

5. Conclusion

Across the country, communities are concerned about the built environment not just for community and economic reasons, but also because of the effect that development has on human health, environmental resources, and natural habitats. *Our Built and Natural Environments* has reviewed evidence demonstrating that the built environment can significantly affect ecological and human health. As citizens and public officials have come to understand the relationships among land use, transportation, and the environment, they have begun to seek new ways to grow—ways that capture the benefits of protecting the environment, and the jobs, economic development, health, and quality of life that depend on the protection of air and water quality.

Urban form affects attainment of national environmental goals in each of the following areas:

- **Habitat and Ecosystems**—Development uses land space and modifies habitats and ecosystems. Land consumption rates in the United States are high and are rapidly increasing. More land was developed during the five-year period from 1992–1997 than during the 10-year period that preceded it. Over those five years, the national rate of development more than doubled to 3 million acres per year. Not only does development directly destroy areas of natural habitat, it can fragment habitat and lead to invasion of non-native species that severely alter ecosystem function and reduce biodiversity. Adverse impacts can be reduced by clustering development to preserve large areas of continuous natural habitat. Development that avoids sensitive and critical habitats, such as wetlands, greenways, and buffer zones around sensitive habitat, can preserve ecosystem integrity and can create amenities for adjacent neighborhoods.
- **Water Quality**—Urban development affects water quality through alterations to the natural flow of water within a watershed, particularly by increasing impervious surfaces and channeling stormwater runoff. EPA estimates that 36 percent of the nation’s lakes, rivers, and estuaries are impaired by pollution, and approximately 21 percent of the lakes, 12 percent of the rivers, and 46 percent of the estuaries are impaired due to urban runoff. As communities nationwide strive to comply with the Clean Water Act and Safe Drinking Water Act, which protect water resources both as natural habitat areas and as sources of clean drinking water, understanding the impact of development on water quality becomes increasingly important. Development results in increased runoff volumes and peak period discharges, which in turn increase sedimentation and pollutant levels, increase water temperature, and reduce stream stability. Water quality is adversely affected by increased pollutant loads that are washed from surfaces in paved areas and deposited from air pollution. Water quality can be improved by minimizing impervious surfaces through more compact, mixed-use development, minimization of parking areas and street widths, use of porous or pervious pavements, and landscaping.
- **Air Quality**—As regions seek to reach air quality attainment goals outlined in the Clean Air Act, the need to improve understanding of the relationship between air quality and development and transportation patterns becomes clear. Motor vehicles emissions currently account for a significant portion of many air pollutant emissions, contributing 57 percent of all CO emissions, 30 percent of NO_x emissions, 44 percent of PM-10 emissions, and 27 percent of VOC emission. Per mile motor vehicle emissions have decreased since about 1970 as a result of vehicle emissions control systems and cleaner fuels, but increasing VMT threatens to reverse this trend in the future.

Air quality is indirectly affected by urban form to the degree that development patterns affect travel behavior. There is significant evidence that compact, mixed-use development focused around transit can reduce vehicle travel and air pollution from motor vehicles. Infill development (including redevelopment of brownfields) generally means greater accessibility to existing transit services, which should reduce vehicle travel compared with development on the urban periphery. Enhancement of the pedestrian environment also can encourage people to walk rather than drive for short distances. In addition, pricing roads and parking so that drivers recognize the full costs of their behavior can work in tandem with changes in urban form to encourage use of transit, carpooling, walking, and bicycling.

- **Global Climate**—Like air quality, global climate is indirectly affected by urban form to the degree that development patterns affect travel behavior. Combustion of motor vehicle fuel emits carbon dioxide, a greenhouse gas that helps trap heat within the atmosphere. Emissions of carbon dioxide from motor vehicles have been increasing over time, and transportation is projected to be the fastest growing source of carbon dioxide emissions of any sector. In 1997, the transportation sector emitted 32 percent of U.S. carbon dioxide emissions from fossil fuels, and carbon emissions from transportation are projected to grow by approximately 48 percent over the 1996-2020 period. Many communities have agreed that global warming is an issue of serious concern and are attempting to encourage practices that reduce greenhouse gas emissions. Examples include providing more transportation choices, reducing vehicle travel, and improving vehicle fuel economy through decreases in traffic congestion.
- **Contamination and Risk in Communities**—Old abandoned industrial facilities in urbanized areas, potentially contaminated with hazardous or toxic waste, pose risks to communities. Redevelopment of brownfields provides the opportunity to clean up contaminated sites, reducing threats to water quality and human health. Brownfields redevelopment has numerous other benefits. It allows more efficient use of existing infrastructure, saving the money and time needed to construct new infrastructure such as schools, roads, and water systems, and it protects a community's open space by placing new development in previously developed areas, rather than on greenspace.

The extent to which some development practices can reduce the direct impacts of development on habitat and hydrology is relatively clear. The magnitude of the impact of land use practices that reduce indirect effects of urban form on air quality can be more ambiguous, due to uncertainties regarding travel behavior. Nonetheless, an overwhelming number of studies on this topic agree that urban form has undeniable implications for environmental goals.

The information reviewed in *Our Built and Natural Environments* provides evidence that:

- U.S. urban form, including its land use and transportation components, has changed significantly in recent decades.
- These changes affect environmental quality over the short and the long run, and interfere with the ability of the United States to meet its health and environmental goals.
- Current development patterns are not simply due to population growth and therefore are not inevitable.
- Communities have choices in their development decisions.

- Communities can exercise that choice by developing the built environment in ways that contribute toward the attainment of health and environmental goals.

There is ample evidence that the built environment matters to communities—not just for social and economic reasons, but also for environmental reasons of national concern. Issues related to our built environment are growing in importance and, if left unaddressed, will make it difficult to meet our nation’s environmental goals. Fortunately, communities, regions, and states are starting to find ways to expand that achieve better economic, community, and environmental outcomes. The U.S. Environmental Protection Agency plans to continue building knowledge about the relationships between land use, transportation, and the environment as it supports our nation in meeting its environmental and human health goals.