather than the exception. "Over 30 percent of all U.S. energy use, 20–40 percent of U.S. pollution, and 30 percent of U.S. waste are caused by the built environment," Loftness said, "yet there is almost no federal funding to evaluate and reduce these costs." The Department of Energy, for example, devotes only 2 percent of its total budget to building research, despite the fact that 35 percent of United States energy use is in buildings. EPA has an equally small budget for building research, and NIH has no dedicated funding to study the effect of the built environment on health.

Moreover, "there are almost no Ph.D. programs in this country dedicated to linking the built environment to health and productivity," she said. "We are looking at an incredibly starved field."

Yet there is no shortage of investment opportunities, should funders and researchers decide to give higher priority to green-design principles. Improved and more extensive application of natural light, shading, passive technologies, and high-performance active technologies, for example, would allow for lower energy use and provide more healthful and productive human environments.

Meanwhile, the impacts that HVAC (heating, ventilation, and air conditioning) systems, for example, have on health remains relatively unstudied, and shortcomings of the past are perpetuated. "We are watching new hospital and office complexes being built with HVAC technology that was developed in the 1950s and has not advanced since," Loftness said. Better HVAC systems would provide personal control, access for maintenance, and separation of ventilation and thermal conditioning. Although such ventilation strategies for improved indoor air quality have been shown to increase productivity and health (Figure 7–2), very few new office buildings even have "operable windows" that allow occupants to control outside air or moderate temperature.

The advantages of improved HVAC design and of increased access to daylight and natural ventilation are beginning to be measured. A number of United States and Canadian studies have shown improved health and performance in schools and offices: from 5–10 percent reductions in sick-building symptoms to 10–25 percent higher reading and math test scores when workers have natural light (see Figure 7–3). Nevertheless, "almost all policies are still driving us forward with very small windows, very dark glass, and sealed buildings—and even workplaces with no windows at all," said Loftness.

Finally, attention must also be paid to the design and renovation of building interiors, she said. "It is extremely important to recognize that the selection of materials and furniture inside buildings is as critical to our health as land-use patterns are." Studies have repeatedly shown, for example, that ergonomic furniture reduces musculoskeletal complaints and medical-claim rates, and improves task performance (see Figure 7–4).

Loftness called on the medical community in general, and the U.S. Centers for Disease Control and Prevention in particular, to initiate and publish research that is critical to improving the built environment. "We have the opportunity to

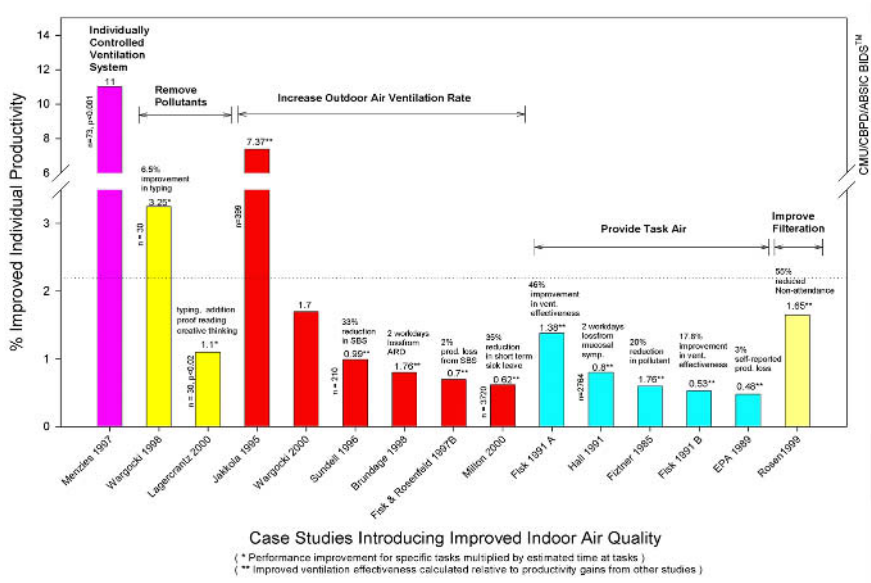

FIGURE 7–2 Access to individually controlled ventilation or ventilation systems that removed pollutants increased worker productivity. SOURCE: Carnegie Mellon CBPD BIDS™/ABSIC Report 2003. Reprinted with permission.

dramatically improve the quality of the places we create," she concluded, "with positive impacts for our youngest to the ends of our lives."

SMART GROWTH

"We like to say that we want to move from building 'developments' to building healthier, safer, and livable—that is, smart-growth—*communities*," said Alex Graziani, executive director of the Smart Growth Partnership of Westmoreland County. To achieve that goal (in accordance with the dictionary definition of "economic growth that consciously seeks to avoid wastefulness and damage to the environment and communities"), the 10 Principles of Smart Growth must apply:

1. *Mix land uses.* Communities that combine land/work/walk tend to be attractively built and maintained places that we wish to travel to, or return to, Graziani said.
2. *Take advantage of compact building design.* "Compact" should apply not

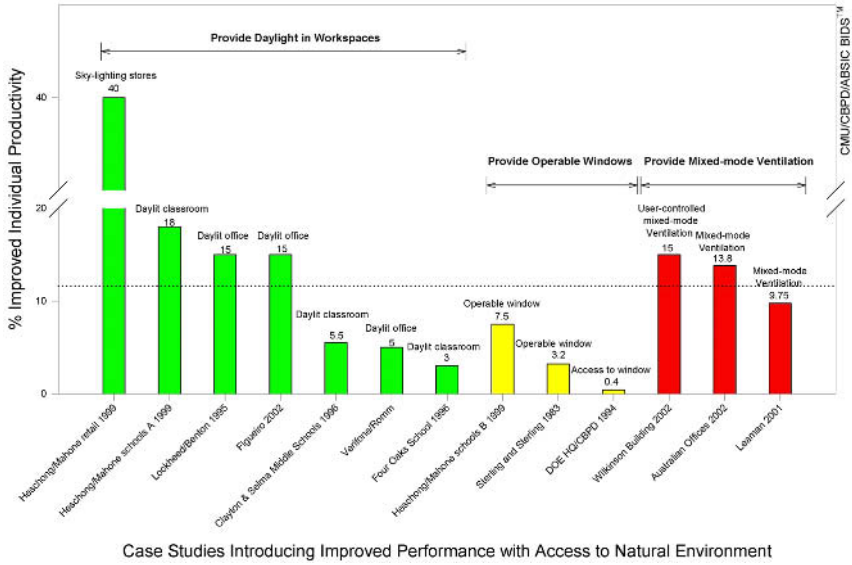

FIGURE 7–3 Access to natural environment increases productivity. SOURCE: Carnegie Mellon CBPD BIDS™/ABSIC Report 2003. Reprinted with permission.

only to buildings per se but to the collection of buildings and other facilities that make up a community.

Conventional development is land-consumptive, while smart-growth development uses the same amount of square feet for offices and houses much more efficiently—and sustainably. For example, instead of everyone cutting his or her own one-acre lot, everyone can use the community green.

3. *Create a range of housing opportunities and choices.* We should be accommodating all kinds of residences, Graziani said, "because we need to build communities, not single-use, single-type developments."
4. *Create walkable neighborhoods.* "If you are able to walk to work, walk to school, and walk to shop, recreate, or worship, you live in a smart-growth community."
5. *Foster distinctive, attractive communities with a strong sense of place.* Communities should not be Anywhere, USA. Their architecture should have distinctiveness and be beautiful to behold, and they should be built for the future, not just for 10 years.
6. *Preserve open space, farmland, natural beauty, and critical environmental areas.* It's important that new-community developers have a strong

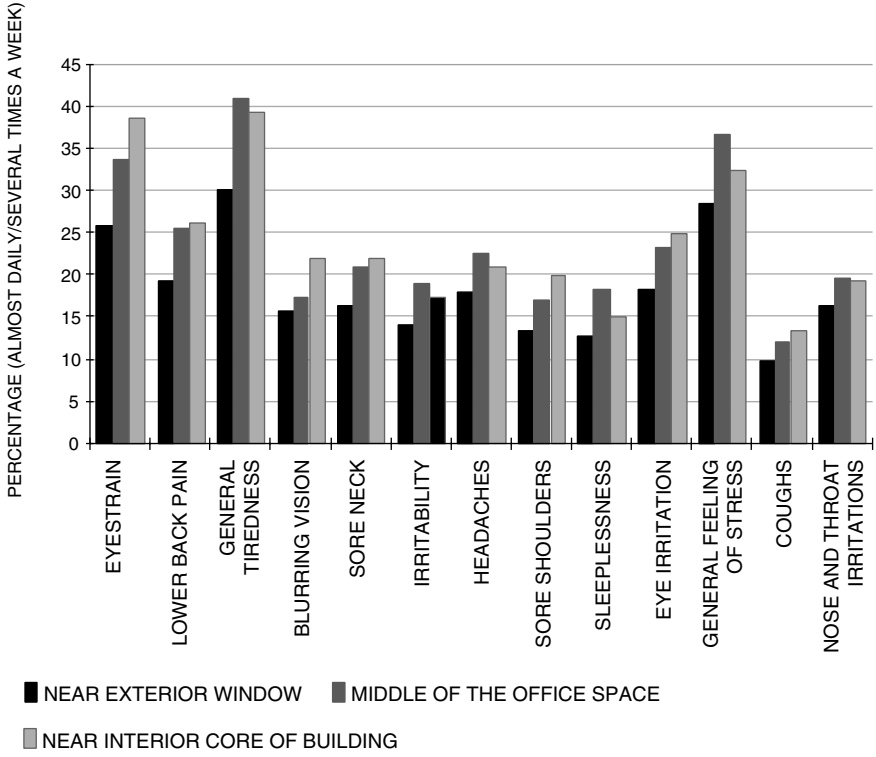

FIGURE 7–4 Individuals who worked near an exterior window had fewer complaints across the range of sick-building symptoms as compared to those who worked in the middle of the office space or near the interior core of the building without access to windows. SOURCE: Carnegie Mellon CBPD DOE Forrestal/Germantown Field Studies, 1995. Reprinted with permission.

sense of landscape architecture, not only to preserve key natural areas but to determine the most harmonious places for home sites and roads and to use parts of the landscape itself for benignly accommodating such needs as storm-water drainage.

7. *Strengthen and direct development toward existing communities.* By concentrating growth where infrastructure already exists, natural areas can be preserved for present and future generations. "Someone once said that Yellowstone National Park exists because Manhattan exists," Graziani noted. "In other words, because people have chosen to live in that high-density community, Yellowstone is there to be enjoyed by all of us."

8. *Provide a variety of transportation choices.* "We should not be building our newest and best developments just for people who can drive, while neglecting people who are disabled or cannot drive because of age [or simply wish to travel by other means]. We need to be building for the entire community."
9. *Make development decisions predictable, fair, and cost-effective.* In regulating developers, it makes sense to give "green lights for doing the right thing while making the wrong thing—conventional development—the one that requires all the variances and conditions," Graziani said. Either way, development becomes more predictable, as well as fair and cost-effective, for the developers and for everyone else.
10. *Encourage community and stakeholder collaboration in development decisions.* Public involvement is essential, he maintained, and where the public doesn't make the right decisions at times, that doesn't mean it's incapable of doing so. Participants need to be helped and informed. This is consistent with Thomas Jefferson's view on the matter: "I know no safe depository of the ultimate powers of the society but the people themselves. And if we think them not enlightened enough to exercise their control with a wholesome discretion, the remedy is not to take it from them but to inform their discretion."

Public involvement also has practical advantages to all concerned. In that spirit, Graziani shared the following "key concept": "A community-based collaborative process is a way to reduce confrontation and improve proposed projects by involving the citizens up front in the development process, using their energy positively instead of negatively."

TRANSPORTATION'S IMPACTS ON ENVIRONMENTAL HEALTH

Transportation and health have linkages across five major categories—physical activity, pedestrian safety, environment, economic, and quality of life—according to David Ginns, a coordinator for Transportation for Livable Communities, which is a joint project of Sustainable Pittsburgh and the Surface Transportation Policy Project (STTP). "The goal of STPP," he said, "is to make our communities more healthy by building transportation systems that serve citizens, not cars. If people can walk to school and work and walk for recreation we will have sound environmental health."

Physical Activity

The design of our communities—the frequent lack of sidewalks, for example, and dependence on the automobile—contributes to higher and higher rates of physical *in*activity in the United States population. In 1991, only a handful of

states had adult obesity rates of more than 15 percent; by 2000, all states except Colorado were in the greater-than-15-percent category. Physical inactivity and consequent obesity have been growing at an especially rapid rate among children. As shown in Figure 7–5, the percentage of overweight children increased during the 1990s as the frequency of children's trips made on foot dropped. Communities where children cannot walk to school or to other activities contributed to the problem.

Pedestrian Safety

"The lack of investment in pedestrian safety contributes to pedestrian deaths," Ginns said. "STPP stands behind an increase in dollars for pedestrian safety and bicycle/pedestrian facilities to resolve this problem and produce healthier and safer communities."

Environment

The environmental problems caused by motor vehicles are legion. For example, they emit 31 percent of the carbon dioxide in the United States, along with 81 percent of the carbon monoxide and 49 percent of the nitrogen oxides. Reducing such emissions, along with other motor-vehicle-related threats, can only be accomplished by investing in alternatives to the automobile.

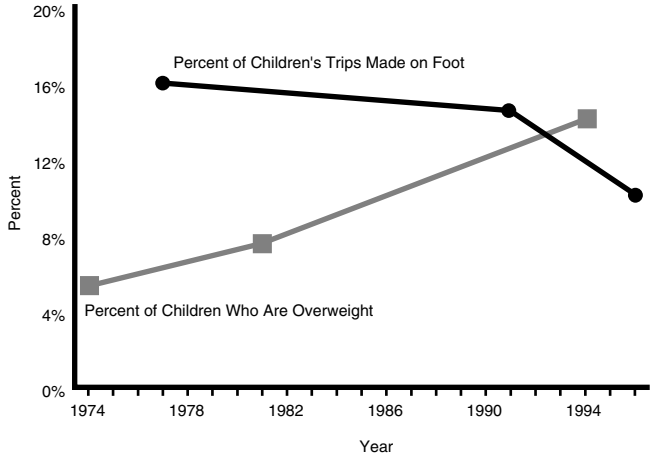

FIGURE 7–5 The number of trips made on foot by children decreased from 1974 to 1996, while at the same time the percentage of children who were overweight increased. SOURCE: Surface Transportation Policy Project © 2000. Reprinted with permission.

Economics

While walking is free, Ginn pointed out that technology-based transportation comes at a price; however, the difference in cost between the bicycle and the automobile is large. The cost of operating a car for one year is approximately $5,170 opposed to $120 for operating a bike. An average family has to work more than 6 weeks to pay a year's car expenses whereas to cover a bike's expenses a family has to work for one day, and walking is free. "By promoting alternative modes of transportation and connecting our communities with bicycle and pedestrian facilities," Ginns said, "we can allow families to invest more dollars in recreational opportunities and, as a result, have healthier families."

Quality of Life

About 40 percent of adults say they would commute by bicycle if safe facilities were available, and STPP encourages investments that make those facilities a reality.

"To make our communities healthier, safer, better connected, and less auto-dependent," Ginn said, requires well conceived and coordinated actions. STTP has formulated such a set of recommendations, which include: (1) collect better data and require more health research; (2) establish bicycle and pedestrian performance measures; (3) set aside targeted funds for bicycle- and pedestrian-oriented projects; (4) develop comprehensive bicycle and pedestrian plans; (5) provide safer and more frequent pedestrian crossings and bicycle routes; (6) require bicycle and pedestrian accommodations in every project; (7) create a "safe routes to schools" program; (8) develop a PR marketing campaign; (9) promote compact growth patterns; (10) reward local governments with incentive grants; (11) suballocate/devolve transportation decision making to the local level; (12) provide a commute benefit for biking/walking; (13) improve public facility siting regulations, including schools.

In a tribute to TV's Fred Rogers (one of several tributes at the symposium for the recently deceased Pittsburgh native), he compared the idealized "Mr. Roger's Neighborhood" to the real world of the city. "We all know we can't make our communities utopian," Ginns said, "but we can make them healthier and safer. This requires investment in public-transportation, bicycle, and pedestrian facilities, as well as changes in how we plan and design our communities for environmental health."

GREEN BUILDING

Pittsburgh's David L. Lawrence Convention Center—the site of this symposium—has the distinction not only of being the first environmentally sensitive convention center in North America; it is, according to the "LEED" standard,

"the largest green building in the entire world." So claimed Gary Goodson, deputy director of the Green Building Alliance, which has helped support the convention center's green design, construction, and operations efforts alongside the architects: Rafael Vinoly and Burt Hill Kosar and Rittelmann.

LEED is an acronym for the Leadership in Energy and Environmental Design rating system, developed by the U.S. Green Building Council, which the council describes as "a voluntary, consensus-based national standard for developing high-performance, sustainable buildings." Goodson pointed out that LEED has five categories—sustainable sites, water efficiency, energy and atmosphere, materials and resources, and indoor environmental quality—each of which he briefly discussed with respect to the "landmark effort" that produced the Pittsburgh convention center.

Sustainable Sites

"We certainly did not win all the battles," Goodson acknowledged, but the center still won enough to garner its superlative green-building distinctions. For example, it satisfies the LEED requirement of 60,000 square feet of floor space per acre. With regard to transportation connections, it accommodates virtually all modes (excepting a helicopter pad and water landing). To play its part in reducing the urban heat-island effect, the center has a reflective roof and underground parking. And to reduce local light pollution, it is not illuminated on the outside. That way, Goodson said, Pittsburghers may better see the stars and migrating birds will be less distracted.

Water Efficiency

Nonpotable water alone is used on the landscaping, and with the aid of a water-reclamation system, the center's consumption of potable water has been reduced by over 80 percent.

Energy and Atmosphere

Energy efficiency has actually been increased over the standard by about 25 percent, but the team believes they could have gone even further with more efficient chillers.

Materials and Resources

Some 90 percent of the now-demolished old center, by weight, was recycled. And regional virgin materials were readily available in Pittsburgh; nearly all of the concrete and steel came from within a 500-mile radius of the city.

Environmental Quality

During construction, dust kick-up from building materials was minimized by keeping them clean. The finished center has an efficient HVAC system and carefully monitors its carbon dioxide emissions. Using PPG's Pure Performance paint, no volatile organic compounds are emitted. There are individual controls in every room, and all of the areas except meeting rooms enjoy daylight views.

With the overall success of this monumental project across all these categories, Goodson suggested, "The Pittsburgh region is a national leader in the green building field."

REVOLUTIONIZING ENERGY SYSTEMS

Electricity is quite inexpensive in the Pittsburgh area largely because most of it comes from burning coal, according to M. Granger Morgan, professor and head of the department of engineering and public policy at Carnegie Mellon University. But in Pittsburgh as elsewhere, some dramatic changes will have to be made in energy systems over the next few decades in order to deal effectively with carbon dioxide and climate change.

Air pollution comes from a variety of sources, but "if you look for the industrial sector that produces the most pollution per unit of economic output, it is electric power, and it produces substantial amounts of oxides of sulfur, oxides of nitrogen, and greenhouse gases," Morgan said. The major greenhouse gas is CO_2, which is created when fossil fuels are burned. But unlike most other air pollutants, which have relatively short residence times in the atmosphere, CO_2 molecules can remain there for more than 100 years.

The result, as is now well documented, is the greenhouse effect. Since the beginning of the industrial revolution, atmospheric concentrations of CO_2 have risen by about 30 percent and the planet has already warmed in response by about 1.5° F. The Intergovernmental Panel on Climate Change (sponsored by the United Nations) estimates that over the next century the earth's average temperature will continue to rise—by 2.5–10° F. "The impacts of such warming on the economies of the United States and other developed countries will probably be quite small, maybe a couple of percent at most," Morgan said, "but the impacts on the economies of some developing countries will likely be much larger, and the impacts on many natural ecosystems will be really enormous."

Such outcomes must of course be averted, but a confounding factor in CO_2 buildup is that stabilizing emissions will not immediately stabilize concentrations. Given the gas's long residence time, massive reductions in CO_2 emissions—in excess of 80 percent—will be necessary in order to stabilize concentration.

Thus, while options such as conservation and renewables can help, Morgan said, "they can't probably get us 80 percent on time scales of a few decades." There has been a recent revolution in thinking about carbon capture and disposal

(CCS) technologies, which take carbon out of fossil fuel, either before or after combustion and then sequester it deep underground or in the oceans. This is a major area of research at the moment, Morgan said, and its principal venue—the National Energy Technology Laboratory—happens to be located just south of Pittsburgh.

Dramatic technological innovation would not be required for CCS, he maintained, as we already produce a good deal of hydrogen fuel (which is what would essentially result after stripping fossil fuel, precombustion, of its carbon) and we move CO_2 long distances in pipelines and inject large amounts of materials underground (Figure 7–6). Also, CCS is comparable in cost to other serious options, such as large-scale wind, and far less expensive than long-term options such as solar photovoltaics.

There are no magic bullets, however. It will take a *combination* of different strategies to begin having serious impacts on CO_2 emissions.

Consequently, people in Pittsburgh and throughout the country must continue to promote energy efficiency in buildings, transportation, and industrial

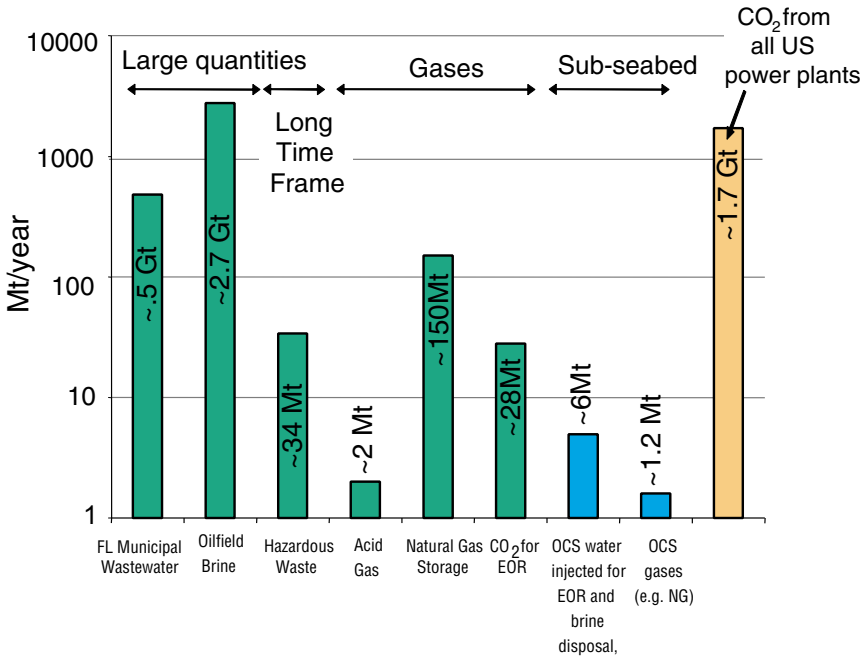

FIGURE 7–6 The mass of current United States fluid injections is greater than the mass of current power plant CO_2 emissions. SOURCE: E. Wilson, Carnegie Mellon University and U.S. Environmental Protection Agency, unpublished. Reprinted with permission.

processes—fleet operators and public buildings can take the lead—and we need to continue to work on mass transit and the development of renewables, Morgan said.

We must also promote combined heat and power systems, which achieve remarkably high efficiencies (more than 80 percent) because they not only make electricity but also use the waste heat to warm (or cool) a building; this is "dramatically better than the current strategy of making the electricity in one place and the heat for the building in another." Meanwhile, "we need to work to get some large demonstration activities for carbon capture and disposal located here in our area, inasmuch as the country's leading lab is here."

Finally, he added, "while nuclear power clearly faces various problems, it is certainly the case that nuclear power is one way to make electricity without carbon dioxide."

8

Where Do We Go from Here?*

In the spirit of analyzing the symposium's sessions and specifying appropriate steps to ensure environmental health in postindustrial cities and elsewhere, a group of panelists from government, industry, academia, and the public-interest arena were asked to consider the following questions:

- What new issues and possibilities did you see in today's discussion?
- What actions do you see as logical next steps?
- Are there natural alliances among environmental and health communities that should be made?
- Are there conflicts between environmental and health issues that need to be resolved?
- What basic research would you most like to see?
- What are the critical local data-collection needs?
- What kinds of coordinating bodies are needed?
- Who is missing from policy making on environmental health issues?

MORE AND BETTER FEEDBACK LOOPS

Several panelists observed that the workshop's sessions had been eye-opening with regard to linkages between environmental and health issues. They noted the need to make these connections better understood by community members as well as by experts, who are sometimes unaware of their work's relevance to other fields or to many of its practical applications. "I have made many presentations using a lot of the same images of development and highways, but I always

*This chapter was prepared from the transcript of the meeting by Steven J. Marcus as the rapporteur. The discussions were edited and organized around major themes to provide a more readable summary and to eliminate duplication of topics.

talked about them, and everyone else in my professional realm talked about them, in terms of impact on the environment—such things as storm-water runoff and air pollution. We never, or rarely, linked back to actual people, health, mortality, illness, and psychological states," said Caren Glotfelty, director of the Environment Program at the Heinz Endowments. "I will never look at these issues in quite the same way again."

"Environmental issues, public health, and community design are often treated separately, but they are inexorably linked at the hip," agreed Court Gould, director of Sustainable Pittsburgh. "When we hurt the environment, we hurt others. Foremost, we hurt ourselves. But it is often hard to see the relationships between these issues. There are not enough feedback loops from which to get information."

Gould noted that several workshop participants, both at the podium and in the audience, had pointed out the need for more and better feedback loops. Kathleen McGinty had referred to the 1993 tragedy in Milwaukee, where drinking water contaminated by *Cryptosporidium* caused the deaths of some 40 to 100 people and produced 400,000 cases of illness. Had a system like PAIRS (the Pennsylvania Incident-Response System) been in place there to detect the threatening situation, much or all of that harm might have been averted. Similarly, Farley Toothman (county commissioner of Greene County, Pennsylvania), in his impassioned comments, talked about the need for feedback loops that link cancer rates in his county to water-quality problems there. Richard Jackson showed how it was the Olympics that raised public awareness to the impacts of vehicular travel and air pollution in Atlanta, as revealed by increases in insurance health-claim rates and frequency of visits to hospital emergency rooms.

Gould cited Senator Robert F. Kennedy's observations on the inadequacy of many of our existing feedback loops and the need to do better. For example, gross domestic product, according to Kennedy, is an inadequate gauge of well-being because "it measures everything . . . except that which makes life worthwhile!" "What he meant," Gould maintained, "was that it includes just about all we do and know about money, but it fails to account for our overall conditions of well-being and quality of life."

INFORMATION SHARING GETS RESULTS

On the subject of well-being and quality of life, Esther Bush, president and CEO of the Urban League of Pittsburgh, stressed that ordinary citizens, especially those in greatest need, must be involved in improving their situation and shaping their future. "Race and poverty are absolutely two issues that have to be explored and have to be included when we talk about areas of environment," she said, which means that "community individuals must be at the table." Only then will they "have the information to know how to build something that would be more healthy."

Information, agreed Raymond F. Vennare, president and CEO of ImmunoSite, Inc., gives people the power to work successfully for the common good. In the

absence of individuals in the community sharing information—that is, "if we all operate in silos"—nothing much is going to happen. Or as Stephen Thomas, director of the University of Pittsburgh's Center for Minority Health, put it: "Knowledge, information, and sustained education at the community level can help give people a voice to come up with options that work for everybody."

And "everybody" means *everybody*, several participants noted. Enlightened information-sharing approaches are not only valuable for people in greatest need but for all who do the sharing. For example, Bush noted that, by partnering with community-based organizations, University of Pittsburgh researcher Herbert Needleman gained local support and credibility, which helped him build trust among those in the community who could provide him with the lead-exposure data he needed. All parties gained useful information for their lives and pursuits.

Similarly, Michael J. Wright, director of health, safety, and environment for the United Steelworkers of America, noted that workers must be included in policy making on environmental health issues in industry— not just manufacturing but other industries as well. "The actual workers who are intimately involved in the production process, whether it is production of goods or of services," Wright said, are not only the most directly exposed to the environmental problems in question but are usually the most knowledgeable on the most practical solutions.

He cited an example from the early 1990s regarding EPA's new regulations for coke-plant emissions. "The people who really made the difference, who got us an EPA regulation that cut pollution from coke plants more than anybody thought we could, and at lower cost, were workers. They were the ones who knew what you could do and what you couldn't."

In some cases, worker and community member might be one and the same. "By training community residents for careers in environmental health," Bush suggested, "this could provide both jobs as well as access to valid and reliable data." Baruch Fischhoff, professor of engineering and public policy at Carnegie Mellon University, said that a program at Xavier University of Louisiana, which "educates African-Americans to do exactly those sorts of jobs, is a sterling example." One participant, noting a need to gather data on long-term cumulative effects of pollutants—involving dispersed and labor-intensive data on life histories, residences, and workplaces, among other things, suggested that secondary-school students might serve as information gatherers. This could "actually contribute in significant ways to the real science of these effects," he said, "while also providing job training and educational experiences for high-school kids."

MAKING CLEAR THE CONNECTIONS

While generally in agreement with the need to create jobs that are meaningful both for individuals' careers and the betterment of community environmental health, Wright also sounded a note of caution. "It's hard to gather life histories

retrospectively and accurately, and we certainly do need that kind of research. But all of us have seen too many examples where the desire for more research has paralyzed current action. In the Steelworkers Union, this occurred with regard to ergonomic injuries, which has been a huge controversy in the last decade. We have all certainly seen it for things like climate change, where the side in the debate that doesn't want to do anything right now keeps saying, 'We need more research, we need more research.' We certainly do need more research, but we *know* that there are toxics in our waterways. We *know* there are problems in our air. We need to take some action now even without all the answers."

Vennare pointed out that while there is plenty of data, there is also a substantial need for integrating these existing databases "relationally." In that way, he said, "you turn the data into information, and you can pull out information that has some kind of meaning." Glotfelty noted that one such mechanism is a geographical information system, being developed with the support of the Heinz Endowments, that can collect data and display them at the same scale in the same way across the region. To be offered to the community as a free resource, it would avoid the situation of "isolated bits and pieces of information that we can't pull together—one little health study there, one little environmental study here, which don't match up" and instead provide "the beginning of a system that should allow us to look much more comprehensively, layering as much data as we can put into it over time, so that we look across the community."

Critical to effective action, panelists agreed, is the presentation of information to the community in a convenient, readily comprehensible way, and the securing of such information in the first place through collaborative efforts among the numerous and often diverse sources.

Communication of environmental health issues requires creativity, said Jerry Thompson, a partner and director at Ketchum Pittsburgh. They are inherently complex, and not always of obvious relevance to people's everyday lives, yet they can often have great impact nevertheless. This may be made clearer and more compelling through simplification and focusing—with the aid, wherever possible, of metrics such as cost-benefit ratios. "It can be difficult to connect the dots on how some of these things work together and how they are relational," he acknowledged. "Some of the science can be mind-boggling and wondrous in and of itself, but when it comes to the communications piece it really is a system to be engineered and managed" to show that some very significant health and social issues are at stake.

To make these issues more appealing to the average citizen, it's incumbent upon the various experts and public-interest groups—that is, professionals who are already aware of the implications, or who at least hold important pieces of the puzzle—to collaborate. "The environmental groups involved with issues of land-use planning and sprawl need to reach out to groups focused on environmental health," said Glotfelty. "Together, these communities can make clear to

the public the connections between human health and the ways we choose to build our buildings and communities."

FACILITATING PROGRESS

Bruce Dixon, director of the Allegheny County Health Department, paraphrased the famous remark of former Speaker of the House Thomas P. (Tip) O'Neill that "All politics is local." Dixon noted that "All *health* is local," which implies that local (and, not coincidentally, politically attuned) entities can play important roles in making the needed collaborations a reality, even when relationships between parties are initially contentious. "We [at the Health Department] have done that quite well," he said. "We deal with people who have environmental interests. We deal with people who have industrial interests. And hopefully we can be the facilitator to bring those two parties together and reach something that is clearly to the betterment of everyone."

Glotfelty hailed such facilitation as highly desirable and an encouraging sign of progress. "For a long, long time nobody seemed to be paying attention to that issue [of land-use planning and its relationship to the environment, and hence to health]. But it's really satisfying for me to see that sprawl's negative effects on all aspects of our lives and the environment is now a major topic of conversation. I cochaired Governor Ridge's Twenty-First Century Environment Commission several years ago, and for the very first time in this state we were able to have a set of government agencies openly sponsor conversations all over the state that actually used the terms 'land use' and 'planning'."

Such agency involvement is not only desirable but essential, one participant remarked. "Environmental issues, health issues, and public health issues are technical issues and organizational issues, but at base they are *political* issues, and all of us as citizens need to address them that way."

For one thing, as Dixon pointed out, agencies play a central role in "constantly having to balance the needs of what is environmentally safe versus the needs of economic development and growth." For another, agencies' regulations and oversight define reality for stakeholders, which ultimately yields positive results. "Everything that has been said could be perceived as bad for business—that businesses leave the region because of compliance, because of local, state, or federal regulations, because of environmental concerns," said entrepreneur Vennare. "But the fact is, I love compliance. I love compliance because it gives businesspeople a blueprint for success. It tells you what the ground rules are. It tells you how to operate your business in the most effective way according to the law."

And political entities, centrally positioned for the long term, can provide continuity. As Thompson noted, such consistency is critical for achieving progress: "It takes a long time to make some of these kinds of changes happen,

and there has to be a sustained commitment to programming and following through."

THE ELEMENTS OF SUCCESS

Sustainable Pittsburgh's Gould offered seven recommendations for such political actors, both in and out of government:

- *Regulatory reform* . We need regulatory reform for solutions on a watershed, airshed, and ecosystem basis, as opposed to the silo/media approach—where we address individual pollutants and often miss the synergistic combinations. Also, we focus too exclusively on geopolitical boundaries.
- *Fiscal reform*. We need to tie federal and state dollars to direct support of regional smart-growth strategies that link land-use planning to transportation and other infrastructure. We need to focus on livable-community design, healthy communities, and equity in transportation and environmental impacts. We need to link economic development to workforce issues, affordable-housing issues, and environmental and sustainable-development issues.
- *Accounting reform*. Following on RFK's words, we need to improve the feedback loops. We need to move away from reliance on gross domestic product and move toward, for example, what Canada has adopted—the genuine progress indicator, or GPI, which uses a new system of national accounts to prioritize human capital, social capital, and environmental capital as well as economic capital.
- *Tax reform*. Let us follow the lead of northern European countries, which are increasing taxes on energy and material use while decreasing taxes on labor and income.
- *Economic reform.* Remove the subsidies for fossil fuels to make renewables more competitive, and particularly find better ways to measure the externalities related to our reliance on fossil fuels.
- *National sustainable-development strategy*. Eleven years ago at the 1992 Rio de Janeiro conference, the United States made some proclamations about getting on board with sustainability. However, we have not realized—as a country—many of those early commitments.
- *Increase support for the research sector*. This is particularly needed for linking community health to the built environment.

Vennare endorsed these recommendations and noted that "if you get at the root of each one of them, it is for the quality of life, for the common good, for taking social responsibility (whether at the federal, state, local, or personal level), and—the only way you can do that—for having personal accountability. I would

suggest that that is not only the reason why we are here; it is the reason why we'll succeed."

In the final commentary of the session, Dixon summarized the basic elements of that success: "We need to continue the dialogue. Collaboration is extremely important, and collaboration across geopolitical lines—a regional approach—is especially important. Integration of services is important too, and so is integration of *people*: we need to have a broad consensus and continued dialogue on what we are doing, where we are headed, and how we get there; and we need to educate people so that they become participants in the whole effort."

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Appendix A

Agenda

ENSURING ENVIRONMENTAL HEALTH IN POSTINDUSTRIAL CITIES

Hosted by

The Institute of Medicine's Roundtable on Environmental Health Sciences, Research, and Medicine
Graduate School of Public Health, University of Pittsburgh
Carnegie Mellon University

March 19, 2003
9:00 a.m. to 5:00 p.m.
David L. Lawrence Convention Center, Pittsburgh, PA

8:30 a.m. **Welcome**
Lynn Goldman, M.D.
Vice Chair, Roundtable on Environmental Health Sciences, Research, and Medicine
Professor, Johns Hopkins University Bloomberg School of Public Health

8:35 a.m. **Charge to Speakers and Participants**
Baruch Fischhoff, Ph.D.
Professor, Departments of Social and Decision Sciences and Engineering and Public Policy
Carnegie Mellon University

8:45 a.m. **What Is Environmental Health?**
Kenneth Olden, Ph.D.
Director
National Institute of Environmental Health Sciences

9:00 a.m. **The Changing Faces of Pittsburgh: A Historical Perspective**
Joel Tarr, Ph.D.
Professor, Urban and Environmental History and Policy
Carnegie Mellon University

9:25 a.m. **Overview of Environmental Health in Postindustrial Cities**
Bernard Goldstein, M.D.
Dean, Graduate School of Public Health
University of Pittsburgh

Keynote

9:45 a.m. **Ensuring Environmental Health in Pennsylvania**
Kathleen McGinty, J.D.
Secretary of the Environment
Pennsylvania

10:15 a.m. **Break**

Special Issue for Pittsburgh: Our Rivers

10:35 a.m. **Introduction**
Mark Nordenberg, J.D.
Chancellor
University of Pittsburgh

10:45 a.m. **Polluted Rivers; Sewage Overflow**
Jared Cohon, Ph.D.
President
Carnegie Mellon University

11:10 a.m. **Rivers As Our Future**
Lisa Schroeder, M.S.
Executive Director
RiverLife Task Force

11:30 a.m. **Discussion**

12:00 p.m. **Lunch (provided)**

12:15 p.m. **Special Address**
Richard Jackson, M.D., M.P.H.
Director, National Center for Environmental Health
Centers for Disease Control and Prevention

Panel 1: Community—Past, Present, Future (Concurrent Session)

1:15 p.m. This session examines the issues facing postindustrial cities. It looks at the progress that has been made and the efforts underway, and identifies the challenges to continuing to move forward.

Moderator: Deborah Lange, Ph.D., Executive Director, The Brownfields Center, Carnegie Mellon University

Addressing Environmental Health Challenges in Postindustrial Cities
Henry Falk, M.D., M.P.H.
Assistant Administrator
Agency for Toxic Substances and Disease Registry
Centers for Disease Control and Prevention

Panelists:

Brownfield Concerns
Mark C. Schneider
President
The Rubinoff Company

The Impact of the Environment on Physical Activity Levels
Andrea Kriska, Ph.D.
Associate Professor
Graduate School of Public Health
University of Pittsburgh

Environmental Justice
Leon Haynes
Executive Director
Hosanna House

Healthy Homes: Community Action
Samantha Roth, MSW
Executive Director
Healthy Home Resources

2:15 p.m. **Audience Participation**

2:25 p.m. **Break**

Panel 2: Systems, Built Environment—Past, Present, Future (Concurrent Session)

1:15 p.m. This panel explores the new areas of environmental health as a city moves from industrial to a knowledge city. Panelists are being asked to address how lifestyle issues (such as urban sprawl, green building, renewable resources, open spaces, and disparities) relate to the health impact of citizens and communities.

Moderator: Carol Henry, Ph.D., Vice President of Research, American Chemistry Council

Health and the Built Environment
Vivian Loftness, M.Arch.
Professor and Head
School of Architecture
Carnegie Mellon University

Panelists:

Smart Growth Means Healthier Communities
Alex Graziani, AICP
Executive Director
Smart Growth Partnership of Westmoreland County

Transportation Issues
David Ginns
Transportation Specialist
Transportation for Livable Communities

Green Buildings: Building for the Future
Gary Goodson
Deputy Director
Green Building Alliance

Energy Systems: The Coming Revolution
Granger Morgan, Ph.D.
Lord Chair Professor in Engineering; Professor and
Department Head, Engineering and Public Policy
Carnegie Mellon University

2:15 p.m. **Audience Participation**

2:25 p.m. **Break**

Panel 3: Where Do We Go from Here?

2:45 p.m. This panel will explore the challenges to meeting the present and future challenges of environmental health. Panelists and participants are asked to think about the following issues:

- What new issues and possibilities did you see in today's discussion?
- What actions do you see as logical next steps?
- Are there natural alliances among environmental and health communities that should be made?
- Are there conflicts between environment and health issues that need to be resolved?
- Where basic research would you most like to see?
- What are the critical local data collection needs?
- What kinds of coordinating bodies are needed?
- Who is missing from policy making about environmental health issues?

Moderator: Baruch Fischhoff

Panelists:

Esther Bush
President and CEO
Urban League of Pittsburgh, Inc.

Bruce Dixon
Executive Director
Allegheny County Health Department

Michael Wright
Director
Health, Safety, and the Environment
United Steelworkers of America

Caren Glotfelty
Program Director
The Heinz Endowments

Court Gould
Director
Sustainable Pittsburgh

Carol Henry
Vice President of Research
American Chemistry Council

Deborah Lange
Executive Director
The Brownfields Center
Carnegie Mellon University

Jerry Thompson
Partner and Director
Ketchum Pittsburgh

Raymond F. Vennare
President and CEO
ImmunoSite, Inc.

4:00 p.m. **Audience Participation**

4:30 p.m. **Summation**
` Bernard Goldstein

5:00 p.m. **Adjourn**

Appendix B

Speakers and Panelists

Esther Bush
President and CEO
Urban League of Pittsburgh

Jared Cohon, Ph.D.
President
Carnegie Mellon University

Bruce Dixon, M.D.
Director
Allegheny County Health Department

Henry Falk, M.D., M.P.H.
Assistant Administrator
Agency for Toxic Substances and Disease Registry (ATSDR), CDC

Baruch Fischhoff, Ph.D.
Professor of Social and Decision Sciences
Carnegie Mellon University

David Ginns
Transportation Specialist
Transportation for Livable Communities

Caren Glotfelty
Program Director
The Heinz Endowments

Lynn R. Goldman, M.P.H., M.D.
Professor
Johns Hopkins University

Bernard D. Goldstein, M.D.
Dean
Graduate School of Public Health
University of Pittsburgh

Gary Goodson
Deputy Director
Green Building Alliance

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Director
Sustainable Pittsburgh

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Executive Director
Smart Growth Partnership of Westmoreland County

Leon Haynes
Executive Director
Hosanna House

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National Center for Environmental Health
Centers for Disease Control and Prevention

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University of Pittsburgh

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The Brownfields Center
Carnegie Mellon University

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School of Architecture
Carnegie Mellon University

Kathleen McGinty, J.D.
Secretary of the Environment
Pennsylvania

Granger Morgan
Lord Chair Professor in Engineering
Carnegie Mellon University

Mark Nordenberg
Chancellor
University of Pittsburgh

Kenneth Olden, Ph.D.
Director
National Institute of Environmental Health Sciences
National Institutes of Health

Samantha Roth
Executive Director
Healthy Home Resources

Mark C. Schneider
President
Rubinoff Company

Lisa Schroeder
Managing Director
Riverlife Task Force

Joel Tarr
Richard S. Caliguiri Professor of History and Philosophy
Carnegie Mellon University

Jerry Thompson
Partner and Director
Ketchum Pittsburgh

Raymond Vennare
President and CEO
ImmunoSite

Michael Wright
Director
Health, Safety, and the Environment
United Steelworkers of America

Appendix C

Meeting Participants

Kellie Anderson
University of Pittsburgh

Myron Arnowitt
Clean Water Action

Felicia J. Bayer
Alcoa

Donald Berman
Berman Consultants

Joan Blaustein
3 Rivers Wt Weather, Inc.

Alex Botkin
CONSAD Research Corporation

Donald A. Brown
Pennsylvania Consortium for Interdisciplinary Environmental Policy

Albert H. Brunwasser
Resource Development & Management, Inc.

Stephen Byers
University of Pittsburgh

Holly Cairns
PA Department of Environmental Protection

Jon Capacasa
Environmental Protection Agency

Cynthia Carrow
Western Pennsylvania Conservancy

Daniel Cinpinski
Housing/Community Environment Program

Jeanne Clark
Citizens for Pennsylvania's Future

Timothy Collins
Studio for Creative Inquiry

Maren Cooke
Carnegie Mellon University

Karen Crenshaw
University of Pittsburgh

Mike Crissey
Associated Press

Ron Cusano
Schnader Harrison Segal & Lewis LLP

Michael Delano
American Map Co.

Allen Dearry
National Institute of Environmental Health Sciences

Daniel Depra
University of Pittsburgh

Melanie Doebler
Penn State University

Jim Driscoll
Driscoll Enterprises, Inc.

Joe Duckett
SNC–Lavalin (Eichleay)

Minh Ha Duong
Carnegie Mellon University

Molly Eggleston
Center for Public Health Practice, University of Pittsburgh

Ryan England
Carnegie Mellon University

Ann English
Carnegie Mellon University

Alice Enz
World Federalist Association of Pittsburgh (WFAP)

George Fechter

Rachel Filippini
Group Against Smog and Pollution (GASP)

Keith Florig
Carnegie Mellon University

Christine Fulton
Soffer Organization

Ann Jones Gerace
Conservation Consultants, Inc.

Jo Ann Glad
Allegheny County Health Department

Cassandra Hadley
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Joan Haley
University of Pittsburgh

Kevin Halloran
Department of Environmental Protection

Janel Hanmer
University of Wisconsin – Madison

Elbert Hatley
Ebony Development, LLC

Emily Heberlein
Heinz School/Carnegie Mellon University

Marijke Hecht
Nine Mile Run Watershed Association

Steve Hepler
Department of Environmental Protection

Martin Hochhauser
Allegheny County Health Department

Dan Holland
Federal Reserve Bank of Cleveland, Pittsburgh Branch

Brian Jensen
Pennsylvania Economy League, Inc.

Meryl Karol
University of Pittsburgh

Lawrence Keller
University of Pittsburgh

Alice Kindling
Allegheny County Health Department

Wendy King
University of Pittsburgh, GSPH

George E. Klinzing
University of Pittsburgh

Steven A. Koehler
Allegheny County Coroner's Office

Julie Kurlfink
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Barbara Kviz
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Richard Laird
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Lina Lukinskiene
University of Pittsburgh

Robert Lurcott

Elizabeth Lynn
McCune Foundation

Joe Marriott
Carnegie Mellon University

Joyce Martin
Department of Environmental Health, University of Cincinnati

George McGrann
Schnader Harrison Segal & Lewis LLP

David McGuigan
Environmental Protection Agency

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Green Earth Services

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Group Against Smog and Pollution (GASP)

Evan Nelson
Group Against Smog and Pollution (GASP)

Ronald Neufeld
University of Pittsburgh

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Pennsylvania Environmental Council

Megan O'Donnell
Carnegie Mellon University

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Development Solutions

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Allegheny County Emergency Local Planning Commission

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Rose Ramos
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Mary Reiter
CONSAD Research Corporation

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Penn State University

Pamela Russell
Pennsylvania Department of Health

Heather Sage
PennFuture

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3 Rivers Wt Weather, Inc

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Nick Shorr
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Michael Shriberg
Chatham College

Jim Smith
Ebony Development, LLC

R. Donald Spencer
Carnegie Mellon University

Byers Stephen
University of Pittsburgh

John Stephen

Paul Supowitz
University of Pittsburgh

Nancy Sussman
University of Pittsburgh

Joseph M. Sutej
Bayer Polymers LLC

Evelyn Talbott
University of Pittsburgh

Ken Thompson
Western Psychiatric Institute and Clinic

Sue A. Thompson
Pennsylvania Biodiversity Partnership

Ernest Tillman
H. F. Lenz Company

Farley Toothman
Greene County Board of Commissioners

Allison Topper
Institute for Healthy Communities

Paul Vogel
Department of Environmental Protection

Jason Vrabel
Community Design Center of Pittsburgh

Charles Vukotich
Allegheny County Health Department

Niel Wald
University of Pittsburgh
Graduate School of Public Health

David Wheitner
Carnegie Mellon University

Irvin Williams
Ebony Development, LLC

Michael J. Wright
United Steelworkers of America

Guoying Yu
University of Pittsburgh

Jeanne Zborowski
University of Pittsburgh

Susan Zidar
Green Pledge