# 3 ▪ Land Use Planning for Environmental Management

This chapter turns the discussion from the concepts of environmental management to land use planning and development. The use of the land is perhaps the most significant driving force in human impact on the natural environment. Land development for human settlement and resource production poses critical impacts on the land itself, but also on water, air, and materials and energy use. The chapter first discusses historic and current land use trends and their relationship to environmental protection. After addressing some of the fundamentals of land use planning, the chapter concludes by introducing emerging approaches to environmental land use planning, including community-based environmental protection, watershed protection, and ecosystem management.

## Land Use and Development

With the focus of this book on land use, it is important to understand the context of land use and development. This section traces early urban development through the advent of urban sprawl in the United States. It briefly discusses government and design responses to sprawl and comments on issues and approaches specific to rural land and community development. Finally, the section addresses land use issues on and planning for public resource lands.

### Urban and Regional Development: The Evolution of and Response to Sprawl

The development and use of land has been a fundamental human activity since the dawn of agriculture and the first permanent human settlements. Hamlets, villages, towns, and cities evolved to accommodate larger populations and the developing needs of society for livelihood, security, commerce, and culture. Lim-

its posed by pedestrian and equestrian transportation kept these settlements dense, compact, and diverse in the mix of people and land uses. The industrial revolution brought industry and rail transportation, which extended the limits of daily travel and the reaches of the city to a metropolitan context. The countryside and hinterlands continued to provide the agricultural and other resource support for the city.

European and nineteenth- and early-twentieth-century American communities followed compact and mixed patterns of urban and land development. The form of development varied. Some planned cities took a "monumental" form of enclosed and dominant landmarks, a socially and physically hierarchical spatial plan, and reliance on a grid or radial layout. A good example is L'Enfant's design for Washington, D.C. Other planned cities were more mechanistic, practical, and functional, containing autonomous parts linked to a larger whole. Company towns, speculative grid towns, or later segregated suburban land uses are examples of this type. In the "organic" or biological form, the city resembles a living thing. It has a definite boundary, an internal structure, and a symbiotic balance in the face of change. One can see this model reflected in the works of notable environmental designers of the past, such as Olmsted, Howard, Geddes, Mumford, Perry, and McHarg (Kostof 1991; Lynch, 1984).

As time progressed, the availability of convenient transportation allowed the central cities to evolve into business districts, and the outer city, then the suburb, to evolve into residential districts. Cities remained the center of business and commerce, at least for a while.

Government first played a role in commissioning urban design that guided growth. However, after the 1920s, the shape of development was directed less by grand design and more by private development projects loosely guided by government regulation. "Modernism seemed to promise that city design could take care of itself if all buildings were modern, were spaced far enough apart, and followed a few simple zoning principles" (Barnett and Hack, 2000). Zoning regulation segregated land uses initially for public health concerns; for example, keeping polluting industry away from residential areas. As zoning evolved it came to segregate a wider range of uses, including commercial from residential use, multifamily from single family residential, and large-lot from small-lot residential. This segregation of uses effectively broke the mixed-use pattern prevalent in earlier developments.

## The Advent of Sprawl

After World War II, a major shift in urban development occurred in the United States: suburban growth, urban sprawl, and the development of Ex-urban and Edge Cities. **Sprawl** is land-consumptive, dispersed, auto-dependent land development made up of homogeneous segregated uses: housing subdivisions, shopping centers, office/business parks, large civic institutions, and roadways heavily dependent on collector roads.

Several forces combined in the 1950s and later to bring about sprawling patterns of land development:

- Population growth spurred by the baby boom and immigration
- Unprecedented economic prosperity
- Widespread use of the automobile
- Massive highway construction, led by the federally subsidized interstate system and other highways that created convenient access to former hinterlands
- Social decay, crime, and racial tensions of many central cities that created an exodus outward
- Urban freeway construction that disrupted many central urban neighborhoods, forcing people to look for alternatives
- Federal policies for subsidized mortgages for single-family homes (e.g., FHA, VA) that led to a construction boom as more could afford the "American dream"
- Local zoning laws that segregated uses, creating separated residential subdivisions, commercial shopping centers, and employment centers

In recent decades, Ex-urban and Edge City developments have become common. These are suburbs far from the central city that become major job and regional retail centers. *Boomburgs* is a new term given to suburban communities outside central cities that have grown to 100,000 or more, are not the largest city in their metro area, and have maintained double-digit growth rates in recent decades. The 2000 census revealed 53 Boomburgs in the United States, nearly all in the Southwest, created largely by master-planned community development and the need to create large water districts. Mesa, Arizona, one of the Phoenix metro's Boomburgs, now has a population of 396,000, more than traditional cities like Minneapolis, Miami, St. Louis, Pittsburgh, and Cincinnati. In the eastern United States, even in the Sun Belt metro areas like Atlanta, growth has been characterized by more fragmented municipalities, which have captured only a small fraction of metropolitan growth (Lang and Simmons, 2001).

The critique of sprawl has been ongoing for a quarter century or more (e.g., U.S. Council on Environmental Quality [CEQ], 1974). Sprawl's greatest triumph has been creation of the personal and family "private realm," be it home, yard, or personal car. But many argue that along with this private triumph has come a public or civic failure. Land uses have separated, and as people have become more segregated—by age, by income, by culture, by race—they have retreated from a more public life, from **communities of place,** to a more controlled life, to **communities of interest.** A landscape of isolated land uses has become a landscape of isolated kids, bored teenagers, chauffeur moms, stranded elderly, weary commuters, and immobile poor (Calthorpe and Fulton, 2001; Duany et al., 2000).

Sprawling development has spoiled the visual and cultural diversity of communities, as suburban areas in all parts of the country now look the same. Keith Charters, mayor of Traverse City, Michigan, said, "If development doesn't go somewhere, it goes everywhere. And if it goes everywhere, you look like anywhere" (quoted in Garrett, 1999).

The physical, economic, and environmental impacts of sprawl are perhaps more significant than the social ones. Land use has spread out. Development density

until 1920 averaged over 6,000 people per square mile; after 1960 it was four times less dense (1,500 people per square mile). Development of houses and roads consumed an average 1/2 acre per person in the 1950s and 1960s; that grew by nearly four times (to 1.83 acres per person) by 1985 (Benfield, Raimi, and Chen, 1999).

In most sprawling development, everyone is forced to drive everywhere. Collector road designs and long commuting distances increase vehicle miles traveled, congestion, and air pollution. Sprawl consumes agricultural land, open space, and natural wildlife habitats at a rapid rate for subdivisions, shopping centers, and roads. Local governments struggle financially to provide urban infrastructure, services, and schools in response to rapidly growing, dispersed developments.

## The Government Response to Sprawl—Smart Growth through Growth Management

Uncontrolled sprawl development has prompted many communities and states to adopt more aggressive growth controls to manage the impacts of development. **Growth management** is defined as those policies, plans, investments, incentives, and regulations to guide the type, amount, location, timing, and cost of development to achieve a responsible balance between the protection of the natural environment and the development to support growth, a responsible fit between development and necessary infrastructure, and quality of life. **Smart Growth** emphasizes development in areas of existing infrastructure and de-emphasizes development in areas less suitable for development. By doing so, it supports and enhances existing communities, preserves natural and agricultural resources, and saves the cost of new infrastructure.

Using an array of management tools, including innovative zoning regulations, urban growth boundaries, infrastructure investments, community planning procedures, tax policies, land acquisitions, and others, many rapidly growing localities have tried to control the pace and location of development. Where they have been unsuccessful or where individual localities have not been able to manage regional growth effectively, several states have adopted state-level guidance and requirements for growth management. Most prominent among these are Oregon, New Jersey, Florida, and Maryland. These and local and regional growth management approaches are discussed in chapters 7 and 8.

## The Design Response to Sprawl—New Urbanism: Compact, Mixed-Use, and Ecological Development

The critique of sprawl prompted creative experiments with new development patterns by several designers and developers in the 1990s. These designers contend that suburban sprawl is not only ecologically but also socially destructive, and that alternative compact urban and community designs that are the most ecologically sustainable are also potentially the most socially valuable (Calthorpe and Fulton, 2001). Collectively, these efforts are called **New Urbanism,** but there are a number of variations. Some designers stress neotraditional compactness and aesthet-

ics (e.g., Andres Duany), rural character (e.g., Randall Arendt), ecological compatibility (e.g., Michael Corbett), pedestrian and transit orientation (e.g., Peter Calthorpe), and social engagement (all of the preceding). All have become party to the Congress for New Urbanism, a movement being reflected in urban development plans in different areas of the country. Concepts of this design response to sprawl are discussed further in chapter 6.

## The Regional Response to Sprawl—The Regional City

In metropolitan areas, it has become evident that sprawl development is not a local but a regional issue and that its management requires regional solutions. However, local governments have long had difficulty forging multijurisdictional solutions to regional problems because of competitive, political, parochial, and often petty differences. Clearly opportunities exist for economies of scale and efficiency in many regional solutions for water supply, wastewater treatment, air quality management, and solid waste management; and many metropolitan areas have taken advantage of them or have been required to do so by state or federal law.

Land use is another matter. Few metropolitan areas coordinate land use management efforts. However, Calthorpe and Fulton (2001) argue that the end of sprawl requires a regional approach. They envision the Regional City containing effective regional transit, affordable housing fairly distributed, environmental preserves, walkable communities, urban reinvestments, and infill development. They see the region providing social identity, economic interconnectedness, and the ecological fabric relating urban centers to bioregional habitats and protected farmlands. Regions depend on neighborhoods and vice versa. The region is the superstructure, and the neighborhood is the substructure. The region is the scale at which large metropolitan economic, ecological, and social systems operate; neighborhoods are a region's ground-level social fabric and community identity.

Bringing about their vision of the Regional City and the end of sprawl is obviously easier said than done. As architects, Calthorpe and Fulton see physical design policies as a key element using building blocks of village, town, and urban centers; districts; preserves; and corridors. They also argue for regional growth boundaries, federal transportation and open space investments, and environmental policies consistent with regional goals. Urban center reinvestment is critical to focus development within urban areas (brownfields) and away from outlying natural areas (greenfields). Still, these regional solutions require regional government or at least a high level of regional cooperation, something lacking in many metropolitan areas. A few models do exist, and they are discussed in chapter 8.

**SIDEBAR 3.1** *Brownfields, Greenfields, and Other Fields* Smart Growth, New Urbanism, and regional approaches aim to accommodate development within urbanized centers and to conserve natural environmental and agricultural lands outside developed areas. Planners have coined a number of clever labels or "fields" to characterize the appropriateness for development within this objective. The first was "brownfields," defined as vacant, potentially contaminated areas within urban centers that are difficult to develop because of suspected financial and environmental risk. Brownfields

redevelopment is beneficial because it cleans up suspected contamination, improves central urban property values, and avoids development on "greenfields" outside the city.

"Greenfields" are those open, natural, or agricultural lands that provide natural amenities, wildlife habitat, natural system benefits, resource production, and community character. New development often converts greenfields to urban uses. Environmental planning and design emphasize development that minimizes impact on greenfield benefits or avoids them altogether. "In-fields," like brownfields, are vacant urban areas available for infill development and redevelopment, but they do not pose environmental risk. With existing development infrastructure and little risk of environmental impact, they are far more desirable for development than greenfields. "Greyfields" are vacant or nonprofitable older suburban commercial centers and parking lots that are prime for redevelopment. Converting such sites to community centers can bring much needed civic space to suburbs. Finally, "brightfields" describe parking lots and other large asphalt expanses available for energy production using solar photovoltaic systems that double as shading devices.

## Rural Land Use and Development

The considerable attention given to urban and suburban development is appropriate because this is where most people live. However, rural and small-town land use and development are also important in environmental land use management for three reasons. First, these greenfield areas are home to important ecological, cultural, and agricultural resources. Second, inherent use of rural land for resource production of agriculture, forestry, and mineral extraction has considerable environmental impact. And third, rural places are increasingly attractive as people grow weary of the congestion and lifestyle of the city and suburbs. As a result, sprawling patterns of rural development are impacting them at an increasing rate.

The 2000 census shows that many rural counties that lost population between 1980 and 1990 rebounded with growth between 1990 and 2000. Retirees, baby boomers who retire early, and increasing numbers of telecommuters not dependent on urban jobs are choosing small-town and rural living. Many of the same environmental planning issues arise in these areas as in ex-urban areas: conversion of productive agricultural lands to nonproductive estates and subdivisions and impacts on natural habitats. An additional issue concerns impacts on the cultural heritage and social character of these communities, as residential development is followed by commercial superstores and other development that affect the economic viability of historic Main Streets.

Several environmental planning approaches specific to rural communities have been developed. Arendt (1996, 1999; Yaro, Arendt, Dodson, and Brabec, 1988) popularized conservation residential design techniques to protect rural and small-town values (see chapter 6). Sargent, Lusk, Rivera, and Varela (1991) adapted the conventional planning process to rural planning, focusing on the resource base of natural areas, agricultural lands, lakes and rivers, and cultural heritage. Other analysts have also focused recent works on rural sustainability (Audirac, 1997; Golley and Bellot, 1999).

They all agree that achieving sustainable development in rural areas is different from urban and suburban planning. It emphasizes local self-reliance and natural resource management. Watershed and ecosystem management principles are most applicable in these areas. The Nature Conservancy's (TNC's) Compatible Economic Development program was designed specifically for rural environmental, economic, and community development. The program includes rapid environmental, economic, and social assessment; engagement of local stakeholders in goal setting and alternative formulation; and fund-raising for local initiatives. TNC has applied the elements of this approach in areas where they have considerable land preserve holdings or biodiversity interests. TNC has come to realize that the effective protection and management of critical rural resources depend on local commitment and economic and community development that is compatible with those natural resources (TNC, 1999).

### Public Resource Lands

Another category of land is public land, which includes federal, state, and regional forest, park, refuge, and range lands. Although public lands are not the primary focus of this book, these lands are important environmental lands, and their planning and management provide useful lessons for private land use. Federally owned land makes up about 30 percent of the total area of the United States, and 90 percent of these holdings are in resource lands administered by the Forest Service, National Park Service, Fish and Wildlife Service, and Bureau of Land Management. These lands include the premier natural lands of the nation, including prime core wildlife habitats, wilderness areas, and the natural jewels of the national parks. However, these are also productive resource lands providing timber, grazing, energy and hard minerals, and a wide range of recreational uses. The greatest planning and management challenge for the administering agencies is determining the appropriate balance among these competing multiple uses.

As society demands greater preservation of and access to wild lands and at the same time greater use of commodity resources from public lands, the challenges facing these agencies increase. They have long prepared management plans for these lands, applying the general planning process presented in box 2.1. In fact, these agencies developed some of the traditional and emerging approaches for environmental land use planning, including sustained yield and sustainability, public participation and conflict resolution, carrying capacity studies, environmental impact assessment of land uses, riparian buffers, watershed management, and ecosystem management. Their experience with many of these techniques is discussed in the chapters that follow.

## Land Use and Environmental Protection

The use of land has considerable impacts on the natural and human environment. Conversion of natural and productive lands to human use, sprawling patterns and inappropriate location of development, road and building construction, and land

use practices after development, all have broad impacts on human environmental health and the natural environment. Land use decisions can exacerbate natural hazards and soil erosion, alter the hydrologic balance, pollute surface and groundwater, destroy wildlife habitats, increase energy use and air pollution, and diminish community character and quality of life. This section introduces several of these effects, which are discussed in greater detail in subsequent chapters. Those chapters also address analytical, planning, engineering, and policy measures to avoid or mitigate these impacts.

## Land Use and Natural Hazards

Environmental risks to humans are increased by poor location or design of land developments. Worldwide natural disasters kill 1 million people each decade and cause hundreds of billions of dollars of damage (Federal Emergency Management Agency [FEMA], 2003). (See chapter 9 for further information on natural hazards.) These do not include the millions of daily incidents of damage and injury not classified as "disasters." There is a difference between "hazard" and "risk." **Hazard** is the inherent danger associated with a potential problem; **risk** is the probability of harm caused by that hazard. People can sometimes increase the degree of hazard. For example, increasing impervious surfaces (paving, rooftops) increases downstream flood flows; undercutting steep slopes increases landslide hazard. More often, however, people increase the risk by placing themselves in harm's way by, for example, building in the floodplain or in a seismic area without proper design. Natural hazards include the following:

- *Weather-related problems* such as flooding, stormwater, snowfall, hurricane and tornado wind damage, drought and excessive heat, and lightning
  - Forty-one weather-related disasters occurred in the United States between 1988 and 2000, each of which caused a billion dollars of damage.
  - Between 1990 and 1997, U.S. *flooding* caused $4.2 billion per year in damages. In the last century, an average 100 Americans per year lost their lives in floods. The most devastating floods have come from East Coast hurricanes, such as Floyd (1999), Georges (1998), and Andrew (1992).
- *Geologic hazards,* such as landslides and avalanches, erosion, support problems, earthquakes, and volcanic activity
  - *Earthquakes* pose a severe risk in active areas of the United States, mostly in Pacific states. The 1994 Northbridge, California, quake caused approximately $30 billion in damage, and the 1989 Loma Prieta quake in northern California caused $6 billion. Although there was loss of life, effective earthquake planning kept the death toll in those quakes small compared with major quakes in less prepared parts of the world.
  - Each year, *landslides* in the United States cause about $1.5 billion in damages and 25 fatalities.
  - *Beach erosion,* measured at two to three feet per year along the East Coast, threatens 53,000 existing and 23,000 currently planned structures over the next 60 years (FEMA, 2003).

- *Ecological hazards,* including wildfire and nuisance, pestilent, and disease-carrying wildlife
  - *Wildfire* damage has increased considerably in recent years as residential development has spread to more remote areas. More than 9,000 homes have been lost to wildfires since 1985, including major fires in Oakland, California (1991), southern California (1993), and Colorado and Oregon (2002).

Planning cannot avoid all natural hazards, but intelligent location and design of structures and land uses can reduce the risks. Natural hazard mitigation requires understanding the hazard, avoiding it by appropriate location of development, reducing land use effects that increase the hazard, minimizing risk through effective design measures, and preparing for the hazard with emergency preparedness plans.

## Land Use Impacts on Human Environmental Health

Land use affects human health directly and indirectly. (See chapter 15 for further information on the relationship between groundwater and human health.) **Environmental health** concerns the impacts of ambient conditions and exposures on physical and mental well-being. It refers specifically to exposure to toxic contaminants of the air, water, and food, as well as noise. It can also include quality of life and mental health issues relating to crowding, congestion, and unpleasant surroundings. Many local sustainability programs are labeled Healthy Communities. Important environmental health issues related to land use include the following:

- *Land use and active living.* Sprawling, auto-dependent land use pattterns contribute to the sedentary American lifestyle that has caused a significant increase in obesity. Health advocates are supporting compact and pedestrian oriented community design to foster more active and healthy living to reduce obesity and enhance cardiovascular activity.
- *Air quality.* The most pervasive local air pollution problem in the United States is ozone, produced by photochemical smog from mostly vehicle emissions. In 1999, 122.4 million people in the United States lived in counties with ozone concentrations exceeding the eight-hour ozone National Ambient Air Quality Standards (U.S. Environmental Protection Agency [EPA], 2000). Sprawling land use patterns increase vehicle use and air pollution.
- *Drinking water quality.* Sources of drinking water, including groundwater, rivers, and surface reservoirs, are susceptible to contamination from nonpoint source pollution from land runoff. Because groundwater is often untreated, it poses the greatest risk of health effects.
- *Fish and swimming advisories.* Water pollution from land runoff, discharge, and atmospheric deposition also affects human health through direct contact and contamination of fish. In 2000, 2,838 fish consumption advisories were issued in the United States, a 7 percent increase over 1999 and a 124 percent increase from 1993. One hundred percent of the Great Lakes and

their connecting waters and 71 percent of coastal waters of the contiguous 48 states were under advisory in 2000. Major contaminants are mercury, PCBs, chlordane, and dioxins (U.S. EPA, 2001). The Environmental Protection Agency's Beach Watch program monitors beach closings around the country. In 1999, 459 beaches (24 percent of those surveyed) were affected by at least one advisory or closing. Most advisories and closing were due to bacterial contamination (U.S. EPA, 2000).

- *Toxic and hazardous waste sites.* In the two decades of the federal Superfund program, designed to identify and clean up old waste sites posing threats to human health, 1,280 dump sites have been added to the EPA's National Priority List. By 2000, 57 percent of the sites had been cleaned up to the extent of no longer posing immediate threats to humans. However, as many as 50 sites are added to the list each year, and according to a recent study by Resources for the Future (Probst and Konisky, 2001), the program will require $14–16 billion over the next decade to keep pace with the problem.
- *Toxic pollution releases.* Although residential proximity to polluting industry is a less pervasive land use problem than in past decades, people still live close to sites that release toxic chemicals. The 1999 Toxics Releas Inventory estimates that industry released 12.5 billion pounds, including 2 billion pounds of air releases, mostly from power plants and manufacturing industry, and 4.75 billion pounds of land releases, mostly from meta mining.
- *Noise, congestion, and mental well-being.* Quality of life is affected by env ronmental conditions. Long-term exposure to noise can cause hearing loss, but it also is a source of annoyance and depression. Likewise, congestion, crowding, and other unpleasant conditions have been shown to create abnor mal responses like road rage.

## Land Use Impacts on Hydrologic Systems

Land development affects the hydrologic system and pollutes surface and gr water (see chapters 13, 14, and 15 for further information).

- *Impervious surfaces* (roads, parking lots, rooftops) associated with urb development
  - increase and speed runoff from storms, increasing downstream floodin
  - reduce infiltration into the ground, reducing groundwater recharge an diminishing stream low- and base-flows that are dependent on seepage subsurface water.
- Agricultural, urban, forestry, and mining uses of the land increase ero and sedimentation and **runoff pollution** into rivers, lakes and estua Runoff pollution is now the largest source of surface water pollution i the United States.

- Land use related sources of pollution, like septic drainfields, underground storage tanks of petroleum products, and landfills and waste lagoons, are the biggest sources of **groundwater contamination.**

## Land Use Impacts on Agricultural and Other Productive Land

Development converts economically productive land such as agricultural lands, forest lands, and aquifer recharge areas to urban uses (see chapter 12 for further information). The National Resources Inventory (NRI) documents land use change in the United States every five years. The latest U.S. Department of Agriculture (USDA, 2001) report covers the period 1992–1997.

- While the 98 million acres of developed land in 1997 made up only 6.6 percent of nonfederal land, development has increased dramatically. During the 1992–1997 period it increased by 2.2 million acres per year. Of the total developed land in the United States by 1997, 11 percent was developed in the previous five years and more than 25 percent in the past 15 years. At the 1992–1997 rate, developed land in the United States would double between 1997 and 2028.
- Forest land and cultivated cropland made up more than 60 percent of the acreage developed between 1982 and 1997. Between 1992 and 1997, 645,000 acres per year of prime farmland was converted to development uses. In the latest 15 years reported (1982 to 1997), 30 percent of newly developed land was converted from prime farmland.

## Land Use Impacts on Ecological Resources

Land-consuming, sprawling development impacts natural ecosystems, productive wetlands, and habitats of wildlife including threatened and endangered species (see chapters 16 and 17 for further information).

- *Wetlands* loss continues, but at a much slower rate than in previous decades. The NRI estimates that half of the 100,000 acres of wetlands lost per year from 1992–97 was to land development. The Inventory estimated net loss at 33,000 acres due to wetland acres gained from restoration and creation (USDA, 2001). In most cases, new wetland acres are of less quality than lost acres.
- The latest Wetlands Status and Trends Report by the U.S. Department of the Interior (USDI; 2001) estimates annual net loss at about 58,500 acres per year over the 1986–1997 period. This does not yet conform to the federal "no-net-loss" policy, but it is a substantial improvement over estimates of loss in previous decades.
- Land conversion impacts *wildlife* by destroying and fragmenting habitat (National Wildlife Federation, 2001). The acceleration of land development in the late 1990s has had a considerable impact that has not been adequately measured. Most attention is given to the habitats of the 1,100 species listed as endangered or threatened under the Endangered Species Act. The Act pro-

vides for incidental impact of development on listed species' habitats with an approved Habitat Conservation Plan (HCP). While HCPs aim to provide habitat protection, the activity also demonstrates the increasing encroachment of development on critical wildlife habitat (USDI, FWS, 2000).

## Land Use Impacts on Energy and Material Consumption

Patterns of land use and construction affect resource consumption. Energy use is increased both by inefficiency of building design and construction and by dependency on automobile transport and commuting distance. The "green building" movement has tried to address the material and energy intensiveness of buildings, while Smart Growth and transit-oriented development attempt to address transportation energy requirements through compact, infill, and transit-oriented development (see chapter 6 for further discussion).

## Land Use Impacts on Cultural Heritage and Community Character

Land development, characterized by open space conversion to roads, subdivisions, and superstores and large shopping centers, can significantly change the character of communities (also see chapter 6). Although some change is inevitable, shaping that change within local context and culture can ease the impacts for local residents and preserve the social heritage. This is especially important in older rural and agricultural communities that find themselves in the path of suburban sprawl or ex-urban development.

## Land Use Conflicts and Environmental Justice

Because of these many environmental impacts, conflicts over land use and development are common. Few people welcome the change and disruption they experience as a result of new land development in their neighborhoods and communities (see chapter 4 for further information). Conflicts take the form of angry residents, litigation, and civil disobedience. If a new development requires public agency approval, for example a permit or rezoning, the conflict will likely come to a public stage. When making such a decision, local planners and elected officials must consider the merits and the controversy generated by the development proposal. This is particularly true of "locally unwanted land uses," or LULUs. Examples include solid waste transfer facilities, wastewater treatment facilities, and other uses that are perceived to pose a hazard or reduction in property values.

Historically, these LULUs have been sited in areas lacking the capacity to object. Often these were poor or minority communities that were excluded from the siting process and were victims of the environmental impact. The environmental justice movement emerged in response, to ensure that all people are protected from disproportionate impacts of environmental hazards.

As discussed earlier, the planner must often play a negotiation and mediation role in trying to resolve land use disputes. The planner must also work to achieve environmental justice through inclusiveness and assessment of disproportionate impacts.

## A Framework for Land Use Planning

As described in table 2.1, planning has its roots in city planning, which itself was born in the design profession. On behalf of municipal governments, great urban designers formulated the physical future development plans for many of our cities. Until about 1950, city planning focused on a physical plan reflecting an urban form. Planning was plan creation. Implementation was achieved by enforceable conformance with zoning regulations based on the plan.

However, urban economic, social, and environmental problems abounded in the 1960s, and planning shifted to address these broader issues by adapting from a design and plan-making perspective to policy analysis and problem solving. As discussed in chapter 2, it also shifted to more participatory planning, as agencies realized that they could better recognize and respond to changing conditions and needs by engaging a broader range of participants in their analysis and decision making (Neuman, 1998).

More analysis and participation strengthened planning, but the reduced emphasis on design and plan-making changed the nature of the land use plans produced. The plans gave more attention to policy elements and less attention to the physical manifestation of community futures. Despite analytical urban policy plans and zoning regulations, the form of urban development was largely left in the hands of the private development sector. The resulting patterns of development, characterized by sprawl, traffic congestion, and damage to environmental resources, have been criticized for not meeting society's needs.

The 1980s and 1990s brought a recovery of interest in urban design perspectives and a resurgence of the "master designer," such as the New Urbanism movement. Although this sense of future image and place is needed, New Urbanism has not yet fully incorporated many elements for effective urban design and planning, such as affordability, environmental sensitivity, and the discursive elements of participatory governance necessary to reflect a broad range of perspectives and needs. As table 2.1 envisions, planners are beginning to integrate analysis, collaboration, and design. More widespread use of information technology and visualization techniques, such as geographic information systems (GISs), has helped this integration by enhancing the analysis, articulating the physical dimensions of future scenarios, and presenting and formulating these scenarios through collaborative discourse.

Kaiser, Godshalk, and Chapin (1995) contend that planning is now recognized as the legitimate authority for managing land use change within the constraints of democratic governance. They characterize land use planning as a game with rules (planning and development procedures) and a number of players or actors (developers and the market, government, citizen interests, and planners). The game develops as sequential interactions among the players and results in a product—a comprehensive or land use plan and implementing mechanisms to guide future land development. Land use planning integrates population and economic forecasting, environmental and land analysis, urban and development design, engineering infrastructure, stakeholder perspectives, and growth management mechanisms.

But fundamentally, planning is done for places and people, and these vary. Plans for old central cities are different from plans for Sun Belt cities and fast-growing suburbs. To touch people and become real, plans need to focus on places within places, like neighborhoods, business districts, parks, and conservation areas. And plans vary with people, their needs, their cultures, their age, and ethnicity. Plans must be built on the context of place and people (Dalton, Hoch, and So, 2000).

The following framework for planning is synthesized from the primary literature sources, including Hoch, Dalton, and So (2000); Kaiser et al., (1995); and Anderson (1995). Preparing community plans involves six basic functions given below. These functions are performed by public agency planners performing the different roles described in chapter 2: technician (intelligence function), designer/visionary (long-range/district/functional planning functions), regulator/negotiator/politician (implementation function), and facilitator of public involvement/negotiator (building consensus function).

## 1. Intelligence: Background Data and Planning Analysis

General and functional planning requires a broad range of information, including census and population data, economic data, engineering data on infrastructure, environmental data, and citizen perspectives. Much of this information is obtained from primary and secondary sources, field investigation, or local knowledge of citizens. Computerized information systems such as GIS, spreadsheets, and statistical software are used to analyze, synthesize, and present information. Land use intelligence involves environmental inventorying and mapping, suitability and carrying capacity analysis, and assessment of land use perceptions (livability, attractiveness, symbolism, and quality of life). Planning intelligence is used in the process of general, functional, and district planning.

## 2. Long-Range General Planning

The most common community plan is the general or comprehensive plan. Although most general plans contain functional, district, and implementation plans, Anderson (1995) suggests a tiered process, in which the general plan is less voluminous, general in nature, and policy oriented. It should have about a 20- to 50-year time horizon and be reviewed every five years. The land use plan is the central element of a general plan because to a large extent land use is its physical manifestation and the determining factor for functional plans. The general land use plan is less specific than the district land use plans.

## 3. District Planning

District or sector plans cover a small area like a neighborhood, a central business district, a redevelopment area, or an environmental preservation area. The district plans often appear in general plans, but according to Anderson, they should be shorter range and more detailed than general plans and should be reviewed every year or two. In either case, they should be consistent with general plans.

The district plans characterize existing land use, identify critical issues, and provide a future vision represented in map and design form. The land use plan for a community comes to life in these district or neighborhood plans. The land classification plan map is the most important physical manifestation of the plan. Based on land use intelligence and public involvement, it groups land areas into appropriate uses, such as various residential, commercial, and institutional classes. It is important to include sufficient design detail at this stage to articulate future development patterns. Too often planners use "bubble" plans using "broad felt markers" to distinguish classes that lead to segregated land uses. Duany et al. (2000) suggest a "fine pencil" level of detail to represent future land use more completely and to articulate mixed use and creative design. It is quite important to engage the public in this design exercise using visioning workshops, design charrettes, and other participatory methods.

## 4. Functional Planning

Functional plans address single topics that cover the entire planning area, including transportation (roads, transit), infrastructure (water, sewer, stormwater, waste management), natural environment, parks and recreation, housing, and economic development, among others. Long-range plans on these topics may be included in the general plan. Short-range plans usually stand alone, are more specific, and need to be consistent with general and district plans. These functional plans usually state a vision or goal, assess the current situation including opportunities and challenges, and articulate objectives and action strategies. The development of functional plans uses the basic planning process (box 2.1) with public involvement.

## 5. Implementation Plans

Implementation plans and programs address the actions necessary to realize the vision, objectives, and strategies of the general, district, and functional plans. Actions include zoning and development regulations, capital improvement plans and budgets, tax policies, and other programs. Collectively, several actions may form a comprehensive growth management program including land use regulations, infrastructure investments, land acquisition, tax policies, and other mechanisms. Such a program aims to guide private land use development to achieve public objectives, including accommodation of development needs, protection of environmental and natural resources, and quality of life.

## 6. Building Community Consensus

Although it is listed separately here, building community consensus through stakeholder involvement and collaborative planning is part of each of the preceding five planning functions. Local knowledge of citizens and businesses contributes to planning intelligence and a variety of public input provides a foundation for effective and politically acceptable district, functional, general, and implementation plans.

## Emerging Approaches for Environmental Land Use Planning and Management

Among the new approaches for environmental land use planning and management are community-based environmental protection (CBEP), watershed management, and ecosystem management. Hundreds of related projects are being developed under these labels throughout the United States. All are similar in goals and approach. They differ only in objectives and geographic scale, and many projects incorporate elements of all three. Watershed and ecosystem management are discussed in more detail in chapter 10.

### Community-Based Environmental Protection

**Community-based environmental protection** has evolved in response to limitations of traditional government responses to environmental and land use problems dependent on centralized institutions and command-and-control regulations focused on a specific medium (e.g., air, water, or land). By thinking beyond a specific media and management approach, CBEP supplements and complements traditional approaches. It is place-based, not media or issue specific, and focuses on the health of ecosystems including people living within those ecosystems (U.S. EPA, 1997).

CBEP has six key principles:

1. Focusing on a definable geographic place, usually a community
2. Working collaboratively with a full range of stakeholders through partnerships
3. Assessing, protecting, and restoring quality of air, water, land, and living resources in the place
4. Integrating environmental, economic, health, and quality-of-life objectives
5. Integrating private actions and public regulatory and nonregulatory tools to forge effective solutions
6. Monitoring and redirecting efforts through adaptive management

The U.S. EPA monitors hundreds of CBEP projects around the country through its CBEP website (www.epa.gov/ecocommunity/).

### Watershed Management

The watershed or drainage catchment has become a useful geographic boundary for managing land and water resources. **Watershed management** is not a new concept, but when coupled with new collaborative planning, it has become an effective approach to environmentally management. In 1996, EPA promoted its Watershed Protection Approach (WPA), which was based on the premise that water quality and ecosystem problems can best be addressed at the watershed

level, not at the individual water body or discharger level. Managing a water body requires managing the land in its watershed (U.S. EPA, 1996).

The WPA has four basic principles:

1. Targeting priority problems
2. Promoting a high level of stakeholder involvement
3. Integrating solutions from multiple agencies and private parties
4. Measuring success through monitoring and other data gathering.

The EPA uses its watershed protection website (www.epa.gov/owow/watershed/) to network the hundreds of active local watershed management groups throughout the country.

### Ecosystem Management

The management of ecosystem integrity and health has become the operating policy of federal land management agencies, like the U.S. Forest Service and the U.S. Fish and Wildlife Service. It developed in response to concerns over biodiversity and the limitations of species-specific wildlife management and commodity-based resource management to ensure resource sustainability. The ecosystem approach has been adopted by many local and regional organizations for environmental management.

**Ecosystem management** has five basic principles:

1. Ecological orientation: ecosystem health, biodiversity
2. Long-term time horizon and ecosystem scale
3. Scientific assessment and analysis
4. Stakeholder involvement: humans and society are part of ecosystems
5. Integrated solutions and adaptive management

## Summary

Environmental land use planning and management is based on the theoretical and historical context provided in these first three chapters. It is a complex, interdisciplinary field that integrates the diverse perspectives of science, politics, policy, and design, in a process of inquiry, collaboration, and creativity. Some of the concepts are elusive (sustainability, quality of life), and some of the process elements are easier said than done (collaborative learning, conflict resolution). Yet it is worth the effort of confronting these conceptual, scientific, and procedural challenges to approach its lofty goals: mitigating effects of natural hazards, achieving more livable and environmentally friendly places to live, and protecting and enhancing natural environmental systems.

The chapters that follow provide greater detail in the quest to achieve sustainable, livable, and green communities through land analysis, planning, and policy.