part I

Process and Tools

Site planning occurs within an environmental and cultural context. As human populations have grown, society's impacts on the earth's ecosystems have increased. Sustainable approaches to site planning attempt to minimize development impacts both on the site and off-site. Vital environmental processes must be protected and, where feasible, degraded ecosystems restored.

Part I of this book summarizes a contextual approach to site planning and design. The first chapter addresses important design goals that can help shape better, and more sustainable, built environments. The second chapter addresses the important role of mapping and other forms of graphic communication in the site planning and design process.

chapter 1

Shaping the Built Environment

Sustainable design balances human needs (rather than human wants) with the carrying capacity of the natural and cultural environments. It minimizes environmental impacts, and it minimizes importation of goods and energy as well as the generation of waste.

U.S. National Park Service

1.1 INTRODUCTION

1.1.1 Functions of Nature

Landscapes have long been settled, cultivated, and in other ways modified by humans. Yet our ability to alter the earth's atmosphere, oceans, and landscapes has exceeded our current capacity to mitigate the impacts of these changes to our environment. Advances in telecommunications technologies, combined with extensive transportation networks and sprawl-inducing land use regulations, continue to loosen the geographic constraints on land development spatial patterns.

"Economic constraints on locational behavior are relaxing rapidly, and, as they do, the geography of necessity gives way to a geography of choice. Transportation costs, markets, and raw materials no longer determine the location of economic activities. We have developed an information-based economy in which dominant economic activities and the people engaged in them enjoy unparalleled locational flexibility. In this spatial context, amenity and ecological considerations are more important locational factors than in the past.

TABLE 1-1 Landscapes encompass natural environmental systems that directly benefit humans.

Function	*Goods or Services*
Production	Oxygen Water Food and fiber Fuel and energy Medicinal resources
Regulation	Storage and recycling of organic matter Decomposition and recycling of human waste Regulation of local and global climate
Carrier	Space for settlements Space for agriculture Space for recreation
Information	Aesthetic resources Historic (heritage) information Scientific and educational information

Source: Adapted from deGroot, 1992, Table 2.0–1.

Cities located in amenity regions of North America are growing more rapidly than others and such trends will intensify as society becomes more footloose" (Abler et al., 1975, p. 301).

The earth's environmental systems perform a wide array of functions that are essential to human health and welfare. For example, nature's "infrastructure" helps protect the quality of the air we breathe and the water we drink, and it provides many other environmental "goods and services." In *Functions of Nature*, deGroot (1992) organizes nature's beneficial services into four functional categories: production, regulation, carrier, and information (Table 1-1). These services sustain life on the planet.

The following indicators reveal, however, that human activities are degrading the environment and imposing serious impacts on the earth's capacity to sustain life:

- Tropical forests are shrinking
- Topsoil losses exceed new soil formation
- New deserts are formed annually
- Lakes are dying or drying up
- Groundwater tables are falling as water demand exceeds aquifer recharge rates
- Rates of plant and animal species extinction are increasing
- Groundwater continues to be contaminated with pesticides and other contaminants
- Global climate change and warming (mean temperature is projected to rise)

- Sea level is projected to rise between 1.4 meter and 2.2 meters by 2100
- Growing hole in the ozone layer over Antarctica

Source: http://earthtrends.wri.org/

Additionally, hurricanes, floods, and other natural hazards increasingly threaten human health, safety, and welfare. According to the National Science Foundation (NSF), since 1989 natural hazards have accounted for an average of about $1 billion in losses per week in the United States. Many disasters causing the loss of life and property can be prevented, or at least mitigated, by proactive decisions to reduce these risks (H. John Heinz, III, Center for Science, Economics, and the Environment, 2000). Mileti (1999), who led the 132 experts, concludes the following:

> The really big catastrophes are getting large and will continue to get larger, partly because of things we've done in the past to reduce risk . . . . Many of the accepted methods for coping with hazards have been based on the idea that people can use technology to control nature to make them safe.

There are, in fact, practical limits to growth, and some locations are far more suitable for development than others. For example, loss of life and property from natural hazards can be avoided, or at least minimized, if the development of the built environment respects nature's patterns and processes.

1.2 TOWARD SUSTAINABLE BUILT ENVIRONMENTS

1.2.1 Community Sustainability

The United Nations Environment Programme (2003) defines *sustainability* as "meeting the needs of current and future generations through integration of environmental protection, social advancement, and economic prosperity." In Ottawa, Canada, as part of the process for developing the city's Official Plan ("A Vision for Ottawa"), citizens agreed to the following set of community sustainability principles. A sustainable community

- minimizes harm to the natural environment, recognizes that growth occurs within some limits, and is ultimately limited by the environment's carrying capacity;
- respects other life forms and supports biodiversity;
- uses renewable and reliable sources of energy and fosters activities that use materials in continuous cycles;
- does not compromise either the sustainability of other communities by its activities (a geographic perspective) or the sustainability of future generations (a temporal perspective);
- values cultural diversity;

- employs ecological decision making (for example, integration of environmental criteria into all municipal government, business, and personal decision-making processes);
- makes decisions and plans in a balanced, open, and flexible manner that includes the perspectives from the community's social, health, economic, and environmental sectors;
- has shared values within the community (promoted through sustainability education) and makes the best use of local efforts and resources (nurtures solutions at the local level).

Source: www.web.net/ortee/scrp/20/23vision.html

Public policy plays a significant role in shaping the built environment (Ben-Joseph and Szold, 2005). For example, zoning codes in the United States emerged in the early twentieth century to protect public health, safety, and welfare (Platt, 2004). These land use controls were effective in separating new residential areas from polluting industries and ensuring that new housing construction met basic health and safety standards. Separating incompatible land uses has long been justified in the United States as a legitimate "police power" of local government (Platt, 2004). Some land use combinations, such as heavy industry and housing, are inherently incompatible. However, zoning codes routinely separate residential development from shops, restaurants, and other commercial uses, often with detrimental consequences for the built environment and public health.

This approach to land use planning typically weakens community identity by facilitating low-density suburban sprawl. In combination with transportation policy and planning decisions, many zoning codes in the United States not only encourage sprawl but also inhibit more sustainable forms of development. Although some communities have made significant strides toward sustainable growth and pedestrian-friendly development, there is a significant need in the United States for land use planning and regulatory reforms (Schilling and Linton, 2005).

1.2.2 Community Resources

A vital step toward developing a sustainable community is to first identify the community's natural and cultural assets. The conservation of natural and cultural resources is a fundamental site planning concern (Figure 1-1). Diamond and Noonan (1996, p. xix) call for recognition of a broad set of community resources:

> A constituency for better land use is needed based on new partnerships that reach beyond traditional alliances to bring together conservationists, social justice advocates, and economic development interests. These partnerships can be mobilized around natural and cultural resources that people value.

According to Arendt (1999), there are nine fundamental types of natural and cultural resources that should be inventoried at the community level:

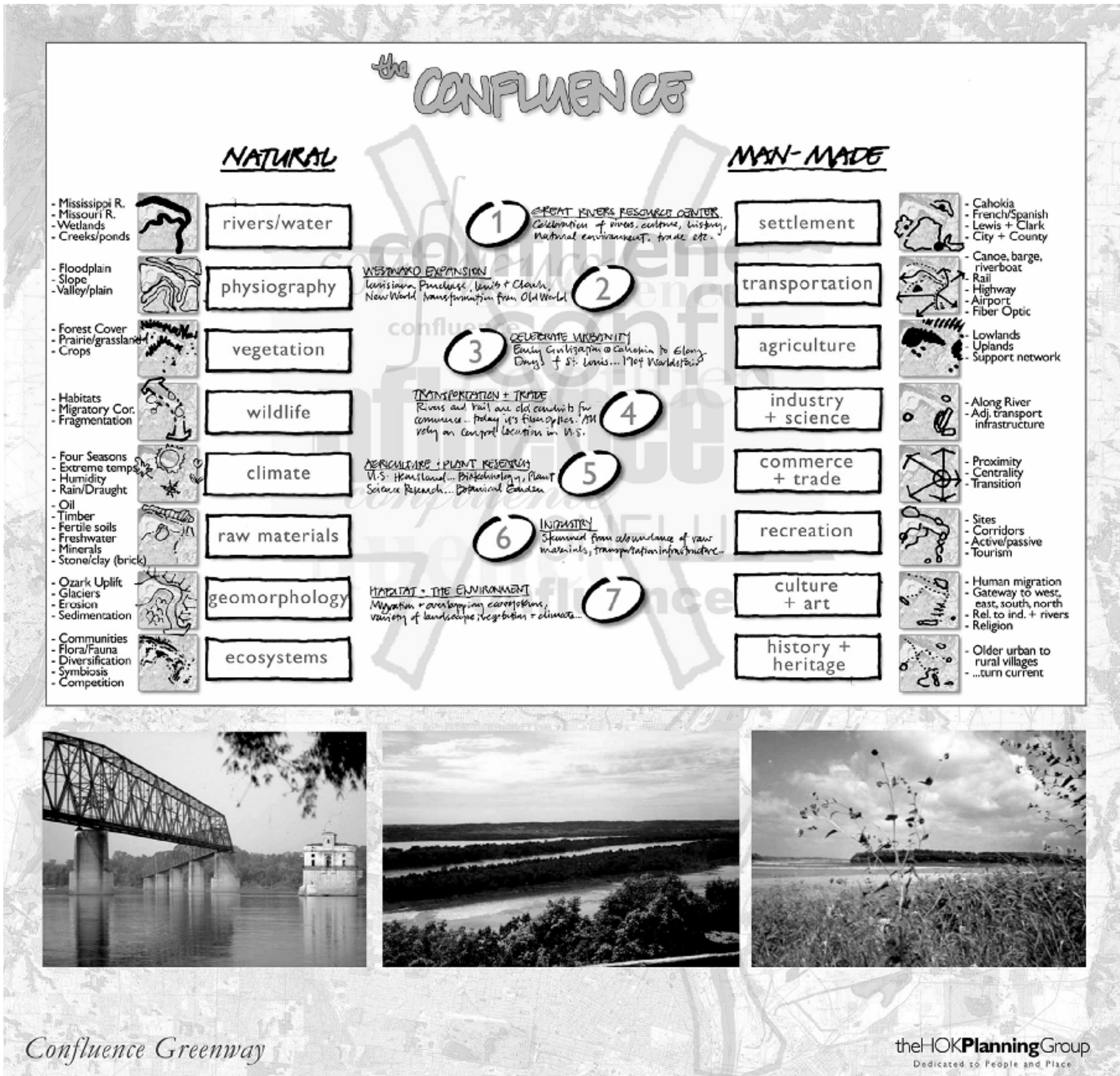

Figure 1-1 Natural and man-made factors influencing a greenway planning project along the Mississippi River in St. Louis, Missouri, USA. Source: The HOK Planning Group.

- Wetlands and wetland buffers
- Floodways and floodplains
- Moderate and steep slopes
- Groundwater resources and aquifer recharge areas

- Woodlands
- Productive farmland
- Significant wildlife habitats
- Historic, archaeological, and cultural features
- Scenic viewsheds from public roads

Collectively, these resources form a unique mosaic or "signature" that defines a community's sense of place to residents and visitors alike. Given their ecological, economic, and psychological importance within the built environment, these natural and cultural resources should be primary determinants of urban form, from the regional to the site scale (Figure 1-2).

1.2.3 Planning Better Communities

The City of Portland, Oregon, has an Office of Sustainable Development whose mission is "to provide leadership and contribute practical solutions to ensure a prosperous community where people and nature thrive, now and in the future" (www.portlandonline.com/osd).

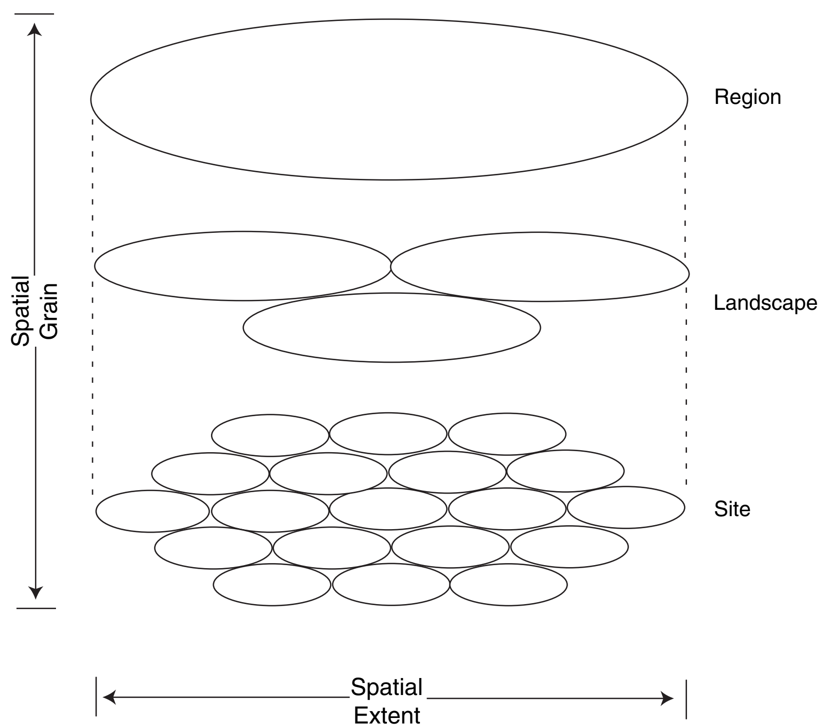

Figure 1-2 Spatial hierarchy—regions, landscapes, sites.

Through outreach, technical assistance, policy and research, the Office of Sustainable Development works to do the following:

- Increase the use of renewable energy and resources
- Reduce solid waste and conserve energy and natural resources
- Prevent pollution and improve personal and community health

Making the built environment more sustainable involves creating more transportation options, more housing choices, and more pedestrian-friendly, mixed-use neighborhoods. Smart Growth principles, endorsed by the American Planning Association and the U.S. Environmental Protection Agency, are practical goals for shaping—and reshaping—the built environment. These principles, guiding both public and private sector decision making, are summarized below.

Smart Growth Planning Goals

- Foster distinctive, attractive communities with a strong sense of place
- Preserve open space, farmland, natural beauty, and critical environmental areas
- Strengthen and direct development toward existing communities
- Mix land uses
- Foster compact building design
- Create a range of housing opportunities and choices
- Create walkable neighborhoods
- Provide a variety of transportation choices

Smart Growth Process Goals

- Make development decisions predictable, fair, and cost effective
- Encourage community and stakeholder collaboration in development decisions

Source: www.smartgrowth.org

Smart growth and sustainable design are complementary paradigms for shaping the built environment. Both approaches encourage the development of pedestrian-friendly communities that not only conserve but celebrate local cultural and natural resources.

1.2.4 Sustainable Site Design

Most communities grow incrementally through a continual process of development and redevelopment. Typically, most of this growth occurs through projects at the site scale. Each

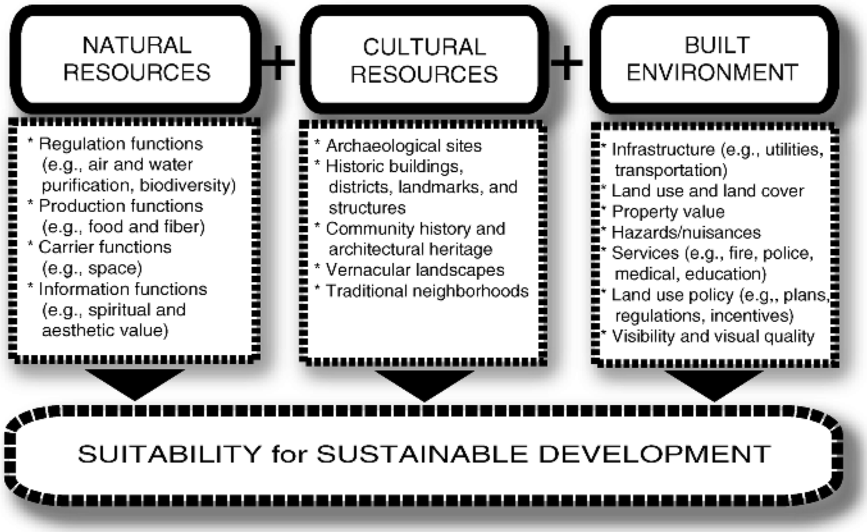

Figure 1-3 Suitability for sustainable development is determined by existing patterns of natural and cultural resources, as well as by the patterns of physical and socioeconomic attributes.

site's carrying capacity is a measure of the type and density of development that can be supported without detrimental effects to society, the economy, or the environment (Figure 1-3). The development of unsuitable sites—or poorly designed development on otherwise suitable sites—can have many negative impacts.

Development impacts vary widely and affect a broad array of natural and cultural resources (Sanford and Farley, 2004). On-site impacts may diminish visual quality and reduce habitat for native vegetation and wildlife. Off-site impacts may include traffic congestion, flooding, or pollution of local surface waters. In *Guiding Principles of Sustainable Design*, for example, the U.S. National Park Service (1993) assesses the potential environmental impacts of new park facility construction by seeking answers to these questions:

- What inputs (energy, material, labor, products, and so on) are necessary to support a development option and are the required inputs available?
- Can waste outputs (solid waste, sewage effluent, exhaust emissions, and so on) be dealt with at acceptable environmental costs?
- Can development impacts be minimized?

A sustainable approach to site planning pays close attention to development intensity and location and considers the initial benefits and impacts of development, as well as the project's life cycle costs. Site planning that is responsive to inherent environmental constraints reduces construction costs, allows the continuation of critical environmental processes, and protects intrinsic natural and cultural amenities. Sustainable site planning is context-sensitive, therefore, minimizing negative development impacts by respecting the

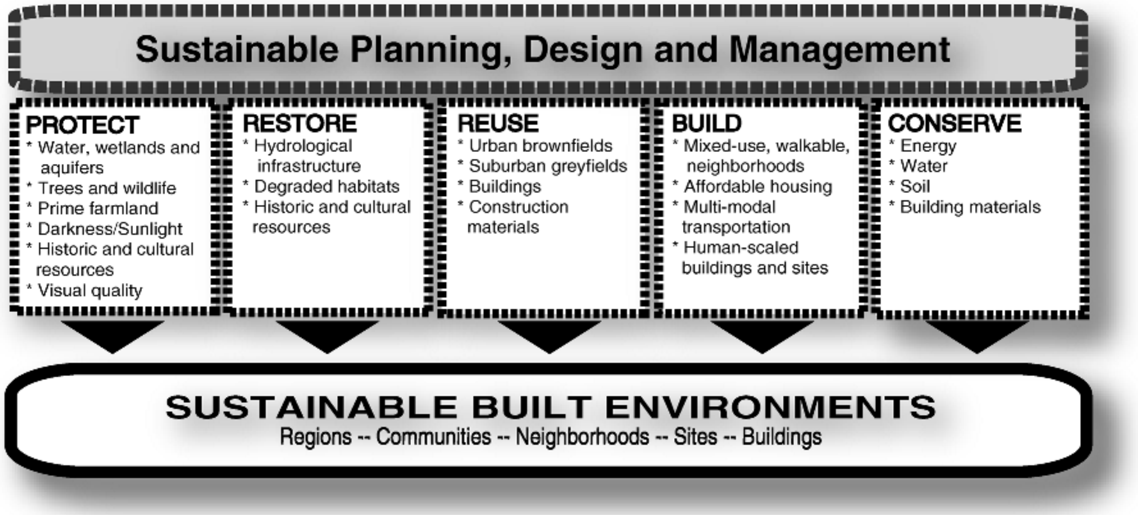

Figure 1-4 Sustainable planning, design, and management is a holistic approach to creating environmentally sensitive development and mitigating environmental degradation.

landscape's natural patterns and processes (Figure 1-4). In *Fostering Living Landscapes* (1997, p. 275), Carol Franklin writes:

> It is the growing realization of the interconnectedness of development and environmental processes worldwide and within our communities that drives the evolution of sustainable design. At every scale, sustainable design is fundamentally about integrating the natural structure of the site with the built environment.

The U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) rating systems for buildings, sites, and neighborhoods are voluntary guidelines that are incrementally improving the sustainability of the built environment. Green buildings enhance employee job satisfaction and productivity (Rocky Mountain Institute) and cost substantially less to operate and maintain than conventional buildings. Careful choices of construction materials and the use of energy and water conserving technologies also reduce development impacts on the environment. Increased productivity, of course, can enhance business profitability (Russell, 1997, pp. 54–55; Stein, 1997, pp. 54–55). Sustainable development is good for business in other ways as well, such as improving market competitiveness by creating favorable "experiences" that enhance customer satisfaction. According to Pine and Gilmore (1999), customer "experiences" are the foundation for future economic growth. Because unsustainable business practices can reduce profitability and competitiveness, sustainability is an issue that is now commonly addressed in a business school education (Burch, 2001).

1.3 THE POWER OF PLACE, THE ROLE OF DESIGN

1.3.1 Good Design Makes a Difference

Mayors, bankers, real estate developers, and many others involved in urban affairs contribute to the "design" or spatial configuration of the built environment. Some designs, however, are far better than others. The arrangement and articulation of streets, buildings, and all other site elements are "design decisions" that—for better or worse—shape the built environment. Design professionals, such as architects and landscape architects, are trained to base these decisions on fundamental design principles, ethical standards, and a thorough understanding of social and environmental context.

The average citizen may think that good design is a frill, or that it simply costs too much to justify the expense. There are many reasons, however, to justify the expense of investing in competent site planning and design. In *Designing the City: A Guide for Advocates and Public Officials*, interviews with mayors, real estate developers, and other individuals expressed strong opinions about the value of good design in the built environment (Bacow, 1995), as follows:

- "Good design promotes public health, safety, and welfare."
- "Good design makes a city work better, not just look better."
- "Good design attracts people to a city, and those people help pay for essentials that help instill pride and satisfaction in what citizens get for their taxes."
- "Well-designed (real estate) products will succeed in tight markets where poorly designed products will not."

Public investment in physical amenities, including historic districts, parks, and waterfront areas, are important community assets that can spur economic growth and serve as catalysts for additional development. These kinds of amenities may also attract companies and individuals seeking to relocate to areas that can provide a high quality of life.

Quality of life is dependent on many factors, including our safety and sense of security, individual freedom, our physical and mental health, leisure and recreation, and opportunities for self-expression as individuals (Kaplan and Kivy-Rosenberg, 1973). Most, if not all, of these factors are affected by the spatial organization and articulation of the built environment. Single-use, sprawling development patterns tend to reduce people's housing choices and limit opportunities for healthier, active living (Frumkin, 2002; Transportation Research Board, 2005).

TABLE 1-2 Benefits of context-sensitive, sustainable site planning and design.

SOCIETY	Pedestrian/bicyclist safety Opportunities for active living Sense of community Attractive surroundings Safe neighborhoods Proximity to public services Minimizes negative impacts on surrounding properties Protects cultural and historic resources
ECONOMY	Attracts investment Attracts visitors and tourists Adds property value Creates marketable "experiences" Quicker real estate sales and rentals in tight markets Attracts high-skilled employees and employers Less time spent commuting Uses land efficiently
ENVIRONMENT	Conserves energy Protects biodiversity Reduces air and water pollution, and urban heat islands) Protects natural processes and sensitive natural areas

Good design that is *sustainable* can reduce the long-term life-cycle costs of operating and maintaining buildings, infrastructure, and sites within the built environment. According to Joseph Romm (1995), up-front building and design costs may represent only a fraction of the building's life-cycle costs. When just 1 percent of a project's up-front costs are spent, up to 70 percent of its life-cycle costs may already be committed; when 7 percent of project costs are spent, up to 85 percent of life-cycle costs have been committed. Consequently, sustainable design benefits society, the economy, and the environment (Table 1-2).

1.4 SITE-PLANNING PROCESS

Site planning is a multiphased process (Figure 1-5). Kevin Lynch (1971, pp.3–4) defined site planning as follows:

> Site planning is the art of arranging the external physical environment to support human behavior. It lies along the boundaries of architecture, engineering, landscape architecture, and city planning, and it is practiced by members of all these professions. Site plans locate structures and activities in three-dimensional space and, when appropriate, in time.

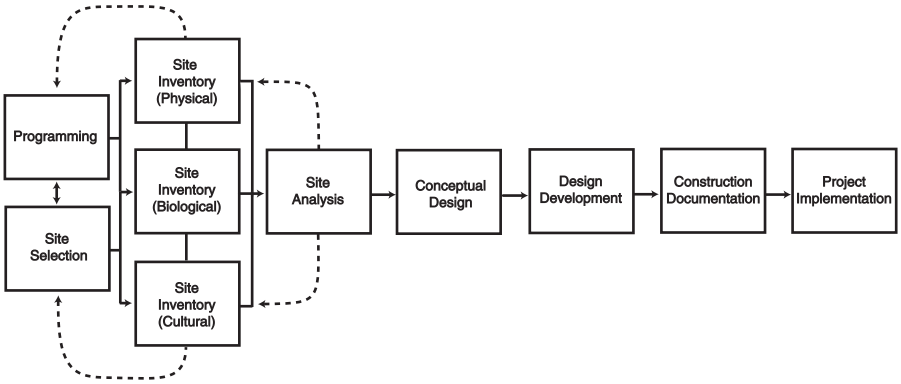

Figure 1-5 Site planning and design process.

Equally important, site planning also involves choices about where not to build. Site planning must be informed, therefore, by a thorough understanding of the site's character and context. Sustainable site planning protects and restores degraded natural and cultural resources and minimizes detrimental impacts of development on the environment.

1.4.1 Preproject (or Predesign) Phases

Clients initiate site-planning projects. Clients may be private individuals; partnerships; corporations; nonprofit organizations; or federal, state, or local governments. In some cases, a client may simply choose a firm that it has worked with in the past. Or the firm may be chosen for its reputation, specializations, or proximity to the client or site. In other cases, a client—especially if it is a government agency—may solicit firms with a Request for Qualifications (RFQ) or a Request for Proposals (RFP). Once the firm is selected, a contract for professional services typically defines the work that will be completed on the project. This contract includes a scope of services, a schedule for delivering the services, and a budget and payment schedule.

Programming

Site-planning projects vary not only in site areas and locations within the urban-rural continuum but also in prospective site uses. One project might involve the construction of roads, buildings, and other infrastructure. Another project might not have any new construction but focuses instead on the conservation, restoration, and management of natural areas or cultural resources. Programming defines the project's objectives and functional requirements, including the proposed activities, area allocated for each activity, and the functional or spatial relationships among those activities.

TABLE 1-3 Example of program elements for an affordable housing project.

Building height	*Unit Density*	*Number of units (by type)*			
Three-story	20 DU/AC	Studio	1BR	2BR	3BR
		10	30	50	10
Five-story	30 DU/AC	Studio	1BR	2BR	3BR
		15	45	75	15

Source: Adapted from Affordable Housing Design Advisor. (www.designadvisor.org)

The program focuses the subsequent analysis and design activities. The program for a multifamily housing project, for example, might include the number, type, and density of housing units that will be constructed on the site (Table 1-3).

The program may be developed by the client alone, or with the assistance of consultants with programming expertise. Programming often includes market analyses, or user demand studies, and the analysis of relevant precedents. Client objectives and preferences for the project are also considered, including the desired uses, special features, design styles, budgets for various project components, and maintenance concerns. An in-depth discussion of programming can be found in Chapter 4.

1.4.2 Site Assessment Phases

Site Selection

Land development typically occurs in one of two ways: clients have a site and choose a program to develop on that site, or clients have a program of intended uses and need a site for those uses. Across the urban–rural continuum, parcels of land vary greatly in size, shape, character, and context. Site selection involves identifying and evaluating alternative sites and selecting the best location for the intended program. More details on the site selection process can be found in Chapter 3.

Site Inventory

Collectively, the features of the site and its surroundings, in conjunction with the project's program, determine the attribute data that are collected for the site inventory. Site inventories map important physical, biological, and social or cultural attributes (Table 1-4). These may include circulation patterns and traffic volumes, existing utility systems, or architectural character within the surrounding built environment. On large projects, attribute mapping and analysis are particularly well suited for applications of geographic information systems. Ecologists, hydrologists, anthropologists, and other experts may participate in collecting, mapping, and analyzing site and contextual attribute data. Yet for any given program and site, there are always attributes that can be ignored to make the process more efficient. The project's program—or intended uses of the site—helps limit the scope of this data collection effort. Chapters 5, 6, and 7 examine the site inventory processes in greater detail.

TABLE 1-4 Examples of physical, biological, and cultural attributes that may be mapped at the site scale.

Categories	*Subcategories*	*Attributes*
Physical	Soils	Bearing capacity Porosity Stability Erodibility Fertility Acidity (pH)
	Topography	Elevation Slope Aspect
	Hydrology	Surface drainage Water chemistry (e.g., salinity nitrates or phosphates) Depth to seasonal water table Aquifer recharge areas Seeps and springs
	Geology	Landforms Seismic hazards Depth to bedrock
	Climate	Solar access Winds (i.e., prevailing or winter) Fog pockets
Biological	Vegetation	Plant communities Specimen trees Exotic invasive species
	Wildlife	Habitats for endangered or threatened species
Cultural	Land use	Prior land use Land use on adjoining properties
	Legal	Political boundaries Land ownership Land use regulations Easements and deed restrictions
	Utilities	Sanitary sewer Storm sewer Electric Gas Water Telecommunications
	Circulation	Street function (e.g., arterial or collector) Traffic volume
	Historic	Buildings and landmarks Archaeological sites
	Sensory	Visibility Visual quality Noise Odors

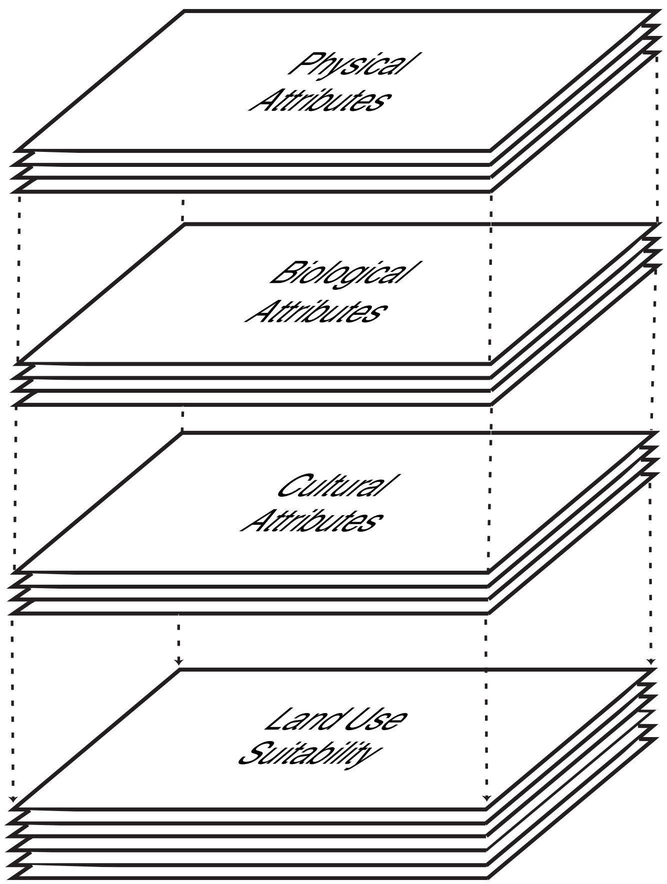

Figure 1-6 Relationship between attribute mapping and land use suitability analysis.

Site Analysis

The site analysis summarizes the site's suitability for the programmed uses. A variety of physical, biological, and cultural attributes can influence the site's suitability for the project under consideration. Information contained in the site's inventory maps can be synthesized to create one or more maps of the site's suitability for development, generally, or its suitability for specific program objectives (Figure 1-6).

Site suitability for a *specific* project is a function of the site's assets and liabilities—or opportunities and constraints. The assets (opportunities) associated with a site may be unique natural or cultural resources that warrant protection. These assets may enhance the site's aesthetic quality and contribute to the site's sense of place within the community or region. Many sites include degraded natural areas that should be restored or enhanced in conjunction with the site's development. Site constraints include chemical contamination from prior commercial or industrial uses. The site analysis may assess whether environmental remediation is needed, what action should be taken to protect adjacent properties from contamination, and what buildings and infrastructures can be used or recycled (Platt

TABLE 1-5 Hazards, constraints, or nuisances that may influence site selection and development

Categories	*Hazards*	*Constraints*	*Nuisances*
Physical	Flooding	Shallow bedrock	
	Storm surge	Shallow water table	
	Hurricane	Erosion susceptibility	
	Earthquake	Hardpan soils	
	Landslide	Expansive clay soils	
	Volcano	Open water	
	Avalanche	Wetlands	
		Aquifer recharge areas	
		Springs and seeps	
		Steep slopes	
Biological	Wildfire	Endangered Species	Insects
Cultural	Toxic waste	Wellheads	Harsh views
	Unstable fill	Historic sites	Odors
		Archaeological sites	Noise

and Curran, 2003). The site analysis also considers regulatory constraints such as zoning and other land use controls.

Mapping the site's opportunities and constraints is essential for sustainable land planning and design (Table 1-5). Providing an understanding of the site within its biophysical and socio-cultural context, the site analysis can be useful to allied professions engaged in the land development and impact mitigation process (see Figure 1-7). More detailed information on this process is available in Chapter 8.

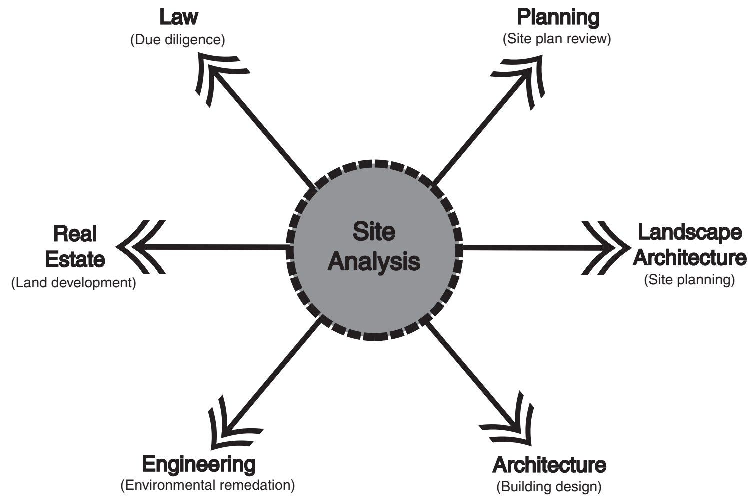

Figure 1-7 Information from the site analysis is utilized by many professions engaged in the land development process.

A site inventory—mapping the site's physical, biological, and cultural attributes—is not a site analysis. A vegetation map, for example, may show the site's existing conditions for a single attribute—the locations of plant communities and also, perhaps, individual specimen trees. This map, like other inventory maps, is valid for any use that might be considered for that site. The fate of the existing vegetation depends on the decisions made in subsequent phases of the site-planning process.

1.4.3 Design Phases

Conceptual Design

Site design is an iterative process transitioning from the general to the more specific. Concept development, the process of adapting the program to the site, flows directly from the site analysis. Sustainable site design adapts the project's program elements to the unique features of the site. Topography, climate, and hydrology, for example, are important environmental factors that shape the design of the built environment. Cultural attributes, including local history and architecture, are also important design determinants.

Concept plans spatially organize the project's proposed elements and on-site improvements. If the program is unrealistic, the design concept and, potentially, budget estimates should reveal those deficiencies, resulting either in a revision of the program and concept, or the selection of a different site. Creating two or more concept plans is particularly useful when seeking consensus from a diverse set of stakeholders. If one concept is clearly superior to the others, then the evidence supporting the better alternative is made more persuasive by comparing it to feasible, but less desirable, alternatives. Frequently, the best concept will be a hybrid plan that is created by merging ideas from two or more alternative concepts. Examples of concept plans, and a more detailed discussion of conceptual design, can be found in Chapter 9.

Design Development

On a concept plan, major program elements—and important existing conditions—are drawn diagrammatically. Circulation pathways are often portrayed as "arrows," for example, and major uses or activity zones are portrayed as "bubbles." The design development process refines, or spatially articulates, these diagrammatic elements of the concept plan. Regardless of the project's program, design development involves documenting—with plans, sections, elevations, and three-dimensional perspectives—how the plan's components will appear and relate to one another functionally. Subsequent design iterations define and articulate the buildings, walls, parking lots, pathways, and other "hard" and "soft" spaces within each of the general land use areas.

Construction Documentation

The construction drawings (that is, plans, elevations, sections, and details) together with the written construction specifications comprise the construction documents (C.D.s). The C.D.s are prepared to ensure that the implementation of the project accurately reflects the approved designs. Once this documentation is complete and the necessary financing and approvals are acquired, the project can be implemented.

1.4.4 Implementation Phase

Depending on the location and scope of the project, approvals and permits may be required from government agencies at the local, state or provincial, and national levels. Local government, especially, plays a significant role in shaping the built environment through the site plan and development review process. More detailed information on this process can be found in Chapter 11.

1.5 KNOWLEDGE, SKILLS, AND VALUES

Site planning is a location-specific, problem-solving endeavor. Unique combinations of site and program create design problems that may have dozens of potentially satisfactory solutions. Some of these solutions, however, are better than others. A satisfactory solution meets the program's functional requirements, while also creating a sustainable and livable place within the built environment.

Site-planning projects typically fall into three basic types:

- Projects with no buildings
- Projects with one building
- Projects with two or more buildings

Projects with no buildings include parks, greenways, and other active and/or passive recreation or nature conservation areas. These are an important but relatively small percentage of professional site planning. Projects involving the siting of one or more commercial or residential building, for example, are much more common. Ideally, the design of the site's building is integrally linked with the planning and design of the site. This typically requires close coordination—particularly during the design-development phase—between the project's architects and landscape architects. Projects involving the siting of several buildings offer opportunities to arrange the buildings in connected sequences of carefully designed outdoor space.

Good site planning requires not only a broad set of skills and knowledge but also the ethics and values to protect critical environmental areas and create sustainable and livable places. Poor site planning may create a variety of unintended consequences. A poorly designed site may, for example, create a vehicle-dominated development that ignores pedestrian needs. Poor design may also create vehicle circulation conflicts, increase human exposure to natural hazards, or degrade environmental quality.

The site planning and design process is far from trivial, as evidenced by professional licensing examinations for architects and landscape architects (NCARB, 2005; CLARB, 2006). According to the National Council of Architectural Registration Boards (NCARB, 2005, p.36), the Architect Registration Exam (ARE) expects registered architects to integrate: "human behavior, historic precedent, and design theory in the selection of systems, materials, and methods related to site design and construction." The ARE also tests for the ability to

> delineate areas suitable for the construction of buildings and other site improvements responding to regulatory restrictions and programmatic requirements . . . and define a site profile and maximum buildable envelope based on zoning regulations and environmental constraints.

Both the ARE and the Landscape Architect Registration Exam (LARE) recognize the complexity of site planning, and test for competence in relevant areas. The LARE's "site design" section, for example, states:

> Landscape architects are expected to develop site or land use plans that take into consideration the off-site and on-site influences to development. Landscape architects must consider various codes, consultant studies, and principles of sustainability when creating a site design.

Furthermore, the Comprehensive Planning Examination administered by the American Institute of Certified Planners (AICP) also expects planners to be familiar with site-planning issues. The exam's "Plan Implementation" section, for example, includes material on "Plan and development project review (including maps, site plans, and design review)."

1.6 CONCLUSION

Development suitability is not uniformly distributed across the landscape. A comprehensive understanding of the site and its context is an essential precursor to "fitting" a project's program to the site. Each site has a unique set of physical, biological, and cultural attributes, and some of these attributes substantially limit the site's suitability for certain uses. If the site's existing conditions are poorly understood, the site's development can result in detrimental environmental, social, and economic impacts.

Site planning by qualified professionals is a multiphased activity to ensure that land is utilized in ways that are functionally efficient, aesthetically pleasing, and environmentally sustainable. In addition to the construction of buildings, walkways, or other structures, sustainable site development often involves the restoration and enhancement of the site's ecological infrastructure.