

1. Introduction

1.1 PURPOSE

Environmental quality and human health are priorities for America. As a nation, the United States has committed to national standards for environmental performance to protect human health and welfare. Congress has set timetables for meeting health and environmental quality goals in every environmental medium, and the U.S. Environmental Protection Agency (EPA) is charged with implementing the federal laws designed to promote public health by protecting the nation's air, water, soil, and climate.

For most of EPA's 30-year history, policy-makers have focused on technological approaches to reducing pollution. These efforts have met with significant success. Emissions from motor vehicles and point sources such as power plants and refineries have been reduced through the use of cleaner fuels and technology, and some of the most visible environmental problems (e.g., lead in gasoline, sulfur dioxide from industry) have been addressed. Despite these successes, technological solutions are unlikely to provide the solution to all of our environmental challenges.

Increasingly, policy-makers are realizing that decisions regarding development patterns and transportation investment have significant impacts on the natural environment. In recent years, cities, states and regions around the nation have begun planning for Smart Growth. Concerns about community livability, loss of open space, traffic congestion, and air and water quality are spurring much of this interest. Recognition is increasing that land use and transportation decisions can either support community goals for livability and environmental protection, or interfere with those goals. Efforts to mitigate growth-related environmental impacts are being promoted by numerous organizations and implemented by communities nationwide.

Our Built and Natural Environments is a technical reference work on the implications of land use and transportation for the environment, written as a resource for technical analysts in state and local governments, academics, and those studying the environmental impacts of urban form. The report:

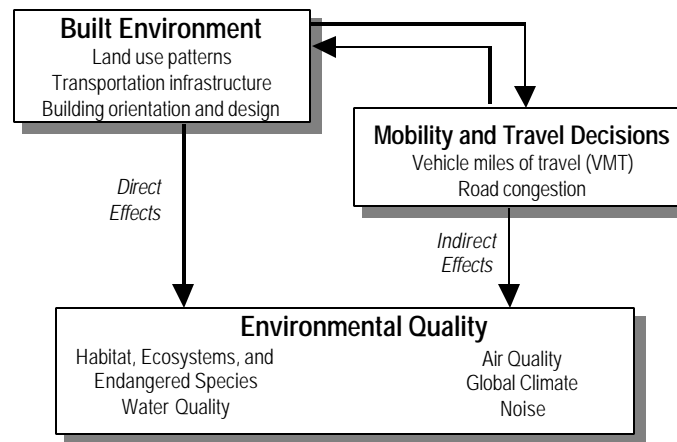
- Articulates current understandings of the relationship between the built environment and the quality of air, water, and habitat.
- Discusses trends in development and transportation and their environmental implications.
- Provides evidence for the view that communities can affect environmental quality positively through Smart Growth land use and transportation development decisions.

The report concludes that together, the built environment and decisions made in response to it dramatically impact environmental health, and ultimately community quality of life. Thus, the form of built environment can help or hinder our nation's ability to meet its environmental goals. As a result, the relationship between the built and natural environments deserves attention from EPA, the agency's colleagues and clients, and communities across America.

1.2 THE EFFECTS OF URBAN FORM ON HUMAN HEALTH AND THE NATURAL ENVIRONMENT

The nation has recognized the environmental implications of industrial discharges for decades. The environmental effects of metropolitan development and transportation investment, however, are more difficult to define. As a result, only recently have they begun to attract widespread attention. As Figure 1-1 illustrates, development decisions have both direct and indirect impacts on the natural and human environments. The built environment directly affects habitat, ecosystems, endangered species, and water quality through consumption, fragmentation, and replacement of natural cover with impervious surfaces. Urban form also affects travel behavior which, in turn, affects air quality (with corresponding impacts on water quality), global climate, and noise.

Figure 1-1: Direct and Indirect Effects of the Built Environment



Direct Effects

Land development affects the environment in two primary ways. First, development uses land and modifies habitats and ecosystems. The extent of land development, the type of development, and the location of infrastructure have direct and long-lasting implications for ecosystems. By interrupting feeding, dispersal, and breeding patterns, even a single roadway that cuts through wilderness can affect the population and diversity of species across a wide area.

Second, development can have significant implications for water quality as buildings, parking lots, roads, and other impervious surfaces alter the natural flow of water within a watershed. The amount of impervious surface as a percentage of land area in a watershed and the location of infrastructure in relation to specific natural resources can be correlated to the health of an area's streams, river, lakes, and estuaries.

These direct effects are relatively well understood and documented, and efforts to preserve wetlands and habitat of endangered species are common. Still, the implications for biodiversity, ecosystems, and water systems are often site-specific and are not universally recognized in community design and planning.

Indirect Effects

Indirect effects of residential and commercial development include the distribution of employment opportunities. In addition, the transportation options available to link residential and commercial locations influence household travel behavior, including trip frequency, trip lengths, and mode of choice. Vehicle travel, in turn, generates air pollutant emissions, greenhouse gas emissions, and noise.

The effects of urban form on travel behavior are less well understood than the direct effects of development, and the magnitude of those impacts is widely debated. Travel behavior is complex, with various factors simultaneously affecting decisions about how much, where, when, and how to travel. Still, significant evidence exists that urban design does affect travel behavior. As a result, there is increasing interest in using land use planning to address transportation, air quality, and greenhouse gas problems.

Our Built and Natural Environments presents findings from researchers, academicians, policy analysts, and others as to how, where, and to what degree development practices and patterns directly and indirectly affect environmental quality.

1.3 TOPICS OF DISCUSSION

Chapter 2 outlines some of the more significant trends in land use and transportation infrastructure development, and their direct environmental consequences. Chapter 3 addresses trends in vehicle travel and environmental effects associated with vehicle use. Both chapters discuss the causes of change over time and suggest that development decisions, public policy, and changing demographics are all important factors in these trends. Chapter 4 provides evidence that different patterns of growth and development can have different impacts on the environment. Patterns and practices that minimize environmental harm include the following:

- Compact development
- Reducing impervious surfaces and improving water retention
- Safeguarding environmentally sensitive areas
- Mixing land uses
- Providing transit accessibility
- Supporting pedestrian and bicycling activity (micro-scale urban design elements)

Chapter 4 also discusses “synergy,” the idea that a combination of strategies together can have greater impact than the sum of individual measures. The chapter illustrates how various planning strategies can work together to improve environmental quality.

The final chapter provides a brief summary and conclusion about the effects of urban form on national environmental goals.