SECOND EDITION

THE ENVIRONMENTAL PLANNING HANDBOOK

for Sustainable Communities and Regions

Tom Daniels

A **Planners Press** Book

ROUTLEDGE

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FOR SUSTAINABLE COMMUNITIES AND REGIONS

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To my wife, Amy, and my three sons, Ethan, Jason, and Lincoln.

You are my inspiration and hope.

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ADA	Americans with Disabilities Act
APA	American Planning Association
APFO	adequate public facilities ordinance
ASCE	American Society of Civil Engineers
AUM	Animal Unit Monthly
BACT	Best Available Control Technology
BCDC	[San Francisco] Bay Conservation and Development Commission
BLM	Bureau of Land Management
BMP	best management practice
BOD	biochemical oxygen demand or biological oxygen demand
CAFE	corporate average fuel economy [standards]
CAFO	confined animal feeding operation
CAP	Central Arizona Project
CCC	California Coastal Commission
CCALT	Colorado Cattlemen's Agricultural Land Trust
CDBG	Community Development Block Grant
CELCP	Coastal and Estuarine Land Conservation Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Act Information System

CFC	chlorofluorocarbon
CIP	capital improvements program
CRP	Conservation Reserve Program
CRS	Community Rating System
CSO	combined sewer overflow
CZMA	Coastal Zone Management Act
DART	Dallas Area Rapid Transit
dB	decibels
DDT	dichlorodiphenyltrichloroethane
DOE	[U.S.] Department of Energy
DOI	[U.S.] Department of the Interior
DOT	[U.S.] Department of Transportation
DRI	development of regional impact
EIS	environmental impact statement
EPA	[U.S.] Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FHA	Federal Highway Administration
FONSI	finding of no significant impact
FRPP	Farm and Ranch Lands Protection Program
FTA	Federal Transit Administration
FWS	[U.S.] Fish and Wildlife Service
GAO	[U.S.] General Accounting Office
GAP	Gap Analysis Program

GIS	geographic information systems
GRTA	Georgia Regional Transportation Authority
HCP	Habitat Conservation Plan
HOV	high-occupancy vehicle
HUD	[U.S. Department of] Housing and Urban Development
ICLEI	International Council for Local Environmental Initiatives
IPCC	International Panel on Climate Change
IPM	integrated pest management
ISTEA	Intermodal Surface Transportation Efficiency Act
LAER	Lowest Achievable Emissions Rate
LEED	Leadership in Energy and Environmental Design
LESA	Land Evaluation and Site Assessment
LID	low-impact development
LRMP	Land and Resource Management Plan
MAP-21	Moving Ahead for Progress in the 21st Century
mpg	miles per gallon
MPO	Metropolitan Planning Organization
MRF	materials recovery facility
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRDC	Natural Resources Defense Council
NWF	National Wildlife Federation
OSHA	Occupational Safety and Health Administration

PAYT	pay-as-you-throw program
PCB	polychlorinated biphenyl
PDD	planned development district
PDR	purchase of development rights
PILTs	payments in lieu of taxes
POP	persistent organic pollutant
PSD	Prevention of Significant Deterioration
PUD	Planned Unit Development
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
RGGI	Regional Greenhouse Gas Initiative
RTP	regional transportation plan
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SDWA	Safe Drinking Water Act
SEPA	State Environmental Policy Act
SIP	State Implementation Plan
SPDES	State Pollutant Discharge Elimination System
SWAP	Source Water Assessment and Protection
TCE	trichloroethylene
TDR	transfer of development rights
TEA-21	Transportation Equity Act for the 21st Century
TIP	Transportation Improvement Program
TMDL	Total Maximum Daily Load
TND	traditional neighborhood development
TOD	transit-oriented development
TPZ	timber production zone

TSCA	Toxic Substances Control Act
TVA	Tennessee Valley Authority
UNFCCC	United Nations Framework Convention on Climate Change
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
VOC	volatile organic compounds
WHIP	Wildlife Habitat Incentives Program

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PREFACE

The only thing certain about the future is that it brings change. Planning is the process of how people anticipate needs, set goals and objectives, and take action to shape change for their personal and collective benefit. Planning as a private act involves deciding how to use financial assets, labor, and natural resources to achieve personal, family, and business goals. Planning as a public act is a political process of translating social values into government policies and programs to protect the public health, safety, and welfare of a community, region, state, or nation. Public planning does not mean total government control. Rather, public planning involves setting regulations and making infrastructure investments to guide the market system of supply, demand, and prices to achieve the goals of society-at-large as well as those of businesses and individuals. In fact, public planning often works best as a partnership between government and the private sector.

Environmental planners seek to shape a community, region, state, or nation by protecting and improving air and water quality and conserving long-term supplies of water, energy, farmland, forests, and wildlife habitats. Environmental planners also aim to increase the resilience of the built environment by reducing exposure to natural hazards, maintaining natural features, and adding green infrastructure. Planning is a continuous process rather than a discrete project or set of projects. Effective planning produces high-quality natural and built environments that stand the test of time.

Environmental planning has become a profession with highly trained and dedicated people from several educational backgrounds, including land use and community planning, geography, geology, hydrology, biology, botany, zoology, chemistry, landscape architecture, climatology, public policy, economics, law, and journalism. Environmental planners work for wildlife conservation organizations, hunting and fishing groups, watershed associations, land trusts, developers, corporations, consulting firms, colleges and universities, and local, regional, state, and federal government agencies.

* * *

People think of themselves as belonging to a place. Familiar open spaces, landmarks, and buildings give us a sense of order and identity. Yet, in the 20th century, America underwent enormous changes in population growth, dispersed settlement patterns, transportation and communications technology, and national wealth that transformed both the natural and built environments. During the 20th century, the nation's population nearly quadrupled

from 76 million to more than 281 million individuals. The mass-produced automobile revolutionized the way Americans live and work by affording greater mobility and the ability to commute long distances. The construction of the interstate highway system not only linked the lower 48 states but also helped create burgeoning suburbs around the major urban centers. Millions of acres of farmland, forestland, and wildlife habitat were converted to housing subdivisions, shopping centers, and office parks. By 1990, four out of five Americans lived in metropolitan areas, and more people were living in suburbs than in central cities for the first time in the nation's history. America had become a suburban nation.

Americans have amassed more wealth than residents of any other country. As of 2014, Americans made up slightly less than 5 percent of the world's 7.2 billion people yet accounted for more than 20 percent of the annual global consumption of natural resources. America's growth and prosperity have come at a price. The combination of population growth, sprawling development patterns, and motor vehicle dependence has unleashed a widespread assault on the nation's air, water, landscapes, and wildlife. Americans are among the world's leaders in per capita emissions of greenhouse gases, the main contributor to global climate change. Meanwhile, many urban and suburban Americans seem to have lost touch with the natural environment.

It was in the 20th century that the nation collectively recognized the need for government action to protect the environment and conserve natural resources. The concept of sustained yield of natural resources began with noted forester Gifford Pinchot and led to the creation of the U.S. Forest Service in 1905. Improvements in farming practices aimed at reducing soil erosion started with the Soil Conservation Service (now the Natural Resources Conservation Service), formed in 1934. However, it was not until the 1960s that the serious degradation of the nation's air and water and loss of open space spurred widespread public support for legislation to clean up pollution, to set standards of environmental quality, and to conserve valuable landscapes.

In the 1960s and 1970s, federal laws created programs to improve air and water quality, established procedures for reviewing the potential environmental impacts of federal development projects, offered protection to endangered species, required safeguards in the disposal of municipal solid waste and the handling of toxic materials, and placed millions of acres of public lands off-limits to development. Congress authorized billions of dollars in grants to state and local governments for the construction of sewage treatment plants to improve water quality. Businesses were compelled to invest billions of dollars to reduce air and water pollution from factories and power plants.

The 1960s and 1970s also marked the start of state-level land-use planning efforts that emphasized land conservation and environmental quality. Hawaii (1961), Vermont (1970), Florida (1972), and Oregon (1973) adopted pioneering programs.

The 1980s marked a low point for federal environmental action. In response, citizens across the U.S. formed nonprofit land trusts to protect land and water resources in their communities and regions. As of 2014, more than 1,700 land trusts had protected a total of more than 50 million acres.

The 1990s initiated a shift in environmental responsibility from the federal government to state, regional, and local governments. States gained primary control of air- and water-quality programs. Metropolitan regions drafted transportation plans to guide federal transportation funding and to meet federal air-quality standards. Local governments began to implement growth management and "smart growth" programs. From 1998 to 2002, voters in more

than 30 states approved more than 500 ballot measures authorizing more than $20 billion for land conservation and "smart growth" projects.

The U.S. Census Bureau has estimated that the nation's population will grow to at least 400 million by 2050, an increase of about one-third above the 308 million total in 2010 and equivalent to adding the population of nearly *three Californias*. Where will these additional people live, work, and play? How will new developments affect air and water quality; greenhouse gas emissions; food, timber, and mineral supplies; plant and animal habitat; and the integrity of cultural resources? Will the environment be sacrificed to accommodate this surge in growth? Or will growth have to adapt to the limited carrying capacity of the natural environment?

Since the first edition of *The Environmental Planning Handbook* appeared in 2003, the U.S. has experienced several major environmental challenges. Hurricane Katrina in 2005 brought out the now widely recognized connection between greenhouse gas emissions, climate change, and extreme weather events that are causing hugely expensive property damage and an alarming loss of life. In 2012, Superstorm Sandy devastated much of the New Jersey coast, flooded large areas of greater New York City, resulted in more than $60 billion in property damage, and took more than 100 lives. That same year, a severe drought affected two-thirds of the lower 48 states, bringing widespread crop failures and underscoring the need for water supply planning and adaption to climate change. Meanwhile, our gains in air and water quality seem to have plateaued. Residents of the nation's sprawling metropolitan areas still rely mainly on cars for transportation. Nonpoint-source water pollution from urban streets and farm fields continues to degrade water quality. Moreover, since 2003 (i.e., in just 11 years), the U.S. has added nearly 30 million people to its population, about equal to the entire population of Canada. It is daunting to improve the quality and durability of the environment in the face of such robust population growth.

Since 1990, the federal government has shown little effective leadership on environmental matters. State and local governments, nonprofit organizations, enlightened businesses, and concerned citizens have tried to fill the gap. Several states have adopted renewable portfolio standards that require utilities to obtain a certain percentage of their electricity from renewable sources, such as wind and solar power. Many states have drafted plans aimed at ensuring adequate long-term water supplies. Local governments have produced climate action plans, green infrastructure plans, and sustainability plans to identify ways to reduce greenhouse gas emissions, maintain and enhance ecosystem services, and improve the overall resilience of the built and natural environments. Nonprofit land trusts continue to "preserve" hundreds of thousands of acres each year. Businesses have recognized that "going green" by reducing energy use, packaging, and waste through safer, healthier, and more easily reused and recycled goods can boost their bottom line. Individuals and households have purchased more fuel-efficient cars and are recycling more, as well as becoming more involved in local planning.

Environmental planning is generally improving in the U.S., but many environmental problems are global in scope. Climate change, often referred to as global warming, poses an enormous long-term threat to the global environment, economy, and society. Climate change has the very real potential to cause substantial losses in wildlife, food production, and habitable areas. Curbing the consumption of fossil fuels would be the quickest way to lower greenhouse gas emissions. But unless there is a technological breakthrough in renewable energy production, countries around the world will continue to rely mainly on fossil fuels

to power their economic activities. Still, the U.S. can set an example by striving to move to a postcarbon economy.

Planners and public officials may struggle to understand environmental problems given the reality of changing and often inexact scientific information. Yet there is an obvious need to continue protecting past gains in environmental quality and to make further gains in order to create truly sustainable communities and regions over the long run. Governments, businesses, and consumers will need to change many practices in order to protect the environment, conserve natural resources, and mitigate and adapt to climate change. Major new technologies and investments in transit, stormwater management, long-term water supplies, energy-efficient buildings, energy conservation, and renewable energy production will be needed. Land-use regulations will have to emphasize compact developments with a mix of land uses that offer residents and visitors opportunities to walk, bike, and take public transit as well as drive.

The environment is nonpartisan. Both conservatives and liberals respect and defend the environment. Forging partnerships and alliances will be necessary across not only political lines but income classes; between the public and private sectors; and among urbanites, suburban dwellers, and rural people. In this way, planning becomes ingrained and accepted as a way to work through and solve community and regional environmental problems and avoid costly mistakes.

* * *

Expanding the capacity of communities and regions to plan for and achieve environmentally sustainable development is a fundamental goal of this book. In short, environmental planning is a means toward the triple bottom line of economic, social, and environmental sustainability. History tells us that if the environment is not sustainable, economic and social disorder are sure to follow.

People need to think regionally. Watersheds, airsheds, and wildlife habitats are examples of regional environmental systems, and water supply and transportation networks are regional infrastructures that require a regional planning approach.

Regional thinking also means a concern with social justice through equal access to a quality environment and a broad distribution of incomes. Environmental planning will not succeed if people perceive it as a way to create green enclaves for a wealthy, elite class and to impose health costs and dangers on those with low incomes.

Protecting the environment does not mean sacrificing jobs. Technology and human innovation are key ingredients in building an economy that is also environmentally sustainable. *Green jobs* can bolster economic growth; examples include retrofitting and constructing buildings for energy conservation, renewable energy production, local food production, and recycling solid waste into new products. In addition, communities and regions with good environmental quality often can attract well-paying high-tech industries and skilled workers. Also, many businesses are adopting environmentally friendly production processes and creating healthy products and services because they are more profitable.

Planning is most effective as a truly participatory process. If people take an active part in shaping plans for their community or region, they will want them to succeed. Successful planning happens when actions transform a common vision into a reality. The number and the creativity of recent community and regional actions throughout the U.S. are surprising and inspiring. Positive changes are happening, but much remains to be done. This book contains

a variety of environmental planning tools, techniques, and processes for maintaining and improving the long-term environmental quality of this wonderful nation.

* * *

This book is intended for public sector planners, private planning consultants, developers, elected officials, environmentalists, concerned citizens, and students—anyone interested in taking an active role in the future of their immediate surroundings, the environment of the U.S., and planet Earth.

The book is divided into six parts. Part 1 begins with a chapter on how communities and regions can incorporate environmental planning into their comprehensive planning process or create separate plans dealing with climate change, green infrastructure, and sustainability. Chapter 2 provides an overview of the disciplines that influence decision making about the environment: law, economics, ethics, and ecology. Part 2 presents the case for environmental planning to protect public health. Chapters 3 through 8 describe the challenges involving air quality, climate change, water supply, water quality, solid waste, and toxic waste as well as the federal, state, and local government regulations and spending programs.

Part 3 discusses environmental challenges and planning programs for the protection of natural areas, including wilderness, wildlife habitat, wetlands, coastal areas, and natural hazards. Part 4 focuses on planning for the working landscape: farming, forestry, and mining. Part 5 examines environmental planning for the built environment. Part 5 begins with Chapter 17, on the role of energy, renewable energy supplies, and energy conservation. Chapter 18 discusses how transportation shapes the built environment and impacts natural resources. Chapter 19 presents ways to create green cities, suburbs, and regions that blend natural areas, green infrastructure, and the built environment. Chapter 20 examines planning for development on greenfield sites. Part 6 summarizes in one chapter the encouraging trends in environmental planning that further the concept of sustainability as well as remaining environmental planning challenges and needs at the local, state, federal, and international levels.

A list of acronyms and their definitions appears at the beginning of the book. In each chapter, I define an acronym the first time it is used. I have listed the sources of facts, figures, ideas, and quotes in endnotes. At the end of each chapter, there is a brief chapter summary. Along with recommendations for further reading so that readers may pursue particular issues in greater depth, at the back of the book, there is a glossary of terms and a list of contacts of public and private organizations that are active in planning the environment.

INTRODUCTION

Guarding the Future: Sustainable Environmental Planning and Development

Then I say the Earth belongs to each . . . generation during its course, fully and in its own right. The second generation receives it clear of the debts and encumbrances, the third of the second, and so on. For if the first could charge it with a debt, then the Earth would belong to the dead and not to the living generation. Then, no generation can contract debts greater than may be paid during the course of its own existence.

—Thomas Jefferson, September 6, 1789

"Sustainable development" has become a popular term with many possible definitions. Sustainable development implies that the production and consumption of goods and services and the development of cities and suburbs can occur without harming the natural environment. The natural environment provides the air, water, and land resources that sustain human life and serve as a "sink" for human wastes. The natural environment, however, is not limitless; it has a limit or "carrying capacity" for how much waste and human development it can accommodate.

The famous 1987 Bruntland Report for the United Nations defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[1] Economist Herman Daly emphasizes the concept of environmental carrying capacity: "Sustainable development means qualitative improvement without quantitative growth beyond the point where the ecosystem cannot regenerate."[2] Planners Philip Berke and Maria Conroy provide a detailed definition of sustainable development as

"a dynamic process in which communities anticipate and accommodate the needs of current and future generations in ways that reproduce and balance social, economic, and ecological systems, and link local actions to global concerns."[3]

Sustainability means durability and quality. Sustainable development describes buildings that last for several generations. It results in a continuous yield of renewable resources, such as timber and fish. Air and water quality, soils, and wildlife resources remain healthy. Sustainability also implies a manageable "ecological footprint"; usually, the higher a community's standard of living and material well-being, the greater the area of land (the larger the footprint) needed to support that community. The U.S. enjoys a high standard of living and has a large ecological footprint, estimated at 20 acres per person in 2007, compared to seven acres per person in Costa Rica.[4] Americans import huge amounts of food, minerals, and oil from other countries; consume enormous amounts of wood, paper, minerals, food, energy, and water; and produce millions of tons of solid waste and toxic waste, of which only about one-third is recycled.

Sustainable development is not an end in itself but rather a means toward improving society's well-being in the long run. Sustainable development carries the promise of long-term economic security, social equity, and environmental integrity. Moreover, sustainable development suggests the need for individual, community, regional, national, and international responsibility to maintain a healthy, high-quality environment.

To bring about sustainable development, the choice is not between an unfettered free market and total government control. Rather, it is selecting the right regulations, spending programs, and financial incentives that will enable markets and market prices to function in socially rewarding ways and compel governments, businesses, and consumers to be good stewards of the natural and built environments.

Sustainable development principles must embrace the following goals:

- the creation and maintenance of healthy environments, featuring clean air and water and biodiversity
- the conservation of energy, soils, and water supplies
- the reduction of greenhouse gas emissions and adaption to the threats of climate change by creating a more resilient built environment
- the reduction, reuse, and recycling of waste
- a requirement that polluters pay for cleaning up the pollution they create
- the cleanup and redevelopment of brownfield sites
- an emphasis on infill development and the reuse of existing buildings rather than building on greenfields in the outer suburbs
- the expansion and upgrading of mass transit along with compact, transit-oriented development
- the construction of mixed-use commercial and residential development that includes public parks and enables walking and biking
- the practice of environmental justice in the siting of controversial land uses, such as landfills and power plants
- the designation of compact-growth areas that have the available services to support development
- the separation of developing areas from sensitive natural areas to avoid natural hazards and to protect wilderness areas and wildlife habitats

- the creation of greenways—linear paths and corridors—to connect cities and towns to the countryside and to each other
- the protection of productive farming and forestry regions

Planning for a Sustainable Environment

Communities across America are already incorporating sustainability into their planning efforts. Some cities and counties have integrated environmental goals and objectives into their comprehensive plans, while others have adopted climate action plans or green infrastructure plans. Still others have adopted broad sustainability plans with social, economic, and environmental goals and objectives. All these plans depend on cooperation between the public and private sectors to set goals and objectives for environmental improvement. But success comes from implementation through public and private investments as well as public regulations and financial incentives. Communities will need to monitor the implementation and performance of these plans and make adjustments as needed to continue progress toward their goals.

Federal and state environmental laws and programs have established air- and water-quality standards and continue to provide funding for pollution cleanup and protection. Yet land-use plans, land-use regulations, and infrastructure spending programs at the local and regional levels can do much to shape the built environment and limit the negative impacts of development on the natural environment. Land-use planning is a public process that first identifies land and water capabilities and constraints and then decides where private and public developments and infrastructure should or should not be located. But plans alone will do nothing unless they are implemented through day-to-day decisions about proposed development projects and are coordinated with long-term "green infrastructure" spending programs for parks, natural areas, stormwater control, and working landscapes, along with "gray" infrastructure investment in sewer and water facilities and transportation networks.

Transportation systems are the single most significant factor in shaping the development patterns of metropolitan America today. Different modes of transportation produce different land-use patterns and different environmental impacts. Cars and trucks are both necessary and convenient in a low-density settlement pattern. But in high-density cities and suburbs, cars and trucks are not as efficient, especially during rush-hour congestion. Motor vehicles use huge amounts of energy and generate substantial air pollutants. Mass transit—commuter trains, light rail, and buses—requires a fairly dense settlement pattern yet produces less air pollution than cars and trucks. Mass transit is also more efficient in moving people through a transportation corridor, such as a highway or a rail line.

Land-use planning in the U.S. has traditionally meant planning for development. But this is changing because simply continuing to allow sprawling development is not financially, socially, or ecologically sustainable. Local and regional land-use planning along with public and private investments are now emphasizing redevelopment and infill development within cities and suburbs; maintaining quality built environments; preserving valuable natural areas, greenways, parks, and working farm and forest landscapes; and carefully designing greenfield developments. In short, communities and regions must plan to protect and preserve those sensitive environmental resources—air, water, shorelines, wetlands, productive farm and forest lands, and green spaces—on which the built environment depends.

A Community Perspective on Planning for a Sustainable Environment

A community is perhaps best thought of as people who live in close proximity, share public services and private institutions, and interact socially. A community is often thought of as a village or a city neighborhood. Yet many of us live in one community and work or shop or attend church in another. In fact, when most of us think of a community, we think locally. But in practice, we often act regionally.

Planning for environmental quality begins at the community level. But environmental planning can focus on a particular property or site, a city block, or a neighborhood. In addition, an understanding of regional environmental problems and opportunities can lead to more effective environmental planning efforts with neighboring communities. Planning is a political process of public decision making, and it is therefore important to form a vision of environmental quality—clean air, clean water, and safe, attractive surroundings. But ultimately a community must take action to protect and sustain its environmental assets and quality of life.

Many local government officials do not really understand how their land-use decisions affect the environment. Planners can play a key role by educating local officials about the environmental consequences of development proposals, public infrastructure spending, and land-use and building design regulations. Planners can promote proactive comprehensive planning that seeks to avoid water and air pollution and land-use problems before they occur, and thus protect the community's quality of life and potential for economic growth and social equity.

The results of reactive community planning are all too common. Many ad hoc citizens groups have sprung up to address single environmental issues in their communities, such as a proposed residential or commercial development on open land. The citizens must raise funds, attend meetings, and generally disrupt their lives. The developer usually says the proposal is permitted under the local zoning and subdivision regulations. And the local government often does not know whose side to take. Unfortunately, the development proposal is often decided at considerable expense in a court of law.

After the development proposal is denied or approved, the ad hoc group disbands. When the next development proposal comes along, the process repeats itself. A new ad hoc group is patched together, the developer goes on the defensive, and the local government is forced to take sides. This reactive approach to environmental protection is inefficient, combative, and costly for citizens, developers, and local governments.

Proactive environmental planning should designate where different types of development are desired along with specific design regulations. It makes more sense for the concerns of the public to be incorporated upfront into the local government's comprehensive plan, zoning, subdivision regulations, and capital improvements programs. Proactive planning provides predictability for all parties about where certain types of development are allowed and where they are prohibited. This greater certainty in the planning process can save everyone time, money, and effort while protecting the environment.

A Regional Perspective on Planning a Sustainable Environment

There are many ways to identify a region. Political boundaries can define a region, such as a county. Population, such as a Metropolitan Statistical Area that contains a city and typically

more than one county, is another way to identify a region. Economic activity can characterize a region, such as California's Silicon Valley. Culture and history also give a region identity; examples include New England or the Tidewater area of eastern Virginia. Natural features can define a region: the Adirondack Mountains of New York, North Carolina's Outer Banks, or Florida's Everglades. Ecological systems can also denote regions, for instance, the New Jersey Pinelands. The size of natural or ecological regions can vary greatly. In the western U.S., the watersheds of the Colorado and Missouri rivers encompass tens of thousands of square miles in several states. The Rocky Mountains stretch from Mexico to Canada. The larger the region, the more complex the planning is because of the greater number of political jurisdictions involved.

It is important to take a regional approach to planning the environment because few watersheds and ecological systems are contained solely within a single political jurisdiction. Large developments, such as ski resorts, shopping malls, and major highways, can have impacts on air and water quality that are felt in more than one town or county. Local governments must recognize their dependence on one another if they are to achieve effective regional environmental planning. In the 1990s, Suffolk County, New York, joined with three towns and the state government to form the Long Island Pine Barrens Commission, which tightly controls development in a 100,000-acre area with a major groundwater source for drinking water and a high concentration of threatened and endangered plant and animal species.

Regional planning enables a more comprehensive and integrated way to manage the environment and development. But new management institutions are needed. Through the 1990s, no metropolitan region in America sprawled as much as Atlanta. Toward the end of the decade, the region's air quality failed to meet federal air-quality standards, and the federal government temporarily withheld additional highway funds from metropolitan Atlanta. In 1999, the Georgia legislature created the Georgia Regional Transportation Authority, a regional land-use and transportation authority for Greater Atlanta with the power to expand mass transit and approve or deny new major building projects. Regional environmental planning is becoming increasingly popular through cooperation among communities.

Managing the Environment: Problems and Possibilities

Biologist Barry Commoner, in his book *The Closing Circle*, listed three laws of ecology that can serve as rules of thumb for environmental decision making and the stewardship of natural resources.[5]

The first law is *There is no free lunch*—that is, every action has a cost. For environmental planning, different development choices will impose different environmental costs. A regional mall with acres of parking will create a higher volume of runoff and more polluted runoff than the forest it replaced.

The second law helps explain why there is no free lunch: *Everything is connected to everything else*. The clear-cutting of an old-growth forest could lead to the extinction of an endangered animal species by destroying its habitat. The clear-cutting may also cause soil erosion and flooding, thus decreasing water quality downstream.

The third law is *You can't fool Mother Nature*. Human attempts to manage the environment don't always work. Houses built in a 100-year floodplain may avoid flood damage for 30 years but then may be swept away in year 31. The houses should not have been built in the floodplain in the first place.

A corollary to the third law might be that *each environmental system has a carrying capacity—a physical limit to the amount of development, pollution, and (human, plant, or animal) population beyond which environmental quality is unsustainable*. This carrying capacity or limit to growth may be stretched by new technologies. But once a carrying capacity is exceeded, environmental quality is likely to decline suddenly, not gradually. However, carrying capacity is often difficult to identify with scientific accuracy.

A Note on "Good Science"

Science is a body of knowledge that describes how we understand both the natural and built environments. In making choices about how to use our environment, we must have accurate information on which to base our decisions. Environmental planning relies on information from a variety of sciences, including biology, botany, chemistry, physics, agronomy, meteorology, geology, epidemiology, hydrology, engineering, and ecology.

"Good science" is objective, technical information based on empirical evidence, past experience, and tested technology. However, an enormous amount of misinformation has been circulated about the environment. There is much about the natural environment and human influences on the environment that is not known with certainty. In some cases, there may be evidence but not conclusive proof. Scientists may disagree about sources of environmental problems and possible solutions. They may also disagree over what can be considered an acceptable level of risk from polluting activities or specific substances. Good science can change over time as new studies are completed, new data are analyzed, and new technologies are created. Technological inventions can influence good science, but it is difficult to predict what new technologies will emerge, when, and at what cost.

Environmentalists often support the "precautionary principle," which holds that the absence of complete scientific certainty should not be an excuse for refusing to take action.[6] A ban on the production of a particular chemical that tends to produce cancer in laboratory animals could be taken as a precautionary measure.

The use of good science faces four main obstacles. First, information may be expensive to gather and analyze in a timely fashion. Second, the results may become politicized when debated by political parties with different interests. Third, some scientific results are based on models, which to a greater or lesser degree are abstractions from reality and typically include certain assumptions. This is not to say that all models are inaccurate or misleading. Rather, models vary in their accuracy and depend on the quality of the data used in the model. Fourth, it may be difficult to anticipate how a proposed development will impact the environment when the effects may not become evident for several years. Also, elected officials who make public rulings on development proposals often spend a relatively short time in office, whereas the negative consequences of their decisions may crop up long after they leave office and are no longer accountable.

Congress frequently calls on the National Academy of Sciences and its National Research Council to provide objective scientific research, free from politics. The U.S. Environmental Protection Agency (EPA), university professors, businesses, and private consultants also conduct scientific studies of the environment. New studies and discoveries often change our thinking about the environment. In the 1970s, the EPA promoted the concept that "the solution to pollution is dilution." This concept resulted in taller smokestacks on coal-fired

electrical plants in the Midwest to reduce local air pollution. Unfortunately, the taller smokestacks sent sulfur dioxide and nitrogen oxide pollution higher into the sky, where winds could carry the pollution eastward to contribute to acid rain in the Northeast. Today, the emphasis is on reducing air pollution emissions at the source.

Or take the case of global climate change. Scientists sharply disagreed about it in the late 1980s, but the 1990s were the warmest decade since weather measurements were first regularly recorded in the 1890s. And the 2000s were warmer than the 1990s. Today, nearly all scientists agree that global climate change is real and poses serious long-term threats to humans and ecological systems.[7]

Good science can influence local and regional environmental plans, regulations, standards, financial incentives, markets, and best management practices. It is important to understand the costs and benefits of each environmental management approach and how to blend a number of approaches into a comprehensive environmental planning package. Ideally, our individual actions and our collective actions will be beneficial to us, our community, our region, and future generations of Americans and earthlings.

Notes

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7. See U.S. EPA. *Climate Action Report 2002*. Washington, DC: USEPA; Kolbert, E. *Field Notes from a Catastrophe: Man, Nature, and Climate Change*. New York: Bloomsbury, 2006.

Part 1

THE ENVIRONMENTAL PLANNING PROCESS

Chapter 1

TAKING STOCK OF THE ENVIRONMENT AND CREATING ENVIRONMENTAL PLANS

If we cannot imagine a healthy, bountiful, and sustaining environment today, it will elude us tomorrow.

—Mark Dowie[1]

Planning is about organizing resources and making choices to achieve goals and objectives. Rachel Carson first used the term "environment" in her book *Silent Spring* to refer to natural places and processes as well as the condition of human settlements. *Environmental planning* explains how governments, businesses, and households decide how to use natural resources, financial capital, and human resources to solve problems in natural areas, rural working landscapes, and the built environments of cities, suburbs, and towns. Governments can use laws, regulations, taxation, infrastructure spending, and financial incentives to encourage environmentally friendly business practices and household lifestyles. Businesses seek to sell goods and services and earn a profit for their owners or shareholders. Businesses are finding that they can reduce costs by cutting waste and energy consumption and also increase profits by offering environmentally responsible goods and services to consumers and other businesses. Households provide labor for government and businesses and are consumers of goods and services. Household choices of what to buy, where to live, and how to live (i.e., recycling efforts) directly affect the quality of the environment.

Planning also involves anticipating problems before they happen. Environmental planning can help communities to avoid or minimize air and water pollution, loss of wildlife, the conversion of farm and forest lands, and degradation of the built environment.

The environment in general consists of air, water, and three main land uses:

1. *Natural areas* are undeveloped lands and waters that provide an array of environmental services, such as water supply,

water recharge and filtration, fish and wildlife habitats, air filtration, and recreation. Natural areas also include natural hazards that pose environmental constraints, such as floodplains, wetlands, and steep slopes.

2. *Working landscapes* of farms, rangeland, forests, mines, and commercial recreation areas provide food, fiber, lumber, minerals, and energy and contribute to the health of rural and metropolitan economies.
3. *Built environments* of cities, suburbs, and towns involve the design and siting of buildings, transportation systems, sewer and water facilities, and public spaces and parkland.

How these three land uses interact with one another affect a community's appearance, size, operations, richness of ecosystem services, and overall environmental quality. Deciding how, when, and where these land uses should or should not change is a fundamental challenge of environmental planning. Yet in the past few decades, the overarching challenge that has arisen is global climate change (see Chapter 4). Climate change has raised air and ocean temperatures and is expected to produce more frequent and severe storms and droughts. Climate change also increases vulnerability to invasive species, wildfires, coastal storms, and rising sea levels. Mitigating emissions of greenhouse gases that contribute to climate change have become central goals of climate change have become central goals of environmental planning.

This book emphasizes how planners, elected officials, and the public-at-large can add environmental planning to the comprehensive plan, land-use regulations, building codes, and infrastructure spending programs. Chapters 3 through 20 each contain examples of how to add environmental planning to the comprehensive plan and how to achieve environmental goals and objectives through an Environmental Action Plan of innovative zoning and subdivision regulations and capital improvements programs (CIPs). It is important to consult your state's planning and zoning-enabling legislation to determine which land-use regulatory tools and financial incentives are allowed in your state. Finally, each chapter contains a discussion of what a planning staff or planning commission should look for in reviewing a development proposal in order to minimize environmental impacts.

Box 1.1. The Role of the Planner in Environmental Planning

Planning is central to any government policy or business decision. Elected leaders and citizens rely on public plans to guide budgets and financial investments, make land-use regulations, and adopt infrastructure spending programs. Local government decisions about public infrastructure investment influence private development decisions. Both public and private developments have major outcomes on transportation systems, development patterns, the mix of land uses, and air, water, and ecosystem quality. Planners need to bring a long-range perspective to the planning process, particularly the cumulative impacts of development projects on the environment.

Planners play a variety of roles in environmental planning: educator, communicator, negotiator, facilitator, enabler, data manager, and expert.

Planners who work for local governments serve as staff to a city or county planning commission. Public planners can help to educate the planning commission about best planning practices for development and environmental protection. Planners also provide data and analysis of development proposals and recommend how these proposals could be improved. In short, planners enable the planning commission to make more informed recommendations to the elected officials about development proposals and changes to the local comprehensive plan, zoning and subdivision regulations, and capital improvements programs. The elected officials make the legally binding decisions about whether to approve development proposals and changes to local regulations and infrastructure programs. Public planners also work directly with the elected officials, keeping them apprised of land-use and environmental matters and helping them respond to public inquiries and requests for action.

Planners must be able to communicate effectively with the public about the purpose of planning for the environment and how different planning tools work. One way local government planners have done this is by offering special evening courses for interested citizens. Another way is to use Internet websites, wikis, and social media to make communication more convenient for the public.

Planners must work with the public to build a consensus on a vision for the community—that is, a direction to work toward. Planners need to explain the importance of the environment to the community as well as the benefits of new planning programs and the costs of inaction. This is especially important when planners are promoting a new comprehensive plan, zoning ordinance, or infrastructure spending program. But communication is not just one way; ideally, planners must involve a variety of stakeholders in the community and broad citizen participation to create active discussions and explorations of a variety of possible planning actions and tools to make the desired changes. In short, planners should not assume that they have all the answers and should be willing to learn what the public wants and how planning can achieve those desired outcomes. A planner who communicates well can garner public support, which can attract the attention and support of the planning commission and elected officials.

Public planners also need to have good negotiation skills for interacting with the public, developers, landowners, the planning commission, and the elected officials. Planning is a political process as well as a legal process, and politics often involves compromise through negotiation.

Planners can facilitate public meetings about planning and can explain to landowners and developers how the comprehensive plan and land-use regulations affect their development proposals. In this way, planners can promote the certain types of development and redevelopment, well-designed developments, and developments in desired locations while protecting environmentally sensitive lands, such as steep slopes, wetlands, and floodplains.

Planners who work for private sector clients should keep in mind that the American Institute of Certified Planners (AICP) code of ethics emphasizes the public interest over private gain. So a planner with a private client should try to promote decisions that are profitable for the client as well as beneficial to the public-at-large. Here, the planner as educator and enabler can help the client understand why a more environmentally friendly development design can be more profitable because it will gain a quicker approval and less public opposition than a poorly designed project. Finally, private sector planners are legitimate experts. They may testify on land-use and environmental planning cases in court.

1.1: Adding Environmental Planning to the Comprehensive Planning Process

Public environmental planning is put into practice through federal, state, and local government laws, regulations, tax policy, and spending programs that discourage, encourage, or require certain actions by companies, individuals, and governments. Federal laws set national standards to protect public health and wildlife and compel improvements in air and water quality and the clean-up of hazardous waste sites. State governments have environmental agencies that coordinate compliance with federal laws and regulations and in some cases set their own environmental standards. Private businesses, households, and nonprofit organizations also do environmental planning to guide their actions that influence environmental quality. But the focus of this book is mainly on environmental planning by cities, towns, and counties. The day-to-day decisions of America's 39,000 local governments about the siting and types of private development and public infrastructure arguably have the greatest consequences for the national environment.

Municipal and county governments have primary responsibility for planning the use of the natural and built environments, although local comprehensive plans and regulations may be influenced by federal and state laws, requirements, and guidelines. The main purposes of local comprehensive planning process are to

1. decide on the appropriate uses of land and the spatial pattern of development;
2. identify lands with development constraints, such as floodplains, wetlands, steep slopes, and shallow depth to bedrock, as well as lack of central water and sewage service;
3. regulate the location, timing, and design of development; and
4. invest in gray infrastructure, such as sewer and water facilities, public buildings, roads, and transit, and in green infrastructure, such as parks, tree planting, green streets, and green roofs, to address current needs and to influence the siting, design, intensity, and sustainability of future development.

The Comprehensive Plan

The comprehensive plan establishes the traditional foundation for local and regional

planning. The plan sets forth a vision of how a community or region should look, function, and grow over the next 10 to 20 years and sometimes longer. The plan provides direction for public and private sector decision makers through an inventory of current conditions and the identification of future needs. The plan expresses goals and objectives for housing, the economic base, public facilities and services, transportation, land use, parks and recreation, and the environment.

A crucial part of the comprehensive plan is a projection of population change. More people bring greater demands for housing, jobs, water, sewage treatment, and land for development. On the other hand, some communities may be losing population or experiencing little population change, but population shifts and new developments within such communities can still affect environmental quality. For example, sprawling development can occur even when there is little population growth and result in more vehicle miles traveled and air pollution emissions.

Particularly important is the comprehensive plan's future land-use map, which details the location of desired land uses and lays the foundation for the zoning map. Planners, public officials, and the general public should evaluate private development proposals and public infrastructure programs according to the goals and objectives of the comprehensive plan as well as the future land-use map.

A fundamental reason to emphasize environmental planning within the comprehensive plan is that it provides a legal basis for the zoning ordinance and subdivision regulations that, along with the CIP and design guidelines, put the comprehensive plan into action. Consistency among the comprehensive plan, implementing regulations, and spending programs is essential. A lack of consistency creates confusion for landowners, developers, elected officials, and the public about the purpose of the plan, the legality and fairness of the regulations, and the need for infrastructure spending.

Also, environmental planning—like a comprehensive plan—should be holistic because, as the second law of ecology states, "everything is connected to everything else."[2] Planning for one aspect of the environment, such as water quality, without recognizing the impacts of other activities (such as air pollution degrading water quality) will result in less effective plans, less accurate regulations, and less successful incentives to maintain or improve environmental quality.

Traditional city or county comprehensive plans often have several shortcomings for sustainable environmental planning. First, the traditional plan usually emphasizes economic development, transportation, and housing and does not place a high priority on environmental quality. It is not uncommon to find comprehensive plans that have little to say about the development capabilities and constraints of the natural environment. This is frequently the case with larger cities that have small amounts of open, developable land as well as rural communities that are hungry for economic activity. Communities on the metropolitan fringe often designate their remaining farmland as "vacant" in the comprehensive plan, as if the land has no legitimate current use and is just waiting to be developed. Many smaller communities try to save time and money by drafting a "policy plan" that does not include an inventory of facts or an analysis of environmental conditions. As a result, policy recommendations often sound like nothing more than a wish list.

A weakness of the traditional comprehensive plan is that it lists several goals and objectives that are often difficult for planners and local governments to prioritize. Is an affordable housing goal more important than a water supply goal? Or, how does an objective to purchase 10 natural gas–powered buses compare with an objective to add 30 acres of parkland?

Many communities have comprehensive plans that are more than 10 years old and no longer reflect the community's conditions or goals and objectives for growth, development, or environmental quality. All too frequently, planning commissions and planning staff find themselves overwhelmed with reviewing development proposals and have little or no time to devote to updating the comprehensive plan, the zoning and subdivision regulations, or the CIP.

Another common problem is that the comprehensive plan of a single community or county may not recognize the environmental impacts of its land-use and development activities on neighboring jurisdictions or vice versa. For instance, the destruction of wetlands upstream will create more flooding downstream. Most land-use and environmental problems are regional, not local. Yet local governments usually try to address these problems by themselves rather than through regional cooperation.

To promote environmental planning, planners would be wise to cite the importance of a quality environment in the economic development chapter of the comprehensive plan. Two of the largest economic sectors in America are high technology and tourism. High technology includes computer-related businesses, health care, biotech, optics, and aerospace, among others. High-tech companies are footloose; they can locate just about anywhere. Moreover, they employ well-paid and highly educated workers who value a healthy environment and an overall good quality of life. Attractive cities, towns, and villages with good air and water quality and access to open space are competitive for high-tech businesses and their workers.

Tourists are looking for unique and enjoyable sights and activities. Scenic vistas, wildlife, recreation areas, clean air and water, historic sites and buildings, and good places to eat, shop, and spend the night all contribute to positive experiences in places that can be visited again and again. This is not to say that everyone should be employed in writing computer software or in hotels. Heavy manufacturing is still important to many communities, as are retail trades, finance, energy production, agriculture, and a variety of service and government-related jobs. But there is a close link between sustainable economic activity and a sustainable environment.

Functional and Area Plans

Local governments have a choice of whether to emphasize environmental issues within a comprehensive plan or to create separate strategic plans. Strategic plans fall into two categories: (1) functional plans and (2) area plans.

A functional plan goes into more detail on a particular topic in a comprehensive plan. For example, many local governments have adopted a functional park-and-recreation plan in addition to the community facilities section of the comprehensive plan. An area plan focuses on a certain geographic location, such as a neighborhood, a transportation corridor, or part of a county. Functional plans and area plans can help to expand on the inventory and analysis of data and the goals and objectives contained in the comprehensive plan. For instance, a hazard mitigation plan is an area plan with elements of a functional plan that expand on the land use and natural resources inventory sections of a comprehensive plan. Planners use a comprehensive plan to note the location of places that are vulnerable to natural hazards. But a comprehensive plan is not a substitute for a detailed hazard mitigation plan.

Local functional environmental plans often include a park and open space plan, water supply plan, Energy Plan, Heritage Area Plan, transportation plan, stormwater management plan, and a hazard mitigation plan. These

and other plans are explored in greater depth in the chapters that follow.

In recent years, several local governments have added a separate green infrastructure plan, which applies to particular areas and expands on the land use and natural resources inventory sections of the comprehensive plan. Climate action plans are also hybrids of functional and area plans. More than 100 local governments have drafted climate action plans to provide guidance on how to reduce greenhouse gas emissions, especially from transportation and buildings, as well as how to adapt to warmer temperatures, more frequent storm events, and rising sea levels.

A small but growing number of local governments have drafted sustainability plans that express the interconnected long-range goals of a sustainable economy, environment, and society. These plans strive for the long-term health of the natural environment, productive working landscapes, efficient public investments, a durable built environment, economic prosperity, and access to a quality environment for all income groups.

Separate functional and area plans can be much more *strategic* than a comprehensive plan. A comprehensive plan asks the general question: "What kind of community do we *want* to have in 20 years?" A strategic plan asks a very different question: "What do we have to do to be the community we *need* to be in 20 years?" Many comprehensive plans fail to come to life because they do not have an action plan element to implement them. A strategic plan more often lays out the regulations, incentives, and investments that a local government and the private sector need to make in order to achieve a level of environmental quality within a set time frame. Strategic plans often include quantifiable goals, such as a 20 percent reduction in greenhouse gases by 2025, or 10 miles of greenways and trails by 2020, or 25 more miles of light rail by 2030.

Whether in a comprehensive plan or a strategic plan, environmental planning must be economically and technologically feasible. It makes little sense to advocate tax policies, capital spending programs, or technologies that a community, region, businesses, or households cannot afford. A plan alone will not guarantee long-term progress toward greater sustainability and quality of life. The key factors are the political will of elected officials; the mix of regulations, incentives, and investments to implement the plan; and the support of the general public for their communities.

By referencing a functional plan or an area plan, the comprehensive plan can effectively make these strategic plans part of the comprehensive plan. As long as the functional and area plans are formally adopted by the elected officials as part of the comprehensive plan, they will have the same legal authority as a traditional comprehensive plan in setting a basis for zoning and subdivision regulations and in guiding capital investments. In short, a modern comprehensive plan is connected to a network of supporting functional and area plans. This network of plans is especially important for including detailed environmental data, analysis, policies, and action strategies to implement the comprehensive plan and the related functional and area plans.

Zoning

Zoning is the most widely used land-use control in the U.S. to guide the future growth and development of a municipality or county. The traditional zoning ordinance consists of two parts: a text describing the rules for each zoning district (Residential, R-1 Single Family, R-2 Multifamily, Commercial C-1, Manufacturing M-1, etc.) and a map showing the location and boundaries of the zoning districts (see Figure 1.1).

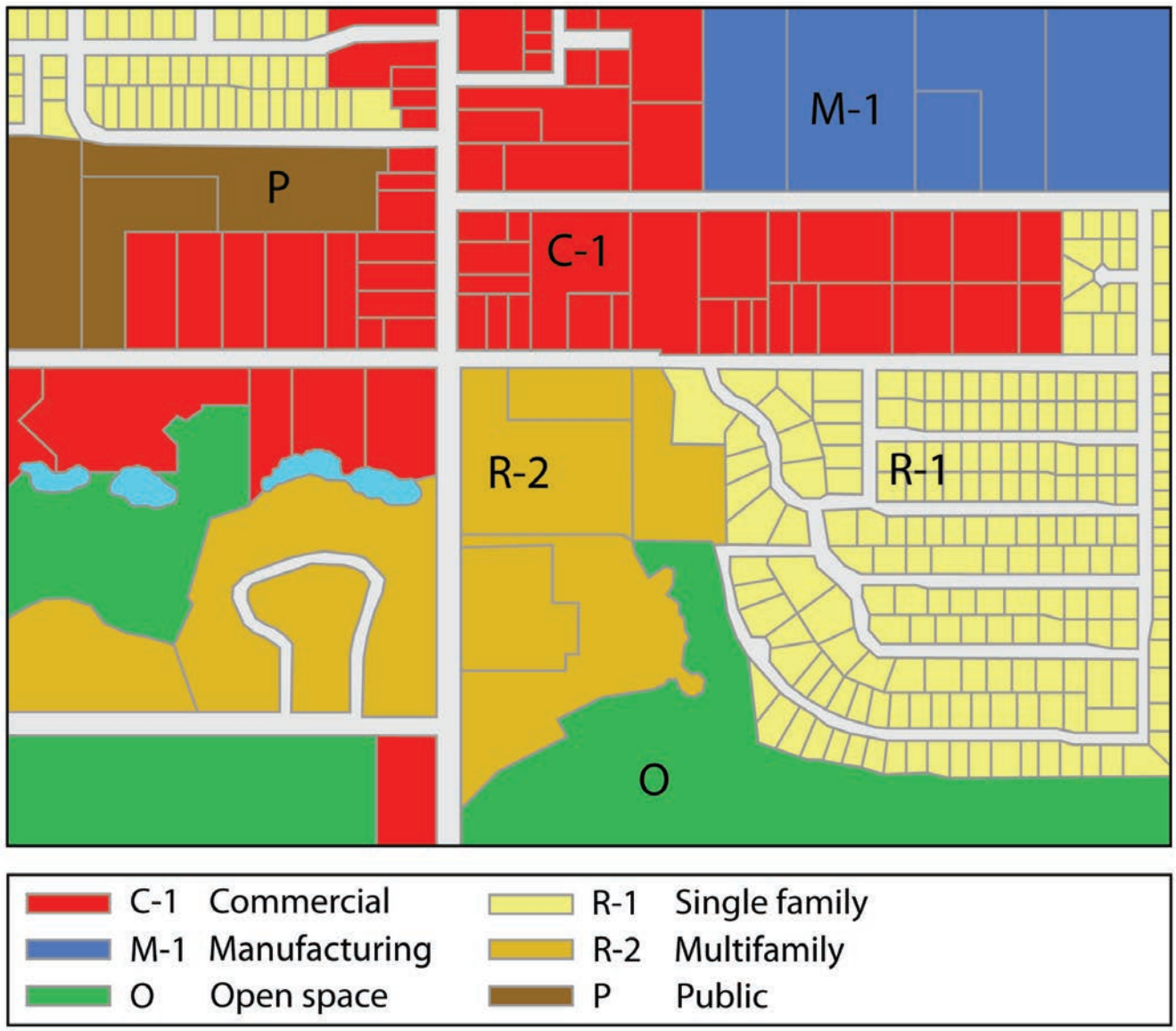

Figure 1.1. General Zoning Map

Zoning has several purposes. First, it serves to implement the goals and objectives of the comprehensive plan and, in particular, the plan's future land-use map. Thus the zoning ordinance should be consistent with the comprehensive plan. In some states, a zoning ordinance that is not consistent with the comprehensive plan could be ruled invalid in a court of law.

Another purpose of zoning is to separate potentially conflicting land uses—such as keeping a steel factory away from single-family homes—to protect public health, safety, and welfare. Each zoning district has different rules for permitted uses, special exceptions, and conditional uses. Permitted uses are normally allowed outright after a review by planning commission staff. Special exceptions are usually reviewed by the zoning board (also called the zoning board of adjustment) after a public hearing, while conditional uses are typically reviewed by the planning commission and the elected governing body after public hearings.

Each zoning district also has specific regulations on lot size, height of buildings, building setbacks from property lines, lot coverage (i.e., how much of a site can be covered with impervious surfaces), and may include other requirements.

One of the most common uses of zoning in environmental planning is the *overlay zone*. An overlay zone creates a double-zone where a landowner or developer must meet the standards of both the underlying zone (such as R-1 Residential Single Family) and the overlay zone (such as a Floodplain Zone). Planners employ overlay zones to protect the public health, safety, and welfare in sensitive environmental areas. For instance, overlay zones include floodplain overlays, aquifer overlays, and steep slope overlays, among others.

Zoning regulations must not remove all economic use of a private property. Otherwise the zoning will violate the takings test of the Fifth Amendment to the U.S. Constitution (see Chapter 2). Zoning must also be reasonable. The reasonableness test is largely a matter of common sense, based on land-use capabilities and constraints. But there should be a clear link between the goals of the comprehensive plan and what the zoning ordinance requires. Zoning, for example, can be used to protect natural areas from intense development; but the importance of the protection of natural areas, such as wetlands, should be described as a goal in the comprehensive plan for environmental, fiscal, aesthetic, and economic reasons.

A valid criticism of traditional zoning is that it often separates commercial and residential land uses and forces people to travel by car from where they live to where they work and shop. This separation of land uses causes more energy consumption, air pollution, and sprawling development. The zoning ordinances of many cities and suburbs have only recently begun to allow for the mixing of commercial and residential uses. A number of commercial and residential uses can be safely combined in a mixed-use zone of small shops, houses, offices, and apartments to create a more attractive, compact, and pedestrian-friendly built environment.

Another criticism of zoning is that it tends to be rigid, resulting in "cookie cutter" housing developments with uniform rectangular lots. Also, local governments may poorly administer their zoning by frequently granting use variances and rezonings for other land uses that defeat the development goals and objectives of the comprehensive plan.

Because of the lack of guidance for the design of buildings in the traditional zoning ordinance, more than 300 cities in the U.S. have adopted a form-based code, at least for specific parts of the city, such as a downtown or a transit corridor. Other cities have incorporated elements of form-based codes into their traditional zoning ordinance to create what is known as a parallel code. A form-based code regulates the design and appearance of buildings more so than land uses. A form-based code emphasizes the importance of the public realm and how private and public buildings influence the public realm in terms of the building height and bulk, building façades, orientation to the street, and parking requirements. Local governments can implement a form-based code by adopting a regulating plan for a part of the city or even the entire city, as Miami has done. The regulating plan includes a combination of street and building standards and may include architectural standards as well. It is far easier to create mixed-use buildings and developments with a form-based code than the traditional zoning ordinance. Thus a form-based code may prove to be more effective in producing walkable mixed-use areas with sufficient density to make mass transit service feasible.[3]

Communities can use *performance zoning* to regulate the potential impacts of land uses rather than limiting land uses to those generally thought to be compatible with the area. Typically, performance zoning relies on buffers

in the form of berms, vegetation, and setbacks to minimize noise and light that would spill over from one property to another. If a landowner can demonstrate that a proposed land use in a certain location will not adversely affect traffic, water quality, or other environmental features, then the proposed land use will be allowed. Performance zoning depends on adequate and trained planning staff to implement and enforce it. We do not recommend performance zoning in rural areas with few planning staff or little planning expertise.

Local governments have all too often based their zoning ordinances and rezoning decisions on the hunt for new development to expand the property tax base. As a result, planning and zoning decisions have tended to downplay topography, hydrology, soils, wildlife habitat, or the availability of adequate infrastructure to support new development. Many communities allow commercial, industrial, and large-lot residential development that will increase the property tax base but openly discourage multifamily housing for fear of a greater property tax burden. This practice—known as "fiscal zoning"—zones out low-income households and promotes both large-lot residential sprawl and arterial commercial sprawl instead of compact, mixed-use developments.

Finally, many zoning ordinances are long, dry texts. It is a good idea to place drawings or photos depicting correct zoning practices in the zoning text. These illustrations will help landowners, developers, elected officials, and concerned citizens to better understand the zoning concepts and implement them in new developments.

Subdivision and Land-Development Regulations

The subdivision and land-development ordinance establishes rules for the design and layout of lots, necessary roads and sidewalks, sewage disposal, drinking water supplies, and stormwater drainage, as well as the retention of open space and vegetation. In some states or communities, the subdivision ordinance may require an environmental impact assessment for all major subdivisions and land-development plans.

The subdivision and land-development process requires the planning commission to review and approve a development proposal in three stages: the sketch plan, the preliminary plat, and the final plat. In the sketch plan stage, the developer presents a conceptual layout of the proposal. This is a brainstorming and negotiation process between the developer and the planning commission or staff rather than a rigorous review of requirements. The planning commission or staff recommends ways to improve the proposal, and the developer then prepares a preliminary plat.

The preliminary plat shows a considerable amount of information about the proposed development, including planned lot configurations, building locations, streets, utilities, neighboring landowners and land uses, and environmental features such as streams, slopes, and vegetation. The planning commission and staff review the proposed development according to the subdivision and land-development regulations and provide an opportunity for the public to comment. The planning commission may approve the preliminary plat, approve it with conditions, or deny it. Most often, the planning commission imposes conditions to ensure that the proposed development meets the standards of the subdivision ordinance. The developer may be required to put up a bond for installing streets, sidewalks, and utilities for the development to ensure that adequate funding for installing the infrastructure will be provided, even if the developer does not perform the installation.

Once the planning commission approves the preliminary plat, there is little the public

can do to change the proposed development. The developer responds to the conditions attached to the preliminary plat approval and then submits a final plat for approval. At this stage, the municipality or county determines whether the developer has met the conditions attached to the preliminary plat, and if so, the chair of the elected officials signs the final plat and it is recorded with the recorder of deeds at the county courthouse. Then the land may legally be subdivided or developed.

From the date the final plat is approved, the developer usually has up to three years to commence the project and five years to complete it. If the project is not begun within the three years or completed within five years, the final plat is null and void and a new application for a subdivision is required. Exceptions may be granted for large developments that are phased in over time, such as for some planned unit developments that can take several years to complete. Time limits for most types of development are a good idea because environmental and other factors can change. In several western states, there is no time limit for starting or completing new construction. For instance, in the real estate boom of the early 2000s, many subdivisions were laid out, legally approved, and then never developed. A large number of these "zombie subdivisions" are still sitting empty. Also, some local governments have mistakenly approved substandard lots in quickly laid out subdivisions that are often constrained by small lot sizes, steep slopes, lack of road access, and lack of water. These substandard lots cannot be developed.

In many suburban communities, subdivision regulations together with rigid zoning ordinances have produced cookie-cutter residential layouts, varied only by the use of road loops and cul-de-sac "lollipops." Curvilinear street patterns that maximize driving and disorientation are all too common. Any open space that is preserved is typically fragmented and often not useful for recreation, wildlife habitat, or other purposes.

The subdivision review process should require developers to present detailed studies of the likely environmental impacts of their proposed projects. Developers may be asked to consider alternative project designs that may be more compatible with the environment. For instance, local subdivision and land-development regulations may require developers to mitigate stormwater runoff through a limit on impervious surface coverage, grass swales, retention of vegetation, and by avoiding construction on steep slopes.

The Capital Improvements Program (CIP)

Public roads, mass transit systems, schools, parks, sewer and water facilities, and police and fire stations have a powerful influence on where development occurs, when it occurs, and the type of development. A CIP describes (1) what public infrastructure a community will build, repair, or replace; (2) where these services are or will be located; (3) when construction, repair, or replacement will happen; and (4) how these infrastructure projects will be funded. Local governments typically use a CIP to budget 5 to 10 years into the future, but this may vary according to a community's estimates of future population growth and service needs.

The purpose of the CIP is to anticipate the location, type, and amount of public service needs and to provide adequate services at a reasonable cost. The CIP can help coordinate projects and avoid mismanagement, such as paving a street one year and tearing it up the next to install a sewer line.

A CIP commonly includes public investments in roads and bridges, mass transit, school buildings, sewer and water treatment plants and lines, municipal buildings, and solid waste disposal sites. These public facilities

are also known as "gray infrastructure." A CIP should also include "green infrastructure" projects, such as parks, trails, purchases of land and conservation easements, green roofs on public buildings, and financial incentives to encourage private landowners to install green roofs, rain gardens, and swales to reduce stormwater runoff. The CIP should contain detailed information on the capacity of current facilities, the projected future demand for public services, and estimated future costs and financing arrangements in relation to expected municipal or county revenues and operating budgets.

Local officials and planners need to coordinate the CIP with the comprehensive plan and the zoning ordinance. *Concurrency* is a policy that requires infrastructure to be in place before public or private development can begin. Local governments can adopt an adequate public facilities ordinance (APFO) or add a concurrency policy into the subdivision and land-development regulations to ensure that new development will not exceed infrastructure capacity or impose an unreasonable tax burden on the community. Concurrency and APFOs are a good way to promote compact phased growth. The State of Washington requires local governments to practice concurrency as part of its 1990 State Growth Management Act. Many local governments in other states have adopted APFOs. Communities may choose to allow privately financed infrastructure to meet concurrency requirements. But it is important to note that a concurrency policy on public infrastructure may not stop the construction of buildings in areas that rely on private wells and individual on-site septic systems.

Many extensions of central water and sewer by municipalities, authorities, and private developers have resulted in leapfrog development and the premature conversion of farmland, forests, wildlife habitats, and open space. Sewer line extensions mean local water bodies will be receiving more treated effluent. More highways and wider roads generate more traffic, air pollution, wildlife fatalities, and stormwater runoff into waterways. The construction of public buildings, such as the city hall, post office, and schools, outside of downtowns and on arterial strips promotes automobile dependence, energy consumption, air pollution, and sprawling development patterns.

One of the most successful uses of CIPs with zoning is an urban growth boundary. The growth boundary is a limit of urban services, such as central sewer and water, agreed on by a city and its one or more surrounding counties. Inside the growth boundary, there should be sufficient land to accommodate development for 20 years. Outside the boundary, the land is primary in farm or forest uses. The idea of a growth boundary is to promote compact development that can gradually expand over time and thus minimize sprawl and the loss of open space.

1.2: The Environmental Planning Process

A good way to make the comprehensive plan a "living document" that people use is by communities and counties adopting an Environmental Action Plan. Local governments can use an Environmental Action Plan to implement goals and objectives from several parts of the comprehensive plan, especially the natural resources inventory, economic base, land use, and community facilities sections. In addition, the Environmental Action Plan can draw on planning strategies and tools in the functional and area plans that are connected to the comprehensive plan. The Environmental Action Plan can recommend regulations, financial

incentives, infrastructure spending programs, and other actions toward promoting a sustainable environment. Finally, the Environmental Action Plan can list short-term, medium-term, and long-term actions; funding sources; and who will be responsible for carrying out the actions and when.

Steps in the Environmental Planning Process

The environmental planning process has eight main steps, most of which contain a mix of technical planning and political "selling" of the benefits of environmental planning (see Table 1.1).

Recognizing the Need for Environmental Planning

To start the environmental planning process, elected officials must be convinced that certain environmental problems exist or could pose threats to public health, safety, and welfare. It helps if interest groups, business leaders, and the general public recognize the need for environmental planning and voice their concerns to the elected officials. Recognizing the need for environmental planning may result from a study done by the local government, such as a water supply plan. Similarly, a partnership of citizens and local government may do a study

Table 1.1. Eight Steps in Creating an Environmental Action Plan

1.	The public and elected officials recognize the need for environmental planning.
2.	Officials then commit people and funding to the environmental planning effort and appoint an environmental advisory committee to assist the planning commission.
3.	The planning commission, staff, and the environmental advisory committee conduct an Environmental Needs Assessment Survey and solicit public input.
4.	The planning commission, staff, and the environmental advisory committee develop a factual base of environmental conditions and analyze the information.
5.	The planning commission, staff, and the environmental advisory committee review the community's comprehensive plan to revise the vision statement, broad goals, and specific objectives to incorporate environmental data and needs over the next 20 years or more.
6.	The planning commission, staff, and the environmental advisory committee draft an Environmental Action Plan to articulate a set of land-use controls, financial incentives, infrastructure spending, tax programs, and building design regulations that will put the environmental goals and objectives of the comprehensive plan into practice.
7.	Elected officials solicit public input and adopt the Environmental Action Plan.
8.	The planning commission and elected officials implement, monitor, and evaluate the performance of the Environmental Action Plan through an annual review of progress toward benchmarks and then make revisions and updates as needed.

that alerts public officials about environmental needs and compels them to act. Elected officials are more likely to adopt an Environmental Action Plan and support specific actions if they receive credit for their support.

Committing People and Money to the Environmental Planning Effort

Elected officials can either give the planning commission and staff the task of drafting an Environmental Action Plan or hire a professional planning consultant to do the job. A wise move is for the elected officials or planning commission to appoint an environmental advisory committee to help with drafting the action plan. Many communities in the northeastern states have appointed a standing local conservation commission to assist the planning commission and elected officials in drafting the environmental elements of the comprehensive plan. The conservation commission can also review and comment on the potential environmental impacts of proposed developments. A local conservation commission or environmental advisory committee should ideally have between 8 and 12 members, and include people from a range of backgrounds, such as business, a local university, environmental groups, local planning, any adjacent municipality that may share a natural resource such as a river, and citizens from different areas of the community. For technical expertise, it is a good idea to include a biologist and an engineer on the committee.

Some communities may want to hire a consultant to help with the Environmental Action Plan. Make sure the consultant is willing to tailor the action plan to the needs and desires of the community. A pitfall to avoid is allowing a consultant to present a "boiler plate plan" used by several communities, an all-too-common practice among consultants. Spell out in a contract what is expected of the consultant, when the work is due, the amount of the consultant's fee, and payment dates.

The Environmental Action Plan should include an acknowledgment of all public and private sources of funding for the plan as well as the major participants, including the planning commission, any advisory committees and volunteers, any consultants, and, of course, the elected officials who will be asked to adopt the plan.

Surveys and Soliciting Public Input

An Environmental Action Plan must involve broad and meaningful participation from the public and a variety of interest groups. A good way for the planning commission and advisory committee to involve the public in the planning process is to conduct an *Environmental Needs Assessment Survey*. The survey gives people in the community the opportunity to voice their opinions about environmental conditions and needed improvements. The survey can ask specific questions about a range of environmental issues, as well as include open-ended questions about what improvements are needed. Other questions might ask for levels of willingness to pay for new environmental services such as additional parks or upgraded water treatment facilities.

Surveys may be distributed in a variety of ways. One way is to mail a survey to a sample of households in the community. Surveys that are clear and short and include a self-addressed stamped envelope and cut-off date for responses often have good return rates. Another way is to post the survey on the community's website. The survey responses will indicate issues of concern in the community or county and will help the advisory committee and planning commission in revising the comprehensive plan. This may include redrafting the vision statement, gathering and analyzing additional environment-related data, and

formulating general environmental goals and specific objectives for the community or county.

Community or neighborhood public meetings, newsletters, and notices in the local media are also helpful in publicizing the needs assessment effort and eliciting public comments. Two sets of meetings are recommended. The first set is to solicit input from the public. The advisory committee and planning commission members should ask people to identify the important environmental aspects of their communities and improvements they would like to see. This can be done effectively in small-group brainstorming sessions (known as focus groups) to draw people out and hear from everyone. It is helpful to have maps of the community or county on hand.

After the surveys and informational meetings have been completed and incorporated into a draft of the action plan, the planning commission and advisory committee should present their findings and recommendations at a second set of public meetings to get feedback from the public. Does the action plan reflect a public consensus? Keep in mind that a consensus does not mean 100 percent support—there will always be some opposition. Are there important environmental issues or strategies that were left out? Taking the extra time to involve the public and make changes to the Environmental Action Plan will pay dividends in the long run. The public will appreciate the opportunity to voice concerns and opinions and will gain a better understanding of what the Environmental Action Plan is trying to do. Additionally, public support is crucial for convincing elected officials to adopt the Environmental Action Plan.

Gathering Data About Environmental Conditions and Analyzing the Data

Studies of the natural and built environments, including projected future impacts of population on environmental resources, create a factual base. The factual base in a comprehensive plan should include (1) a natural resources inventory of air, land, water, and wildlife resources and (2) a built environment inventory of buildings and gray infrastructure. These studies should present accurate, unbiased information on the current condition of the local or regional environment. The factual base will help to answer a variety of questions, such as the following: What is the quality of the community's air and water? What type of wildlife and wildlife habitats exist? What is the condition of the sewage treatment plants? What is the suitability of lands and water resources in the community for different types of development? Federal, state, regional, and local governments are good sources of information. Local and state universities and environmental nonprofit organizations may also be helpful. Private consultants may be useful for specific tasks. Some of this information may be available from the community's current comprehensive plan.

Natural Resources Inventory

Natural resources include air, water, soils, geologic formations, farmland, forests, minerals, wetlands, and plant and animal species. In the inventory, planners should identify the location, quantity, and quality of these resources as well as their suitability for development, development constraints such as steep slopes and floodplains, and vulnerability to pollution or natural hazards.

A frequent challenge in putting together a natural resources inventory is that a community's political boundaries may differ from geologic or ecological boundaries. For example, the community may be part of a river basin or wildlife migration route. A community may need to consult with neighboring communities, counties, and regional planning agencies

to gather complete inventory data. Dutchess County, New York, adopted a natural resources inventory in 2010 to serve as an information source for individual towns as they create comprehensive plans and make day-to-day decisions on the location of new development.[4] The natural resources section of the Port Washington, Wisconsin, comprehensive plan states, "Approximately 25.8 percent of the City of Port Washington planning area is covered by hydric soils (about 2,531 acres), generally associated with stream beds and wetland areas. Although hydric soils are generally unsuitable for development, they may serve as important locations for the restoration of wetlands, as wildlife habitat, and for stormwater detention."[5]

Resource maps are very useful, and a composite map of natural resource layers, generated by a geographic information system (GIS) is highly recommended (see Figure 1.2). Several states have GIS databases accessible online. If available, remote sensing information may also be helpful, especially for regional maps. Topographic maps from the U.S. Geological Survey (USGS) display elevations, roads, water bodies, and settlements. Other USGS maps can help to identify historic, current, and projected community land-use patterns. Aerial photos of the community or region can be especially helpful in showing the pattern of development (whether sprawled or compact), the amount of built-up area and undeveloped land, and where future development might best be accommodated.[6] Orthophotos are computerized aerial photographs that are scale-corrected and distortion free. They are available from most local offices of the Natural Resources Conservation Service (NRCS). Digitized property tax maps showing property boundaries and land parcel patterns can be overlaid on top of the orthophotos. Planners can then add GIS data layers from the natural resources inventory maps (see Table 1.2) and built environment maps (roads, sewer and water lines, schools, hospitals, and other buildings). Planners can identify land parcels from local tax maps. Areas with many small parcels will not be suitable for development that requires large acreages, such as industrial parks. Areas with large parcels have better potential for natural resource uses, such as farming, forestry, or mining. Combining

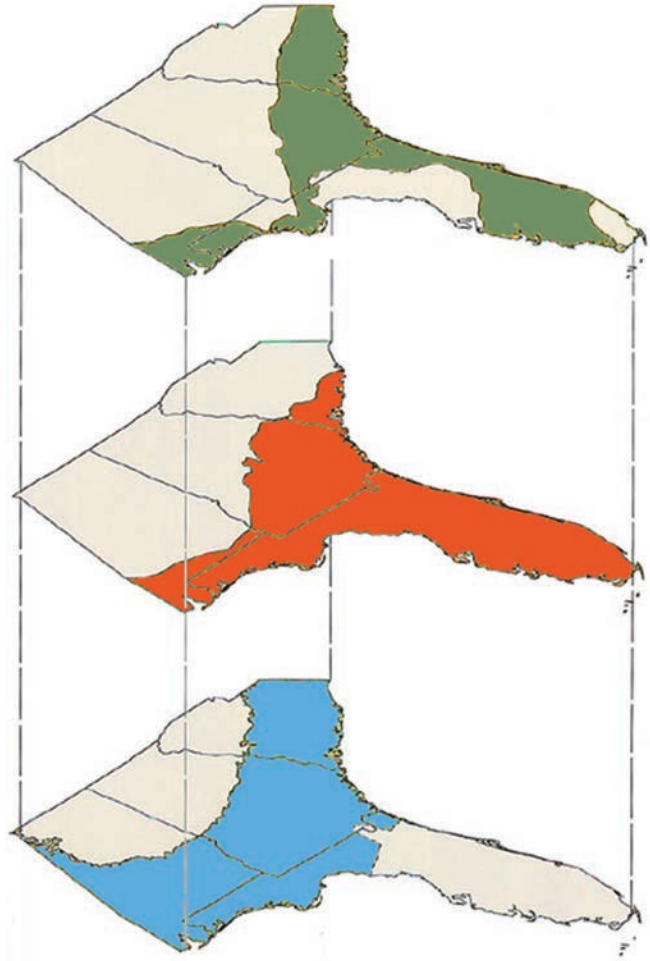

Figure 1.2. Geographic Information System Database Layers: Aquifer Systems of the Southeastern United States

Green: surficial aquifer system; orange: Floridian aquifer system; blue: Southeastern Coastal Plains aquifer system.

Source: Adapted from U.S. Geological Survey, *Ground Water Atlas of the United States*, HA-730-G, Figures 8,10, and 11, 2009. http://pubs.usgs.gov/ha/ha730/ch_g/jpeg/G009.jpeg.

Table 1.2. Environmental Features to Show on the Natural Resources Inventory Maps	
Natural Environmental Features	
1.	Soils, geology, and topography
2.	Watersheds, streams, water bodies, floodplains, and wetlands
3.	Aquifer recharge areas and delineated wellhead areas
4.	Wildlife habitat
5.	Vegetation (forest cover, cropland, pasture, prairie, etc.)

parcel patterns with soils, topography, and proximity to sewer, water, and major roads provides a picture of development potential for specific sites. It is also important to identify any lands owned by federal, state, or county governments, which are generally off-limits to development.

Planners can include discussions of the following natural resources in a natural resources inventory: soils, geography and topography, water resources, wildlife habitat, vegetation, and air quality.

Soils. Soils information can include slope, erosion potential, wetness, strength, depth to bedrock, frost action, shrink-swell, prime agricultural soils, forest soils, and suitability for on-site septic systems. County soil surveys produced by the NRCS provide all this information as well as general soils maps (see Figure 1.3). In many counties, soil surveys have been digitized for GIS applications. Soils information indicates the ability of an area or parcel of land to support buildings, absorb water, and grow plants (see Table 14.1 in Chapter 14).

Soils with high productive capability for agriculture and forestry are deep, level, and well drained; contain a wealth of micro-organisms and organic matter; and can produce crops with a minimum of fertilizers. These also tend to be the same soils that can best support development and are most suitable for the use of on-site septic systems. Slopes of more than 15 percent should be avoided for building sites. Shallow depth to bedrock, poor drainage, and wet soils also hamper the construction and stability of buildings. Low weight–bearing soils, which might support development of single-family houses, might not be able to support heavier commercial, industrial, or institutional buildings. Septic systems in porous soils run a high risk of polluting groundwater, while septic systems in heavy clay soils may result in the back up of effluent to the surface.

Geology and Topography. The geology of the community or region consists of the underlying rocks, mineral and aggregate deposits, and the topography of the landscape. Geology can help to identify areas likely to have productive groundwater aquifers and areas vulnerable to groundwater contamination. Planners should map underground faults that could lead to land subsidence, landslides, or earthquakes. There may also be unique geological features such as caves, mesas, and rock outcroppings that planners should note. Topographic maps will show ridges and steep slopes (Figure 1.4) and reveal stormwater drainage patterns. A study of topography will also

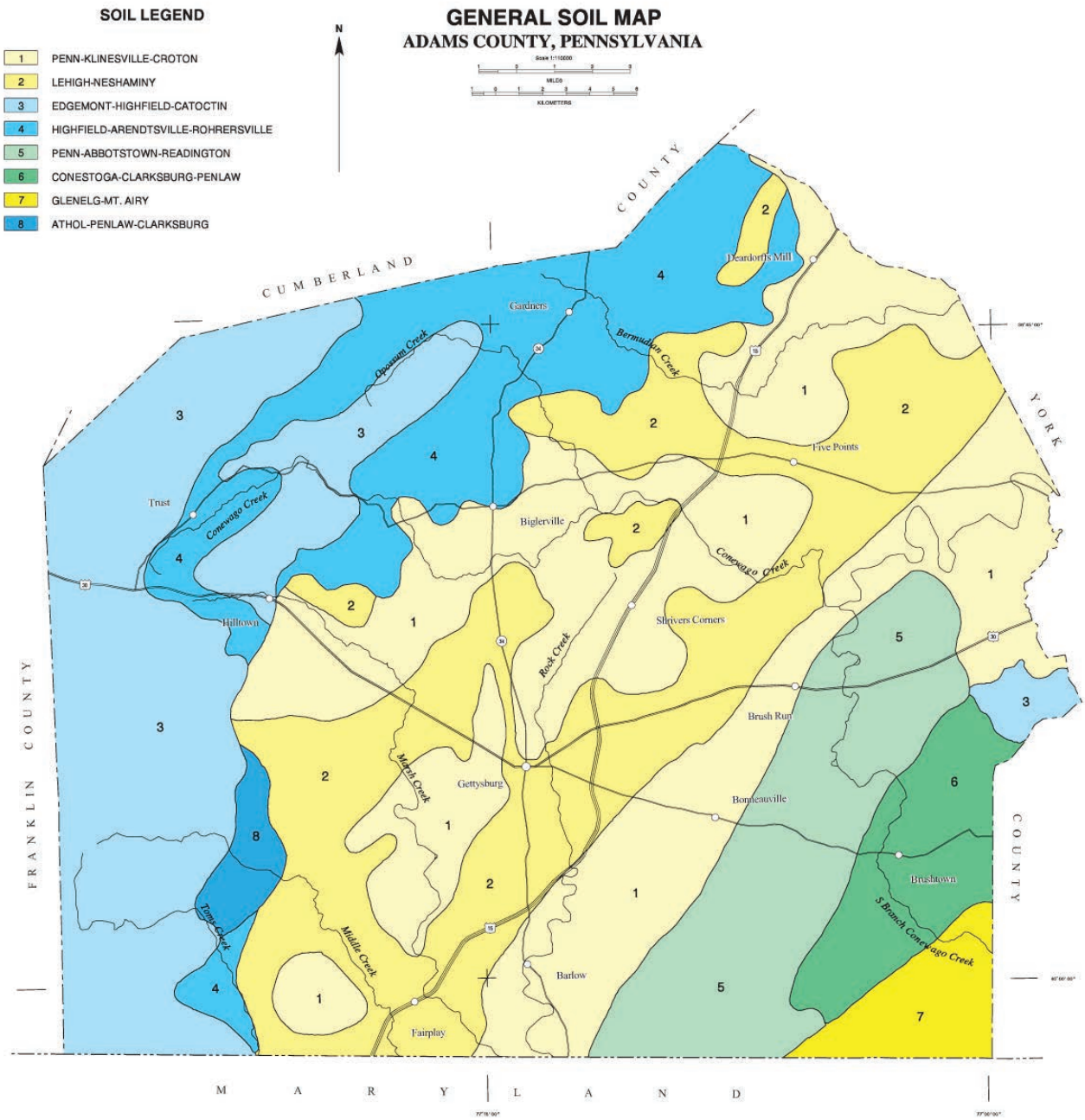

Figure 1.3. Map of Soil Types from the Adams County, Pennsylvania, Soil Survey.

Source: Natural Resources Conservation Service (NRCS).

be helpful in viewshed analysis, with an eye toward protecting outstanding vistas. Planners can obtain data on geology and topography from the USGS, the state environmental agency, and the state land grant university.

Water Resources. Important water resources include groundwater and surface water, public water supplies, wetlands, and floodplains. Planners should obtain or draft maps on the location and extent of water resources as well as watershed and aquifer boundaries (see Chapter 5). Topographic quadrant maps from the USGS and maps of wetlands from the national wetlands

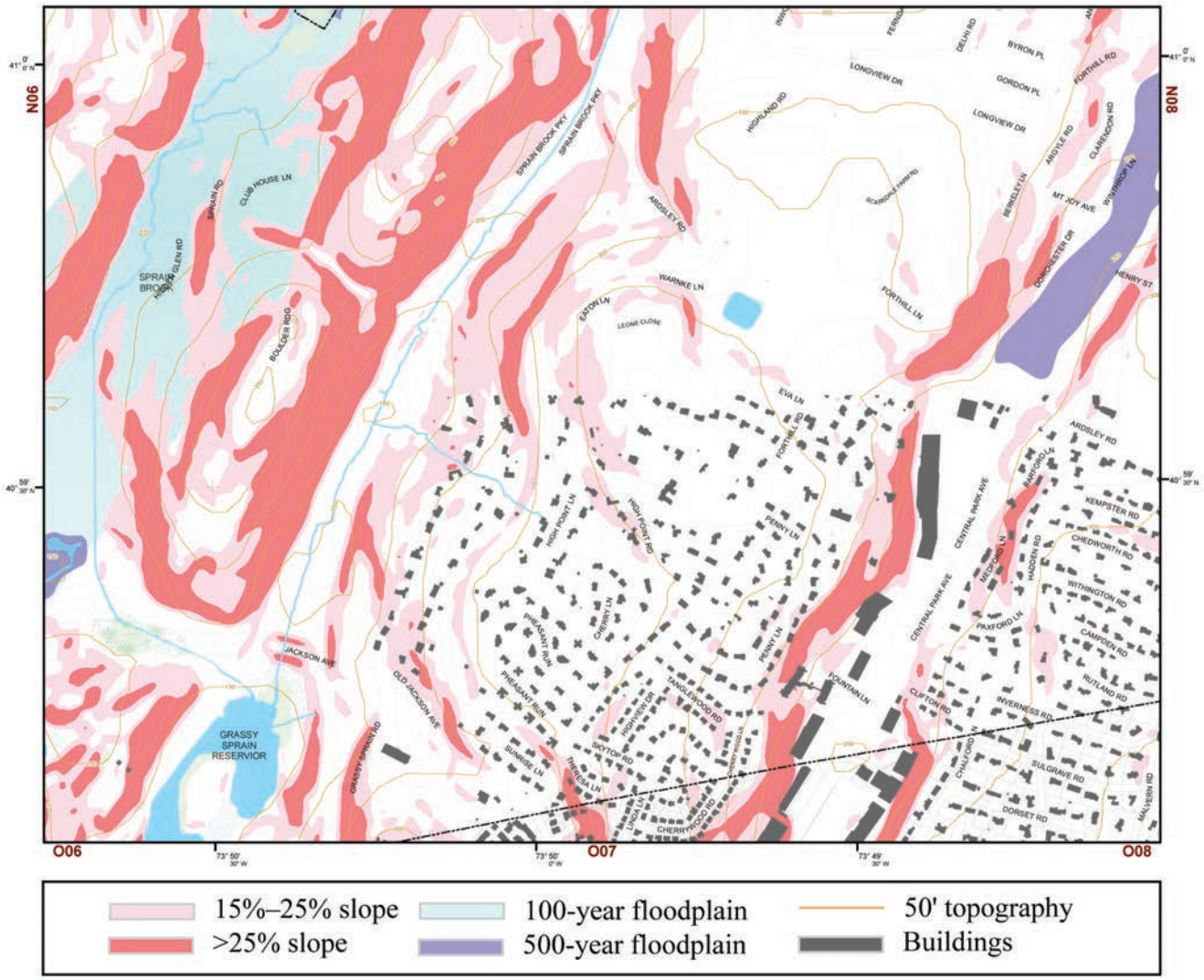

Figure 1.4. Map Identifying Steep Slopes for the Natural Resources Inventory, Yonkers, New York.

Source: Westchester County, NY, GIS Department.

inventory are helpful. Information on the flow or yield of surface and groundwater may be available from state water resources or environmental agencies and the U.S. EPA. Planners should note the community's present water consumption and treatment capacity. Planners can also describe the use of water for wildlife, recreational purposes, and energy production, along with minimum stream flows to sustain these uses. If there are known pollution problems that could threaten water supplies, planners can describe them and identify them on a map (see Chapter 6). For instance, it is important for planners to map known hazardous waste sites and landfills, along with testing of the nearby groundwater.

Planners can also describe the quality of surface and groundwater resources. Water-quality data are available from public water suppliers, the local municipality, and the state water resources or environmental agency.

It is essential for planners to identify and map wetlands (see Chapter 11). Good sources of information include the national wetlands

inventory from the U.S. Fish and Wildlife Agency and state-level wetlands maps from the state environmental agency. The county soil survey has maps that identify the location of wet or hydric soils, although not all hydric soils are considered wetlands.

Identifying floodplains is important to avoid construction in these dangerous areas (see Chapter 13). The Federal Emergency Management Agency (FEMA) publishes floodplain maps nationwide. While much of the mapping is old, FEMA has updated maps for many communities. Additional information may be available from the state environmental or water resources agency.

Wildlife Habitat. Planners should describe and map significant wildlife habitat, nesting areas, migration routes, fish spawning grounds, and feeding spots. Wildlife habitat can be identified by knowledgeable local volunteers, conservation groups, and personnel from the state land grant university and state fish and wildlife department. Habitats can be rated for importance and vulnerability. Planners can identify in a general way any threatened and endangered plant and animal habitats so as to protect species from possible poaching or habitat destruction (see Chapter 10). But state environmental agencies are often reluctant to give out specific information on the location of threatened or endangered species habitat.

Vegetation. Planners can list and map lands in forest cover, farm use, or other type of vegetation. Sources of information include satellite imagery and aerial photos. Planners can digitize this information into a GIS database and combine it with the wildlife habitat map.

Air Quality. An inventory of air quality includes measurements of carbon monoxide, particulates, nitrogen dioxide, lead, ozone, and sulfur oxides, which are the main air pollutants identified by the federal government under the Clean Air Act Amendments of 1970 (see Chapter 3). Planners can note how many days each year the air quality fails to meet one or more of the standards for these six pollutants. Carbon dioxide emissions are also important to determine, though this information may be more difficult to find. Carbon dioxide was ruled a pollutant by the U.S. Supreme Court in 2007, and as of 2014, the EPA had not yet adopted broad regulations on carbon dioxide emissions, which contribute to climate change (see Chapter 4). Information on air quality is available from the state environmental agency and from the regional office of the EPA. Local air quality is typically described but not mapped. Regional air-quality maps are more common.

A Built Environment Inventory

A built environment inventory can show the location, number, age, and condition of the housing stock, commercial and industrial buildings, parks, and public buildings. The inventory can also include the location and condition of public infrastructure, including roads, sewer and water lines, schools, landfills, and police and fire stations. The built environment has important connections with the natural environment. The amount of developed land, land with development potential, and the location of different land uses have implications for stormwater management, transportation and energy use, air and water quality, and exposure to natural hazards. For example, the Town of Dennis, Massachusetts, included a section on Human/Built Systems in a draft of their 2012 comprehensive plan. The section includes the following four topics: (1) a housing inventory, (2) cultural and historic resources, (3) public services and facilities, and (4) transportation.[7]

Planners can identify and map buildings and neighborhoods with historic and cultural value, public buildings and spaces, streetscapes, and blighted areas. These are all areas with potential for improving the quality of life for residents in the neighborhood.

Historic buildings and streetscapes have been key assets in the redevelopment of many cities and towns across America. Public buildings and spaces draw people together and create a sense of community. Open spaces and greenways offer parkland and wildlife habitat, filter runoff, and buffer watercourses. Information on the built environment can be found through the state historic preservation office and city and county planning offices.

Analysis of the Natural Resources Inventory and Built Environment Inventory

The analysis of the natural resources inventory and the built environment inventory consists of three parts: a land and water suitability analysis, an environmental quality analysis, and a current trends analysis.

Land and Water Suitability Analysis. A key product of the natural resources inventory is a *land and water suitability analysis*, which identifies those areas of the community that are appropriate for development, places that have moderate limitations for most developments, and areas that should be protected in their natural state because of severe environmental constraints and natural hazards. Planners can show the suitability analysis for the community on one or more GIS maps with several layers of environmental information (see Table 1.2). The analysis should also denote land with particular capabilities, such as productive farm and forest soils, as well as areas that will maintain critical natural processes such as wetlands and aquifer recharge areas. Overall, the land and water suitability analysis can provide important information on the *carrying capacity* of the community—that is, how many people and how much development the community can sustainably support before serious negative environmental impacts occur. In short, the land and water suitability analysis is a primary building block of the comprehensive plan and any sustainability plan. For example, Lancaster County, Virginia, located in the eastern Tidewater area, identified two types of rural areas in its efforts to protect the water quality of the Chesapeake Bay: (1) Resource Protection Areas and (2) Resource Management Areas. The Resource Protection Areas are lands that directly affect water quality, such as tidal wetlands, shorelands, and buffer lands. The Resource Management Areas are lands that, if improperly managed, could degrade water quality. Development on these lands is subject to standards and permit requirements to ensure minimum impact.[8]

Rating Natural Resources and Development Suitability. The land and water suitability analysis should contain a method to rate or classify the development potential of different lands. For instance, planners can identify development constraints and natural hazards with a color code on GIS maps (red for severe limitations, orange for moderate limitations, yellow for few limitations) or a numerical points system with developable lands receiving higher points than lands with development limitations.

Planners can depict natural resources worthy of protection by using a separate color code, such as shades of green. For instance, prime farmland could be shown in dark green and farmland with more than 15 percent slope in light green.

Planners can prioritize natural resources for protection according to

1. whether the resource is renewable or irreplaceable—if irreplaceable, the resource is more valuable;
2. the rarity of the site—the less common, the more valuable the resource, particularly in the case of habitats of threatened and endangered plant and wildlife species;
3. the size of the site—generally, the larger the site, the more important it is;
4. the diversity of plants, wildlife, scenic views, and other natural features—the

greater the diversity the more important the site is; and

5. the fragility of the site, including the quality of the undisturbed site and human threats to the site.

Planners can create a rating system for development potential that is clear and understandable to nonexperts. The rating system and maps will help planners in creating the future land-use map and zoning map, as well as in the day-to-day development review process.

Environmental Quality Analysis. Planners can perform an environmental quality analysis to compare state and federal environmental standards with actual conditions in the community. For example, planners can compare local air and water quality against federal air and water pollution standards. This analysis provides baseline information that can help a community identify environmental quality problems, evaluate alternative solutions, rank its natural resources for protection, and set priorities for action. Planners can use the baseline information to set environmental quality targets, which can be readily updated to document progress toward environmental quality benchmarks.

Current Trends Analysis. Recent trends in population growth, acreage developed, acreage in public parks, vehicle miles traveled, waste recycling, loss of threatened or endangered plant and animal species, air and water quality, and water use give indications of the direction of environmental quality. In the current trends analysis, planners ask the following questions: Where are we going in terms of population growth, land development, and environmental quality? Are these trends sustainable? What will be the environmental costs if these trends continue? What will be the economic costs and social impacts? Planners can project recent environmental trends to help answer these questions.

In the current trends analysis, planners can discuss the indicators of environmental strengths, weaknesses, opportunities, and threats to the community or region based on the information provided in the Natural Resources and Built Environment Inventories together with population projections. Strengths for a particular community might include a pleasant setting with scenic views, good-quality water, and a collection of solid historic buildings. Weaknesses might feature poor air quality and a lack of public transportation. Opportunities might exist for creating a greenway along a riverfront and rehabilitating historic buildings for commercial purposes in the downtown. Threats might involve flooding, sprawling suburbs, and a loss of open space. The current trends analysis will be useful in revising the community's comprehensive plan, especially the vision statement and the broad goals and specific objectives to achieve that vision. A major purpose of a comprehensive plan is to influence current trends to produce better outcomes.

The Vision Statement, Broad Goals, and Specific Objectives

The planning commission and environmental advisory committee combine input from the public Environmental Needs Assessment Survey and the data and analysis of the built and natural environments into a *vision statement* for the community or region. The vision statement describes what the quality of the natural, working, and built environments of the community or region should be over the next 20 or more years. The vision statement serves as an overall policy directive for the local government, as well as the foundation for the environmental goals, objectives, and the Environmental Action Plan. The vision statement

typically advocates four outcomes: compliance with state and federal environmental standards; a healthy, sustainable environment; a sustainable economy; and a good quality of life for all citizens.

Next, the planning commission and advisory committee can articulate environmental goals and objectives that not only reflect community desires and priorities but also provide direction for elected officials on public spending, taxation, and land-use regulation. This is the first step in making the environmental vision a reality. The goals and objectives must be based on a solid technical analysis of the natural and built environments, realistic costs, and an understanding of relevant state and federal environmental programs. A common problem is that a goal or objective may be rejected for being "politically not feasible," even though it would significantly improve or protect environmental quality. Goals and objectives should address the full range of environmental issues facing the community or region and should build on strengths (such as a good water supply), address weaknesses (lack of park land), opportunities (ecotourism), and threats (groundwater pollution).

Setting Goals and Objectives

Goals. Goals are broad statements that reflect a community's values and desires. Goals provide direction to local officials in their decision making and should be clear and decisive. Sample environmental goals might include the following:

1. Ensure compliance with state and federal environmental standards for air and water quality.
2. Increase the recycling of solid waste into useful products.
3. Conserve on the amount of land used for development by promoting compact, mixed-use development.
4. Expand mass transit to reduce reliance on the automobile and reduce air pollution.
5. Increase the amount of public park land.
6. Reduce the emission of greenhouse gases.

Objectives. Objectives spell out specific ways to attain goals. Each goal usually depends on achieving more than one objective. The following sample objectives would help meet each of the preceding goals:

a. Adopt a wellhead protection ordinance to limit development near public water supplies.
b. Contract with a private recycling firm to increase the amount of solid waste recycled.
c. Revise the zoning ordinance to allow smaller minimum lot sizes and a mix of commercial and residential uses.
d. Explore funding for additional buses or the construction of a commuter light-rail system.
e. Revise the subdivision ordinance to require mandatory dedication of park land or fees in lieu thereof.
f. Add bicycle lanes to promote cycling as an alternative to driving.

It is very important for planners and elected officials to coordinate the goals and objectives of the comprehensive plan. A major problem with many traditional comprehensive plans is that they have several conflicting goals and objectives that may create confusion and effectively cancel each other out. The common theme of sustainability should link the goals

and objectives. Communities and planners will find it useful to prioritize environmental goals and objectives, especially in relation to housing, transportation, community facilities, and economic development goals.

The Environmental Action Plan

The chief reason so many comprehensive plans end up sitting on a shelf is that they do not include a detailed action strategy. Planners can establish indicators of success in the Environmental Action Plan along with annual benchmarks for progress toward short-term and long-term outcomes or targets. For instance, Marin County, California, did this in their 2007 Countywide Plan. Then planners can report on progress toward the targets in periodic reports, ideally each year. For example, New York City produced reports in 2011 and 2012 to measure the success of its 2007 PlaNYC.

The Environmental Action Plan articulates a set of land-use regulations, infrastructure spending, tax and incentive programs, and building codes that will put the comprehensive plan into practice (see Table 1.3). These recommended actions should be consistent with the plan's objectives. The action plan lists proposed activities, who is expected to do the work, funding options, and timelines for completion and is laid out in an easy-to-read table format. A clearly presented action plan will keep the comprehensive plan alive in the minds of the public and local government and help toward its full implementation. Ideally, the local elected officials will adopt the Environmental Action Plan as part of the comprehensive plan.

Plan Implementation, Monitoring, and Evaluation

A plan is only meaningful if it is implemented. As the City of San Francisco said in its 1997 sustainability plan, "The only goal of producing this plan is to begin implementing it."[9] The successful implementation of an Environmental Action Plan involves the use of effective spending programs, incentives, and environmental and land-use regulations. Above all, it requires cooperation among government, businesses, citizens groups, and households.

Monitoring of the implementation efforts is essential for identifying successes and shortcomings and can provide information for recommending changes to existing programs as well as opportunities to use new environmental planning techniques. To monitor the progress of the Environmental Action Plan and to keep the local government accountable, planners can use benchmarking. Benchmarks are measurable targets, such as acquisition of a certain number of acres of park land, improvements in water quality from Class C (impaired) to Class A (swimmable and fishable), or adding 10 miles of track to a light-rail system. Each year, the planning commission or elected officials can set targets tied to specific objectives in the action plan. The planning commission can then assess the progress toward the benchmarks and publish an annual Environmental Action Report. The report can indicate which benchmarks were met and which were not and then suggest needed adjustments in policy priorities, regulations, and spending programs. Above all, benchmarking and the annual Environmental Action Report keep the Environmental Action Plan and the comprehensive plan in front of the public, businesses, and elected officials. Finally, the planning commission should review and update the action plan every three to five years to reflect changes in community desires and priorities, to keep the plan responsive to changes in environmental quality, and to keep the community on course toward long-range sustainability goals.

Box 1.2. The Private Sector and Environmental Planning

One of the most important trends since 1970 is the growth in private sector environmental planning. To comply with government regulations, businesses have formed environmental management units. Moreover, in working to reduce the costs of environmental compliance, businesses have been challenged to operate more responsibly and sustainably. New technologies are enabling businesses to reduce waste and toxic substances, save energy and water, and produce more durable products. These trends are encouraging because they show that businesses can be both environmentally friendly and profitable.[10]

In several states and many communities, land developers have had to address a wide range of questions about the impacts of their proposed developments on the natural and built environments, from air and water quality to transportation and aesthetics. Some developers have abandoned the uniform "cookie-cutter" designs of residential subdivisions in favor of mixed-use residential and commercial projects that emphasize pedestrian access over motor vehicles. The trend toward urban redevelopment after the housing crash and Great Recession of 2007–2009 has highlighted the principles of new urbanism, which takes as its model the village—designed to be compact and walkable, with mixed uses at a human scale, and a vibrant public realm.

The private nonprofit sector has taken on a rapidly expanding role in environmental planning, especially in the protection of natural areas, wildlife habitat, waterways, working landscapes, and historic buildings. The number, size, and importance of land trusts, conservancies, watershed associations, and citizens groups have grown impressively over the past 30 years. No longer is environmental planning conducted solely by governments. The result has been an increasing number of public-private partnerships in local and regional planning, land preservation, watershed protection, and redevelopment efforts.

1.3: A Further Look at Functional and Area Environmental Plans

Many local governments have adopted one or more environmentally oriented functional or area plans in addition to their comprehensive plan. The purpose of these special plans is to focus attention on one or more environmental problems and to create a strategic course of action. Ideally, these plans should be made part of the comprehensive plan because the comprehensive plan provides the legal basis for zoning and subdivision regulations and guides CIPs.

Climate Action Plan

The lack of federal policies and actions to curb greenhouse gas emissions has compelled more than 120 American cities to draft climate action plans to mitigate and adapt to climate change.[11] These cities recognized that local decisions about land use, transportation, building design, and energy consumption can have not just local impacts but global impacts as well. The first step in creating a climate action plan is to estimate the greenhouse gas emissions in a baseline year from the community's energy consumption and waste generation.

Table 1.3. Innovative Techniques to Implement an Environmental Action Plan

Zoning

1. Special overlay zones protect sensitive resources, such as wildlife areas, steep slopes, wellhead protection areas, floodplains, and wetlands.
2. Performance zoning regulates impacts rather than uses.
3. A community and the federal government can designate historic districts to help protect historic areas and make property owners eligible for federal (and possibly state) investment tax credits (see Chapter 19).
4. Bonus density or an increased height bonus is available for environmentally sensitive building design or use of green roofs.
5. Form-based codes regulate the appearance of development rather than uses.
6. Large minimum lot-size zoning protects farmland, forestland, and conservation areas.

Subdivision Regulations

1. To evaluate the potential impacts of development, especially for a large development, a local government's subdivision ordinance can require a developer to conduct a local environmental impact assessment.
2. Vegetation requirements can include buffers between properties and the replacement of trees and vegetation removed in the development process.

Capital Improvements Programs

1. Urban or village growth boundaries link capital improvements with zoning. They also provide a way to resolve annexation disputes, identify urban service areas for public sewer and water service, and separate developed areas from rural areas (see Chapters 14 and 20).
2. A policy of concurrency linked to an adequate public facilities ordinance can promote phased growth.
3. Impact fees and exactions require developers to pay for the cost of the development of public services, such as parkland and traffic improvements (see Chapter 20).
4. Property tax incentives in the form of reductions in property tax assessments for farm and forest lands or historic properties can provide an incentive not to convert property from these uses (see Chapters 14, 15, and 19).

5. Fee simple land acquisition, the purchase of development rights, and the transfer of development rights are techniques to keep land open. The public purchase of land in fee simple gives the public ownership of the land, such as in the case of purchasing land for a park. In a purchase of development rights program, a landowner voluntarily sells to the public the right to develop his or her land; the landowner still owns the land but can only use it for farming, forestry, or open space purposes. A transfer of development rights program to protect farmland and open space areas or historic structures allows landowners to sell transferable development rights to developers who transfer the development rights to properties they are then allowed to develop more intensively (see Chapters 9, 14, and 15).

Other Regulations

1. Building codes are standards for the construction of new buildings and renovations and can address energy conservation, as well as safety (Chapter 19).

2. Nuisance ordinances can regulate light and noise pollution.

Note: Planners may want to seek legal advice about how to implement these tools and techniques and whether they are legally allowed in their particular state or community.

Next, a forecast is made of future emission levels based on current trends. Then greenhouse gas reduction targets are established according to a timeline.[12] The city drafts an action plan to implement changes to land-use regulations, infrastructure investment, building codes, and public education to achieve the greenhouse reduction targets. The city must then monitor progress toward the reduction targets and make adjustments in its climate action programs as needed.

Albany, California's, 2010 climate action plan (see Chapter 4) features three strategies that have the greatest potential to reduce greenhouse gas emissions:[13]

1. Increased energy efficiency in buildings, including zero emissions city buildings by 2015; enhanced energy efficiency standards for new construction, increased use of renewable energy, and improved energy management in homes and businesses
2. Reduced automobile emissions through improving pedestrian and bicycle infrastructure, improving public transit service, promoting pedestrian- and transit-oriented development, and improving the energy efficiency of the city's vehicle fleet
3. Increasing recycling and composting through educating residents

Green Infrastructure Plan

The term "green infrastructure" covers a range of open space and stormwater management investment projects. At the site level in cities, green infrastructure in the form of green roofs, rain gardens, bioswales, and street trees have proven effective in capturing, retaining, and infiltrating stormwater. At the regional or landscape scale, green infrastructure can link open spaces, providing recreation and a variety of ecosystems services (see Box 1.3).

Benedict and McMahon define green infrastructure as "a strategically planned and managed network of wilderness, parks, greenways, conservation easements, and working lands with conservation value that supports native species, maintains natural ecological processes, sustains air and water resources, and contributes to the health and quality of life for America's communities and people."[14]

In most cities and counties, the CIP emphasizes the construction, repair, and maintenance of "gray infrastructure," such as roads, bridges, public sewer and water facilities, schools, municipal buildings, and police and fire equipment. Yet cities and counties can include "green infrastructure" investments in parks, greenways, trails, stormwater management, and farmland and forestland preservation in their CIPs. Like gray infrastructure, green infrastructure usually involves long-term investments and annual operating costs that require careful consideration of financing arrangements and project priorities.

One goal of green infrastructure is to maximize ecosystem services. There are four general categories of ecosystem services: provisioning, regulating, cultural, and supporting.[15] Provisioning services produce food, fiber, and energy for humans, plants, and animals. Regulating services affect climate, air quality, waste treatment, and water quality and supplies. Cultural services refer to opportunities for recreation, education, and spiritual or aesthetic enjoyment from contact with nature. Supporting services underlie the others with basic natural processes such as photosynthesis and nutrient cycling. Different types of green spaces provide different arrays of services. Thus communities and regions need a variety of green infrastructure to provide a range of ecosystem services, from provisioning (farms and forests), to regulating (forest and wildlife preserves), to cultural (parks and greenways), and supporting (open space). A green infrastructure project can provide multiple ecosystem services. For example, greenways often buffer water bodies; intercept, infiltrate, and filter pollutants; and provide recreational trails and wildlife migration corridors.

Green infrastructure plans embody six design characteristics:

1. Multifunctionality
2. Connectivity
3. Habitability
4. Resiliency
5. Identity
6. Return on investment[16]

A key goal of any green infrastructure plan is connectivity.[17] Isolated strips of open land do not provide as rich ecosystem services (air and water filters, wildlife and plant habitat) as a connected network of green spaces. The connected green infrastructure is also more resilient to natural events, such as rainstorms and flooding. Finally, connected green infrastructure can help create regional networks of trails that tie cities and suburbs with the countryside.

Lancaster County, Pennsylvania, adopted its green infrastructure plan, *Greenscapes*, in 2009. The plan has four main themes: (1) the preservation of outstanding natural resources, such as pristine streams and interior forests; (2) the conservation and stewardship of important natural resources, including floodplains, steep slopes, and wetlands; (3) the restoration of degraded ecosystems, and improvement of air and water quality; and (4) recreation as a way to improve public health.[18] The plan first presents an analysis of existing conditions: land use, demographics, natural vegetation, steep slopes and highly erodible soils, unique geological features, watersheds, water quality,

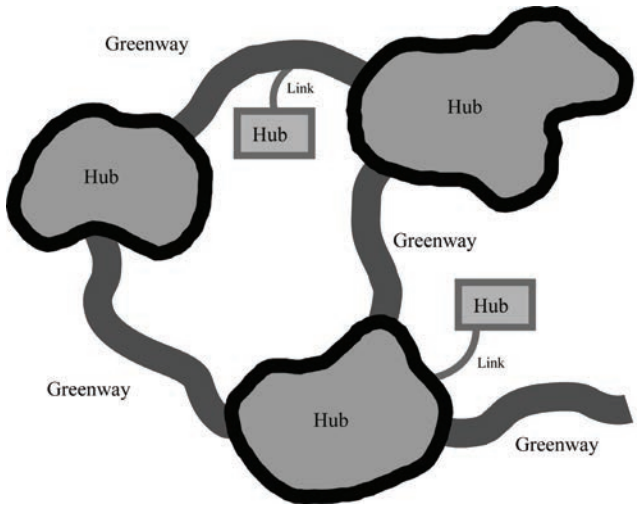

Figure 1.5. Hub and Greenway, Node and Link Patterns for Connected Green Infrastructure

Source: Lancaster County, PA, Planning Commission, *Greenscapes*, 2009, p. 78.

air quality, biodiversity, interior forests, priority plant and animal habitat, parks and recreation areas, and trails. The plan then lays out the desired green infrastructure system of open-space hubs and greenways and smaller open-space nodes and links in a series of maps based on the pattern in Figure 1.5.

Each of the four goals in Greenscapes is supported by objectives and strategies to achieve those goals. The plan describes a variety of tools that local governments can use, including land-use, transportation, watershed, and open space policies and plans; zoning and subdivision regulations; investments in green infrastructure to acquire land or permanent conservation easements; and education and partnerships with landowners and nonprofit organizations.

Environmental Policy Plan

A policy plan is a set of desired outcomes and recommendations to achieve those outcomes. Typically, however, a policy plan lacks the detailed facts and careful analysis found in a comprehensive plan or a future land-use map on which to base the zoning map. In many cases, a policy plan appears to be a wish list, which may or may not realistically reflect the community's ability to make recommended changes.

In 2007, New York City adopted *PlaNYC 2030: A Greener, Greater New York*, which can be thought of as a hybrid between a comprehensive plan and an environmental policy plan.[19] The plan differs from a comprehensive plan in three main ways. First, the plan was drafted by the city with input from 25 city agencies rather than broad public input. Second, the city's economic and social issues were not explored in depth. PlaNYC strongly implies, however, that environmental improvement, both in the natural and built environments, will strengthen the resilience of the economy and promote social harmony. Third, PlaNYC does not contain a future land-use map on which to base the zoning map.

PlaNYC addressed New York City's need to accommodate an expected increase of one million residents by 2030 while advocating for improvements to the city's built and natural environments. The plan focused on six issues: land (housing, open space, and brownfields), water quality and supply, transportation congestion and repair, energy, air quality, and climate change. For each issue, the plan spelled out goals and objectives. In total, the plan listed 127 objectives or initiatives for the city. Like a comprehensive plan, the goals and objectives were tied to a new vision for New York:

> It is a vision of providing New Yorkers with the cleanest air of any big city in the nation; of maintaining the purity of our drinking water and opening more of our rivers and creeks and coastal waters to recreation; of producing more energy more cleanly and more reliably,

> and offering more choices on how to travel quickly and efficiently across our city. It is a vision where contaminated land is reclaimed and restored to communities; where every family lives near a park or playground; where housing is sustainable and available to New Yorkers from every background, reflecting the diversity that has defined our city for centuries.[20]

In 2011 and 2012, the City of New York released updates to PlaNYC, reporting on progress toward the goals and objectives of the 2007 plan. Achievements included stricter energy efficiency regulations for buildings, more than 200 acres of new parkland, the planting of nearly half a million trees, and a 13 percent reduction in greenhouse gas emissions from 2005 to 2011.[21] This kind of benchmarking and monitoring is essential for keeping a plan alive in the minds of elected officials and the general public. The goals of the 2011 update include the following:

1. Create homes for almost a million more New Yorkers while making housing and neighborhoods more affordable and sustainable.
2. Ensure all New Yorkers live within a 10-minute walk of a park.
3. Clean up all contaminated land in New York City.
4. Improve the quality of our waterways to increase opportunities for recreation and restore coastal ecosystems.
5. Ensure the high quality and reliability of our water supply system.
6. Expand sustainable transportation choices and ensure the reliability and high quality of our transportation network.
7. Reduce energy consumption and make our energy systems cleaner and more reliable.
8. Achieve the cleanest air quality of any big U.S. city.
9. Divert 75 percent of our solid waste from landfills.
10. Reduce greenhouse gas emissions by more than 30 percent by 2030.
11. Increase the resilience of our communities, natural systems, and infrastructure to climate risks.[22]

New York City has succeeded in creating a plan that provides direction for action by the city government, businesses, and households. The benchmarking and monitoring has helped to keep the plan a living document. In short, PlaNYC has established a model for an environmental policy plan that other large cities can look to as they forge goals, objectives, and actions to improve their natural and built environments.

Sustainability Plan

A true sustainability plan must address the long-term durability of the natural and built environments, the local economy, and social equity.

In 2010, the City of Grand Rapids, Michigan, approved a sustainability plan for the next five years with the subtitle *Managing the Economic, Social, and Environmental Resources of the City through a Framework of Sustainability Outcomes and Targets*.[23] The city established a planning process based on a variety of local plans that city departments could use to achieve targets and outcomes by specific

deadlines (see Figure 1.6). Each department submits a quarterly report on progress, which is summarized in a gap analysis, documenting the difference between progress and the targets. The city then can amend the sustainability plan to better focus resources on outcomes and targets that are proving more difficult to meet.

The elements of the sustainability plan include the following:

Economic Sustainability

1. A strong economy
2. Diverse supplier base
3. Employment and workforce training
4. Financial management/sustainability
5. Enhanced customer service
6. Vital business districts

Social Sustainability

1. Great neighborhoods
2. Strong education, arts, and community
3. Civic engagement
4. Healthy lifestyles and healthy environments
5. Public safety

Environmental Sustainability

1. Energy and climate protection

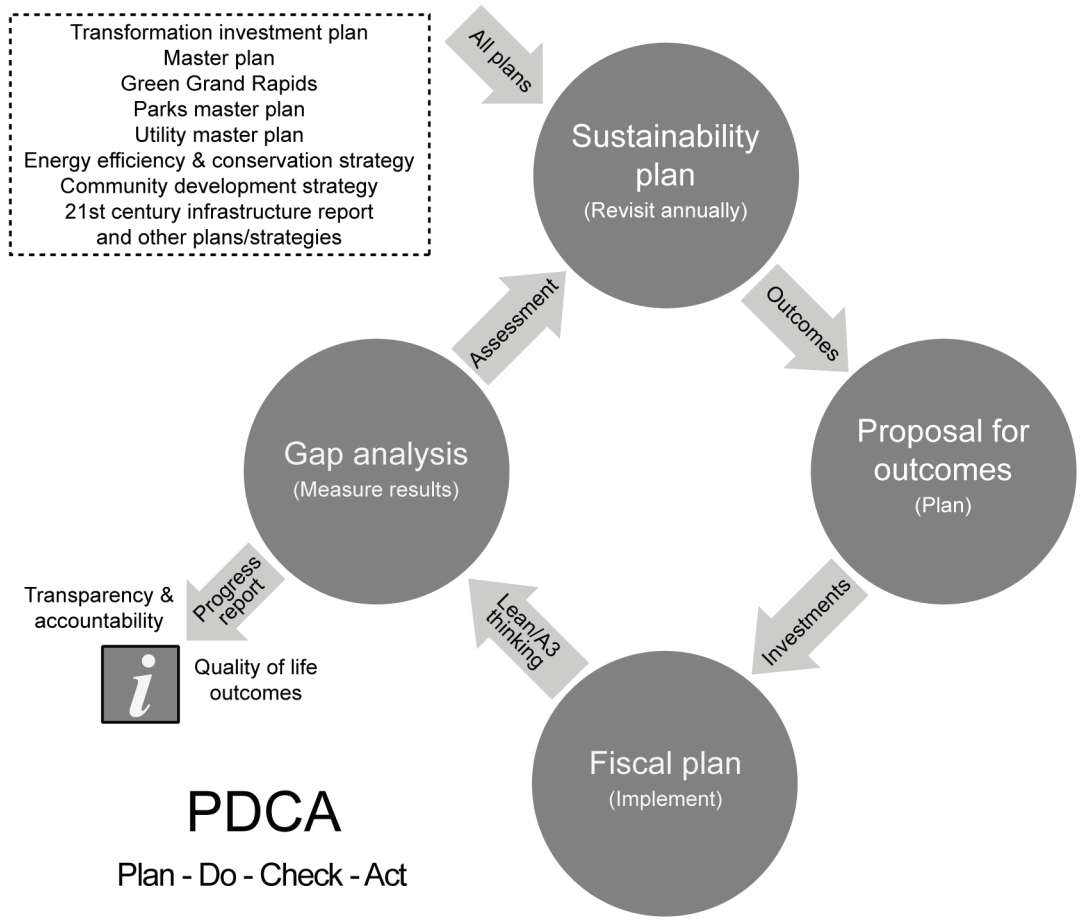

Figure 1.6. City of Grand Rapids Sustainability Plan: Plan-Do-Check-Act Process

2. Environmental quality and natural systems
3. Land use and development

The following are specific desired environmental outcomes:

A. Maintain an adequate and safe water supply.
B. Improve the quality of the Grand River and its tributaries.
C. Protect and maintain healthy ecosystems and habitats.
D. Reuse and recycle; and reduce waste sent to landfills.
E. Ensure that sound land uses enhance the natural environment.
F. Ensure quality design and construction of the built environment in accordance with the City's Master Plan and Zoning Ordinance.
G. Ensure access to parks and open spaces for all citizens.
H. Reduce greenhouse gas emissions (carbon footprint) and impact on climate change.[24]

These principles speak to the importance of the triple bottom line of environmental, economic, and social sustainability. The challenge, of course, is to implement the plan and move toward greater sustainability over time.

State and Regional Environmental Plans

States and regional governments have crafted a number of environmental plans to guide decision making. For instance, California, Georgia, Hawaii, New Mexico, Pennsylvania, and Texas have state water management plans. Thirty-three states have source water protection plans to protect surface and groundwater used by rural residents.[25] Every state has a wildlife action plan to protect land and water bodies that provide wildlife habitat. The 2008 Farm Bill required every state to conduct an assessment of their forests and devise ways to respond to threats and improve forest health. These plans, known as Forest Action Plans, also identify priority forest landscapes for long-term protection and preservation. Each state has a State Comprehensive Outdoor Recreation Plan, which is required for eligibility to obtain funding for recreation projects from the federal Land and Water Conservation Fund. All states have a State Implementation Plan to improve air quality to meet federal air-quality standards.

There are four main types of regional environmental plans: (1) plans that protect special environmental regions and resources, (2) river basin plans, (3) metropolitan transportation plans, and (4) growth management plans that aim to balance environmental protection with economic growth. The Adirondack Park Plan in upstate New York, the Pinelands Plan in New Jersey, and the Lake Tahoe Regional Plan spanning parts of California and Nevada are examples of plans that were created to protect special fragile ecological regions from excessive development.[26] The comprehensive plan of the Delaware River Basin Commission directs the decisions of staff and representatives from four states (Delaware, New Jersey, New York, and Pennsylvania) and the U.S. Army Corps of Engineers.[27] The Delaware River watershed provides water to more than 15 million people. The commission, created in 1961, has responsibilities for water-quality protection, water withdrawals, issuing permits for natural gas wells, drought management, flood management, and recreation. Transportation plans for metropolitan areas were required under the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991. ISTEA mandated

that a metro area have a transportation plan in order to qualify for federal transportation funds (see Chapter 18). A metro area drafts a 20-year regional transportation plan, a three- to five-year Transportation Improvement Program, and a list of desired transportation projects. Furthermore, the metro plans must be consistent with the State Implementation Plan for achieving compliance with the federal air-quality standards under the Clean Air Act.

Envision Utah, a public-private partnership of business and civic leaders and elected officials, was formed in 1997 and has advocated that communities and regions pursue a quality growth strategy for a strong economy, environment, and quality of life.[28] Envision Utah first focused on the Greater Wasatch region around Salt Lake City, where population growth, water supply, air quality, transportation systems, and affordable housing are key issues. The Greater Wasatch region is expected to grow from 1.6 million people in 1995 to 5 million in 2050. The region has 10 counties and 91 cities and towns. Envision Utah decided to use *scenario planning* to form their regional plan. With plenty of public input, Envision Utah then developed four alternative growth scenarios. The first scenario continued the sprawling low-density, automobile-oriented development patterns. The second scenario was only a little less sprawling, based on current local land-use plans. The third scenario emphasized more compact and walkable development, some of which would be placed within existing urban areas. House-lot sizes would average slightly more than a quarter of an acre. The fourth scenario would put nearly half of all new development in existing urban areas and accommodate most of the remaining growth in compact new towns. The transit system would be greatly expanded. After a broad public outreach campaign, a public survey showed a preference for the fourth scenario. TRAX, the light-rail system around Greater Salt Lake City, opened in 1999 and has grown to three lines, 41 stations, and 20 miles of track with more expansions planned by 2015.[29] The light-rail system helps to implement the compact development and investment in urban areas called for in the fourth scenario. One example is the new town of Daybreak, which began construction in 2004. When Daybreak is fully built out by 2024, it is expected to have 20,000 residential units and 9.1 million square feet of commercial space. Already, Daybreak is connected by the TRAX light-rail system to Greater Salt Lake City.[30]

The Metropolitan Area Planning Council (MAPC) of Greater Boston used scenario planning in creating their 2008 MetroFuture plan, a 30-year plan for managing growth.[31] The first scenario showed a projection of trends based on current development (see Figure 1.7a). The purpose of a plan is to change negative trends and support positive trends. In this case, the MAPC wanted to enable economic growth while reducing the amount of open space lost to development. The MAPC then tested a number of alternative scenarios using different assumptions about future development. From the several alternative scenarios, a preferred scenario was selected (see Figure 1.7b). The preferred scenario would reduce the loss of open space by 115,000 acres between 2000 and 2030.

1.4: Day-to-Day Planning Decisions: Review of Development Proposals

The day-to-day implementation of the comprehensive plan and other environmental plans occurs through the recommendations and decisions made by planning commissions, zoning boards, zoning officers, and elected officials as they review proposed development projects for consistency with the plans,