

National Conference of State Legislatures  
**ENVIRONMENTAL  
HEALTH SERIES**

April 2000  
No. 3

## **Growth Management and Healthy Cities**

by Glen Andersen  
NCSL Environmental Health Project

Uncontrolled urban growth, highway congestion, air and water pollution, and the continued sprawling of the suburban landscape all affect the public's health. These seemingly disparate issues play important and interconnected roles in determining the quality of life in and around America's cities. Recognizing that cities can have both positive and negative impacts on health and well-being, the healthy cities concept promotes designs and practices that integrate social, economic, environmental, and public health concerns into planning and design. These issues continue to gain importance as state populations increase—many will see growth rates from 26 to 50 percent between 1990 and 2010. Some states—including Arizona, Maryland, Oregon and Pennsylvania—are developing programs and legislation to address the problems related to population growth and urban sprawl.

### **OVERVIEW**

How we design our environment profoundly affects our quality of life and health. While unmanaged growth and urban sprawl burden society with increased resource consumption, longer commuting times and shrinking open spaces, they can negatively affect health as well. Sprawl impacts environmental quality and health in multiple ways; it creates air pollution by increasing transportation time and fossil fuel use, water pollution by increasing the amount of runoff, and heat islands by shrinking open spaces and increasing paved and built areas. Poorly planned, car-oriented cities and urban sprawl also can discourage walking and exercise, which are important components of disease prevention and health promotion.

### **Contents**

*Overview* ..... 1  
*City Growth and*  
*Human Health* ..... 2  
*Heat Islands* ..... 6  
*Hitting the Highway* ..... 6  
*Air and Water Quality—*  
*Essential for City Health* .... 8  
*State Policy* ..... 12  
*Federal Policy* ..... 13  
*Notes* ..... 15



Humans have been altering their living environment for centuries, often with profound impact on community health and average life-span. Although water and waste treatment have improved public health, evidence shows that environmental factors in many cities are having a negative impact on a number of urban and suburban residents. Relatively recent developments in modern science have made it easier to identify environmental factors that influence human health, providing the information needed to create healthier living environments and cities. Many studies show that cases of asthma and other illnesses rise and fall along with levels of air and water pollution.

A more than 30-year increase in life-span as well as dramatic reductions of once common diseases provides evidence that the overall health of the average American improved throughout the last century. Although some of this progress can be attributed to medical advancement, about 80 percent of increased life-span can be attributed to improvements in public health, including introductions of healthier living environments, cleaner water, and safer, more nutritious food. Still, many of our urban and suburban areas create excessive environmental stressors that can adversely affect health. Since 75 percent of the U.S. population lives in urban areas,<sup>1</sup> ensuring that our cities provide a healthy environment is essential to the nation's productivity and well being.

Where does the United States stand in relation to growth related environmental quality and health issues?

- In 1997 more than 100 million people in the United States lived in areas that violated the U.S. Environmental Protection Agency's air quality standards.
- A 1998 report by the United States Geological Survey found that 95 percent of streams and 50 percent of wells near agricultural and urban areas contained one or more pesticides.
- From January to September 1994, 1,500 fish advisories were posted throughout the United States—73 percent of these postings were related to mercury contamination.<sup>2</sup> (The primary source of mercury is coal-burning power plants.)
- In 1996, about 40 percent of the nation's surveyed rivers, lakes and estuaries were too polluted for basic uses, such as fishing and swimming.<sup>3</sup> (Urban runoff, sewage and lawn chemicals contribute to this problem)

## **CITY GROWTH AND HUMAN HEALTH**

The built environment plays an essential role in the health and well being of the individuals and communities that inhabit urban, suburban and rural areas. It influences physical and chemical factors that affect human health, such as water, air, temperature, comfort, physical

activity and safety.

### **Air in the City**

Air quality across the nation has improved in most communities since the enactment of the Clean Air Act in 1970. Most of the six criteria air pollutants in EPA's focus (nitrogen dioxide, carbon monoxide, sulfur dioxide, ozone, particulates and lead) have decreased, however, the levels that are considered harmful to humans decreased as well.

The EPA has conducted a scientific review of thousands of papers regarding the health effects of criteria pollutants and determined that current standards are not adequate to protect human health. Results of this research lead the EPA to conclude that current standards for particulates, ozone and carbon monoxide do not provide a sufficient margin of safety, because too many members of the population are susceptible to adverse health effects at these levels.

Examples of research indicate a deficiency in current air quality standards (see figure 1)

- Adverse effects on the lung function of individuals who are exercising outdoors have been detected when ozone levels are half the current U.S. EPA standard.
- Mortality and asthma hospital admissions increase at ozone and particulate levels that are 30 percent lower than current EPA standards.<sup>4</sup>

Multiple studies demonstrate a cause and effect relationship between adverse health effects and levels of ozone, particulates and sulfates. Hospital admissions for asthma increase as ozone and sulfates levels increase, as do cases of pneumonia and influenza; rising particulate levels correlate with increased mortality rates.

Approximately 113 million people live in areas that do not meet EPA's current standards for clean air and are at risk for related adverse health effects such as asthma and respiratory infections. Each year an estimated 50,000 people in the United States die due to illnesses that are created by or exacerbated by air pollution.<sup>5</sup>

*Running in a polluted urban area for 30 minutes produces the same amount of carbon monoxide in the blood-stream as smoking a pack of cigarettes.<sup>10</sup>*

*Number of people living in Areas that violate EPA Air Quality Standards*

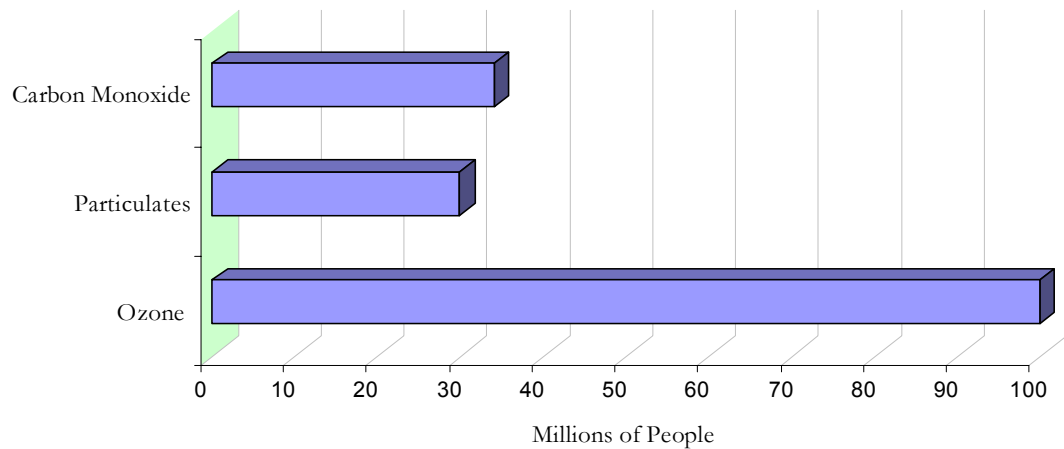


Figure 1.

Source: *Latest Finding on National Air Quality: 1997 Status and Trends*, US EPA, 1998.

Most air pollution is produced by the combustion of fossil fuels for transportation, electricity, heating and industry. It logically follows that items influencing these factors—such as urban design, growth patterns, and transportation planning—will influence air quality. The EPA estimates that transportation-related air pollution causes 40,000 premature deaths in the United States annually—a number comparable to the number of annual deaths caused by motor vehicle accidents. Because transportation is the main source of pollution in urban areas, applying planning concepts that include transportation management can have dramatic effects on air quality.<sup>6</sup>

Current growth patterns demonstrate a trend: people are migrating from the city to neighboring areas that are characterized by widely dispersed, land-intensive suburbs. These sprawling settlements increase the distance and time it takes for individuals to reach places of work, commerce, and recreation, thus increasing automobile dependence and its accompanying pollution. Automobile-oriented outer suburbs use three times the amount of gasoline per person relative to inner and middle suburbs that provide rail and bus transit options, and five times as much as the walking-oriented core suburbs.<sup>7</sup> The difference depends not only on distances traveled, but also on the mode of transport. Bus and rail travel (including heavy rail, light rail and trams) use less energy than the automobile for each mile a person travels; bus travel uses around 30 percent less energy than a car, while rail uses almost 80 percent less.

A major problem confronting transportation planners is the incredible growth not only in the number of vehicles on the road, but also in the distance individuals travel each day in their cars and trucks. Although there has been significant progress since 1970 in reducing vehicle emissions per mile traveled, the number of vehicles on the road and the distances they travel have doubled during the same time span. Transportation planners throughout the nation are predicting longer commute times on increasingly congested roadways. Highway congestion, besides having dramatic effects on air quality, decreases productivity and increases commuter stress. A 10 mile car trip in light traffic that lasts 11 minutes produces 2 grams of volatile organic compounds (VOCs, chemicals that react with sunlight to create ozone); the same trip in heavy traffic that lasts 30 minutes generates seven grams, a 250 percent increase in VOC emissions. Pollution amounts are more than double for sport utility vehicles, which make up an increasingly greater percentage of commuter vehicles.

Using growth management techniques that promote walking, rail and bus travel will not only reduce pollution emissions, but also will decrease transit times and increase productivity. Most peak-hour travel on urban roadways occurs under congested or highly congested (near stop-and-go) conditions. A recent study by the Texas Transportation Institute found that vehicle gridlock costs America \$76 billion per year by increasing transit time, shipment time, vehicle operating costs, fuel consumption and air pollution. Policies such as California's requirement that 10 percent of new vehicles offered for sale by 2003 produce zero emissions help control pollution from mobile sources but do little to reduce congestion. Additional plans include cleaner burning reformulated fuels, more efficient catalytic converters and alternative engine designs.

Although tailpipe emissions reductions are an integral part of improving urban air quality, relying solely on these reductions is not likely to suffice in the long run. First, the number of automobiles and higher-emission sport utility vehicles increases each year, as do vehicle miles traveled per person. The increase in vehicles and miles traveled could counteract gains from improved auto emissions. Second, this approach will do nothing to deal with increasing commute times and congestion. Finally, it does not address the quality of life and safety issues that impact both residents who must spend frustrating commuting hours in traffic and their children who are not able to safely bike, walk or play in their communities.

Some cities—such as Portland, Oregon—have had progressive growth management plans in place for years. Portland has far less serious air quality problems than other high-growth cities, because it has implemented growth management plans that avoid massive highway expansion and focus more on light rail transit, high-frequency bus service, and walking and bicycling facilities. Portland's planning approach has helped reduce growth in the number of miles each person travels, giving it the fewest total miles traveled relative to other higher

growth U.S. cities. Less driving (along with better fuels and pollution controls) means less pollution: in 1972, Portland's air was so dirty it violated federal health standards on one out of every three days. Currently, there are no violations.

Although methods and principles exist for designing transportation plans that preserve air quality, many air quality planners have been frustrated in their attempts to achieve these goals through the planning process. A main barrier to air-quality-conscious transportation planning is the weak link between transportation planning and land use regulation that exists in virtually all cities, Portland being an exception.<sup>8</sup>

### ***Overview of Major Air Pollutants***

**Sulfur Dioxide** Results mainly from coal combustion, sulfur dioxide is linked to increases in respiratory problems including asthma. It is also the principal cause of acid rain.

**Particulate matter** These small particles lodge in the lungs and hamper their ability to function. Studies show that, as particulate matter increases, so do cases of bronchitis, asthma, respiratory illness and mortality.

**Ozone** Created when ultraviolet (UV) radiation from the sun contacts nitrogen oxides and volatile organic compounds (VOCs)—chemicals that react with sunlight to create ozone, a main component of smog. Ozone is a highly reactive chemical that can irritate and damage lung tissue. Asthma and other respiratory illness have been found to increase along with ozone levels.

**Nitrogen oxides** Results from the burning of fossil fuels, either in power plants or vehicles; nitrogen oxides—aside from promoting ozone—can impair the body's immune system and increase the likelihood and severity of respiratory illness.

**Lead** Since the phaseout of leaded gasoline, lead emissions have decreased dramatically. Current emission violations tend to exist near industrial sources such as smelters. Lead remains a serious problem in many cities, where lead paint in older housing—especially in lower-income neighborhoods—is responsible for the nearly 1 million U.S. children who currently have low level lead poisoning.

**Carbon monoxide** Carbon monoxide reduces oxygen delivery to the body's organs and tissues. It causes headache, fatigue and flu-like symptoms and has been linked to hospitalization for congestive heart failure and cardiovascular disease. In cities, automobiles are responsible for approximately 90 percent of all carbon monoxide pollution.

**Mercury** Mercury can damage the nervous system and cause permanent brain damage and cerebral palsy in newborns of mothers who consume mercury contaminated fish. Coal combustion and incineration make up more than 85 percent of all mercury released into the environment in the United States.

Source: *Latest Finding on National Air Quality: 1997 Status and Trends*, EPA, 1998.

## **Water**

As population continues to grow, so does the importance of fresh water. Development, agricultural pollution and suburban sprawl all continue to affect water resources and have reduced the usability of the nation's waters. In 1996, the EPA reported that 36 percent of the nation's streams, 39 percent of its lakes and 97 percent of the Great Lakes do not support designated uses. This indicates that some type of pollution has damaged the water body to the extent that it is not fit for its intended uses, such as swimming, fishing, sailing or as a source of drinking water.

Water quality in many parts of the country also is under assault from mercury. In 1994, 52 tons were emitted by U.S. sources. Mercury may damage the nervous system and cause permanent brain damage and cerebral palsy in newborns of mothers who consume too much mercury contaminated fish. Mercury has powerful accumulative properties—an adult walleye may contain a mercury level 150,000 times higher than the water in which it lives. The EPA states that, from January to September 1994, 1,075 fish advisories were posted due to mercury contamination alone; more than 40 states have issued mercury fish consumption advisories for at least one of their water bodies.

With so many bodies of water have fishing and swimming restrictions, it is important to note that much can be done to make waters safer for recreation and the environment.

Depending on the region and city size and structure, between 12 and 50 percent of surface water pollution finds its source in urban runoff, according to the EPA report, *National Water Quality Inventory - A Report to Congress*. Paving of roads, highways and parking lots to accommodate automotive transportation bypasses the natural filtering ability of the soil. Vehicle and industry pollutants that settle on roads and parking lots are washed into lakes, streams and estuaries each time it rains. Encouraging alternative forms of transportation and urban/suburban designs that reduce automobile dependence will decrease the need for surface paving. Using of paving materials that allow water to pass through to be filtered by the soil is an additional approach to reducing runoff. Some cities also collect runoff in the sewer system and treat it before release.

*Ozone found in the upper regions of the earth's atmosphere protect the planet from harmful radiation. When ozone forms at ground level, it can be harmful to humans, animals and plants.*

Attacking the mercury problem means dealing with its main sources: coal burning utilities and waste incinerators, both of which are influenced by demand and consumption in urban areas. Mercury pollution created by electric utilities can be reduced by fuel switching, installing mercury scrubbers, using low-mercury coal and reducing energy demand. Removing products that contain mercury before the incineration process and implementing policies that encourage mercury-free replacements for products that contain mercury will help reduce incineration-based mercury emissions.

Although many of the previously mentioned pollutants are known to have negative health consequences at higher levels, most of us are exposed to a cocktail of hazardous substances, usually at low levels. Currently, little research is available to determine the risk posed by low-level exposures to mixtures of different chemicals, many of which are found in human breast milk and even the most remote regions of the planet. With a host of new untested chemical compounds introduced each year, determining toxicity of the complex chemical mixture to which the average person is exposed is difficult. By using newly developed pollution prevention procedures and management technologies—many of which require low investment and provide economic returns—release of the growing number of potentially harmful pollutants can be substantially reduced.

## **HEAT ISLANDS**

Physical factors that influence human health, such as temperature, are highly influenced by urban design. Many cities have eliminated heat dissipating open spaces and created dark paved surfaces and buildings, producing "heat islands" that increase ambient temperatures by up to nine degrees, depending on the season and time of day.<sup>9</sup> This phenomenon is caused primarily by the lack of vegetation and the presence of heat absorbing surfaces such as roads, parking lots and buildings that radiate heat during the day—and also at night, which is otherwise a time of cooling. Heat islands not only place heat stress on inhabitants, but also increase the likelihood of smog formation, further compounding heat's physical stress. Results of the heat island effect on health include: numerous excess deaths each year due to heat-related increase of stroke, heart attack and other diseases. The power of high temperatures was demonstrated in the summer of 1995, when a major heat wave struck Chicago and caused more than 500 deaths attributable to heat-related illness. Heat islands are expensive as well as unhealthy – a city like Los Angeles runs up an additional \$100,000 per hour in cooling costs because of the heat island effect.

According to Hashem Akbarim, a staff scientist and heat island expert at Lawrence Berkeley National Laboratory, short- and long-term methods are available to mitigate the negative effects of heat islands. There are two quick remedies for summer heat islands. The least

expensive alternative is to use lighter colored surfaces, as in traditional Mediterranean cities. A second option is to plant shade trees—another ancient practice. In the long term, integrating heat management into urban design as a whole will be most effective. This process might include decreasing the acreage of paved surfaces, creating buildings with better light reflectivity and improved insulation, and incorporating more open spaces with grass and trees.

## **HITTING THE HIGHWAY**

The U.S. roadway system has perhaps the greatest influence on city design. Many cities are struggling to accommodate growing numbers of automobiles and cope with inefficiency, pollution and sprawl.

Atlanta is one city that has been battling such issues—intractable traffic congestion and too much road travel have contributed Atlanta's violations of EPA's clean air standards. Major highway expansion has not solved the problem; drivers quickly fill new high-capacity roadways soon after they are built. Atlanta commuters now drive the farthest—an average 34 miles each day—when compared to residents of other large high growth cities around the nation.

Highway expansion projects in Atlanta, Phoenix, Los Angeles and other cities have tended to cause congestion, longer commute times and associated air quality problems, thus increasing congestion rather than reducing it. Transportation engineers theorize that new highways simply invite more driving—when a new, larger roadway is available, people are likely to take trips they otherwise would not have taken, and may choose to live farther from their place of work. Also, new residential and business developments may be encouraged by the road expansion. Because of this phenomenon, some cities have fought against the push to build more and larger roadways. Milwaukee currently is using federal transportation money to tear down a partially-built section of highway that was meant to cut through the city. The city is trying to prevent government-subsidized urban sprawl and avoid encouraging roadway induced city flight while nurturing neighborhoods and businesses within the city. Maryland is also altering business as usual, and will no longer allow state investment in growth-related projects outside designated priority funding areas.

Although the federal government has made some movement in the direction of growth management, the amount of funding slated to preserve open space is tiny relative to the billions dedicated to building, maintaining and expanding roads. Although growth management planning has been criticized by some as social engineering, the past 50 years of the subsidized federal highway system—accompanied by strict zoning laws—could be considered social engineering in its own right. Widespread zoning codes that require a separation of businesses and residential neighborhoods demand reliance on automobiles and

constantly expanding roadways, and has done much to shape the look of U.S. cities. The current structure of cities and suburbs is far from the natural result of economics and consumer demand. Cities would probably look quite different if transportation subsidies were eliminated and mixed-use zoning were allowed. Mixed-use zoning—which is a violation in most suburbs across the nation—is what one sees in older cities and towns throughout United States, where shops, businesses, and houses exist on the same block.

Because cities and suburbs comprise a complex interaction of air, water, land, structures, people and other living creatures, the challenges of growth are best dealt with by understanding these interactions when looking for solutions. Highway expansion may have impacts that reach far beyond the newly paved surface: local air and water quality may be adversely affected, and traffic may decrease the ability of residents to walk, run or bike in the area. These new events could reduce the quality of life for residents, increase pedestrian traffic accidents, decrease property values and lead to an exodus of residents to more secluded suburban neighborhoods.

## **STATE POLICY**

No state policies specifically target health as it relates to growth management, however, quality of life issues, safety and pollution are often mentioned among the reasons for implementing growth management strategies.

One of the first states to address the growth problem was Maryland, which passed legislation in 1997 that provided state funds to local governments and private land trusts to purchase land and development rights as a way to preserve open space and manage growth.

Arizona passed HB 2361 and HCR 2027 in early 1998, providing state funds for open space acquisition while tightening local planning requirements. HB 2361 is designed to make local governments accountable for development decisions by requiring that they conform to local plans. The legislation requires that plans contain elements to address open space, growth areas, environmental planning and payment for development costs. HCR 2027 proposed a referendum on the November 1998 ballot to appropriate \$220 million from the state general fund during an 11-year period. The referendum passed, providing revenue to purchase state trust lands—or the development right to such lands—for dedication as open space.

Other states that have passed growth management legislation include Florida, Oregon, Tennessee, Utah and Vermont.

Among U.S. cities, Portland, Oregon is probably the most progressive in implementation of growth management plans. The Portland plan emphasizes maintenance of a tight urban

growth boundary, focusing growth on centers and corridors, preserving residential neighborhoods as the dominant land use and developing a system of urban green spaces for active use and nature. As a result of these measures, Portland expects new urban land development to increase by only 2 percent between 1996 and 2017, even though the city's population will increase by 40 percent.

## **FEDERAL POLICY**

Although the healthy city approach has not yet been incorporated into federal policy, several acts have been passed that relate to various elements of the healthy city ideal.

*Intermodal Surface Transportation Efficiency Act (ISTEA), 1991* – This act authorized highway, highway safety, transit and other surface transportation programs. It allowed federal funds to be used in a more flexible manner, depending on the local transportation solution cities and regions found most appropriate. It promoted transit and light rail, and includes funding for key public health activities, including injury prevention, physical activity, public transportation and welfare to work programs, and environmental protection efforts. ISTEA's Congestion Mitigation and Air Quality Improvement Program (CMAQ) provides funding for states and localities to reduce emissions and to work toward meeting national ambient air quality standards.

*Transportation Equity Act for the 21st Century (TEA-21), 1998* – This act continues to promote and improve programs started under ISTEA, while introducing new initiatives to deal with the steadily increasing transportation demands of a growing population. Highlights are increased flexibility in the use of funds (e.g. for bike paths, sidewalks, etc.), emphasis on measures to improve the environment and focus on the planning process as the basis of good transportation decisions. The act increases the amount of funds that are available to mitigate congestion and to help cities improve air quality through transportation solutions.

*Clean Air Act (CAA), 1970* – Amended in 1977 and 1990, it establishes criteria and standards for regulating toxic air pollutants to safeguard public health and the environment. In July 1997, the EPA issued stricter ozone and particulate matter air quality standards under CAA, taking into account children's susceptibility to air pollution. The more stringent standards aim to reduce the effects of outdoor air pollution on asthma and other illnesses.

*Clean Water Act (CWA), 1977* – This act establishes criteria and standards for pollutants—including pesticides—in surface water bodies. In 1987, the Clean Water Act was reauthorized to focus on sewage treatment plants and toxic pollutants, and authorized citizen suit provisions.

The EPA—which is encouraging managed growth as a means to improve environmental

quality—has formed the Smart Growth Network (a group of institutions and individuals who provide a forum for facilitating planned growth in cities and communities across the United States.) Smart growth is defined as development that is environmentally, fiscally, and economically smart.

In January 1999, Vice President Gore announced the “Better America Bonds” program, which is to provide \$700 million in federal tax credits over five years to help state and local governments preserve open space. Soon after this announcement, President Clinton announced the “Lands Legacy” proposal for the FY 2000 budget that would appropriate 1 billion dollars to preserve open space and promote the development of urban parks, greenways, recreation and wildlife habitat, with part of the money also being directed to “Smart Growth” planning.

A decision by the U.S. Court of Appeals on May 14, 1999, may hamper the ability of states and regions to make their city environments healthier. The Court of Appeals held that the Clean Air Act public health standard provisions, as implemented by the U.S. EPA, are unconstitutional as an improper delegation of legislative authority. The EPA's proposed tightening of air quality standards, which was deemed necessary to adequately protect human health, is now postponed indefinitely.

## **SUMMARY**

The way we choose to design our environment has a profound effect on health and quality of life. Because the majority of the U.S. population lives in urban areas and the greatest growth occurs in cities, it is essential to ensure that urban design and growth management incorporate health considerations. Some cities have already implemented strategies that promote residents' health and quality of life by using a number of different approaches, including: mixed use planning that allows people to work, live and shop in their neighborhoods; pedestrian-oriented developments; promoting walking and biking paths and open space; and reducing automobile dependence with transit alternatives. Many other tailored approaches have also been successful.

State and local lawmakers can play a significant role in developing the healthy city—from passing legislation to promoting essential partnerships between departments of environmental quality and public health, developers, businesses, transportation and land planners, and lending institutions.

## Notes

1. 1990 U.S. Census Bureau Data.
2. U.S. EPA, *Update: Listing of Fish and Wildlife Advisories* Fact Sheet (Washington, DC: U.S. Environmental Protection Agency, March 1998).
3. U.S. EPA, *The Quality of Our Nation's Water: National Water Quality Inventory Report to Congress 1996* (Washington, DC: U.S. Environmental Protection Agency, 1996).
4. Bert Brunekreef, D. Dockery, and M. Krzizanowski, "Epidemiologic Studies on Short-term Effects of Low Levels of Major Ambient Air Pollution Components," *Environmental Health Perspectives* 103, Supplement 2, (March 1995).
5. Moore, Curtis A. *Dying Needlessly: sickness and Death Due to Energy-Related Pollution* Issue Brief (MA: Renewable Energy Policy Project, 1997).
6. Joseph Aicher, *Designing Healthy Cities: Prescriptions, Principles, and Practice* (Malabar, FL: Krieger Publishing Company, 1998).
7. Peter Newman, and J. Kenworthy, *Sustainability and Cities* (Washington, DC: Island Press, 1999) 33.
8. Arnold M Howitt, and Elizabeth M. Moore, *Linking Transportation and Air Quality Planning* (Report from Harvard University to EPA and DOT, March 1999).
9. H. Akbari, S. Davis, S. Dosano, J. Huang, and S. Winnett (eds.), *Cooling Our Communities: A Guidebook on Tree Planting and Light-Colored Surfacing* (Berkeley, CA: Lawrence Berkeley National Laboratory Report LBL-31587, 1992).
10. American Lung Association *Outdoor Air Pollution Fact Sheet* (1999).