

SECOND EDITION

SITE ANALYSIS

A CONTEXTUAL APPROACH TO
SUSTAINABLE LAND PLANNING AND SITE DESIGN



James A. LaGro Jr.

Site Analysis

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A Contextual Approach
to Sustainable Land Planning
and Site Design

Second Edition

James A. LaGro Jr.



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Preface

CONTEXT

A context-sensitive approach to sustainable planning and development helps to protect public health, safety, and welfare. By avoiding inherent site problems, or constraints, and by capitalizing on inherent site assets, or opportunities, site planners can limit long-term maintenance costs and, more important, reduce the risks to life and property from natural hazards. The careful analysis of sites—and the site’s context—can lead to better development proposals and, ultimately, to higher-quality built environments.

Qualified site planners and designers are vital to this process. Proposals for carefully sited projects may receive faster approvals and permitting, improved marketability, and rent and sales premiums (Bookout, 1994). The emphasis of the second edition, like the first, is on the site planning process and the organization, analysis, and communication of information throughout this process. This second edition keeps the same structure and format as the first but delves into greater depth within each phase of the site planning process.

WHAT’S NEW

New content has been added to every chapter of this second edition. Substantial revisions were made to Chapter 1 (Shaping the Built Environment), Chapter 2 (Visualization of Spatial Information), Chapter 3 (Site Selection), Chapter 6 (Site Inventory: Biological Attributes), Chapter 7 (Site Inventory: Cultural Attributes), Chapter 8 (Site Analysis: Integration and Synthesis), Chapter 9 (Conceptual Design), Chapter 10 (Design Development), and Chapter 11 (Project Implementation). Chapter 10 from the first edition was divided and expanded to create Chapters 10 and 11 in the second edition. This revised edition explores in more detail the linkages between site conditions and ecologically sustainable development—and redevelopment—of the built environment. More attention

is also given to finer-scale site and building design issues and to the development regulations and design review processes that influence the shaping of the built environment.

ORGANIZATION OF THE BOOK

This book is divided into four parts. Part I, Process and Tools, contains Chapter 1 (Shaping the Built Environment) and Chapter 2 (Visualization of Spatial Information). The first chapter summarizes the site planning and design process and places site planning and design in the broader context of sustainable planning and development. The second chapter addresses the basic principles of mapping and graphic communication in site planning and design.

Part II, Site Selection and Programming, also has two chapters. Chapter 3 (Site Selection) examines the goals and methods of site suitability analysis leading to the comparison and selection of sites. Chapter 4 (Programming) focuses on programming methods such as user surveys, focus groups, and market analyses.

Part III, Site Inventory and Analysis, is the core of the book. Chapter 5 (Site Inventory: Physical Attributes) and Chapter 6 (Site Inventory: Biological Attributes) cover a wide array of physical and biological attributes that, depending on the unique features of the site and the program, may be analyzed during the site planning and design process. Chapter 7 (Site Inventory: Cultural Attributes) concentrates on documenting relevant cultural, historic, and regulatory attributes. Chapter 8 (Site Analysis: Integration and Synthesis) describes how site opportunities and constraints for specific project programs are identified and documented in support of the subsequent phases of the site planning and design process.

The last three chapters of the book are in Part IV, Design and Implementation. Chapter 9 (Conceptual Design) addresses the spatial organization of the programmed uses and activities on the site. Chapter 10 (Design Development) addresses the spatial articulation of the organizational framework established in the conceptual design phase. This chapter explores design theory and “form-based” development regulations, which communities are increasingly employing to guide development and shape changes to the built environment. Chapter 11 (Project Implementation), the book’s final chapter, addresses the permitting and approval processes, techniques for mitigating development impacts, and construction documentation and contract administration. The book concludes with an Appendix and a Glossary. The Appendix lists both commercial, non-profit, and government resources for data and other relevant planning and design information.

EDUCATIONAL USES

The Council of Landscape Architectural Registration Boards (CLARB) conducted a task analysis of the profession of landscape architecture in North America in 1998. One goal of the survey was to document the types of work performed by practicing landscape architects. The respondents were asked to identify their work tasks and rank them in terms of each

TABLE I-1 Partial results of a survey of more than 2000 landscape architects. Self-assessment of work tasks (by rank) that affect public health, safety, and welfare.

<i>Rank</i>	<i>Task</i>
2	Identify relevant laws, rules, and regulations governing the project.
3	Evaluate natural site conditions and ecosystems (for example, slopes, wetlands, soils, vegetation, climate).
6	Identify required regulatory approvals.
10	Evaluate the capability of the site and the existing infrastructure to support the program requirements.
11	Elicit user's intentions and determine needs.
15	Determine the opportunities and constraints of the site.

Source: CLARB, 1998, p. 7.

activity's perceived contribution to the protection of public health, safety, and welfare. This is an important question because state licensing laws for landscape architects, architects, and other professions are explicitly intended to protect public health, safety, and welfare. Completed surveys were received from a randomly selected sample of more than 2000 landscape architects. Six of the fifteen most important tasks listed in the CLARB survey—including two of the top three—involve either site selection or site analysis (Table I-1).

This second edition of *Site Analysis* is intended for students in introductory design studios and site inventory/analysis courses in landscape architecture and students in site planning courses in architecture and urban planning. These include both graduate and undergraduate courses taught in universities throughout North America and, to a more limited extent, in Europe, Central and South America, Africa, and Asia. This book is also intended for practitioners studying for professional licensing exams in landscape architecture, architecture, or planning. Although the book is most relevant to professional practice in North America, the text also should have utility in Europe, Asia, and other developed and developing areas. Finally, this book also can serve as a resource to elected local officials and citizens in the United States who serve on local boards and commissions charged with reviewing site plans and land development proposals.

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For the second edition, generous contributions of additional maps and project graphics were made by Jim Fetterman (The HOK Planning Group); Fran Hegeler and Jim Stickle (Wallace, Roberts & Todd); and Paul Moyer (EDAW, Alexandria). The revision process was aided by several published reviews of the first edition and by constructive suggestions from three anonymous reviewers of the author's second edition proposal to the publisher. David LaGro also provided helpful comments on the proposal. Bridget Lang advised, cajoled, and offered thoughtful and constructive reviews of the entire draft manuscript.

Margaret Cummins, acquisitions editor at John Wiley and Sons, facilitated the production of both the first and second editions. Additional assistance from the publisher was provided by Jennifer Mazurkie, James Harper, Kim Aleski, Lauren Poplawski, Amy Zarkos, and copyeditor Elizabeth Marotta.

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.

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.

<i>Function</i>	<i>Goods or Services</i>
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;

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- 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: