Final Report
Agreement T2695, Task 14
Land Use Efficiency

STRATEGIES AND TOOLS TO IMPLEMENT TRANSPORTATION-EFFICIENT DEVELOPMENT: A REFERENCE MANUAL

Phase 2 of Integrating Land Use and Transportation Investment Decision-Making

by

Anne Vernez-Moudon
Professor

Matthew Cail Nicolas Pergakes Colin Forsyth Lora Lillard
Research Assistants, Urban Form Lab

Department of Urban Design and Planning
University of Washington, Box 355740
Seattle, Washington 98195

Washington State Transportation Center
University of Washington, Box 354802
1107 NE 45th Street, Suite 535
Seattle, Washington 98105-4631

Washington State Department of Transportation
Technical Monitors
Jean Mabry and Sarah Kavage
Central Puget Sound Urban Planning Office, TDM Resource Center

Prepared for
Washington State Transportation Commission
Department of Transportation
and in cooperation with
U.S. Department of Transportation
Federal Highway Administration

September 2003

TECHNICAL REPORT STANDARD TITLE PAGE

1. REPORT NO.	2. GOVERNMENT ACCESSION NO.	3. RECIPIENT'S CATALOG NO.
WA-RD 574.1		

4. TITLE AND SUBTITLE	5. REPORT DATE
Strategies and Tools to Implement Transportation-Efficient Development: A Reference Manual. Phase 2 of Integrating Land Use and Transportation Investment Decision Making	September 2003
	6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)	8. PERFORMING ORGANIZATION REPORT NO.
Anne Vernez-Moudon, Matthew Cail, Nicolas Pergakes, Colin Forsyth, Lora Lillard	
9. PERFORMING ORGANIZATION NAME AND ADDRESS	10. WORK UNIT NO.
Washington State Transportation Center (TRAC) University of Washington, Box 354802 University District Building; 1107 NE 45th Street, Suite 535 Seattle, Washington 98105-4631	11. CONTRACT OR GRANT NO. Agreement T2695, Task 14
12. SPONSORING AGENCY NAME AND ADDRESS	13. TYPE OF REPORT AND PERIOD COVERED
Research Office Washington State Department of Transportation Transportation Building, MS 47372 Olympia, Washington 98504-7372 Doug Brodin, Project Manager, 360-705-7972	Final Research Report
	14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

This study was conducted in cooperation with the U.S. Department of Transportation, Federal Highway Administration.

16. ABSTRACT

This Reference Manual addresses land use and development practices that support and improve the efficiency and effectiveness of associated transportation systems. It references strategies and tools used to foster transportation-efficient land-use patterns (transportation-efficient development is defined as supporting the use of alternative transportation modes while reducing the need to drive alone). The manual documents state-of-the-art best practices at the national level, in addition to practices that are specific to Washington State and the Puget Sound region.

The Manual is in two parts: regulatory strategies and tools and financial strategies and tools. The *strategies* (six regulatory and four financial) relate to the planning and policy-making environment shaping land use – those general approaches and related policies used to plan transportation-efficient land use and development. Each strategy in turn contains a number of *tools*, the specific mechanisms used to guide the implementation of the strategies. Detailed explanations of how the tools have functioned or can work are provided, along with examples of specific applications and case studies to illustrate the scope and extent of the tools' effectiveness.

The Reference Manual is the second product of a three-phase project by the Washington State Department of Transportation, which is known as *Integrating Land Use and Transportation Investment Decision-Making*. The first phase reviewed current land-use and development practices by the various local jurisdictions. It is summarized in *Implementing Transportation-Efficient Development: A Local Interview* (WSDOT 2002, WA-RD 549.1). The third phase will integrate findings from phases 1 and 2 with other data to produce criteria for evaluating the transportation efficiency of land-use and development patterns. It will provide WSDOT with a method to assess how existing and planned land uses could extend, support, or shorten the lifespan of existing or planned transportation system capacity.

17. KEY WORDS	18. DISTRIBUTION STATEMENT
Land use and transportation, smart growth, development, zoning, codes, parking, affordable housing, public/private financial strategies, transportation efficiency,	No restrictions. This document is available to the public through the National Technical Information Service, Springfield, VA 22616

19. SECURITY CLASSIF. (of this report)	20. SECURITY CLASSIF. (of this page)	21. NO. OF PAGES	22. PRICE
None	None		

DISCLAIMER

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Washington State Transportation Commission, Department of Transportation, or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

For more information about the reference manual, or about anything mentioned within, please contact:

Jean Mabry
206-464-1266
mabryj@wsdot.wa.gov

Sarah Kavage
206-464-1267
kavages@wsdot.wa.gov

ACKNOWLEDGEMENTS

The University of Washington and the TDM Resource Center gratefully acknowledge the support from the technical advisory committee for the "Integrating Land Use and Transportation Investment Decision-Making" project:

Dave Anderson, Office of Community Development
Mark Hallenbeck, Washington State Transportation Center (TRAC)
Craig Helman, Washington State Department of Transportation
Pat Morin, Washington State Department of Transportation
Rocky Piro, Puget Sound Regional Council
Scott Rutherford, University of Washington
Seth Stark, Washington State Department of Transportation

The Reference Manual has also benefited from support from the Puget Sound Regional Council (PSRC). PSRC staff was involved in structuring the contents of the manual, documenting strategies and tools, and reviewing the various draft versions. Special thanks go to Norm Abbott, Ben Bakkenta, Ned Conroy, King Cushman, and Ivan Miller. At the University of Washington Urban Form Lab, several students provided assistance in the development of the manual: Chanam Lee, Douglas Gardner, and D.W. Sohn.

CONTENTS

PROJECT CONTEXT ..... **xiii**

INTRODUCTION TO THE REFERENCE MANUAL **1**
LAND USE AND TRANSPORTATION 1
PURPOSE AND CONTENTS OF THE REFERENCE MANUAL 3
REFERENCE DATABASE 4
USING THE MANUAL 4
NEED FOR ADDITIONAL WORK 5
WORKS CITED 6

PART A: REGULATORY STRATEGIES AND TOOLS **7**

INTRODUCTION TO PART A **8**
FORMAT OF THE REFERENCE MANUAL 9
SUMMARY TABLES 12

I. MIXED LAND USES **16**
INTRODUCTION 16
AREA-LEVEL TOOLS AND APPLICATIONS 19
1. Use of Performance Zoning/Standards to Allow Mixed-Use Development 19
2. Planned Unit Development Zoning Techniques 19
3. Creation of Neighborhood District Zoning. 20
4. Establishment of Mixed-Use Targets 22
5. Adoption of Zoning Codes to Parallel Existing Conventional Development Codes 22
6. Limiting Auto-Oriented Businesses to Certain Locations 23
PARCEL-LEVEL TOOLS AND APPLICATIONS 23
1. Density Bonuses to Encourage Mixed-Use Commercial/Residential Buildings 23
2. Allowing or Requiring Residential Above Commercial/Retail 24
3. Ground Floor Commercial/Retail Requirements 24
4. Allowing Home Occupations in Zoning Codes 26
RESEARCH HIGHLIGHTS 26
SUGGESTED RESOURCES 27
WORKS CITED 28

II. COMPACT DEVELOPMENT **29**
INTRODUCTION 29
AREA-LEVEL TOOLS AND APPLICATIONS 31
1. Increasing Public Acceptance of Density 31
2. Establishment of Minimum Density Zoning 31
3. Minimum Floor Area Standards for Employment Centers 32
4. Maintaining Average Densities in Environmentally Constrained Areas 32
5. Use of Transitional Zoning 32
6. Overlay Zones along Transit Corridors 35
7. Shadow Zoning 36
8. Density Bonuses to Stimulate Development in Target Areas 36
RESIDENTIAL PARCEL-LEVEL TOOLS AND APPLICATIONS 37
1. Lower Minimum Lot Sizes in Single Family Areas 37
2. Setting Average Lot Sizes 37
3. Allowing Zero Lot Line Development and Reducing Required Setbacks 38
4. Allowing Accessory Dwelling Units 39

RESEARCH HIGHLIGHTS 41
Research on Transit Supportive Land-Use Densities 41
Research on Perceptions of Density 42
Research on Population and Economics 42
Research on Land Use, Development Patterns, and Travel Behavior 43
SUGGESTED RESOURCES 45
WORKS CITED 45

III. CONNECTIVITY OF MOTORIZED AND NON-MOTORIZED FACILITIES 47
INTRODUCTION 47
TOOLS AND APPLICATIONS 49
1. Instituting Block Size Maximums 49
2. Allowing Lanes or Alleys in Commercial and Residential Areas 50
3. Allowances for Future Street Extensions 50
4. Requiring a Continuous Network of Streets While Limiting or Eliminating Culs-de-Sac and Dead End Streets 52
5. Requiring a Continuous Network of Pathways for Pedestrians and Bicyclists 52
RESEARCH HIGHLIGHTS 55
SUGGESTED RESOURCES 56
WORKS CITED 56

IV. PARKING 58
INTRODUCTION 58
PARKING SUPPLY TOOLS AND APPLICATIONS 58
1. Lowering Minimum Parking Requirements 59
2. Setting Maximum Parking Requirements 59
3. In-lieu of Parking Fees 60
4. Land Bank Provisions of Future Parking 62
5. Flexible Parking Standards in Exchange for Amenities Such as TDM Actions 62
6. Allowing On-Street Parking to Contribute to Private Parking Requirements 63
7. Allowing Redevelopment of Unused Parking Areas 63
PARKING MANAGEMENT TOOLS AND APPLICATIONS 64
1. Require Parking Below or Behind Building 64
2. Shared Parking Between Different Land Uses or Adjacent Properties 64
3. Management of On-Street Parking 66
4. Lower Parking Ratios for Development Near Transit 66
5. Rideshare Parking Requirements 68
6. Implementing Parking Best Practices 68
RESEARCH HIGHLIGHTS 69
SUGGESTED RESOURCES 72
WORKS CITED 72

V. PEDESTRIAN ENVIRONMENT AND SAFETY 74
INTRODUCTION 75
STREET DESIGN TOOLS AND APPLICATIONS 76
1. Designing the Streets 76
2. Reducing Street Width Standards on Neighborhood Streets and Collectors 77
3. Design Intersections That Balance Pedestrian and Auto Movements 79
4. Road Geometrics to Accommodate Transit on Arterials 80
5. Access Management 80
6. Use of Traffic Calming Techniques 82
7. Regulations Focusing on Pedestrian Access and Crosswalk Requirements 87
8. Regulations Focusing on Bicycle Access 87
BUILT ENVIRONMENT TOOLS AND APPLICATIONS 89
1. Building Setbacks and Orientation 90

2. Building Fronts and Entrances 90
3. Building Articulation/Modulation 91
4. Ground Floor Window and Transparency Requirements 92
5. Weather Protection requirements (Awnings, Transit Shelters) 92
6. Establishment of Minimum Local Standards for Pedestrian and Bicycle Amenities. 94
7. Open Space/Plaza Requirements 95
RESEARCH HIGHLIGHTS 95
Research on Street Widths 96
SUGGESTED RESOURCES 97
WORKS CITED 98

VI. AFFORDABLE HOUSING 100
INTRODUCTION 100
AFFORDABLE HOUSING TOOLS AND APPLICATIONS 101
1. Inclusionary Housing Practices in Zoning and Comprehensive Plans 101
2. Use of Density Bonuses to Attract New Affordable Housing 103
3. Accessory Dwelling Units 104
4. Adaptive Reuse of Buildings 105
5. Changing Parking Standards to Reflect the Actual Needs of a City or District 106
RESEARCH HIGHLIGHTS 106
SUGGESTED RESOURCES 107
WORKS CITED 107

PART B: FINANCIAL STRATEGIES AND TOOLS 109

INTRODUCTION TO PART B 110
FORMAT 111
WORK CITED 112

I. PUBLIC/PRIVATE FINANCING 114
INTRODUCTION 113
1. Local Improvement Districts 113
2. Benefit Assessment Districts 114
3. Business Improvement Districts 114
4. Public Development Authorities 116
SUGGESTED RESOURCES 116
WORKS CITED 117

II. TAX-BASED PUBLIC FINANCING 118
INTRODUCTION 118
1. Land Value Taxation 118
2. Tax Abatement Programs 119
3. Multi-Family Tax Abatement Zones 120
4. Tax Increment Financing (TIF) 122
5. Revenue Tax Sharing 123
SUGGESTED RESOURCES 124
WORKS CITED 124

III. PUBLIC SECTOR INCENTIVES 126
INTRODUCTION 126
1. Land Assembly/Banking 126
2. Transfer of Development Rights 127
3. Use of Density Bonuses to Stimulate Infill Development in Target Areas 129
4. Impact Fee Waivers/Reductions 129

5. Streamlined Review of Permits 131
6. Design Review and Guidelines 133
7. Programmatic Environmental Impact Statement 134
8. Interlocal Agreements and Memoranda of Understanding 135
SUGGESTED RESOURCES 135
WORK CITED 136

IV. PRIVATE SECTOR SUPPORT 137
INTRODUCTION 137
1. Location-Efficient Mortgage Programs 137
2. Financing of Development 138
3. Community Land Trusts 139
SUGGESTED RESOURCES 139
WORK CITED 139

FIGURES

Figure		*Page*
1	Components of land use	2
I.1	Typical mixing of uses in urban and suburban neighborhoods	17
I.2	Vertical mix of uses in a building or parcel	18
I.3	Horizontal mix of uses in a parcel	18
I.4	Walking as a feasible travel option in mixed-use areas	18
I.5	Small-scale neighborhood convenience retail fits in single-family areas	18
I.6	Live/work on Main Street in Kentlands, Md.	19
I.7	Mixing of land uses at Orenco Station	21
I.8	Residential over ground floor retail	21
I.9	Orenco Station live/work units	21
I.10	Vertical mixed use at Orenco Station	21
I.11	Horizontal mixed use	21
I.12	Residential uses over retail	25
I.13	Residential uses over retail	25
I.14	Residential uses over retail and office	25
I.15	Office over retail	25
I.16	Ground floor retail in compact residential area	25
II.1	Considering compactness at the area level.	30
II.2	Considering density at the site level	30
II.3	Courthouse area in Arlington County, Va.	30
II.4	Increase average densities while respecting existing fabric of residential neighborhoods	34
II.5	Townhouse in Vancouver, B.C., with steeply scaled roof form	34
II.6	Townhouse in Vancouver, B.C., in transition zone between mixed commercial and residential development	34
II.7	Zero lot lines allow for more compact development	40
II.8	Zero lot lines allow for more compact development	40
II.9	Accessory units within block	40
II.10	Accessory dwelling units can advance multiple objectives	40
II.11	Section of Mayor's House with accessory unit	40
III.1	Networks of streets, blocks, an sidewalks	48
III.2	Development is broken into a series of short blocks	51
III.3	Frequency of intersections offers more decision points	51
III.4	Plan of pedestrian mews in Paseo Plaza, San Jose, Calif.	51
III.5	Pedestrian mews in Paseo Plaza, San Jose, Calif.	51
III.6	Pedestrian routes provide direct links to destinations	54
III.7	Bicycle routes as part of a continuous network	54
III.8	Streetscape of Caper's Block, Vancouver, B.C.	54
IV.1	Parking located to the interior and side of buildings in Bethesda Row	61
IV.2	Pedestrian and street separate from parking lots	61
IV.3	Pedestrian and street separate from parking lots	61
IV.4	Mizner Park in Boca Raton, Fla	67
IV.5	Granville, Island, Vancouver, B.C.	67
IV.5	Granville, Island, Vancouver, B.C.	67
V.1	A car-oriented strip commercial development transformed to create a pedestrian-oriented environment	75

V.2 Plan of intersection at Prospect and Springfield Avenue, Maplewood, N.J. 81
V.3 Multimodal street in downtown Portland, Ore. 81
V.4 Section of downtown Portland street, Ore. 81
V.5 Local accessibility to transit. 83
V.6 Traffic calming and pedestrian environments 84
V.7 A strategy to facilitate traffic calming and pedestrian activity at this busy intersection in Towson Business District, Md. 86
V.8 Secure bicycle storage and bicycle racks support a multimodal environment 88
V.9 Caper's Block, Vancouver. B.C. 93
V.10 Caper's Block. 93
V.11 Redmond, Wash. 93

VI.1 High quality design makes multi-family affordable house attractive 102
VI.2 Affordable mixed-use housing with on-street parking 102
VI.3 Vermont Village, a mixed-use development of 36 affordable townhouses 102
VI.4 Vermont Village Plaza 102

TABLES

Table		*Page*
1	Examples of other manuals and guidebooks	5
A.1	Summary of regulatory strategies and tools	10
A.2	Impacts of regulatory strategies on travel behavior	12
A.3	Applications of regulatory tools	13
I.1	Studies testing the relationships between mixed-use variables and travel	27
II.1	Studies finding relationships between travel behavior and density	44
IV.1	Typical parking demand reductions	71
V.1	Cities with narrow roadway width standards	78
V.2	Communities with narrow residential street standards	78
V.3	Traffic calming strategies and devices	85
V.4	Kirkland's code for blank wall treatment	91
V.5	Extracts from Portland's code	94
V.6	Travel impacts of strategies addressing pedestrian environments	96
B.1	Impacts of financial strategies and tools on transportation-efficient land use and development practices	111
B.2	Summary of financial strategies, tools, and applications to implement transportation-efficient land use	112

PROJECT CONTEXT

The Washington State Department of Transportation (WSDOT) commissioned the Reference Manual as part of a larger, three-phase effort known as *Integrating Land Use and Transportation Investment Decision-Making.* The flow chart below describes the relationships between the three phases of work. The first phase, carried out by WSDOT's TDM Resource Center, reviewed current land use and development practices by the various local jurisdictions in the I-405 and SR 520 corridors. The Reference Manual, the second phase, focuses specifically on land use and development practices that support and improve the efficiency and effectiveness of associated transportation systems. The third phase will integrate findings from Phases 1 and 2 with other data to produce criteria for evaluating the transportation efficiency of land use and development patterns, providing WSDOT with a method to assess how existing and future land uses could extend, support or shorten the lifespan of existing or future transportation system capacity.

Phase 1
IMPLEMENTING TRANSPORTATION-EFFICIENT DEVELOPMENT: A LOCAL OVERVIEW
completed 2002 - report now available

Phase 1 is a research project that examines the implementation of local land use actions that encourage transportation-efficient development (transportation-efficient development supports the use of alternative transportation modes, while reducing the need to drive alone).

This work takes a broad view of the effectiveness of local strategies to encourage transportation-efficient development, helps to determine what local actions are best at producing transportation-efficient land use on the ground, and shows where disconnects or barriers inhibit implementation (WSDOT 2002).

Phase 2

Strategies and Tools for Transportation-Efficient Land Use and Development Practices: A Reference Manual
timeframe: 2001-2002

Phase 2 documents available resources and serves as guidance to local jurisdictions on how, where and when to encourage transportation-efficient development. The guide includes the following elements:

- An inventory of regulatory tools and related planning processes to implement transportation-efficient development.
- Information on best practices and relevant research.
- A review of financial incentives used in both the public and the private sectors.

PHASE 3
Refinement of Land-Use Criteria: Guidelines for WSDOT
timeframe: 2003-2005

Phase 3 will develop more detailed land-use criteria and transportation performance measures that WSDOT can use during the corridor planning and programming investment decision-making processes. Focused on the urban portions of the central Puget Sound region, the criteria and measures could be used to do the following:

- Provide a clear, thorough methodology that can be used at the **corridor planning level** for locating and targeting investments.
- Evaluate how well local jurisdictions' land use strategies, programs, and practices support efficiency of the **transportation system** as defined by RTPO/MPO plans and regional growth strategies.
- Help WSDOT and others evaluate how local land use decisions affect the performance of state and regional transportation investments at the **programming level**.

INTRODUCTION TO THE REFERENCE MANUAL

LAND USE AND TRANSPORTATION

Land use and transportation are two sides of the same coin. The shape and form of road networks have always corresponded closely to the location, structure, and size of towns and cities. Yet, as the number and size of cities grew, as auto travel became ubiquitous, and as land-use and transportation planning became increasingly specialized, the symbiotic relationship between land use and transportation became difficult to manage. The recent popularity of growth management and smart growth stems from the recognition that land-use and transportation planning must be interconnected to benefit safe and effective travel. This interconnectedness needs to happen not only in planning, but in implementation.

WSDOT began to address the need to connect land use and transportation more than a decade ago, supporting several projects and studies to strengthen the link between the two. This early work enhanced the understanding of how policies, processes, methods, strategies, and tools commonly used in the urban planning and transportation sectors affect the shape of metropolitan regions and their transportation systems. The current three-phased work program, of which this manual is a part, focuses on how transportation systems can, with supportive land uses, allow a greater throughput of people and use existing or future planned capacity more efficiently. Thus, transportation efficiency can be defined as having a choice of easily accessible travel modes, lowering the need for SOV travel, and increasing opportunities for para-transit, transit, and non-motorized travel.

Efficient travel behavior is important because it more efficiently uses available roadway space, which can thereby reduce capital investment needed to expand or maintain mobility. Efficient travel behavior can also have benefits for regional air quality, and recent research has also begun to show connections between efficient travel behavior and public health: because of contributions to air pollution, high degrees of auto use have been shown to degrade respiratory health. Recent studies have also indicated that there is a correlation between transportation-efficient land-use patterns and increased physical activity/health levels.

With this definition, the stated objective of achieving transportation efficiency demands the integration of policies affecting land use and transportation. SOV, para-transit, transit, and non-motorized travel correspond, in this order, to an ascending scale of land-use dependency. The automobile is least dependent on supportive land use, only requiring the distance between gas station locations to be shorter than that covered by a tank of gas. On the other end of the spectrum, non-motorized travel is the most land-use dependent mode of travel, demanding short distances between complementary origins and destinations.

Efficient travel behavior is positively associated with such land-use characteristics as dense residential or employment development and mix of complementary land uses within small areas. These land use characteristics are in turn associated with transportation infrastructure and facilities that support efficient travel behavior, such as frequent transit service, and complete sidewalk and bike lane networks on arterials, collectors, and local streets.

Achieving transportation efficiency also means addressing potential conflicts between mobility and accessibility. While mobility is an important planning and design criterion associated with state and regional transportation systems, providing accessibility to destinations is a primary goal of *local* planning. Whereas a primary function of state transportation agencies is to accommodate

regional travel and to address mobility goals, local jurisdictions tend to pay attention to local travelers' accessibility to regional facilities.

Conflicts between mobility and accessibility goals can be reduced if land uses and development patterns, especially near regional transportation facilities, support efficient transportation behavior. Such behavior includes not only reduced numbers of trips taken by SOVs, but also reduced lengths of vehicle trips, as well as increased use of more efficient modes of travel such as carpooling, transit, walking, and biking.

Urban metropolitan land uses and development patterns result from policies and actions taken by both private and public sectors (Figure 1). Private sector participants include landowners, developers, builders, and eventual users of the properties. They greatly vary in size and area of influence, ranging from large corporate entities to individuals. Yet all, regardless of size, must adhere to the regulatory frameworks devised by the public sector that coordinate private actions on urban land.

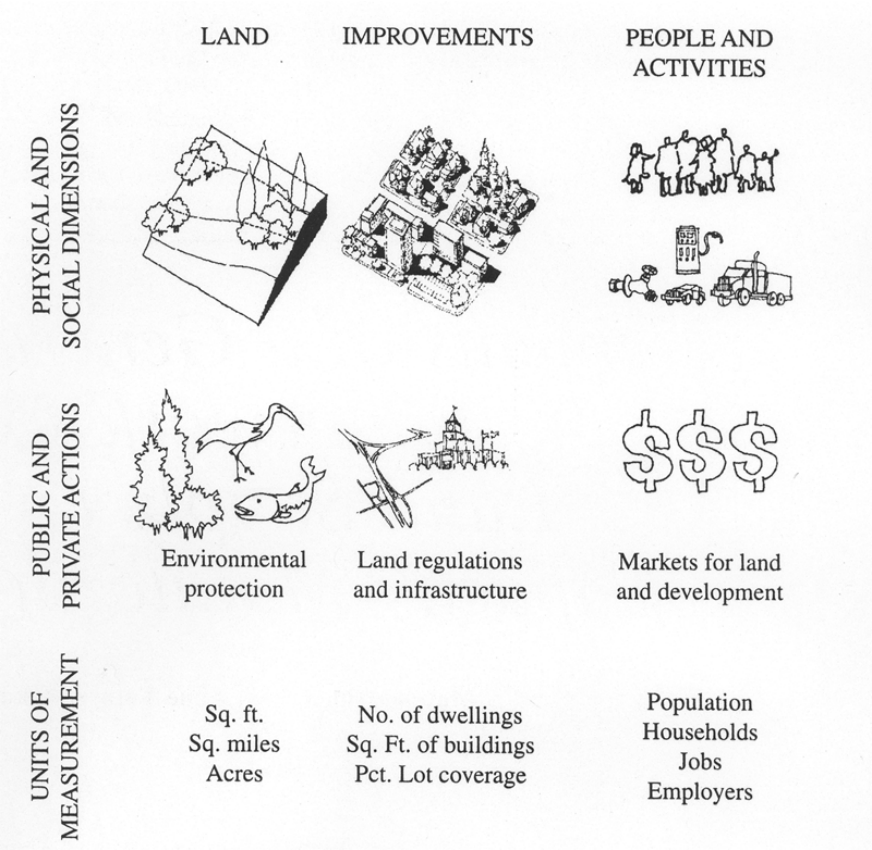


Figure 1: Components of land use (Moudon and Hubner 2000).

Local government is the public agent with ultimate legal powers to set land-use policy and regulations. However, other laws at the federal, state, and county levels can directly and indirectly affect the way local governments set and enforce their land-use codes. Furthermore, public sector agencies, being landowners in their own rights, can act as developers. As such, they can also be powerful agents of change in land-use practices. The General Service Administration, for instance, is the largest owner of office buildings in the country. Its property holdings can

greatly affect local office markets, and its internal policies can shape demand for certain types of buildings at the local level.

Similarly, public agencies in charge of, for example, transportation or recreation facilities have power over relatively large property holdings, whose improvements can help shape land-use and development patterns at the local level. Examples of such powers include the recent rise in transit-oriented development (TOD) in and around transit facilities, where public lands may be redeveloped for compact mixed-use development. Another example is the ongoing transformation of publicly owned undeveloped lands into recreation or environmentally significant areas that help balance the impact of, and ultimately serve, private development.

PURPOSE AND CONTENTS OF THE REFERENCE MANUAL

This manual references strategies and tools used locally and nationally to foster transportation-efficient land-use and development patterns (transportation-efficient development supports the use of alternative transportation modes, while reducing the need to drive alone). *Strategies* relate to the overall planning and policy-making environment shaping land use—the general approaches and related policies used to plan transportation-efficient land use and development. *Tools* refer to the specific mechanisms that are used to guide implementation of those strategies.

The focus is on strategies that the public sector can employ to affect the use of *private land*. Approaches that public sector agencies can use to affect the development of public lands are largely excluded from this document, as they entail processes that are less generalizable and more dependent on the specifics of local conditions than those affecting private land holdings.

The primary purpose of the Reference Manual is to itemize and explain basic approaches to coordinating land-use and transportation policies that lead to system efficiency. The manual documents state-of-the-art best practices at the national level, in addition to those practices that are specific to Washington State and the Puget Sound region.

Strategies and tools for transportation efficient land-use and development practices included in the Reference Manual are of two kinds:

1. Those that address the *regulatory frameworks* governing the use and development intensity of urban land
2. Those that use the *financial aspects* of land development to influence the types of land uses and development patterns.

While the strategies reviewed rely on public sector actions that will encourage the private sector to generate transportation-efficient development, public sector policies and actions must eventually meet private sector approval to ensure successful implementation. Good land-use and development practices derive from a coordinated process in which both the public and the private sectors work together to produce desired outcomes.

The Reference Manual consists of two parts. Part A, *Regulatory Strategies and Tools for Transportation-Efficient Land Use and Development Practices*, consists of six strategies:

I. Mixed land uses (10)
II. Compact development (10)
III. Connectivity of motorized and non-motorized facilities (6)
IV. Parking (13)
V. Pedestrian environment and safety (16)
VI. Affordable housing (5)

Part B, *Financial Strategies and Tools for Transportation-Efficient Land Use and Development Practices,* consists of four strategies:

I. Public/Private Financing (4)
II. Tax-Based Public Financing (6)
III. Public-Sector Incentives (8)
IV. Private-Sector Support (2)

Each strategy in turn contains specific tools used for implementation. The number of tools associated with each strategy is shown in parentheses. The manual explains how the tools have functioned or can work and provides examples of specific applications to illustrate the scope and extent of the tools' effectiveness.

REFERENCE DATABASE

The process of compiling the Reference Manual generated an extensive database of more than 400 references to periodicals, journal articles, websites, manuals, handbooks, and books. A CD Rom attached to the Reference Manual contains this database. It works in EndNote, an application that specializes in storing, managing, and searching for bibliographic sources in a reference library. The reference database can be easily sorted and filed to find a source reference or an abstract, or to organize personal notes and commentary.

Reference records can be queried by a keyword search such as author, title, reference type, or subject, which will list sources that have the search term in any part of the record's text. Any word or acronym (such as infill or TDM) can be searched as a keyword. A combined search can also be performed, such as looking for TDM and Seattle in a single effort.

An index of 87 keywords was specially developed to help search topics related to the Reference Manual. These include Mixed Use, Density, Connectivity, Parking, Urban Design, Affordable Housing, Financial Incentives, Smart Growth, Land Use and Transportation, Transit Oriented Development (TOD), Transportation Demand Management (TDM), Model Codes and Regulations, Non-Motorized Transportation

USING THE MANUAL

The Reference Manual aims at a general audience of professionals in land use and transportation, to help them share known and tested ways in which land-use strategies can support efficient transportation behavior, including how and where these ways have been successfully applied.

The innovative aspect of this manual lies in the attempt to produce a document that land-use and transportation policy makers and regulators can use as a basis for agreement on future land-use policy. It provides a common ground from which WSDOT can work with its own staff as well as with local jurisdictions on coordinating transportation and land-use actions. The strategies contained in the Reference Manual can serve as a basis from which to devise and recommend strategies that offer the greatest opportunity to support planning and programming of new services and facilities. They also can be the backbones of agreements between WSDOT and local jurisdictions regarding future directions for integrating new development with transportation investments.

Other states and local government agencies have produced similar reference documents that facilitate the development of policies and the formulation of agreements between public and

private sector participants. Table 1 provides an array of formats and audiences targeted by others. Overall, these documents help to rally participants in understanding mutually beneficial approaches to land use and transportation.

Table 1: Examples of other manuals and guidebooks

Title	Date	Sponsoring Agency	Outreach	Targeted Audience
Getting to Smart Growth: 100 Policies for Implementation	2001.	International City/County Management Association and Environmental Protection Agency	National	Planners, developers, and citizens
Commercial and Mixed Use Development Handbook	2001	Oregon Transportation and Growth Management Program	State of Oregon	Planners, architects, and developers
Smart Development Code Handbook	Aug 1997	Oregon Transportation and Growth Management Program, Oregon Department of Transportation, Oregon Dept. of Land Conservation and Development	State of Oregon	Planners, citizens, and elected officials
Better Site Design: A Handbook for Changing Development Rules in Your Community	1998	Center for Watershed Protection	State of Maryland	Developers, planners, landscape architects
Creating Transit Station Communities in the Central Puget Sound Region: A Transit-Oriented Development Workbook	1999	Puget Sound Regional Council	Puget Sound Cities	Developers, planners, architects, transit planners, and engineers

This manual differs from others because of its inclusion of best practices that are specific to Washington State and the Puget Sound region. It also recognizes that both regulatory and financial strategies can affect future land development. In addition, it covers an unusual range of concerns about effective land-use practices, spanning from those of the private development to those of the research community. The former focuses on the economic viability of the strategies while the latter wants to confirm the effectiveness of transportation-efficient land-use and development practices. The result is a broad ranging manual that could be customized in further steps of the process of negotiation between state, regional, and local stakeholders. The Reference Manual, or parts of it, could be expanded because it is supported by an extensive list of references on all of the subjects treated, thus allowing further in-depth reporting on specific strategies and applications. On the other hand, it could be compacted or streamlined to address a variety of lay audiences: from elected officials to local communities affected by changes in land-use policies.

NEED FOR ADDITIONAL WORK

As indicated, the strategies and tools of this manual pay scant attention to the land-use and development practices of public land owners. In future work, it would be useful to address the special circumstances related to publicly owned lands and to non-taxable lands in general. Together with environmentally sensitive areas, lands in public or quasi-public ownership or trust can amount to as much as 50 percent of the surface of metropolitan areas. Within its Urban Growth Boundary, for example, Portland Metro has almost 7 percent of its land in public facilities (excluding parks, which cover 9 percent of the UGB lands) and 15 percent in streets. In urbanized King County, the areas of Kirkland Downtown and Upper Queen Anne have more than 20 and 30 percent of their lands in non-taxable properties, respectively. It would therefore be

worthwhile to specifically study the extent to which the uses of these lands support or undermine transportation efficiency.

Special districts in Washington State are excluded from growth management considerations, even though their actions can have a significant impact on development patterns and transportation facilities. School districts, for example, have a particularly important impact on travel patterns. School budgets typically favor new construction over rehabilitation, thus encouraging the location of new facilities on green fields. A few states, Maryland among them, have successfully addressed and reversed the effects of school location and development standards on sprawl. Other special districts, such as sewer, water, and general utility districts, are major landowners, and their policies can hinder or improve transportation efficiency. As well, many federal, state, and local government agencies across the nation continue to have development standards that are frequently unrelated to, and often do not support, transportation efficiency. As for schools, they often aim to acquire inexpensive land, which means land at the fringe of metropolitan areas. While the costs of new infrastructure may be covered and thus may not directly affect local public budgets, such locational decisions by major public agencies can run counter to transportation-efficient land-use practices. Furthermore, the new facilities often act as magnets for private businesses that seek to locate in the same area, further inflating the demand for fringe lands.

Complementary strategies and tools addressing transportation-efficient use of public and non-taxable lands would help cover all aspects and types of developments that affect transportation systems.

WORKS CITED

Moudon, A. V., and Hubner, M. (2000). "Monitoring Land Supply With Geographic Information Systems." John Wiley & Sons, New York.

WSDOT. (2002). "Implementing Transportation-Efficient Development: A Local Interview, Phase I of Integrating Land Use and Transportation Investment Decision-Making." WSDOT.

PART A:
REGULATORY STRATEGIES AND TOOLS TO IMPLEMENT TRANSPORTATION-EFFICIENT LAND USE

INTRODUCTION TO PART A

This part of the Reference Manual is organized by six major elements of transportation-efficient land use: Mixed Land Uses, Compact Development, Connectivity, Parking Management, Pedestrian Environment and Safety, and Affordable Housing. These six elements are not the only way of grouping the different aspects of transportation-efficient land use. The groupings used derive from extensive local and national research on the relationship between land use and transportation carried out over the past decade. These elements have been documented as having some impact on travel behavior. Although more research has been done in some areas than others on how each element affects travel behavior (for instance, the amount of research on compact development is much greater than the amount of research on affordable housing), relationships have been found in all of these six areas.

The elements of transportation-efficient land use were originally identified during research for "The TDM Guide for Planners," a guidebook on transportation demand management (TDM) developed by the TDM Resource Center in 1996, updated in 2000. Originally, the TDM Guide discussed nine broad land use strategies that could be used to encourage alternative mode use. Several of those strategies were collapsed during the "Implementing Transportation-Efficient Development" research (Phase 1 of the *Integrating Land Use and Transportation Investment Decision-Making* project), resulting in the six elements defined below.

These six elements are not mutually exclusive. As an example, measures that increase density will also, because they increase total housing supply in an area, increase housing affordability. In a similar fashion, measures that contribute to connectivity will also improve the pedestrian environment.

The six elements are as follows:

- **MIXING LAND USES** is the combining of different land uses within a small enough area (typically within walking distance – ¼ to ½ mile) to encourage non-motorized travel. Ten specific tools to encourage the implementation of mixed-use development are associated with this strategy.
- **COMPACT DEVELOPMENT** is development at densities that are high enough to support transit use and to entice other land uses to locate in close proximity. Ten tools to increase density of development are associated with his strategy.
- **CONNECTIVITY OF MOTORIZED AND NON-MOTORIZED FACILITIES** is the provision of road, street, sidewalk, trail, or bike lane networks that offer directional choice of travel route and that optimize route directness for the different modes of travel. Six tools are associated with this strategy.
- **PARKING SUPPLY AND MANAGEMENT** limits the availability of parking, especially free parking, minimizes the visual impact of parking on the street environment, and encourages shared parking between neighboring land uses. Such strategies minimize SOV use for short and very short trips and encourage walking between chained trips. Thirteen tools are associated with this strategy.
- **PEDESTRIAN ENVIRONMENT AND SAFETY** is the spatial arrangement and design of places that are safe and comfortable to walk in, thus enticing large numbers of people to walk. Sixteen tools are associated with this strategy.
- **AFFORDABLE HOUSING** is the provision of housing for a range of income groups and household types in livable places. Affordable housing is closely related to jobs-housing balance—by increasing the jobs-housing balance in an area and allowing people to live closer

to their work if they choose, affordable housing can thereby shorten or change the nature of their travel. Five tools are associated with this strategy.

Specific tools used in conjunction with the strategies make up the bulk of the contents of Part A. Sixty tools are reviewed. It is important to note that none of these strategies or tools should be looked at as a magic bullet to encouraging alternative mode use. On the contrary, successful regulation to foster transportation-efficient land uses often depends on the application of multiple strategies and tools. Mixing uses, for example, is most likely to occur in compactly developed areas because the latter provide a market large enough to support multiple uses.

Regulatory strategies and associated tools have been tested and successfully applied in many jurisdictions across the country following the passage of federal ISTEA and TEA-21 legislation. With the passage of the Growth Management Act of 1990, the State of Washington has been at the forefront of innovative land use approaches to channel metropolitan growth in such a way that it optimizes public and private infrastructure investments, including transportation investments. King County, the most populous county in the state, has had growth control measures for more than 20 years. Therefore, the strategies that follow come from within the context of long-term commitment to growth management at the regional and county levels.

FORMAT OF THE REFERENCE MANUAL

Table A.1 provides a summary list of tools reviewed under each element of transportation-efficient land use. Each element is presented in a separate section that includes an introduction to the approach, the tools available for accomplishing the strategy, examples of specific applications of the tools, supportive research, and suggested resources. The information is provided in the following format:

INTRODUCTION TO STRATEGY

Each strategy is briefly described to show why it is relevant and how it is used to meet the goals of transportation-efficient land use and development. A discussion of the social, economic, and environmental benefits to a community is included, as well as obstacles in meeting this strategy. This includes working with existing planning processes, land-use regulations, and market approaches in place.

TOOLS AND APPLICATIONS

Tools are selected from a range of tools that have been used around the country to implement the strategies. Individual jurisdictions will have unique requirements and will need to determine how the tools can be adapted to local conditions. Specific applications, such as model code regulations, are discussed to illustrate the scope and possible impacts of the tools. Selected case studies explain how a tool was used, what it achieved, and lessons learned. Example applications and case studies are from local governments and various agencies in the United States as well as in Washington State.

Tools and applications may be organized in subclasses to facilitate the understanding of the different facets of a strategy. For example, tools that enhance mixed use and compactness are classified into area-based and project-based tools. Area-based tools apply to a zone, neighborhood, or a district, whereas project-based tools focus on individual parcels within one or more zones. For the compact development strategy, on the other hand, tools applying to residential development are different from those effective in employment land uses.

RESEARCH

Recent research results analyzing the impact of each strategy are included to provide evidence of the effectiveness of the strategy on land use and urban development patterns, travel behavior, transportation systems, or market preferences.

SUGGESTED RESOURCES

Appropriate sources in the literature are quoted for further reference and work on each strategy.

Table A.1: Summary of regulatory strategies and tools

I. MIXED LAND USES

SUBAREA-LEVEL APPLICATIONS

1. Use of performance zoning/standards to allow mixed-use development
2. Planned unit development (PUD) zoning techniques
3. Creation of neighborhood district zoning.
4. Establishment of mixed-use targets
5. Adoption of zoning codes to parallel existing conventional development codes
6. Limiting auto oriented businesses to certain locations

PARCEL-LEVEL APPLICATIONS

1. Density bonuses to encourage mixed-use commercial/residential buildings
2. Allowing or requiring residential above commercial/retail
3. Ground floor commercial/retail requirements
4. Allowing home occupations in zoning codes

II. COMPACT DEVELOPMENT

AREA-LEVEL APPLICATIONS

1. Increasing public acceptance of density
2. Establishment of minimum density zoning
3. Minimum floor area standards for employment centers
4. Maintaining average densities in environmentally constrained areas
5. Use of transitional zoning
6. Overlay zones along transit corridors
7. Shadow zoning
8. Density bonuses to stimulate development in target areas

RESIDENTIAL PARCEL-LEVEL APPLICATIONS

1. Lower minimum lot sizes in single family areas
2. Setting average lot sizes
3. Allowing zero lot line development and reducing required setbacks
4. Allowing accessory dwelling units (ADUs)

III. CONNECTIVITY OF MOTORIZED AND NON-MOTORIZED FACILITIES

1. Instituting street-block size maximums
2. Allowing lanes or alleys in commercial and residential
3. Allowances for future street extensions
4. Requiring a continuous network of streets while limiting or eliminating culs-de-sac and dead-end streets
5. Requiring a continuous network of pathways for pedestrians and bicyclists

Table A.1: Chart of regulatory strategies and tools (continued)

IV. Parking Supply and Management

Parking Supply Applications

1. Lowering minimum parking requirements
2. Setting maximum parking requirements
3. In-lieu of parking fees
4. Land bank provisions for future parking
5. Flexible parking standards in exchange for amenities such as TDM actions
6. Allowing on-street parking to contribute to private parking requirements
7. Allowing redevelopment of unused parking area

Parking Management Applications

1. Requiring parking below or behind buildings
2. Shared parking between different land uses or adjacent properties
3. Management of on-street parking
4. Lower parking ratios for development near transit
5. Rideshare parking requirements
6. Implementing parking best practices

V. Pedestrian Environment and Safety

Street Design Applications

1. Designing the travelways
2. Reducing street width standards on neighborhood streets and collectors
3. Designing intersections that balance pedestrian and auto movements
4. Road geometrics to accommodate transit on arterials
5. Access management
6. Use of traffic calming techniques
7. Regulations focusing on pedestrian access and crosswalk requirements
8. Regulations focusing on bicycle access

Built Environment Applications

1. Building setbacks and orientation
2. Building fronts and entrances
3. Building articulation/modulation
4. Ground floor window and transparency requirements
5. Weather protection requirements (awnings, transit shelters)
6. Establishment of minimum local standards for pedestrian and bicycle amenities.
7. Open space/plaza requirements

VI. Affordable Housing

1. Inclusionary housing practices in zoning and comprehensive plans
2. Use of density bonuses to attract new affordable housing
3. Accessory dwelling units (ADUs)
4. Adaptive reuse of buildings
5. Changing parking standards to reflect the actual needs of a city or district

SUMMARY TABLES

The following summary tables help the reader to place the strategies and tools in the context of urban and transportation planning, and to better understand the contexts in which the strategies and tools are best applied. Table A.2 summarizes the associations known to exist between the regulatory strategies described and travel behavior.

Table A.2: Impacts of regulatory strategies on travel behavior

REGULATORY STRATEGIES	Reduce VMT	Reduce VHT	Decrease #SOV Trins	Increase Transit Use	Increase Non-motorized
1. Mixed land uses	**1**	**1**	**2**	**2**	**1**
2. Compact Development	**-**	**-**	**2**	**1**	**2**
3. Connectivity of Motorized and Non-Motorized Facilities	**1**	**-**	**2**	**2**	**1**
4. Parking Supply and Management	**2**	**-**	**1**	**1**	**2**
5. Pedestrian Environment and Safety	**2**	**-**	**2**	**2**	**1**
6. Affordable Housing	**1**	**1**	**-**	**2**	**-**

1=Primary effect of regulatory strategy
2=Secondary effect of regulatory strategy

Table A.3 indicates the specific locations where the various tools are best applied. Locations focus on areas of either planned or actual concentrated development based on general land-use categories as well as categories that have been part of the planning process of the central Puget Sound region. These locations are as follows:

- Urban Centers designated in *Vision 2020*
- Transit-oriented developments (TOD, used in the preparation of *Destination 2030*)
- Cluster (concentrations of residential development often mixed with retail, used in the preparation of *Destination 2030*)
- Retail (retail centers of various sizes)
- Office (concentrations of office uses)
- Residential (concentrations of residential uses)

To keep the chart simple, transit-oriented development includes transit corridors.

Table A.3: Applications of regulatory tools

REGULATORY TOOLS	URBAN CENTER	TOD	CLUSTER	RETAIL	OFFICE	RESIDENTIAL
I. MIXED LAND USES						
SUB-AREA LEVEL TOOLS						
1. Use of performance zoning/standards to allow mixed-use development	√	√	√			
2. Planned unit development (PUD) zoning techniques	√	√	√			√
3. Creation of neighborhood district zoning.		√	√			
4. Establishment of mixed-use targets	√	√	√			
5. Adoption of zoning codes to parallel existing conventional development codes	√	√	√	√	√	√
6. Limiting auto oriented businesses to certain locations	√	√	√			√
PARCEL-LEVEL TOOLS						
1. Density bonuses to encourage mixed-use commercial/residential buildings	√	√	√			
2. Allowing or requiring residential above commercial/retail	√	√	√			
3. Ground floor commercial/retail requirements	√	√	√			
4. Allowing home occupations in zoning codes						√
II. COMPACT DEVELOPMENT						
AREA-LEVEL TOOLS						
1. Increasing public acceptance of density						√
2. Establishment of minimum density zoning	√	√	√			
3. Minimum floor area standards for employment centers	√				√	
4. Maintaining average densities in environmentally constrained areas				√	√	√
5. Use of transitional zoning						√
6. Overlay zones along transit corridors		√				
7. Shadow zoning						√
8. Density bonuses to stimulate development in target areas	√	√	√		√	
RESIDENTIAL PARCEL-LEVEL TOOLS						
1. Lower minimum lot sizes in single family areas						√
2. Setting average lot sizes						√
3. Allowing zero lot line development and reducing required setbacks						√
4. Allowing accessory dwelling units (ADUs)						√

Table A.3: Applications of regulatory tools (continued)

REGULATORY TOOLS	URBAN CENTER	TOD	CLUSTER	RETAIL	OFFICE	RESIDENTIAL
III. CONNECTIVITY OF MOTORIZED AND NON-MOTORIZED FACILITIES						
1. Instituting street-block size maximums	√	√	√	√	√	√
2. Allowing lanes or alleys in commercial and residential	√	√	√	√	√	√
3. Allowances for future street extensions						√
4. Requiring a continuous network of streets while limiting or eliminating culs-de-sac and dead-end streets						√
5. Requiring a continuous network of pathways for pedestrians and bicyclists	√	√	√	√	√	√
IV. PARKING SUPPLY AND MANAGEMENT						
PARKING SUPPLY TOOLS						
1. Lowering minimum parking requirements	√	√	√	√	√	√
2. Setting maximum parking requirements	√	√	√			
3. In-lieu of parking fees	√	√	√			
4. Land bank provisions for future parking	√	√	√			
5. Flexible parking standards in exchange for amenities such as TDM actions.	√	√	√		√	
6. Allowing on-street parking to contribute to private parking requirements	√	√	√			
7. Allowing redevelopment of unused parking area	√	√	√			
PARKING MANAGEMENT TOOLS						
1. Requiring parking below or behind buildings	√	√	√			
2. Shared parking between different land uses or adjacent properties	√	√	√			
3. Management of on-street parking	√	√	√	√	√	√
4. Lower parking ratios for development near transit		√				
5. Rideshare parking requirements	√	√	√		√	
6. Implementing parking best practices	√	√	√	√	√	√

Table A.3: Applications of regulatory tools (continued)

REGULATORY TOOLS	URBAN CENTER	TOD	CLUSTER	RETAIL	OFFICE	RESIDENTIAL
V. PEDESTRIAN ENVIRONMENT AND SAFETY						
STREET DESIGN TOOLS						
1. Designing the travelways	√	√	√	√	√	√
2. Reducing street width standards on neighborhood streets and collectors	√	√	√	√	√	√
3. Designing intersections that balance pedestrian and auto movements	√	√	√	√	√	√
4. Road geometrics to accommodate transit on arterials		√				
5. Access management	√	√	√	√	√	
6. Use of traffic calming techniques	√	√	√	√	√	√
7. Regulations focusing on pedestrian access and crosswalk requirements	√	√	√	√	√	√
8. Regulations focusing on bicycle access	√	√	√	√	√	√
BUILT ENVIRONMENT TOOLS						
1. Building setbacks and orientation	√	√	√	√	√	√
2. Building fronts and entrances	√	√	√	√	√	√
3. Building articulation/modulation	√	√	√	√	√	√
4. Ground floor window and transparency requirements	√	√	√			
5. Weather protection requirements (awnings, transit shelters)	√	√	√			
6. Establishment of minimum local standards for pedestrian and bicycle amenities.	√	√	√			
7. Open space/plaza requirements	√	√	√	√		√
VI. AFFORDABLE HOUSING						
1. Inclusionary housing practices in zoning and comprehensive plans	√	√	√			√
2. Use of density bonuses to attract new affordable housing	√	√	√			
3. Accessory dwelling units (ADUs)	√	√	√			√
4. Adaptive reuse of buildings	√	√	√			
5. Changing parking standards to reflect the actual needs of a city or district	√	√	√			

I. MIXED LAND USES

INTRODUCTION

Mixing residential, commercial, recreational, educational, and other land uses in districts and neighborhoods creates vibrant and diverse communities. Mixed land uses are critical to achieving places in which people can live, work, and play without being dependent on SOV travel.

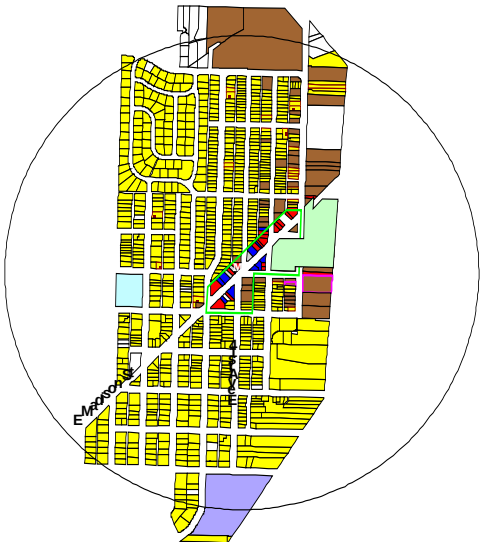
Land use mix can occur at the neighborhood or district level and at the parcel level. Traditional urban neighborhoods mix commercial and residential uses at a smaller scale than contemporary suburban neighborhoods (Figure I.1). At the parcel level, land uses can be mixed vertically or horizontally. A vertical mix of uses (Figure I.2) occurs when two or more land uses exist in a single building. These multiple-use buildings typically have retail or services on the ground floor and residential or office above. A horizontal mix of uses (Figure I.3) is where different uses are not located within the same building but are present within a certain radius (typically walking distance), site or block. Horizontal mixed use works best for large projects where neither the project nor the surrounding area can sustain the development densities that are associated with vertical mix. It also fits suburban areas where multiple-use buildings are uncommon or non-existent. Both approaches are effective in shrinking distances between activities and can help reduce the number of vehicular trips and support non-motorized travel.

Different land uses located in close proximity to each other make non-motorized modes of travel (walking, bicycling, etc.) feasible for more people in a community (Figure I.4). A mix of uses also adds variety and vitality to commercial centers, neighborhoods, or transit corridors, balancing different types of activities over the course of days and nights (Municipal Research and Services Center of Washington 1997). With mixed use, areas can function around the clock, seven days a week.

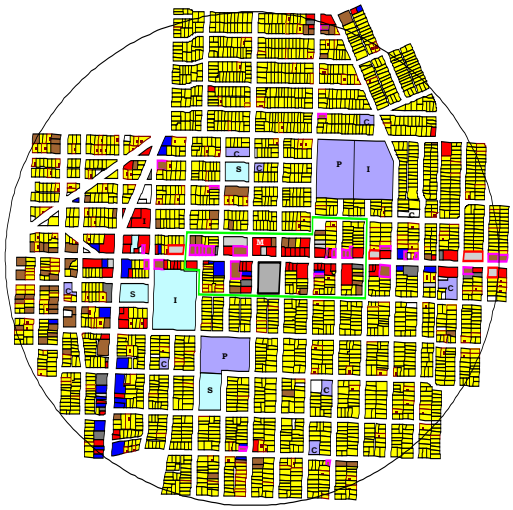
Although many cities in the Puget Sound Region have revised their zoning codes to allow mixed uses in some areas, most local zoning ordinances in the U.S. typically separate uses—specifying and permitting limited sets of compatible land uses in each zone. Historically, single-use zoning aimed to prevent functionally incompatible uses from locating in close proximity to each other—some commercial and industrial uses were much more noxious and disruptive to city residents in the early 1900s. While the separation of uses remains appropriate in some cases, the single-use districts that developed over the past 50 years means that residents in these areas must rely on automobiles just to take care of basic errands.

Mixed-use development can be successful in a variety of situations, but its application must be carefully considered. In order to serve the larger resident population, retail uses generally require only a small proportion of the total land in a neighborhood center To require more mixed-use development than the market will bear can lead to vacant storefronts, which can undermine efforts to redevelop or densify a center.

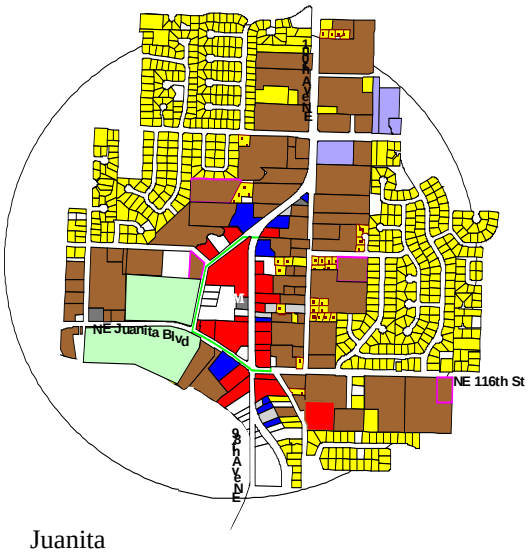
Existing neighborhood commercial centers can also be targeted for new residential development that will create a demand for services and activities. Even single-family zones can benefit from strategically placed, small-scale neighborhood/convenience commercial zones (Figure I.5).



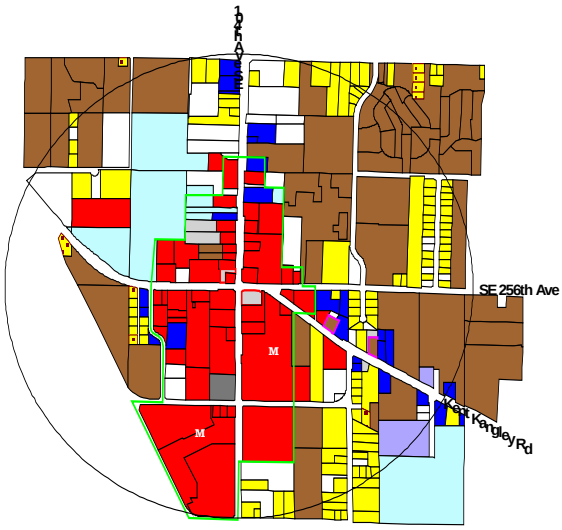
Madison Beach



Wallingford



Juanita



Kent East Hill

<u>Figure I.1</u>: Typical mixing of uses in urban and suburban neighborhoods: Different scales at which land use can be mixed in target areas (radius of circle is one-half mile). Madison Beach and Wallingford are both Seattle neighborhoods platted in the early part of the 20th century, while Juanita and Kent's East Hill were platted in the second part of the 20th century. Madison Beach and Wallingford have small commercial (red) and multifamily parcels (Brownson et al.), while Juanita and Kent East Hill have large parcels. The area zoned for commercial uses in Kent East Hill is too large to support walking.

\

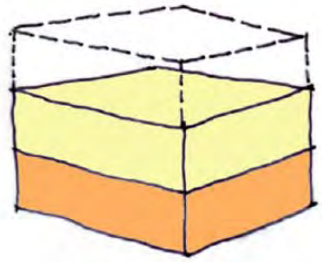


Figure I.2: Vertical mix of uses in a building or parcel (also called multiple-use building).

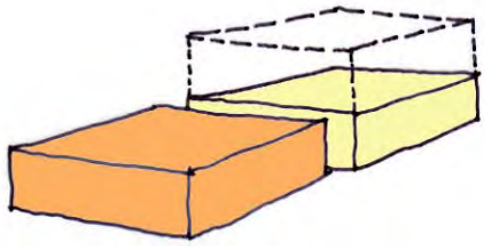


Figure I.3: Horizontal mix of uses in a parcel.

Figure I.4: Walking as a feasible travel option in mixed-use areas.

Figure I.5: Small-scale neighborhood convenience retail fits in single-family areas.

Figure I.6: Live/work on main street in Kentlands, Md.

AREA-LEVEL TOOLS AND APPLICATIONS

1. USE OF PERFORMANCE ZONING/STANDARDS TO ALLOW MIXED-USE DEVELOPMENT

Performance zoning or standards focus on directly controlling the impacts of new development on existing uses rather than regulating the uses themselves. In order to encourage a mix of uses, performance zoning seeks compatibility between land uses in terms of activities, functions, and aesthetics.

Many communities are now incorporating performance standards into their traditional zoning to allow greater mix and compatibility between uses. These performance standards spell out the desired end result, and allow flexibility in the particular means or approach for achieving the objective. A code may, for instance, require that "on-site parking should not be visible from the public street," allowing a range of alternatives (such as underground parking, landscaping, berming, or change in topography) to be used to accomplish the stated objective (Municipal Research and Services Center of Washington 1997). Several communities in other states emphasize project performance rather than land use as a basis for project approval.

Applications

The *Hardin County, Ill.*, development guidance system is an award-winning example of a flexible land-use regulation approach for a rural community. The *Breckenridge, Colo.*, permit system and *Largo, Fla.*, performance standard approaches have also gotten a lot of attention as flexible regulatory approaches (Environmental Protection Agency and International City Management Association 2001).

Envision Utah is a public/private organization that has been established to help steer the future development of Utah with what it calls its “Quality Growth Strategy.” Instead of making zoning restrictive, Envision Utah recommendations outline tools to make it flexible and responsive to market forces (Environmental Protection Agency and International City Management Association 2001).

Vancouver, Wash., has devised a so-called floating district, with district-specific regulations intended to provide the community with a mix of mutually supporting urban retail, service, office, light industrial, and residential uses. This district promotes coordinated, cohesive site planning and design, which encourages mixed or multiple use, dense developments, and pedestrian and bicycle facilities to promote efficient travel and the use of transit. Special design and parking requirements ensure pedestrian and transit-oriented development (Municipal Research and Services Center of Washington 1997).

2. PLANNED UNIT DEVELOPMENT ZONING TECHNIQUES

Planned unit development zoning (PUD) can help create pedestrian friendly, mixed-use communities if it is accompanied by complementary design guidelines. PUD zoning has been used as interim zoning, allowing planners to control the nature and location of new, often large, developments. It can also serve as a short-term stopgap measure while a master plan or zoning standards are being revised to include mixed-use districts.

Applications

Kentlands, Md., (Figure I.6) is a traditional neighborhood development that was first built using a PUD ordinance. The success of this community, as well as that of others, has made it easier over time to adopt more far-reaching policies to support growth management and pedestrian-friendly development.

San Diego, Calif., established an urban village overlay zone that encourages mixed-use development. This overlay zone is responsible in part for creating a pedestrian-oriented, mixed-use development in the Hillcrest neighborhood, which combines shopping, offices, restaurants, and homes (Environmental Protection Agency and International City Management Association 2001).

3. CREATION OF NEIGHBORHOOD DISTRICT ZONING

Some cities have experimented with creating new zones to carry out specific land-use objectives without modifying their basic zoning code. New zones may apply to downtown areas, main street districts, neighborhood centers, or community commercial centers. This approach can be beneficial in jurisdictions where existing land-use codes are significantly different from what is desired, making mere revision of existing zoning difficult. On the other hand, creating new zones can add complexity to a land-use code, making the code difficult for the developer, the community, and the planner to use (Puget Sound Regional Council 1999).

Application

Orenco Station is a pedestrian-oriented, mixed-use community in Hillsborough, Ore. Two years of discussions, design studies, and negotiations with city, state, and transit officials culminated in a new zone customized for Orenco Station, which was dubbed a "station community residential village," or SCRV (Urban Land Institute 2001). The new zone established design guidance to allow for a heterogeneous, urban mix of housing types and land uses not typically found in the suburbs (figures I.7 – I.11).

Model Code Application

Portland, Ore.
"The Neighborhood Commercial 1 (CN1) zone is intended for small sites in or near dense residential neighborhoods. The zone encourages the provision of small-scale retail and service uses for nearby residential areas. Some uses, which are not retail or service in nature, are also allowed so a variety of uses may locate in existing buildings. Uses are restricted in size to promote a local orientation and to limit adverse impacts on nearby residential areas. Development is intended to be pedestrian-oriented and compatible with the scale of surrounding residential areas. Parking areas are restricted, since their appearance is generally out of character with the surrounding residential development and the desired orientation of the uses" (Municipal Research and Services Center of Washington 1997).

Figure I.7: **Mixing of land uses at Orenco Station**

Figure I.8: **Residential over ground floor retail**

Figure I.9: **Orenco Station live/work units**

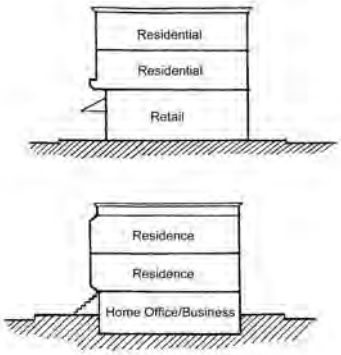


Figure I.10: **Vertical mixed use at Orenco Station**

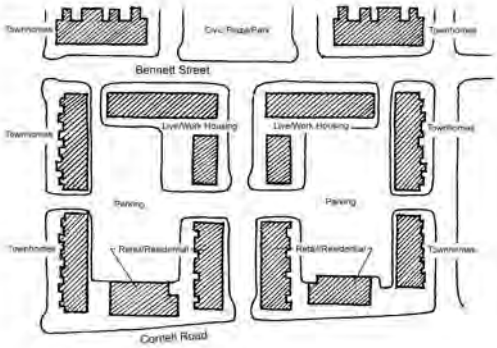


Figure I.11: **Horizontal mixed use**

4. ESTABLISHMENT OF MIXED-USE TARGETS

According to a study by the City of Seattle, mixed-use projects are more likely to succeed where commercial uses are clustered in compact areas surrounded by reasonably dense residential areas (Figure I.13) (Puget Sound Regional Council 1999). To help create specific mixes of activities, jurisdictions can establish targets for amounts and types of development to take place in designated areas. Research shows that the different land uses in a mixed-use community typically fall within the following ranges:

- Public uses (including park space and civic uses) – 5 to 15 percent of total land area
- Commercial retail space – 10 to 50 percent of total land area
- Residential development – 30 to 80 percent of total land area
- Employment – 20 to 60 percent of total land area

This approach requires regular monitoring of actual development and adjustments to zoning if targets are not met within the planned time frame. Targets should be locally applied on the basis of land-use goals specific to the planning area. Unless the targets are implemented carefully, large blocks of single-use areas can still occur, with limited access provided to nearby residents, employees, or shoppers. Mixing uses in designated areas is not an exact science, and meeting the goals listed above does not guarantee a practical mix of uses.

5. ADOPTION OF ZONING CODES TO PARALLEL EXISTING CONVENTIONAL DEVELOPMENT CODES

Changing existing zoning codes so that they can facilitate mixed-use development can be a time-consuming and politically difficult process. However, local governments can permit and encourage mixed-use development by creating codes that parallel existing codes. In this situation, the option to use conventional codes remains, but the parallel codes make it legal to develop innovative projects, such as those that accommodate mixed-use development or treat parking differently than allowed in a city zoning code. This approach gives developers an opportunity to build mixed-use projects without having to endure the long approval process associated with variances and rezone applications.

Application

Fort Myers Beach, Fla., adopted an optional smart growth code in parallel to its conventional existing code. This smart growth code allows buildings to be constructed without setbacks and eliminates some of the open space requirements in order to permit more compact construction. This parallel code approach was written in such a way as to allow a quick comparison of the “old” and “optional” codes, and has been highly successful. Although some viewed this format as awkward and lengthy, it has served its purpose by convincing landowners that the optional smart growth code is in their best interests (Environmental Protection Agency and International City Management Association 2001).

6. LIMITING AUTO-ORIENTED BUSINESSES TO CERTAIN LOCATIONS

Because of their low intensity of development and reliance on automobile access, some land-use types are inappropriate in areas targeted for increased transit use, bicycling, and walking. Uses such as fast food restaurants, car washes, banks, and auto sales or repair businesses are generally incompatible with mixed-use zones.

Applications

In *Redmond, Wash.*, auto-oriented uses are only allowed in specific subareas of the city's downtown (two out of six downtown zones) (WSDOT, 2002 #506).

In the Northgate neighborhood of *Seattle, Wash.*, auto-oriented uses are allowed in commercial office and retail zones, but not along designated "major pedestrian streets" (WSDOT, 2002 #506).

PARCEL-LEVEL TOOLS AND APPLICATIONS

1. DENSITY BONUSES TO ENCOURAGE MIXED-USE COMMERCIAL/ RESIDENTIAL BUILDINGS

Density bonuses in target areas can serve as incentives to encourage mixed use or any other type of development a neighborhood needs. Ideally, density bonuses give these target areas a competitive edge over non-targeted areas. At the same time, they should not result in projects that are out of scale and character with the existing environment. Density bonuses often come in exchange for certain benefits or amenities to ensure that new development makes a net positive contribution to the neighborhood, and they are a common tool for encouraging housing in downtown areas.

Applications

The City of *Bellevue, Wash.*, uses a FAR (floor to site area ratio) incentive system to implement transportation-efficient development in its downtown. The city gives bonuses for downtown developments that combine residential with commercial uses, including façade treatments, the provision of underground parking, and TDM actions. The success of this incentive system has been attributed to the generous density bonuses provided (WSDOT 2002).

Cities such as *Seattle, Wash.*, and *Washington, D.C.*, encourage developers to add residential uses in otherwise commercial zones by giving density bonuses. In *Orlando, Fla.*, the downtown code allows increases in the floor area of projects that include more than one use, with density bonuses increasing with each additional type of use. In *Portland, Ore.*, the downtown ordinance permits developers to triple the maximum allowable floor area of a project that has residential uses.

2. ALLOWING OR REQUIRING RESIDENTIAL ABOVE COMMERCIAL/RETAIL

Allowing or requiring mixed-use buildings in targeted areas provides a ready market for non-motorized travel. Also, incorporating residential development in mixed-use commercial and retail projects can add new housing types to an area, contributing to the diversity of a community (figures I.12 to I.14). Bringing residents into an area helps support local commercial establishments while the retail or services in a mixed-use development adds to the vitality in an existing neighborhood.

Model Code Application

Dupont, Wash. (This approach has been applied in a mixed-use zone)
"Where business and residential portions of the building are located on different floors, business/commercial uses shall occupy the floors below the residential uses to preserve a residential atmosphere for the residents above" (Metro Regional Services 1997).

3. GROUND FLOOR COMMERCIAL/ RETAIL REQUIREMENTS

A number of communities encourage or require retail uses on the ground floor of residential or office buildings (figures I.15 an I.16). This may include requiring a portion or all of a parcel's street-fronting ground floor to house commercial uses. The vertical mixing of uses is typically accepted and successful in dense commercial areas with high pedestrian activity. Such areas, however, must be limited in size to what the market can support, as noted in the applications below.

Applications

San Jose, Calif.
As office space was taking over street-level uses in the downtown area, the city implemented a ground floor retail ordinance, which affects approximately 17 acres of downtown. This ordinance paved the way for a new, three-million-square-foot mixed-use project that is hoped to "bring a critical mass of retail in the downtown" to help office workers walk to and from their lunch time errands, and to extend downtown activities at night and on weekends (Levy 2001).

Seattle, Wash.
The amount of ground floor commercial or retail zoned in a given area needs to be to be balanced with market forces. In the early 1990s, the City of Seattle experienced over-saturation of ground-floor commercial or office uses in mixed-use developments as the result of an "umbrella" zoning requirement to include ground-floor retail or commercial uses in new multi-family developments. The city subsequently reduced the size of areas where mixed uses were mandated.

Other communities addressed the over-saturated market issue by working some flexibility into their codes. Often the retail requirement is waived once the area has reached market needs. In these cases, however, ground floor uses still must espouse an "open, people-feel" in harmony with existing mixed-use types (Thomas and Potter 1993).

Figure I.12: Residential uses over retail

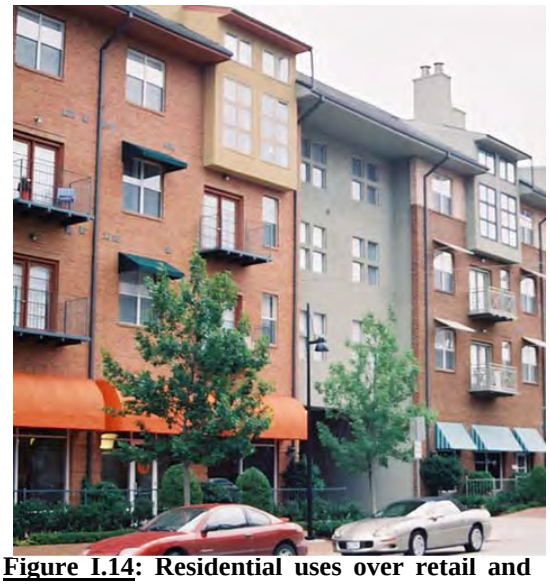


Figure I.14: Residential uses over retail and office

Figure I.15: Office over retail

Figure I.13: Residential uses over retail

Figure I.16: Ground floor retail in compact residential area

Model Code Applications

Vancouver, Wash. (This approach was applied in a mixed-use zone)
"Different uses, either within a single building or on a development site, must be provided. Residential uses must be provided, but are not permitted on the ground floor of mixed-use structures. In the Downtown activity center, commercial uses must be provided on the ground floor" (Metro Regional Services 1997).

4. ALLOWING HOME OCCUPATIONS IN ZONING CODES

Most residentially zoned areas traditionally prohibit businesses to be run out of a home. The intent is to retain the residential nature of the area by maintaining low traffic volumes, keeping noise down, and strangers out. However, with changes in family structure, household composition, and the advent of computer-based businesses and telecommuting, these factors may no longer be priorities in new and existing communities (Weiss 1993).

Applications

Portland, Ore.
In 1991, the Portland planning department rezoned a part of the city as a mixed commercial/residential zone, which allows "business-based homes." Following the zone change, a new urban infill development sited between an existing warehouse and a single-family home consists of "ten new self-contained, individually owned, mixed-use buildings, each with a 2,200-square-foot commercial base topped by a 2,200-square-foot townhouse" (Macht, 2000).

Montgomery County, Md.
The county set up four categories of "home occupations" based on their anticipated impact on the surrounding community: no impact, registered, major, and home health practitioner. These categories entail an ascending degree of government involvement in regulating the conduct of the business (Weiss 1993).

RESEARCH HIGHLIGHTS

- In 1998, a *Los Angeles Times* survey of homeowners in southern California's Orange County reported that three out of four respondents prioritized living in a walkable community where people stroll to restaurants, shops, parks, and public destinations (Lassar 1999).

- People who work in walkable mixed-use developments are more likely to take transit or to carpool to work because they can walk to lunch and to the stores and services they need every day (Cambridge Systematics 1994). A study of Seattle and Eastside neighborhoods showed that the number of pedestrian trips was ten times higher in environments characterized by medium density, mixed-use, small blocks, and continuous sidewalks than in King County as a whole (Rutherford 1995).

- According to a report published in the *New Urban News*, every dollar invested in transit-supportive land-use developments corresponds to $1,400 still invested in conventional suburban development (Puget Sound Regional Council 2000).

Table I.1: Studies testing the relationships between mixed-use variables and travel

Research Project	Area of Analysis	Significant Relationships
(Cervero 1989)	Suburban employment centers (National comparison)	Walk/bike and transit shares are greater where retail uses complement office uses
(Cambridge Systematics 1994)	¼ mile radius around work sites in Los Angeles area	Transit share is greater with substantial land-use mixing or convenience services nearby. Walk/bike share is greater where substantial land-use mixing or convenience services nearby.
(Cervero 1991)	Six U.S. Metropolitan areas	Transit share is greater in mixed-use and multi-story buildings. Average vehicle occupancy is higher in mixed use buildings
(Cervero 1996)	Eleven U.S. Metropolitan areas	Use of transit and walk/bike is more likely where commercial uses are nearby. Work trips are shorter where commercial uses are nearby. For short trips, mixed uses induce walk/bike commuting as much as high-rise development
(Cervero and Kockelman 1997)	San Francisco Bay Area, CA	VMT for nonwork trips is lower where intensity factor or amount of vertical mixing is greater.
(Loutzenheiser 1997)	San Francisco Bay Area, CA	Walking to a transit station is more likely where retail uses predominate around transit stations

Source: (Ewing and Cervero 2002a; Ewing and Cervero 2002b)

SUGGESTED RESOURCES

Cambridge Systematics. (1994). "The Effects of Land Use and Travel Demand Management Strategies on Commuting Behavior." Environmental Protection Agency and US Department of Transportation, Washington, D C.

Ewing, R. (1995). *Best Development Practices: Doing the Right Thing and Making Money at the Same Time.* Tallahassee, FL, Dept. of Community Affairs.

OTAK Associates (2001). *Commercial and Mixed Use Development Handbook.* Portland, Oregon, Transportation and Growth Management Program.

Planning Advisory Service (1997). Creating Transit Supportive Regulations Report No. 468. Chicago, IL, American Planning Association.

Puget Sound Regional Council (1999). *Creating Transit Station Communities in the Central Puget Sound Region*. Seattle, WA: PSRC

Puget Sound Regional Council. Transit Oriented Development. www.todcommunities.com

Smart Growth Network and International City Management Association (2001). Getting to Smart Growth: 100 Policies for Implementation. http://www.smartgrowth.org/pdf/gettosg.pdf

WORKS CITED

Brownson, R. C., Housemann, R. A., Brown, D. R., Jackson-Thompson, J., King, A. C., Malone, B. R., and Sallis, J. F. (2000). "Promoting physical activity in rural communities: walking trail access, use and effects." *American Journal of Preventative Medicine*, 18(3), 235-241.

Cambridge Systematics. (1994). "The Effects of Land Use and Travel Demand Strategies on Commuting Behavior."

Cervero, R. (1989). *America's Suburban Centers - The Land Use-Transportation Link*, Unwin Hyman, Boston, Mass.

Cervero, R. (1991). "Land Use and Travel at Suburban Activity Centers." *Transportation Quarterly*, 45, 479-491.

Cervero, R. (1996). "Mixed Land Uses and Commuting: Evidence from the American Housing Survey." *Transportation Research A*, 30, 361-377.

Cervero, R., and Kockelman, K. (1997). "Travel Demand and the 3Ds: Density, Diversity, and Design." *Transportation Research D*, 2, 199-219.

Environmental Protection Agency, and International City Management Association. (2001). "Getting to Smart Growth: 100 Policies for Implementation."

Ewing, R. R., and Cervero, R. (2002a). "Travel and the Built Environment - A Synthesis." *Transportation Research Record*(1780), 87-114.

Ewing, R. R., and Cervero, R. (2002b). "Travel and the Built Environment: A synthesis." *Transportation Research Record*(1780), 87-114.

Lassar, T. J. (1999). "Hitting the Streets." *Urban Land*(July), p. 32-37.

Levy, P. R. (2001). "Making Downtown Competitive." *Planning*, April, 16-19.

Loutzenheiser, D. R. (1997). "Pedestrian Access to Transit: Model of Walk Trips and Their Design and Urban Form Determinants Around Bay Area Rapid Transit Stations." *Transportation Research Record*, 1604, 40-49.

Metro Regional Services. (1997). "Creating Livable Streets." METRO Regional Services, Portland,OR.

Municipal Research & Services Center of Washington. (1997). "Infill Development Strategies for Shaping Livable Neighborhoods." *38*, Municipal Research and Services Center, Seattle, WA.

Puget Sound Regional Council. (1999). "Creating Transit Station Communities in the Central Puget Sound Region: A Transit-Oriented Development Workbook." Puget Sound Regional Council, Seattle.

Puget Sound Regional Council. (2000). "Compilation of Papers on Tax Increment Financing written by PSRC staff."

Rutherford, G. S., J.M. Ishimaru, and E.D. McCormack. (1995). "The Transportation Impacts of Mixed Land-Use Neighborhoods." Washington State Transportation Commission, Seattle, WA.

Thomas and Potter. (1993). "Mixed use development standard study prepared for the City of Seattle." Department of Construction and Land Use, Department of Neighborhoods, City of Seattle.

Urban Land Institute. (2001). "Urban Infill Housing: Myth and Fact." Urban Land Institute, Washington, D.C.

Weiss, B. (1993). "Restricting Home-Based Businesses." *Planning Commissioner's Journal*, Fall, 12-15.

WSDOT. (2002). "Implementing Transportation-Efficient Development: A Local Interview, Phase I of Integrating Land Use and Transportation Investment Decision-Making." WSDOT.

II. COMPACT DEVELOPMENT

INTRODUCTION

In addition to using land more efficiently and effectively supporting the use of alternative transportation modes, higher density housing types support a wider variety of lifestyles and incomes than conventional detached single-family dwellings. By responding to changing household characteristics, higher density housing options allow members of a community to remain in that community throughout their lifetime (for instance, as a young adult, a single parent, or a retiree). A concentration of residential or office development also provides a market for nearby services—thus potentially fostering mixed-use communities and further encouraging efficient travel behavior.

Development density levels in many of the urbanized areas of the United States are increasing in response to growing concerns about sprawl and inefficient use of public and private resources in metropolitan areas (Fader 2000; Grogan 1999; Pendall 2000). Well designed higher density housing is being built to fit into existing districts or neighborhoods. Local jurisdictions often give density bonuses in exchange for certain benefits or amenities to ensure that new compact development makes a positive contribution to existing urban and suburban development.

Still, conventional residential development often continues to occur at densities lower than those called for in comprehensive plans, primarily because zoning regulations are not consistent with the plan goals. They may not accommodate sufficient densities in multifamily or mixed-use areas, or may require minimum lot size requirements that limit the extent of compact development. Frequently zoning codes specify a maximum density, rather than a minimum density or an acceptable density range. Zoning in metropolitan fringe areas may fail to account for the expenses involved in extending urban services to outlying development, resulting in artificially low development costs for developers but increased public costs over time as a city or county is left to cope with the costs of extending water, sewer, and transportation infrastructure. Also, residents may oppose infill development needed to meet planned densities, further encouraging developers to build at less than planned densities. Multi-family housing can be perceived as unattractive, incompatible with lower densities, and lacking amenities (Municipal Research and Services Center of Washington 1995).

Further issues arise with compact residential or employment developments that are isolated from their surroundings and/or dispersed throughout a metropolitan area. Compact building complexes surrounded by large expanses of low-density development, vacant lands, or open space can be transportation-efficient internally, but can continue to support automobile travel to other locations.

Compactness needs to be considered at the area level and at the site-specific level (figures II.1 and II.2). Area-level compactness yields a critical mass of development that supports various types of transit and encourages non-motorized travel. However, fostering compact residential development goes hand in hand with mitigating the potential visual impacts of compact development, which can be achieved by controlling design at the site level (Figure II.3). Compactness is also closely related with parking requirements and associated costs, as reviewed in Chapter 4.

Figure II.1: Considering compactness at the area level. The Courthouse area in Arlington County, Va., introduced high-density commercial and residential along Metro Rail Corridor previously occupied by strip commerical development, preserving existing single-family areas along the strip.

Figure II.2: Considering density at the site level. Combining mixed-use development of different densities in the Courthouse area in Arlington County, Va.

Figure II.3: Courthouse area in Arlington County, Va. Row houses help make transition between high-rise apartments and single-family area

AREA-LEVEL TOOLS AND APPLICATIONS

1. INCREASING PUBLIC ACCEPTANCE OF DENSITY

The challenge for Washington communities is to fit compact development into the existing fabric of established neighborhoods. Design strategies that blend into existing neighborhood features can facilitate public acceptance of compact development. In Arlington County, Va., 1960s strip commercial development along the Metro Rail line was gradually replaced by high-density commercial and residential development, strategically focused around the rail stations (figures II.1 and II.2) (Porter 1996). Older single-family areas located behind the strip remained largely untouched. The impact of higher density was further mitigated by gradually decreasing the height of buildings from the station nodes to the single-family areas (Figure II.3).

Vancouver, B.C.'s, studies of neighborhood acceptance of density showed that factors other than design may be important. Family housing will be favored, as will housing that includes community amenities, such as a park or a school (City of Vancouver Planning Department 1999). Owner-occupied units are also preferred. Careful location may be another key to accepting higher density infill housing. New development that replaces poorly maintained or nonconforming uses or improves existing heterogeneous areas near transportation, shopping, and other services can meet with greater community acceptance.

2. ESTABLISHMENT OF MINIMUM DENSITY ZONING

Traditional zoning codes focus on maximum density thresholds, which development may or may not meet—frequently undermining plans for compact activity centers. On the other hand, minimum density thresholds require development to be at or near planned densities. By ensuring that development occurs at densities consistent with comprehensive plans, minimum density standards help achieve growth targets or urban form and growth management objectives. A similar (and in most cases, probably more realistic) strategy is the establishment of a density range, which sets both minimum and maximum density thresholds

Requiring minimum densities in areas targeted for future growth might slow development in the short run as market adjustments take place. Density requirements and thresholds should reflect densities that the local market can support. Other options could include requiring minimum densities only in designated areas, or to suggest higher densities through regulatory incentives, such as reduced parking requirements (Puget Sound Regional Council 1999).

Application areas include single-family and multi-family residential zones, employment areas, neighborhood centers, and mixed-use centers.

Applications

Portland, Ore., revised its zoning code in 1991 to apply minimum densities in single-family and multi-family zones to meet its comprehensive plan policies. Minimum density zoning was found particularly useful in residential areas dominated by single-family, detached residential development.

Portland's experience showed that minimum density requirements can be written in a variety of ways and tailored to different zoning designations. For example, zoning

can target an average density for an entire development or neighborhood. In this case, lot sizes may vary with some large lots if they are balanced by a number of smaller lots. Maximum lot area standards may be applied to single-family areas. While, for instance, a typical single-family residential zone calls for lots to be at least 5,000 square feet, a minimum density zoning provision will set a maximum lot area of 7,000 square feet.

For multi-family zones or planned-unit developments, minimum density requirements will set minimum numbers of dwelling units per acre. The zone might call for a maximum of 20 units per acre with a minimum of 12 units per acre. Using incentives for developers, communities can set forth a range of both minimum and maximum densities to ensure that residential development occurs at the target level (Oregon TGM 2000).

3. Minimum Floor Area Standards for Employment Centers

Compact development needs to support transit and non-motorized travel at both the home and the work end of the trip. Minimum floor area ratios (FAR, the total area of building divided by the site area) and allowable lot coverage standards are common tools used to control development density in employment zone. An FAR of 0.4 typically requires multistory buildings in order to accommodate parking at ground. The maximum allowable lot coverage in an activity center or downtown can be 100 percent if open space is available in public plazas or parks. Lot coverage standards should be reviewed on the basis of local character and community priorities (OTAK Associates 2001).

4. Maintaining Average Densities in Environmentally Constrained Areas

Areas may fall short of density goals as other regulations, which overlay those of the zoning district, eat away at permitted densities. In particular, area density can be reduced after environmentally constrained lands are subtracted from the total land area used for calculating allowed density. To address this issue, some communities have developed a sliding scale approach, which allows a decreasing portion of the density to be transferred to other sites in the area of concern as the percentage of constrained area increases. (This strategy also applies to a transition zone between two residential zones—e.g., between single-family and multi-family zones, or between low-density and medium/high density multi-family zones—see subsection 5 below) (Municipal Research and Services Center of Washington 1995)

5. Use of Transitional Zoning

Transition zones are used to reduce the functional conflicts and visual contrast between high- and low-density zones or commercial and residential zones. Special treatment of the boundaries between these zones helps integrate them both functionally and aesthetically. Transition zones can allow a mix of building types found in the “base” zones on either side of the boundary, within one or more blocks of the boundary (figures II.2 to II.4). In cases of boundaries between different land uses, most jurisdictions require reduced development intensity on the commercial side of the zone boundary. Portland, Ore., allowed the reverse—increased densities on the residential side of the zoning boundary.

Applications

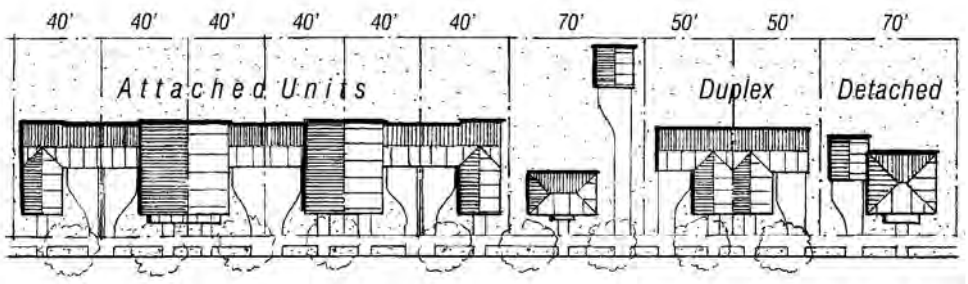
A 15-unit multi-family house development in *Vancouver, B.C.*, is located on a 100-foot wide by 125-foot-deep corner lot (figures II.5 and II.6). The site is in a transition zone between mixed commercial and residential development. The project is notable for the way it bridges the high and low-density forms while maintaining the appearance of a single-family development. The development is split into two separate buildings, taking advantage of the corner site. A steeply scaled roof form minimizes the apparent bulk of the buildings, contributing to a single-family appearance. The design also disguises the fact that the units are built on top of a parking garage. (City of Vancouver Planning Department 1999)

Zoning for Transitional Sites—These standards allow for a transition of development intensities between nonresidential and single-family zones. A gradual, stepped increase in density is allowed for single-family zoned lots that are adjacent to commercial, employment, or industrial zones. The transition site provisions encourage increased density on the residential side of the zoning boundary and hence seek to accommodate additional housing development with minimal impacts on the built-up, single-dwelling neighborhoods (City of Portland Planning and Zoning Code Ch. 33.110).

1. Qualifying situations. The side lot line of the residential lot must abut the lot in a nonresidential zone for more than 50 percent of the residential length. If the lot accommodates an attached housing project, the extra unit allowed by this subsection applies to the attached housing project (i.e., apartments, townhouses), rather than just to the lot adjacent to the nonresidential zone.
2. Density. The lot or attached housing project may have one dwelling unit more than is allowed by the base zone.
3. Lot size. Lots must comply with lot size standards for new lots in the base zone except for lots in attached housing projects, which may be reduced to accommodate the extra dwelling unit.
4. Housing types allowed. The lot may contain a duplex or be divided for attached houses. If the development is in the form of attached housing, the site development regulations for attached houses apply.
5. Lot coverage. For attached housing projects, the general lot coverage standard of a base zone applies to the entire project, rather than to each individual lot.

Tacoma's Special Development Permit Criteria for Permitting Higher Density—Tacoma, Wash., will consider special development permits for two- or three-family units where special circumstances make development or continuation of single-family development difficult. Tacoma's code specifies some criteria to ensure compatibility with surrounding development. Tacoma's hearing examiner uses the following criteria to consider whether additional units are appropriate:

1. Location on an arterial street
2. Location in close proximity to a more intensive zoning district
3. Unusually large lot size for a one-family dwelling



<u>Figure II.4</u> Increase average densities while respecting existing fabric of residential neighborhoods.

<u>Figure II.5</u> Townhouse in Vancouver, B.C., with steeply scaled roof form minimizes the apparent bulk of the buildings, and contributes to a single-family appearance.

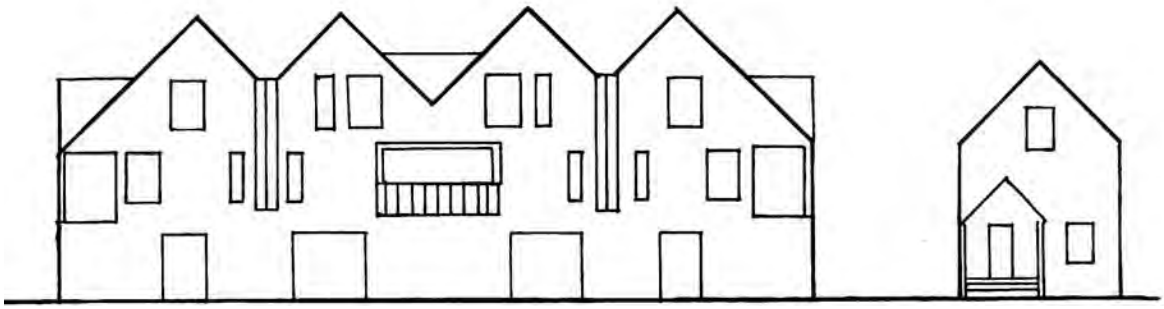


Figure II.6 Townhouse in Vancouver, B.C., in transition zone between mixed commercial and residential development

4. The presence of unusual natural site characteristics, such as steep topography or unstable soil conditions
5. The existence on the site of a one-family dwelling of more than 2,400 square feet in the case of an application for conversion to a two-family dwelling, or 3,200 square feet in the case of a conversion to a three-family dwelling.

Zoning for Duplexes on a Corner Lot—Portland, Ore., has successfully used a number of approaches for subtle increases in density without requiring formal development reviews. For instance, the city permits duplexes on corner lots with unit entrances facing different streets, resulting in a development with a single-family appearance. Duplexes and attached houses on corner lots can be designed so each unit is oriented towards a different street. This gives the structure the overall appearance of a house when viewed from either side of the street (City of Portland Planning and Zoning Code Ch. 33.110). The following code language is used to permit corner lot duplexes:

1. Qualifying situations. This provision applies to new development in the corner lots of certain residential zones (R20 through R25 zones). Conversion of existing housing is prohibited under the regulations of this subsection.
2. Density and lot size. One extra dwelling unit is allowed on corner lots. For duplexes, the lot must comply with the minimum lot size standard for new lots in the base zone. For attached houses, the original lot (before the division for the project) must comply with the minimum lot size standard for new lots in the base zone.
3. Additional site development standards. Each unit of the duplex or attached house must have its address, front door, driveway, and parking area or garage oriented to a separate street frontage.

6. OVERLAY ZONES ALONG TRANSIT CORRIDORS

Transit "overlay zones" require special land-use and building design standards in targeted areas. In these zones, required densities may be higher within a certain distance of a fixed-route transit stop or station. With supportive land-use policies, development along transit lines can create and support higher population and employment densities.

Model Code Applications

*Eugene, O*re.
"The Transit Oriented Development (TOD) Overlay Subdistrict is intended to promote the creation and retention of mixed land uses in areas with high potential for enhanced transit and pedestrian activity. Pedestrian circulation and transit are especially important and have increased emphasis in this subdistrict."

"The development standards for this district provide for intensification of development. The standards are designed to encourage compact urban growth, opportunities for increased choice of transportation mode, reduced reliance on the automobile, and a safe and pleasant pedestrian environment by insuring an attractive streetscape, a functional mix of complementary uses, and provision of amenities to

support the use of transit, bicycles, and pedestrian facilities" (Lennertz Coyle and Associates 1997).

Arlington County, Va., established a number of special corridor redevelopment districts and associated corridor overlay zones around major transit centers for the purposes of creating a transit-supportive development pattern (figures II.1 to II.2). One particular district, the "C-O Rosslyn Commercial Office Building, Retail, Hotel and Multiple-Family Dwelling District" is profiled as a model tool (1) to create premier office and retail space at 3.8 FAR, hotel and residential development at 4.8 FAR, meeting the goals and policies of Arlington County; and (2) to implement urban design, streetscape and open space plans and policies and to achieve superior architecture and the best in urban design practice. Height limits of development in the district are 35 feet; except for office, retail and service commercial buildings, which may be a maximum of 153 feet, and hotel and multiple-family dwellings, which may be a maximum of 180 feet, if approved by site plan. Transportation Demand Management plans must be approved as part of any site plan approval unless the county board determines otherwise (Mid-America Regional Council [MARC] 2001)

7. SHADOW ZONING

Shadow zoning is a regulatory mechanism used in areas where development is limited but significant growth is anticipated. It is useful in so-called "joint planning areas," or unincorporated areas that may eventually be annexed by adjacent incorporated jurisdictions. Regulations controlling development in these areas seek to allow for future densification. Buildings and infrastructure are sited and designed to promote the incremental accommodation of compact development.

8. DENSITY BONUSES TO STIMULATE DEVELOPMENT IN TARGET AREAS

Density bonuses are increases in development capacity that are permitted in exchange for special amenities. Density bonuses can encourage development that contributes to neighborhood needs and can promote infill development in target growth areas. As noted in the section on Mixed Use Development, density bonuses are often given in exchange for amenities to ensure that new development makes a net positive contribution to the neighborhood.

Model Code Applications

Clark County, Wash.
"[The county] provides for special infill incentive densities in urban single family zones to maximize utilization of public facilities and services. Within each of the zones, a 20 to 25 percent minimum lot size reduction is offered. For instance, a 4,500 square foot lot is allowed where the base density is normally 6,000 square feet. Infill development must be less than two and a half acres, all public services must be available, the housing type must be the same as on adjacent lots, urban development must exist on at least two sides and the plat must be designed to protect privacy and character of adjacent property."

Woodinville and *King County, Wash.*, offer a residential density incentive (RDI) for residential development in urban residential zones and in several commercial zones. Density of up to 150 percent of the base zone density is possible in exchange for providing benefits related to community goals. Up to 200 percent density bonus is possible if 100 percent of the residential units are affordable. Also, a 10 percent increase above the base is offered for development located within one-quarter mile of routes with at least a half-hourly transit service during peak and non-peak daytime hours. The City of Woodinville allows 1.5 bonus units for every unit of permanent low-income (non-elderly) rental housing (up to a maximum of 30 for each five acres) and offers bonus units for a number of other specified amenities (Woodinville Municipal Code Ch. 21.34). (Municipal Research and Services Center of Washington 1997)

Bellevue, Wash., FAR Bonus System Downtown—Bellevue uses a "carrot and stick" approach to improving the pedestrian environment in the downtown zone. The carrot is an "amenity incentive program" in which the zoning code outlines how developers can earn a square footage or height bonus by providing specific pedestrian amenities. These amenities include an arcade, public plaza, fountain, sculpture, or pedestrian-oriented street frontage. The stick is the requirement for a minimum level of amenity (Jack Faucett Associates 2000).

RESIDENTIAL PARCEL-LEVEL TOOLS AND APPLICATIONS

This section includes regulatory tools that address the site-specific characteristics for development, such as lowering minimum lot size standards or setting average lot size in single-family residential areas. Changing setback requirements and allowing accessory units also help increase density in areas that do not have suitable sites for higher density development.

1. LOWER MINIMUM LOT SIZES IN SINGLE FAMILY AREAS

The design and layout of parcels in a new development can have a substantial effect on density levels. Small lots and flexible requirements for housing design help to encourage denser development. Changing the orientation of houses so that the house's shortest side fronts the street uses land more efficiently, achieving densities of 7 to 10 dwellings per acre (Burden and Wallwork 2000).

Densities of eight8 or more units per acre are preferred to support bus service. Generally, an area developed with 4,000- to 5,000-square foot lots can support regular transit service (Municipal Research and Services Center of Washington 1995)—designs that can be achieved through clustered or small lot single-family homes and zero-lot line or row housing (Zydofsky 2000). Two-story townhouses and single-family homes with accessory units can achieve densities of 12 to 20 units per acre, while attractive 3- to 4-story buildings with flats above parking have been built at densities of 30 to 70 units per acre (Zydofsky 2000).

2. SETTING AVERAGE LOT SIZES

Most codes specify exact minimum lot areas and even define minimum lot width and depth to establish the character of a single-family neighborhood. Yet the ability to vary lot dimensions gives developers and builders the flexibility necessary to provide various housing types and to

address market demand. It also allows developers to build according to site conditions and to mix single- and multi-family units. Subdivision and zoning codes should seek to balance design flexibility and neighborhood compatibility by establishing limits on the range of possibilities.

Model Code Application

Fort Collins, Colo., requires an overall minimum average density of 12 dwelling units per acre of residential land. It even goes so far as to require multiple housing types and varied lot sizes and dimensions to add diversity within new developments (Lennertz Coyle and Associates 1997)

The city's Land Use Code applies the following standards to its Medium Density Mixed-Use Neighborhood District (Division 4.5, zones M-M-N):
"Mix of Housing Types. A complete range of the permitted housing types is encouraged in a neighborhood and within any individual development plan, to the extent reasonably feasible, depending on the size of the parcel. The following minimum standards are intended to promote such variety:
(a) A minimum of two (2) housing types shall be required on any development parcel sixteen (16) acres or larger, including parcels part of a phased development. A minimum of three (3) housing types shall be required on any development parcels thirty (30) acres or larger.
(b) Lot sizes and dimensions shall be varied for different housing types to avoid monotonous streetscapes. For example, larger housing types on larger lots are encouraged on corners. Smaller lots are encouraged adjacent to common open spaces.
(c) The following list of housing types shall be used to satisfy this requirement:
- Small lot single-family detached dwellings on lots containing less than six thousand (6,000) square feet.
- Two-family dwellings.
- Single-family attached dwellings.
- Mixed-use dwelling units.
- Group homes.
- Multifamily dwellings."

(City of Fort Collins Land Use Code)

3. ALLOWING ZERO LOT LINE DEVELOPMENT AND REDUCING REQUIRED SETBACKS

Setback requirements, particularly side setback requirements, can be relaxed to allow attached housing types, providing a range of choices of housing types and compactness (figures II.7 and II.8). A local jurisdiction can establish setback requirements that are proportional to lot size and proposed building types (Oregon TGM 2000).

There are numerous examples of zero-lot-line residential developments that have performed well in the real estate market, including

- Villa D'Este at Sweetwater in Longwood, Fla.
- Casa Del Cielo in Scottsdale, Ariz.
- Deerfield Knoll in Chester County, Pa.
- Oakbridge in Lakeland, Fla.
- Palmer Ranch in Sarasota, Fla.

Model Code Application

The City of *Redmond, Wash.*, uses the following code for zero lot line development:
(1) Building Setbacks.
(a) A dwelling unit may be placed on one interior side property line, giving it one zero side/interior setback. If it is an interior lot line, the setback standard from the other side property line shall be 10 feet, except in the RA-5 zone where the other side setback shall be 30 feet and the R-1 zone where 20 feet shall be the opposite side setback.
(b) One building side/interior setback may also be reduced so long as the opposite side/interior or side street setback on the lot is increased by an amount corresponding to the original side setback reduction.
(c) These side/interior setback reductions shall not apply to side setbacks adjacent to lots that are not part of the zero lot line development.
(2) Privacy. In order to maintain privacy, no windows, doors, air conditioning units, or any other types of openings in the walls along a zero lot line shall be allowed except where such openings do not allow for visibility into the side yard of the adjacent lot, such as a clerestory skylight or opaque window.
(3) Eaves. Eaves along a zero lot line may project a maximum of 18 inches over the adjacent property line ((20C.30.100)

4. ALLOWING ACCESSORY DWELLING UNITS

Accessory dwelling units (ADUs, also known as mother-in-law units) have been advocated for many years. However, because of a desire to restrict unwanted uses or rental units in single-family areas, they have generally not been permitted by local zoning codes. Recently more cities are beginning to permit accessory units because of their relative utility. ADUs can increase density while maintaining single-family neighborhood character, provide affordable housing for new or small households, allow for intergenerational independence, and provide space for a home office, studio or similar use (Fader 1999) (figures II.9 and II.10).

Model Code Application

Sumner, Wash., allows for accessory dwelling units with certain provisions, including allowing only one ADU per building; one of the units is occupied by the homeowner; one additional parking space is provided; and the accessory unit is more than 300 but less than 800 square feet (Lennertz Coyle and Associates 1997).

Application

The Mayor's House in *Vancouver, B.C.*, is an example of residential infill that respects and complements basic urban design rules in a historic neighborhood context. The project includes eight units of infill development and a new accessory unit built in the back of a historic home (Figure II.11). Also developed is an adjacent vacant lot with a new primary residence and an accessory unit (City of Vancouver Planning Department 1999).

Figure II.7 and Figure II.8: Zero lot lines allow for more compact development.

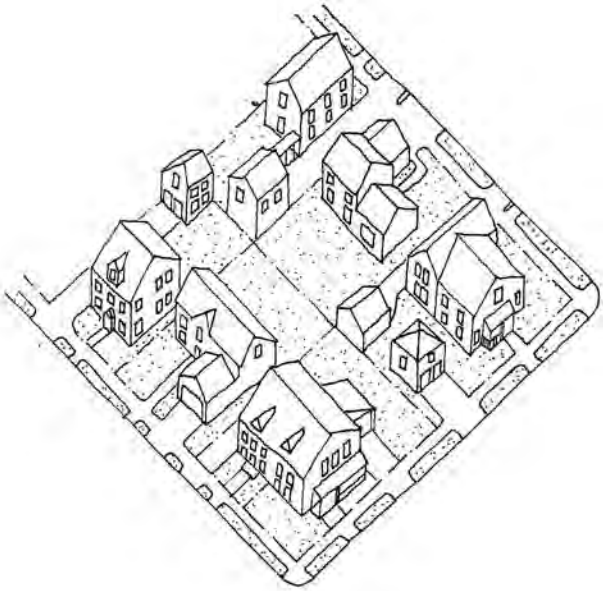


Figure II.9: Accessory units within block.

Figure II.10 Accessory dwelling units can advance multiple objectives.

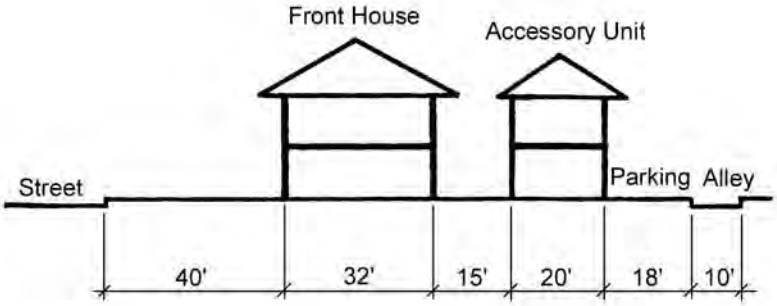


Figure II.11 Section of Mayor's House with accessory unit.

RESEARCH HIGHLIGHTS

Density is an important measure for how "urban" an area is and has been established in research as the land-use variable most highly correlated with transportation behavior. Increases in urban and suburban densities are associated with, and are hypothesized to drive, increases in mixed -use development, more efficient provision of infrastructure and services, parking costs, and parking availability.

To capture the effect of density on travel behavior, density of development must be calculated at a scale smaller than the metropolitan area or than the jurisdictions within it. In many metropolitan areas, selected neighborhoods are 10 or 50 times denser than the metro average and yield travel behaviors that differ significantly from the region as a whole. To reduce underestimations apparent in density measurements in transit nodes and along corridors, density calculations need to be buffered within the designated transit population catchment area—typically ¼ to ½ mile for those expected to walk, and 1 to 2 miles for those transferring from other transit lines.

Density is measured by the number of people or amount of activity in a given area. In residential areas, density is typically measured in residential dwelling units per acre. In employment areas, it can be measured as the number of jobs per acre. Floor area ratios (FARs) provide measures of net commercial and service uses. The term "net residential density" refers to parcels in land occupied by residential uses, or, in some cases, includes only residentially *zoned* land in the density calculation. "Gross density" refers to the number of residential units normalized by the total of all lands (in residential and other uses, and with roads and open space).

RESEARCH ON TRANSIT SUPPORTIVE LAND-USE DENSITIES

- By locating more people within a given area, compact communities can make transit services viable. Research has found that transit ridership increases significantly with increased density. Density can be driven by the timing of transit headways (bus, commuter or light rail) and supply of free parking. Rail stations with 5- to10-minute headways require higher densities than stations with 30-minute headways (Munro and Biemiller 1977).

- It is estimated that people will willingly walk to destinations (services, transit stops, etc.) located within a quarter to one-half of a mile radius. Thus, a minimum density of six to eight households per acre around bus stops will support bus service, and 15 to 20 households per acre will support rail transit (Cambridge Systematics 1994; International City/County Management Association 2001).

- Employment uses of at least 50 or more employees per gross acre can support a high level of transit service, especially if development is clustered around transit access points. A study of the Puget Sound area found a shift from cars to transit or walking does not occur until employment density reaches 50 to 75 employees per gross acre (Frank and Pivo 1994a; Municipal Research and Services Center of Washington 1995).

The Puget Sound Regional Council provides the following general guidelines in establishing density targets:

1. Residential densities should approach seven to eight households per gross acre to support local bus service connections to transit hubs. Household densities should

reach, at minimum, 10 to 20 dwelling units per gross acre close to a transit transfer station.

2. Employment densities of 25 jobs per gross acre with employment clustered close to a transit transfer station will support frequent high-capacity transit service. A density of 50 jobs per acre is a preferred target for higher frequency and high volume service provided by light rail.
3. Commercial uses with surface parking should strive to achieve a floor area ratio (FAR) of 0.5 to 1.0. Structured parking generally requires a FAR of at least 2.0. With a mix of appropriate services, density is less important for retail uses (Puget Sound Regional Council 1999).

RESEARCH ON PERCEPTIONS OF DENSITY

Research on the perception of density highlights attitudes and preferences that are important to understand when trying to implement transportation-efficient land use.

- In one published study conducted in 17 different neighborhoods in Los Angeles County, two of six physical form attributes were correlated with perceptions of density: block lengths and number of intersections per 100 acres. The longer the blocks and the fewer the number of intersections, the more often people overestimated the density of neighborhoods. Street width, slope, block shape diversity, and street shape were found to have no impact on perceived density (Flachsbart 1979).

- Another study focused on suburban communities tested a number of physical characteristics for their effect on perceived density. The research showed that perceived density is partly dependent on the amount of space between houses, the size of the front yard, the variety of house styles, and views from the neighborhood (Beck et al. 1987).

- A study conducted at the University of California at Berkeley explored physical characteristics that influence people's perception of density on urban residential streets. Three physical characteristics were found to be strongly associated with perceptions of lower density:
  1. Greater building articulation
  2. Less façade area or smaller buildings
  3. A greater number of "house" like dwellings (Bergdoll and Williams 1990).

- Researchers at the University of North Carolina used surveys with pictures of development options to survey consumer preferences. People preferred higher-density development that combines smaller lots, smaller homes, mixed housing types, parks and open space, narrower streets with sidewalks, and commercial development (Malizia and Goodman 2000).

RESEARCH ON POPULATION AND ECONOMICS

The clustering of high tech industries in areas such as Silicon Valley has shown the economic benefits of urban agglomeration in spite of improved communication technology. High-level financial and planning activities, as well as information-based industries, can benefit from proximity and agglomeration in major commercial centers. To the degree that transit

complements compact land use patterns, it can contribute to economic productivity and development.

- A recent study found that doubling a county-level density index is associated with a 6 percent increase in state-level productivity (Haughwout 2002).

- According to a study by the Brookings Institute, "the number of new housing permits in large, central cities more than doubled between 1991 and 1998, growing at a faster rate than that of suburbs and metropolitan areas in general" (Porter 2001). Another study suggests that there will be increasing demand for higher-density housing because of changes in demographics and consumer preferences for different housing types (Galster 2001).

- Home buyers are shown to be willing to pay a significant premium for housing in communities with features such as moderate density and greater accessibility. Similar patterns are found in older, medium-density suburbs that have overcome problems such as poor public services and concerns over crime (Eppli and Tu 2000).

RESEARCH ON LAND USE, DEVELOPMENT PATTERNS, AND TRAVEL BEHAVIOR

The results of research on the connections between land-use patterns and travel behavior have been culled in a recent article (Ewing and Cervero 2002) and are summarized in the table below. Generally, research shows that residential and employment densities are the land-use variables most highly correlated with travel behavior. Increases in urban and suburban densities are also associated with increases in mixed-use development, more efficient provision of infrastructure and services, higher parking costs, and decreased parking availability.

- The City of Portland found a clear correlation between more compact residential densities and greater use transit and non-motorized transport. In areas that average one household or less per acre, over 95 percent of all trips are by automobile. In comparison, in areas with five or more households per acre, 20 percent more trips are made by transit and non-motorized modes. The latter figure appears to underestimate alternative mode trips because it excluded trips of under six blocks, a category in which many or most walking trips fall (Parsons Brinkerhoff Quade and Douglas Inc. 1997; Washington State Energy Office 1994).

- Residential density is consistently found to be the land-use variable with the most predictive power to explain auto ownership and vehicle miles traveled (VMT) (Ross and Dunning 1997; Zhang 2003). The next most significant variables highlighted in one study (Holtzclaw 1994) are, in order, income, household size, transit service within walking distance, and the pedestrian and bicycle friendliness of the streetscape. Mixed land uses are also important but were too strongly correlated with residential density to show up after the impact of density was accounted for.

- Looking for pockets of existing compact, mixed-use development can help identify areas where automobile use can be more easily reduced. Moudon and Hess (2000) found that 40 percent of residents in suburban areas of the central Puget Sound region live in multi-family housing, and about half of those live in medium-density "suburban clusters" of over two thousand residents, in close proximity to neighborhood retail. However, these developments often lack pedestrian access to nearby retail and public services or good

transit accessibility, discouraging residents from using alternative travel modes for errands and commuting.

- A study in California has shown that doubling household density in a community had the effect of reducing VMT by 20 to 30 percent (Holtzclaw 1994).

Table II.1: Studies finding relationships between travel behavior and density

RESEARCH PROJECT	AREA OF ANALYSIS	SIGNIFICANT RELATIONSHIPS
(Spillar and Rutherford 1990)	Metropolitan areas (five Western U.S. metro areas)	Transit trip rate rises with densities
(Parsons et al. 1996)	Portland Metro Area	VMT is lower where household densities are higher or more employment is accessible by either mode
(Cervero 1994)	Three California metropolitan areas	Rail transit commute share is greater for higher density residential settings. Higher densities induce more walk access trips to rail Rail transit commute share is greater at higher density work settings
(Frank and Pivo 1994b)	Central Puget Sound Region, Wash.	Transit share of work trips is greater at higher employment densities. Walk share of work trips is greater at higher population densities, higher employment densities, and with a greater mixing of uses. Walk share of shopping trips is greater at higher population densities and at higher employment densities
(Holtzclaw 1994)	San Francisco Bay Area, Calif.	VMT is lower at higher net household densities.
(Cervero and Gorham 1995)	Southern California and San Francisco Bay Area	Transit share is greater at higher densities and in transit-oriented neighborhoods. Effect of density on higher transit ridership is compounded by transit oriented design and vice versa
(Dunphy and Fisher 1996)	Nationwide survey	Vehicle trips are less frequent at higher densities. Transit trips are more frequent at higher densities. Walk trips are more frequent at higher densities. VMT is lower at higher densities
(Shimek 1996)	Nationwide survey	VMT is lower at higher densities. Vehicle trips are less frequent at higher densities
(Strathman and Dueker 1996)	Nationwide survey	Use of transit is more likely at higher densities (through the effect of density on paid parking)
(Ross and Dunning 1997)	Nationwide survey	Walk mode share is greater at higher population and residential densities. Transit mode share is greatest at the highest population and residential densities
(Buch and Hickman 1999)	Dallas, Texas	Transit ridership is higher in areas of high employment densities

Source: (Ewing and Cervero 2002)

SUGGESTED RESOURCES

Center for Watershed Protection. (1998). *Better Site Design: A Handbook for Changing Development Rules in Your Community*. Site Planning Roundtable, Maryland, August.

Ewing Reid R. and Robert Cervero. (2002). "Travel and the Built Environment: A Synthesis." *Transportation Research Record 1780*:87-114.

Municipal Research Service Center. (1997). *Infill Development Guide*. Seattle, WA.

Oregon Transportation and Growth Management Program. (1995), *Tools of the Trade Handbook* http://www.lcd.state.or.us/tgm/

OTAK Associates. (2001). *Commercial and Mixed Use Development Code Handbook*. Prepared for the Oregon Transportation and Growth Management Program. http://www.lcd.state.or.us/tgm/

Puget Sound Regional Council. (1999). *Creating Transit Station Communities in the Central Puget Sound.* Seattle, WA: Puget Sound Regional Council.

Urban Land Institute. (2000) *Density by Design: New Directions in Residential Development*. Washington, DC: Urban Land Institute

WORKS CITED

Beck, Bressi, and Early. (1987). "Study cited in Bergdoll and Williams 1990:17," University of California, Berkeley.

Bergdoll, J. R., and Williams, R. W. (1990). "Density Perceptions on Residential Streets." *Berkeley Planning Journal*, 5, 15-38.

Buch, M., and Hickman, M. (1999). "The Link Between Land Use and Transit: Recent Experience in Dallas." Presentation at the 78th Meeting of the Transportation Research Board, Washington,D.C.

Burden, D., and Wallwork, M. (2000). "Handbook for Walkable Communities."

Cambridge Systematics. (1994). "The Effects of Land Use and Travel Demand Strategies on Commuting Behavior."

Cervero, R. (1994). "Transit-Based Housing in California: Evidence on Ridership Impacts." *Transportation Policy*, 1(3), 174-183.

Cervero, R., and Gorham, R. (1995). "Commuting in Transit Versus Automobile Neighborhoods." *Journal of the American Planning Association*, 61, 210-225.

City of Fort Collins Land Use Code. "Article IV Districts, Division 4.5 Medium Density Mixed-Use Neighborhood District." Ordinance No. 177, 2002.

City of Portland Planning and Zoning Code Ch. 33.110.

City of Vancouver Planning Department. (1999). "Vancouver's Urban Design: A Decade of Achievements." City of Vancouver, Vancouver.

Dunphy, R., and Fisher, K. (1996). "Transportation, Congestion, and Density: New Insights." *Transportation Research Record 1552*, 89-96.

Eppli, M., and Tu, C. C. (2000). "Valuing the New Urbanism; The Impact of New Urbanism on Prices of Single-Family Homes." Urban Land Institute.

Ewing, R. R., and Cervero, R. (2002). "Travel and the Built Environment: A synthesis." *Transportation Research Record*(1780), 87-114.

Fader, S. (1999). "Density By Design." Urban Land Institute, Washington D.C.

Fader, S. (2000). *Density by Design: New Directions in Residential Development*, Urban Land Institute, Washington, D.C.

Flachsbart, P. (1979). "Residential Site Planning and Perceived Densities." *American Society of Civil Engineers, Journal of the Urban Planning and Development Division 105*, UP2.

Frank, L. D., and Pivo, G. (1994a). *Relationships Between Land Use and Travel Behavior in the Puget Sound Region*, WSDOT, Olympia, WA.

Frank, L. D., and Pivo, G. (1994b). "Relationships Between Land Use and Travel Behavior in the Puget Sound Region." WSDOT, Seattle.

Galster, G. (2001). "Wrestling Sprawl to the Ground: Defining and Measuring an Elusive Concept." *Housing Policy Debate*, 12(4), 681-717.

Grogan, B. (1999). "Reaching out to Redevelop." *Urban Land*(February), 48.
Haughwout, A. F. (2002). "Public Infrastructure Investments, Productivity and Welfare in Fixed Geographic Areas." *Journal of Public Economics*, 83(3), 405-28.
Holtzclaw, J. (1994). "Using Residential Patterns and Transit to Decrease Auto Dependence and Costs." National Resources Defence Council, San Francisco, 16-23.
International City/County Management Association. (2001). "100 Policies for Implementation."
Jack Faucett Associates. (2000). "Livable Communities Handbook: Land Use and Design Strategies for the South Bay Cities." Appendix B.
Lennertz Coyle & Associates. (1997). "Smart Development Code Handbook Appendix."
Malizia, E., and Goodman, J. (2000). "Mixed Picture: are higher-density developments being shortchanged by opinion surveys?" *Urban Land*, July, 12.
Mid-America Regional Council {MARC]. (2001).*Arlington County, VA Transit-Supportive Overlay Zoning and Redevelopment District Designation*. http://www.qualityplaces.marc.org/5a_tools.cfm?Tool=37. Accessed August 29, 2003.
Municipal Research & Services Center of Washington. (1995). "Creating Transit Supportive Regulations: A Compendium of Codes, Standards, and Guidelines." MRSC, Seattle, WA.
Municipal Research & Services Center of Washington. (1997). "Acessory Dwelling Units." *33*, Municipal Research and Services Center, Seattle, WA.
Munro, S., and Biemiller, A. (1977). "Standards for Public Transit." *Transit Canada Magazine*.
Oregon TGM. (2000). "Neighborhood Street Design Guidelines-An Oregon Guide to Reducing Street Widths."
OTAK Associates. (2001). "Commercial and Mixed Use Development Handbook." Transportation and Growth Management Program., Portland, Oregon.
Parsons, Brickerhoff, Quade, and Douglas. (1996). "Transit and Urban Form - Commuter and Light Rail Transit Corridors: The Land-Use Connection." TCRP Report, 16 vol. 1, Washington DC.
Parsons Brinkerhoff Quade and Douglas Inc. (1997). "Making the Land Use/Transportation/Air Quality Connection: Making the Connections - Technical Report." *vol. 8*, 1000 Friends of Oregon.
Pendall, R., Fulton, William, and Harrison, Alicia. "Loosing ground to sprawl. Density trends in metropolitan America." *Paper presented at the Fair Ground Conference*, Atlanta, GA.
Porter, D. (2001). *Smart Growth Guide*, Urban Land Institute, Washington, DC.
Porter, D. R. (1996). "Profiles in Growth Management." Urban Land Institute, Washington, DC.
Puget Sound Regional Council. (1999). "Creating Transit Station Communities in the Central Puget Sound Region: A Transit-Oriented Development Workbook." Puget Sound Regional Council, Seattle.
Ross, C. L., and Dunning, A. E. (1997). "Land Use and Transportation Interaction: An Examination of the 1995 NPTS Data." Georgia Institute of Technology, Prepared for the U.S. Department of Transportation, Federal Highway Administration, Washington, DC.
Shimek, P. (1996). "Household Motor Vehicle Ownership and Use: How Much Does Residential Density Matter?" *Transportation Research Record 1552*, 120-125.
Spillar, R. J., and Rutherford, G. S. (1990). "The Effects of Population Density and Income on Per Capita Transit Ridership in Western American Cities." *ITE Compendium of Technical Papers*, 327-331.
Strathman, J. G., and Dueker, K. J. (1996). "Transit Service, Parking Charges and Mode Choice for the Journey to Work: An Analysis of the 1990 NPTS." Presentation at the 75th Meeting of the Transportation Research Board, Washington, D.C.
Washington State Energy Office. (1994). *Municipal Strategies to Increase Pedestrian Travel*.
Woodinville Municipal Code Ch. 21.34.
Zhang, M. (2003). "The Modifiable Area Unit Problem in Measuring Urban Form for Travel Analysis." Paper presented at the ACSP-AESOP Planning Congress, Leuven, Belgium.
Zydofsky, P. (2000).*Building Livable Communities with Transit*. http://www.lgc.org/freepub/land_use/articles/buildcomm.html.

III. CONNECTIVITY OF MOTORIZED AND NON-MOTORIZED FACILITIES

INTRODUCTION

Connectivity is a characteristic of the route network where travel takes place and refers to the directness of the route used for travel. People seek to minimize travel distances (and concurrently, their travel time) to a destination.

Motorized and non-motorized travel present different connectivity issues because of their different speeds and levels of effort required for travel. Having a direct route available is more important for slower modes of travel, especially walking. (Because it is many times faster than other forms of transportation, automobile travel makes actual distances less relevant.)

The connectivity of a road or street network is directly related to the size of the blocks that define the network. A fine-grained network (such as the grid-like street system found in older cities) reduces trip distances and congestion by providing more direct routes. Branched street networks, commonly found in post-war suburban development, channels all traffic onto a few arterials, providing few direct routes (Ewing 1995).

Street patterns in most suburban communities are made up of large blocks of continuous streets, serving many dead end, internal cul-de-sac streets (Figure III.1). Streets are designed to allow for auto movement and isolated land uses. This hierarchical street system causes problems for both vehicular and alternative mode travel. Few continuous linkages exist, increasing the distance between destinations and limiting the choice of direct routes. All trips, whether by car, foot or bicycle, are forced onto the collector or arterial street without regard for their ultimate destination. For vehicles, longer-distance travelers are forced to wait in traffic with those just driving across the street to the store – a trip which could have been made on foot or on a parallel route had a fine-grained street network been in place. For pedestrians, the lack of access makes even a walk to a grocery store or bus stop a circuitous and time-consuming task.

Transit supportive land use practices call for streets to be less dependent on a hierarchy. An interconnected street system provides multiple routes to local destinations, resulting in any single street being less likely to be wide and overburdened by excessive traffic. A fine-grained street network also allows transit routes to serve more residences.

Streets should be designed to keep through-trips on arterial streets and provide local trips with alternative routes. Local and regional accessibility are strengthened when a continuous network of streets, sidewalks and trails link different parts of communities. Streets that converge at important nodes (such as transit stops) can provide pedestrians with the option for walking for some trips in a safe and comfortable environment.

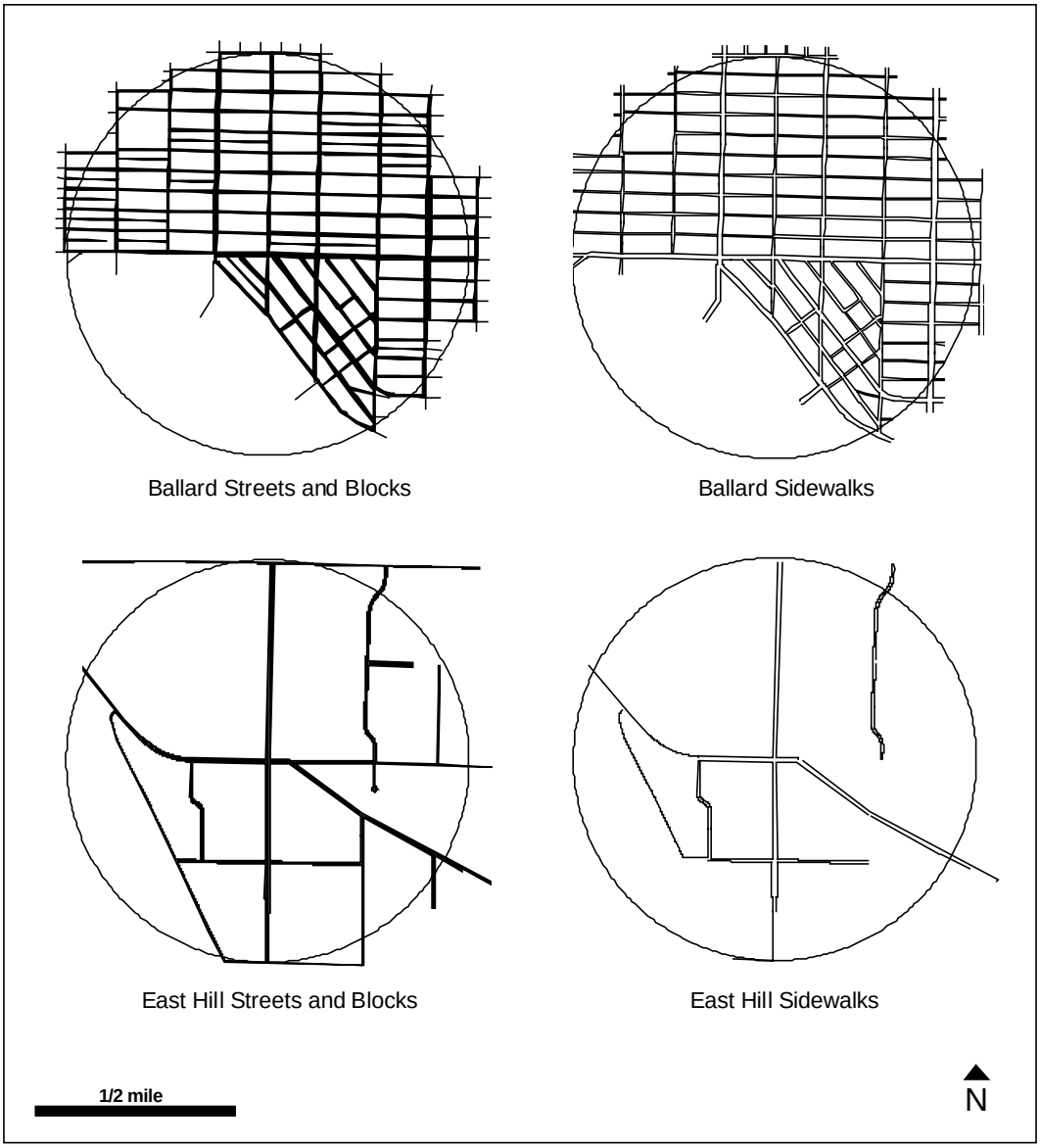


Figure III.1: Networks of streets, blocks, and sidewalks. Contrast between the networks in Ballard, an area developed at the turn of last century and Kent East Hill, developed since the 1960s. There are 28.0 and 6.5 miles of streets in Ballard and Kent East Hill, respectively, and 40.4 and 6.1 miles of sidewalks. Yet the two areas have similar population of approximately 7,000 people within a one-half mile of their center (Hess 2001)

TOOLS AND APPLICATIONS

1. INSTITUTING BLOCK SIZE MAXIMUMS

Small blocks support pedestrian travel because their frequent intersections create more direct routes, shorten distances between trip origin and destination, and ease wayfinding. They maximize natural light, create neighborhoods and districts at a human scale, and contribute to a diverse, vibrant pedestrian experience. Finally, short blocks also slow down motor vehicles—the high frequency of intersections offers an increased number of decision points for both automobiles and pedestrians

Large blocks derive from large suburban development parcels (as can be seen in areas of apartment complexes and malls), which can range from 2,800- to 4,000-foot block perimeters (the sum of all the sides of a block). Due to the dominance of the automobile, block sizes have increased significantly in the mid-20th century.

Breaking down the size of large parcels and street blocks is essential to accommodating pedestrian travel (Figure III.2). Large development sites, such as apartment complexes, retail centers, and their attendant parking lots, can be made into smaller blocks by retrofitting them with a network of local streets, driveways, and sidewalks. Residential and commercial block perimeters should range from 300 feet to 800 feet to ensure walkability by providing direct routes between origins and destinations for pedestrians and slowing down vehicular traffic (Figure III.3). Although smaller blocks are preferred, larger retail centers often create blocks of up to an average of 1,600 feet long, with a range of 1,400 to 1,800 feet (Puget Sound Regional Council Staff 2000). Vehicular traffic can accommodate such large blocks, but pedestrian paths intersecting at least every 300 feet need to be provided within these blocks.

Model Code Application

> "The street shall be designated to create blocks that are generally rectilinear in shape, a modified rectilinear shape or another distinct geometric shape. Amorphously shaped blocks are generally discouraged except where topographic or other conditions necessitate such a configuration. To the greatest extent possible, blocks shall be designed to have a length of 480 feet. Lanes (alleys) shall be permitted to bisect blocks" (Nelessen 1994).
>
> "Cities and counties must identify all vacant and redevelopable parcels of 5 or more acres planned or zoned for residential or mixed use development and prepare a conceptual new streets plan map. The map shall be adopted as part of the Transportation System Plan element of the local Comprehensive Plan. The purpose of this map is to provide guidance to land owners and developers on desired street layout…" (City of Portland 1998)

Applications

> A mobility study for the *Delaware Department of Transportation* calls for a preferred standard of 200- to 500-foot block lengths in subdivision street networks. Blocks longer than 500 feet should be required to have mid-block crosswalks and pass-throughs (Ewing 1995).

> According to a *North Carolina Department of Transportation* study of traditional neighborhood development, all or most low-speed, low-volume streets should have short block lengths of between 250 and 500 feet. Exceptions may be needed because of topography, environmental protection, preservation of cultural resources, and similar considerations (North Carolina Department of Transportation 2000)

2. ALLOWING LANES OR ALLEYS IN COMMERCIAL AND RESIDENTIAL AREAS

Using alleys for driveways and garage access in single-family residential areas helps to keep blocks free of curb cuts. Sidewalks are open and pleasant for pedestrians, while retaining the option of compact housing development. Alleys are economically feasible when used in conjunction with narrow residential streets, allowing the net available land for development to remain the same.

Alley driveways with special paving, sometimes called mews, are also being developed in higher density housing developments. Originally narrow cartways flanked by stables, today's mews are designed as semi-private drive lanes or walkways cut into the grid of city blocks (Fader 2000). Mews may provide access to garages or serve as pedestrian entrances to townhouses located on either side of the right-of-way. Mews also help pedestrians walk through the site along a network of continuous internal paths (figures III.4 and III.5).

Model Code Example

> Pedestrian-way easements ten feet wide, through the center of blocks more than 600 feet long, may be required by the approving agency in order to provide convenient pedestrian access to transit stops, a station, to shopping, or other community facilities. (State of New Jersey Model Site Plan Approval Ordinance, 1997).

3. ALLOWANCES FOR FUTURE STREET EXTENSIONS

Permits for subdivisions and individual developments are typically reviewed and approved incrementally as individual property owners are ready to develop their properties. Yet in order to ensure that that the streets developed for the individual sites constitute a coherent network, an area-based network plan is necessary to match up lot patterns and other development features. A network plan allows future street and pathway extensions to be considered when individual subdivisions are reviewed, ensuring the evolution of a complete system as development intensifies.

Applications

> In *Eugene, Ore., w*hen land subdivision or partition results in a lot that is one-half acre or larger in size, the planning director may require that the location of parcel lines and other details of layout be such that future division may readily be made without violating the requirements of this code and without interfering with orderly extension of adjacent streets, bicycle paths and access ways (Municipal Research and Services Center of Washington 1995)

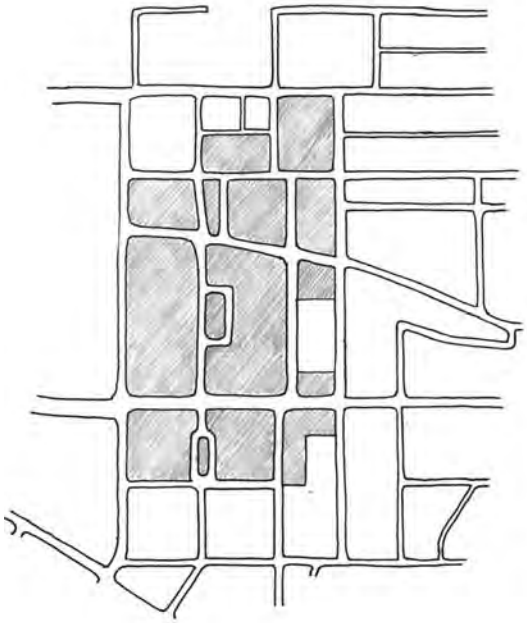


Figure III.2: Development is broken into a series of short blocks

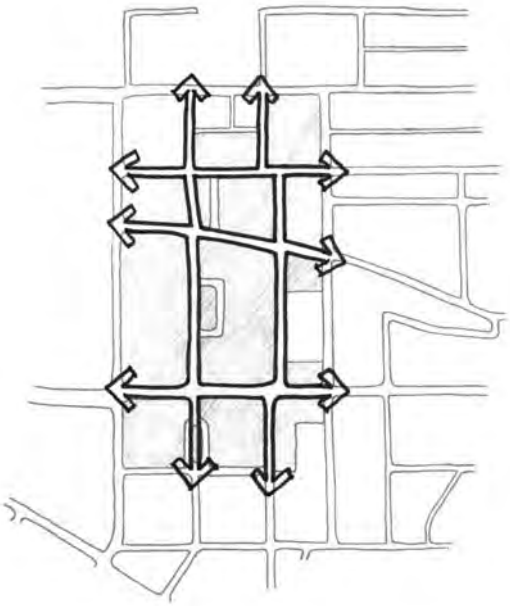


Figure III.3: Frequency of intersections offers more decision points

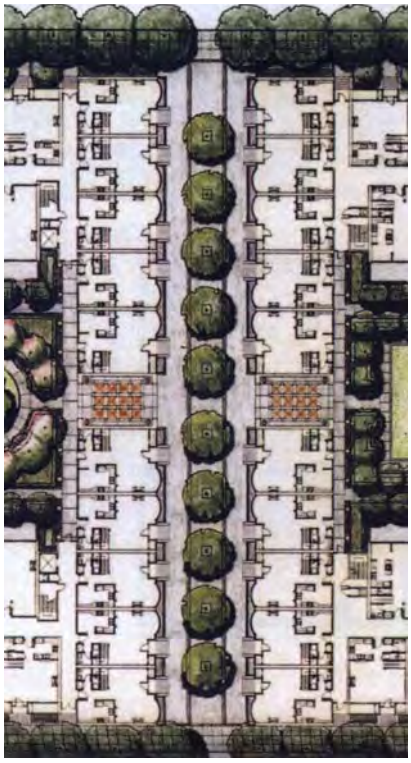


Figure III.4: Plan of pedestrian mews in Paseo Plaza, San Jose, Calif.

Figure III.5: Pedestrian mews in Paseo Plaza, San Jose, Calif.

Redmond and *Kirkland, Wash.*
Blocks to be broken up with through-streets, or blocks that need additional pedestrian connections through them, are identified in these cities' comprehensive plans or zoning codes. Requirements to increase connectivity are in place for future proposed development in these locations. (WSDOT 2002)

4. REQUIRING A CONTINUOUS NETWORK OF STREETS WHILE LIMITING OR ELIMINATING CULS-DE-SAC AND DEAD END STREETS

The use of culs-de-sac and dead end streets should be avoided, as they can greatly increase travel distances to nearby destinations. Where it is not possible to directly connect new to existing streets, access ways for pedestrians can still be provided (Institute of Transportation Engineers 1999).

Model Code Example

In *Portland, Ore.*, culs-de-sac, dead end streets, and flag lots* shall only be permitted when one or more of the following conditions prevent an otherwise required street connection: excess slope (20 percent or more); presence of a wetland or other body of water that cannot be bridged or crossed; existing development on adjacent property that prevents a street connection; presence of a freeway or railroad. Culs-de-sac, when permitted, shall be as short as possible and shall in no event exceed 400 feet in length.

Culs-de-sac shall be permitted only where there is no feasible connection with an adjacent street. If cul-de-sac streets represent more than 10 percent of the total lane miles in a development, the subdivider shall be required to demonstrate that alternative internal circulation systems exist that would minimize use of culs-de-sac are infeasible (TRI-MET 1993).

*Flag lots occur when deep but narrow parcels are subdivided perpendicularly to the public access street, with only one of the subdivided lots fronting the street. Lot access to the street is via a shared or an individual private driveway. Several flag lots, each with its own private driveway, can result in an increased number of curb cuts

5. REQUIRING A CONTINUOUS NETWORK OF PATHWAYS FOR PEDESTRIANS AND BICYCLISTS

Good pedestrian access requires direct links to destinations, yet new subdivisions are frequently walled off from surrounding areas through the use of perimeter fences, walls or shrubbery, which often block direct access to nearby destination points. Sidewalks frequently terminate at the edge of the property, at the end of parking lots, or when a change in topography or other obstacles occurs.

Development codes can prevent such occurrences, making walking and wheel chair use safe, convenient, and comfortable (Figure III.6). For transit stops and commercial areas, pedestrian routes should be located along (and visible from) all streets. Bicycle routes should be part of a continuous network and link employment centers, schools, and other community facilities (Figure

III.7). Wheelchair-accessible pedestrian pathways and sidewalks need to be continuous and connected to streets and adjacent developments.

Application

Caper's Block in *Vancouver, B.C.*, covers the entire north block of West 4th Avenue between Vine and Yew Streets in the center of the Kitsilano neighborhood, defined by a vibrant commercial street. The development program called for street-level retail with office space on the second floor and two to three floors of residential above (Figure III.8). Two of the project's key urban design objectives are to optimize its contribution to the street, providing street front continuity, and to achieve residential intensification while respecting the existing surrounding residential neighborhood. To mitigate the impact of the project's significant street frontage, the building is broken into three sections separated by small courtyards. These courtyards also provide a fine-grained, pedestrian network into the block. (City of Vancouver Planning Department 1999)

The *City of Portland, Ore.*, requires that commercial and shopping districts provide "6-foot-wide paths of travel adjacent to businesses" to accommodate all pedestrians, including people in wheelchairs, with strollers, small children, and canine companions.

Model Code Example

Clark County, Wash.
"An on-site pedestrian circulation system that links the streets, parking and the primary entrances of the structure(s) on the site shall be provided. The pedestrian system may include sidewalks or pedestrian trails. These sidewalks or pedestrian ways must connect the pedestrian system to existing and/or proposed pedestrian systems on adjacent developments unless it is determined that adequate safety and security cannot be maintained. Convenient pedestrian access to transit stops shall be provided" (Municipal Research and Services Center of Washington 1995).

Figure III.6: Pedestrian routes provide direct links to destinations.

Figure III.7: Bicycle routes as part of a continuous network.

Figure III.8: Streetscape of Caper's Block, Vancouver, B.C.

RESEARCH HIGHLIGHTS

Network connectivity is closely related to age of development, with post-1950 development having a distinctly different network than pre-1950 development. Age of development has been used as a proxy for connectivity in several studies of network connectivity. There are a number of more accurate ways to measure network connectivity, made possible by the increased coding of networks into GIS or other computer mapping formats.

The density of intersections (number of intersections per mile) or mean block size (perimeter) are two simple measures. Another, more complex measure divides the number of street links by the number of nodes or link ends (including culs-de-sac) — more links relative to nodes means more connectivity. A network connectivity index of 1.40, about halfway between traditional towns and standard suburban development, is an acceptable target for network planning purposes (Ewing 1995). Route directness measures calculate the ratio of airline distance to actual travel (or network distance). Areas with small blocks typically do not exceed a ratio of 1.3, while most suburban development are ratios of 1.4 and higher (Hess 1999).

All of these measures, however, are sensitive to the size of the spatial unit used to normalize them. For example, a traffic analysis zone (TAZ) may have a large mean block size even though parts of the development patterns within it consist of small blocks. Measuring network connectivity should therefore be done by using spatial units that relate to the speed of the mode of travel considered. Therefore, for car travel relatively large units such as TAZ may be adequate, but for pedestrian travel, the unit should likely not exceed 1 mile square.

- The 1990 National Personal Transportation Survey reports that 27 percent of all travel trips are less than 1 mile long, a feasible walking distance. Another 13 percent of trips are within 2 miles, a comfortable biking distance (Nationwide Personal Transportation Survey (NPTS); Washington State Energy Office 1994).

- Communities that improve non-motorized travel conditions often experience significant increases in non-motorized travel and related reductions in vehicle travel (Parsons Brinckerhoff Quade and Douglas Inc. 1996; PBDQ 1996).

- One study found that residents in a pedestrian friendly community walked, bicycled, or rode transit for 49 percent of their work trips and 15 percent of their non-work trips, representing an increase of 18 and 11 percentage points, respectively, of trips made by residents in comparable automobile oriented communities (Cervero and Radisch 1995).

- Another study found that the number of pedestrians walking to their neighborhood center is three times higher in neighborhoods with small street blocks and sidewalks than in otherwise comparable communities with large street blocks and discontinuous sidewalks. With density and mix of uses held constant, the study found that walking increases in areas where pedestrian networks are continuous and complete, with a high degree of connectivity (Moudon et al. 1997).

- A street design study looked at the impacts of increasing the number of local street connections in selected communities on vehicular traffic. On the basis of five geographical areas, the study showed that increasing the number of street intersections per mile to a range of between 10 and 16 street connections per mile had the following effects:

- Delay for autos reduced by 17 percent overall
- Traffic on arterials decreased by 13 percent
- Greater percentage of "regional" traffic (longer trips) on arterials
- Greatest benefit for auto traffic at 10 to 16 connections per mile

These significant findings emphasized that even modest improvements in connectivity can benefit local and regional travel, in addition to facilitating walking, bicycling, and transit access (Kloster et al. 1999).

SUGGESTED RESOURCES

Ewing, R. (1999). *Mobility-Friendly Street Standards for Delaware.* Washington, DC, Surface Transportation Policy Project Transportation Research Board.

Ewing, R. and R. Cervero. (2002). *Flexible Design of New Jersey's Main Streets*. Newark, NJ, New Jersey Department of Transportation, Alan M. Voorhees Transportation Center at Rutgers University.

Handy, S., R. G. Paterson, et al. (n.d.). Planning for Street Connectivity: Getting from Here to There. *PAS Report 515*. Chicago, IL, American Planning Association.

Metro Regional Services. (1997). *Creating Livable Streets*. Portland,OR, METRO Regional Services.

Kulash, W. M. (2001). *Residential Streets*. Washington, DC, Urban Land Institute.

Washington State Community Trade and Economic Development (1998). *Model Code Provisions: Urban Streets and Subdivisions*. Olympia, WA, Office of Community Development.

WORKS CITED

Cervero, D. R., and Radisch, C. (1995). "Travel Choices in Pedestrian Versus Automobile Oriented Neighborhoods." University of California Transportation Center, University of California, Berkeley, Berkeley, CA.

City of Portland. (1998). "Pedestrian Master Plan." Office of Transportation Engineering and Development.

City of Vancouver Planning Department. (1999). "Vancouver's Urban Design: A Decade of Achievements." City of Vancouver, Vancouver.

Ewing, R. (1995). *Best Development Practices: Doing the Right Thing and Making Money at the Same Time*, Dept. of Community Affairs, Tallahassee, FL.

Fader, S. (2000). "By Design." *Urban Land*(July), 54-58, 112.

Hess, P. M. (2001). "Pedestrians, networks, and neighborhoods: A study of walking and mixed-use, medium-density development patterns in the Puget Sound region," Ph.D. Dissertation, University of Washington, Seattle, WA.

Hess, P. M., Moudon, A. V., Snyder, M. C., Stanilov, K. (1999). "Site design and pedestrian travel." *Transportation Research Record*, 1674, 9-19.

Institute of Transportation Engineers. (1999). "Traditional Neighborhood Development: Street Design Guidelines." *ISBN 0-935403-34-5*, ITE, Washington, DC.

Kloster, T., Daisa, J., and Ledbetter, R. (1999). "Linking Land Use and Transportation Through Street Design." Metro, Portland.

Moudon, A. V., Hess, P., Snyder, M. C., and Stanilov, K. (1997). "Effects of Site Design on Pedestrian Travel in Mixed-Use, Medium-Density Environments." Washington State Transportation Center (TRAC), Olympia, WA.

Municipal Research & Services Center of Washington. (1995). "Creating Transit Supportive Regulations: A Compendium of Codes, Standards, and Guidelines." MRSC, Seattle, WA.

Nationwide Personal Transportation Survey (NPTS). (1990). U.S. Department of Transportation, National Highway Administration, Washington, DC.

Nelessen, A. C. (1994). *Visions for a New American Dream: Process, Principles, and an Ordinance to Plan and Design Small Communities*, Planners Press, American Planning Association, Chicago, IL.

North Carolina Department of Transportation. (2000). "Traditional Neighborhood Development (TND) Guidelines." Division of Highways.

Parsons Brinckerhoff Quade & Douglas Inc. (1996). "Transit and Urban Form." Transportation Research Board, National Research Council, Washington DC.

PBDQ. (1996). "Transit and Urban Form."

Puget Sound Regional Council Staff. (2000). "Compilation of Papers on Tax Increment Financing written by PSRC staff."

TRI-MET. (1993). "Planning and Design for Transit." TRI-MET, Portland, OR.

Washington State Energy Office. (1994). *Municipal Strategies to Increase Pedestrian Travel*.

WSDOT. (2002). "Implementing Transportation-Efficient Development: A Local Interview, Phase I of Integrating Land Use and Transportation Investment Decision-Making." WSDOT.

IV. PARKING

INTRODUCTION

The amount, price, and location of parking play an important role in creating urban environments that support alternative modes of transportation and present a significant challenge (Commute Trip Reduction Task Force ca. 1996). The planner must be aware of the balance necessary between access for the different modes, maintaining tenant visibility while providing an attractive streetscape, and financial tradeoffs inherent in a city's parking and density requirements.

The availability and cost of parking at or near local destinations influence an individual's choice to drive, take transit, bike, or walk. Expansive areas of poorly designed and located surface parking lots create barriers that discourage pedestrian travel and transit use, while large parking structures produce areas that lack active uses and can be perceived as unsafe. Most local parking standards require large supplies of parking, encouraging unlimited automobile use – when drivers find ample amounts of free parking at their destination, there is little reason to consider alternative modes of travel. The City of Olympia, Wash., estimates that parking accounts for 54 percent of the site coverage in a typical commercial development – the at-grade parking surface is twice as large as the building footprint, which accounts for 26 percent (Dunphy 2000).

Parking standards and design that support pedestrian activity both decrease walking distance between activities and increase the attractiveness of a streetscape. Parking management can help to reduce conflicts between autos and other travel modes. For example, off-street parking can be shared between properties (including those with different land uses) and placed in a location that does not interfere with pedestrian movement and access to transit.

The costs associated with the supply and placement of parking significantly affect individual real estate projects. The provision of parking makes lower priced land at the urban fringe more economical to private developers than higher priced but more accessible urban locations. Commercial developers consider free, unlimited, and visible parking right in front of stores an integral part of their marketing strategies. They argue that visible and unconstrained parking constitutes the first positive contact between tenants and customers.

In addition, parking requirements directly affect the financial viability, form, and appearance of new development. Surface parking has more negative impacts on pedestrian environments, but structured parking adds significant costs to new development. Structured parking can only be a viable alternative to surface parking if densities and height limits are sufficient to cover the costs of the structure.

PARKING SUPPLY TOOLS AND APPLICATIONS

Most current parking requirements encourage an oversupply of parking. They are applied inflexibly, with little consideration to the geographic, demographic, and specific land-use characteristics of a development site (Shoup 1999b); WSDOT 1999: 200). Parking requirements are based on trip generation studies that have been performed at new, suburban sites where free parking is expected. For retail uses, parking requirements are associated with the number of square feet of development, with no differentiation made between small but densely occupied uses with high customer turnover (such as fast food eateries) and large retail surfaces with lower

customer turnover (such as department stores). Such standards are ineffective in higher density areas where parking is priced, transit service is better, and TDM programs may apply. Parking requirements can typically be reduced 10 to 30 percent at appropriate sites if standards reflect actual parking demand (Victoria Transportation Policy Institute 2001).

1. LOWERING MINIMUM PARKING REQUIREMENTS

Excessive parking standards are not appropriate in densely built areas, especially where transit service and other alternative modes can substitute for automobile travel. To accommodate growth in parking demand, communities can lower minimum off-street parking requirements in zoning regulations and development policies. Utilizing demand studies that more accurately reflect local conditions, or doing a survey of local parking demand, can justify reductions in parking requirements. Coordinating parking requirements among jurisdictions is helpful in order to avoid conflicts and minimize competing interests (Bradley et al. 1998). Unfortunately, this is typically a contentious process.

Applications

Olympia, Wash., conducted field studies of actual parking use and adjusted its parking requirements downward to reflect real demand. For example, on the basis of its studies, the city now requires between 2.5 and 4 spaces per 1,000 square feet for office uses, with smaller office complexes required to provide a higher ratio of parking to space. One space per residential unit is required for accessory or studio units and for any residential unit in the downtown business or high-density multifamily zones.

Portland, Ore., relies on its efficient light rail transit for transport and has succeeded in implementing very low parking requirements. The city requires only one parking space per residential unit in most zones, two spaces per 1,000 square feet of floor area for most retail uses, and 2.5 parking spaces/1,000 square feet of floor area for office uses.

2. SETTING MAXIMUM PARKING REQUIREMENTS

Where public parking and frequent transit service are provided, local governments can consider limiting how much parking can be developed on a property. Maximum parking ratios are typically based on land use type and size. Exemptions to the standard can be provided for parking structures, shared parking, valet parking spaces, market-rate parking, or similarly managed parking facilities.

Some urban areas impose limits on parking capacity allowed for various types of uses, or within particular areas as part of their TDM programs. The City of Seattle, for example, allows a maximum of one parking space per 1,000 square feet of downtown office space. The City of San Francisco limits parking to 7 percent of a downtown building's floor area (Victoria Transportation Policy Institute 2001).

Applications

Cambridge, Mass.
The city code (16.51.2) states that: "minimum and maximum parking requirements for accessory off-street parking shall be provided as follows:
(1) Residential Uses: 1 space per unit minimum and 1.5 spaces per unit maximum.
(2) General Office Use: 1 space per 1,250 gross square feet maximum and 1 space per 625 gross square feet minimum.
(3) Technical Office for Research and Development Uses: 1 space per 1,675 gross square feet minimum and 1 space per 840 gross square feet maximum.
(4) Retail and Consumer Service Uses: No accessory parking shall be required if the retail and consumer service uses are located on the ground floor and front on and have a public entry directly onto a publicly accessible street."

Downtown *Portland, Ore.*, development projects have had limits on the number of new commuter parking spaces allowed since the mid-1970s. Office buildings on the transit mall can provide only 0.7 parking spaces for every 1,000 square feet of office space, while buildings farther away are allowed more, but never more than two spaces per 1,000 square feet. These limits have shrunk the supply of downtown parking from 3.4 parking spaces for every 1,000 square feet of office space in 1973 to 1.5 spaces in 1990 (The Seattle Daily Journal of Commerce 1997);City of Portland Planning and Zoning Code Ch. 33.226, 2002).

3. IN-LIEU OF PARKING FEES

"In-lieu" fees allow developers to forego providing their own on-site parking and pay into a fund for off-site municipal parking facilities. This technique yields efficient, shared parking facilities that can be optimally located to ensure the functionality and design quality of a district (Shoup 1999a).

Public parking is a particularly efficient way to manage shared parking since each space can serve many users and destinations. It has been estimated that 100 public parking spaces are equivalent to 150 to 250 private parking spaces (Litman 1999). Additionally, in many areas, the oversupply of existing parking may mean that even if existing standards are reduced, there will be little, if any, impact on people's travel behavior in the future. It may, then, be more important to look at parking in a neighborhood comprehensively rather than simply revising parking standards.

Applications

A parking district created by *Montgomery County, Md.*, served as a critical incentive to and subsidy for a new mixed-use project called Bethesda Row. The county established a parking lot district for the Bethesda Central Business District many years ago, building parking facilities that users pay for on an hourly or daily basis. The facilities are supported by a surtax on tax assessments for properties that do not provide their own parking, allowing owners of smaller buildings to avoid having to provide their own on-site parking, and ensuring that all of the parking in the area is operated and managed in an efficient manner (figures IV.1 to IV.3). (Urban Land Institute 2001)

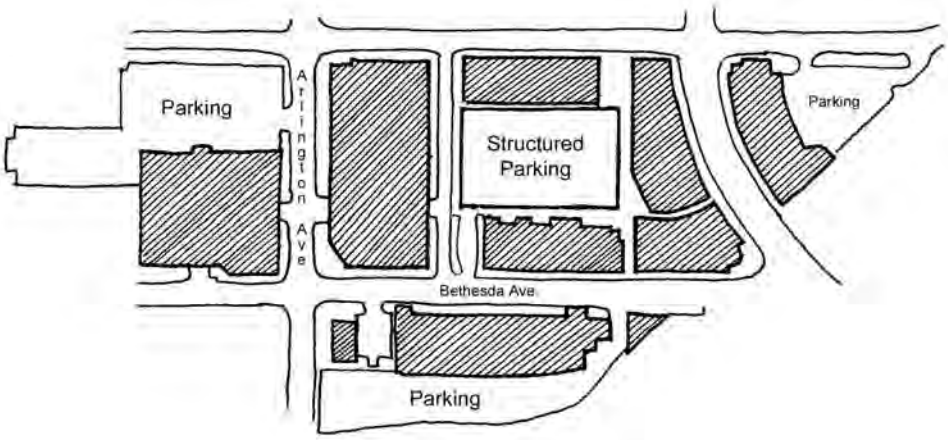


Figure IV.1: **Parking located to the interior and side of buildings in Bethesda Row**

Figure IV.2 and Figure IV.3: **Pedestrian and street separate from parking lots**

Pasadena, Calif., introduced a system of "zoning credit parking contract." For $50 to $200 per space, businesses can purchase parking credits that fulfill parking requirements through spaces in nearby public garages (Everett-Lee 2001).

4. LAND BANK PROVISIONS OF FUTURE PARKING

At-grade parking on private property consumes a considerable amount of land that yields low returns. Local jurisdictions can offer incentives to minimize the amount of off-street, at-grade parking on a site by allowing developers to locate parking off-site, in a nearby location appropriate for parking. The undeveloped parts of sites can then be "land-banked," or reserved for future development, rather than used for at-grade parking.

Applications

Iowa City, Iowa, gives developers the option of land-banking unbuilt parts of parcels in designated zones and negotiating with the city for future parking on site or elsewhere (OTAK Associates 2001). This provision encourages developers to use their land more intensely.

5. FLEXIBLE PARKING STANDARDS IN EXCHANGE FOR AMENITIES SUCH AS TDM ACTIONS

Many cities find it advantageous to waive parking standards or to reduce parking ratios in downtown locations and in densely developed districts. Lower parking standards benefit the private sector by lowering development costs and, in effect, by yielding higher development capacity. Flexible parking standards also benefit the public sector by reducing the number of vehicles on specific sites, thereby encouraging transit use or non-motorized travel within the district. They also help yield more compact development and increase active, people- rather than car-oriented uses, and create pedestrian-friendly environments.

Applications

Regulatory codes in *Orlando* and *St. Petersburg, Fla.,* allow developers to build 20 percent fewer parking stalls than required by contributing 80 percent of the savings to city programs to encourage alternatives to driving (Washington State Energy Office 1994).

An adaptive-use project on the site of the former American Can Company in the Canton neighborhood of *Baltimore, Md.,* uses flexible parking standards. The project involves a mix of 140,000 square feet of office, 300,000 square feet of industrial, and 60,000 square feet of retail uses, for which providing adequate parking was a challenge. The developer adapted the first and second floors of the American Can building into a 170-space garage dedicated to office use during the day. During the evening, the parking is open to service the retailers. A 120-space surface lot and provisions to use 45 spaces in a nearby municipal lot help meet parking demand for the project. This arrangement required a code variance to normal parking requirements.

The high-density infill Pearl Court Apartments project in *Portland, Ore.*, benefited from flexible parking standards. Built at 211 units per acre, the project offers both market-rate and affordable housing units. Because of the neighborhood's pedestrian, bicycle, and mass-transit facilities, the city allowed the developer to reduce the required amount of parking on site, making the development of the affordable units viable (Everett-Lee 2001).

6. ALLOWING ON-STREET PARKING TO CONTRIBUTE TO PRIVATE PARKING REQUIREMENTS

On-street parking has multiple benefits, including convenience and flexibility for drivers, and protection from traffic for pedestrians. On-street parking can be efficiently configured as angle parking on streets with low volumes of low-speed traffic (but high demand for parking). On-street parking provides a good visual and safety buffer between the sidewalk and a main arterial, while still allowing frequent transit access. Jurisdictions can provide credit for off-street parking if on-street parking is available [OTAK Associates 2001: 61]

Applications

While most jurisdictions in the *Puget Sound* region are careful not to take on-street parking away from residents, some will, on a case by case basis, lower off-street parking requirements for selected new projects where on-street parking is available (WSDOT 2002b)

A low parking ratio of 0.66 cars per unit was allowed for the Cotton Mill apartments project in *New Orleans, La.*, because street parking was generally available in the surrounding neighborhood, especially at night when residents needed it most (Dunphy 2003)

7. ALLOWING REDEVELOPMENT OF UNUSED PARKING AREAS

Surface parking lots often cover more ground than the building they are intended to serve, especially in suburban centers, commercial corridors, and multifamily complexes. This unfortunate reality generates environments that the public has consistently rated as unpleasant (Nelessen 1994) and constitutes a barrier to building compact, pedestrian, and transit supportive places. Several cities and jurisdictions have taken measures to encourage the redevelopment of unused parking at-grade into more attractive and active uses such as publicly accessible open space. Others have sought to facilitate private development in target areas with large amounts of at-grade parking.

Applications

In *Columbus, Ohio*, an unused parking lot will be transformed into green space as part of a rehabilitation project involving the Beatty Recreation Center. The Beatty Recreation Center shares property with Beatty Elementary School, which houses special needs children in the Columbus Public School System (National Park Service 2001).

Texas Tech University, in *Lubock, Texas,* has been reclaiming unused parking areas for landscaping (Texas Tech University 2003).

PARKING MANAGEMENT TOOLS AND APPLICATIONS

Parking management is recognized as among the most effective techniques for putting transit, carpools, pedestrians, and bicycles on a more equal footing with the automobile. A parking management plan can address supply and demand as well as pricing, wayfinding, intermodal connections, maintenance, and capital improvements for public parking.

1. REQUIRING PARKING BELOW OR BEHIND BUILDINGS

Surface parking lots take up large amounts of space, separate uses and activities, and discourage walking in many suburban cities. Locating surface parking behind buildings, underground, or in the interior of a block can offer safe and efficient access for pedestrians.

Applications

Given the high price of land in their centers, *Seattle* and *Bellevue, Wash.*, successfully use strategies to encourage the placement of parking below or behind buildings. Seattle uses a variety of overlay zones and special street designations with parking location requirements that promote high rates of underground/behind building parking. Downtown Bellevue uses a FAR incentive system, which gives substantial density bonuses for placing parking underneath the building (WSDOT 2002a).

2. SHARED PARKING BETWEEN DIFFERENT LAND USES OR ADJACENT PROPERTIES

Property owners in neighborhood or urban centers typically restrict parking on their property to their own customers. In areas of high demand, conflicts arise as property owners police their parking lots and even try to fine violators. Agreements to share parking between adjacent property owners resolve many of the conflicts between private owners and their customers. Shared parking helps even out the different peak utilization rates associated with different uses. It also benefits the public by reducing the number of vehicular trips made between shopping destinations and encourages non-motorized travel in commercial and retail districts.

Calculation of shared parking requirements in areas of mixed retail and commercial uses is typically based on the land use with the highest parking demand. Because shared parking involves customers and employees from a group of properties with a range of peak parking demand, the strategy typically lowers parking requirements for individual commercial properties by 20 to 40 percent. In general, the larger and more diverse the groups of users, the more efficiently parking can be shared, as parking demand by time of day, day of week, and duration varies significantly enough (Figure IV.4). Shared parking also saves space because each property owner or tenant wants to keep parking occupancy below 85 percent.

For shared parking to operate successfully, the participating owners of facilities need to be in close proximity to each other and have different peak operating times on a daily or weekly basis.

It follows that developments with mixed land uses allow parking supply reductions since different uses, such as office centers, have weekday peaks, while others, such as dining and recreation centers, have evening and weekend peaks. Mixed-use developments typically allow a 30 to 50 percent reduction in parking. Similarly, assigning automobile commuters or residents of multi-family housing to a group of spaces (a "zone") rather than an individual space, allows a 15 to 25 percent reduction in parking area, since some vehicles are away at any particular time (Litman 2000).

Flexible zoning regulations can support shared parking by allowing firms to trade parking capacity among themselves to optimize use (Litman 2000). As noted earlier, public parking facilities, including on-street parking spaces, are efficient shared facilities.

Model Code Application

Portland, Ore., developed a Model Shared Parking Ordinance for application in the metropolitan area, along with Model Shared Use Parking Agreements (OTAK Associates 2001; Portland Metro 1997)

Applications

As part of a massive redevelopment of its downtown, *Oakland, Calif.,* addressed the potential for increasing shared parking for its commercial areas with the understanding that shared commercial parking can also serve nearby residential areas. The City conducted a thorough study of short- and long-term parking demand, including an inventory of both existing land uses and a parking occupancy study. The study concluded that the parking requirements for office space could be reduced from 3 spaces to 1.44 spaces per 1000 gross square feet. Also, the provision of a shared parking facility located within 1000 feet of a downtown subway station could reduce the area necessary for parking by up to 40 percent for offices, 75 percent for retail, 58 percent for residential, and 72 percent for hotel. This effort resulted in adjustments to parking prices to reflect such variables as vacancy factors, mass transit access, household auto ownership rates, and operations of special use facilities like the convention center.

Circle Center, a mixed-use development in *Indianapolis, Ind.,* took advantage of the city's shared-parking allowances for private mixed-use projects and the availability of public off-site parking to meet its requirements. Less than 3,000 stalls were built instead of the 6,000 required of a standard development. The project's central location also contributed to increasing the number of pedestrians downtown, as workers could easily reach City Center on foot.

Tri-Met (*Portland* area) park-and-ride policy encourages shared parking near transit stations as an efficient and cost effective way to provide parking while minimizing the amount of land devoted to parking facilities (Litman 2000). Different park-and-ride lots are shared with nearby apartment complexes, a regional justice center, churches, and movie theaters at more than three-dozen sites. With some transit oriented development projects, Tri-Met allows the total supply of off-street parking to decline as development takes place around stations. For example, a park-and-ride facility can be replaced by a new transit oriented development of at least 30 residential units per acre, at least 75 employees per acre, or other comparable high

density development (Tri-County Metropolitan Transportation District of Oregon 1993).

Shared parking is allowed and encouraged in many jurisdictions of the *Puget Sound* region. A 2002 study of more than 150 projects permitted showed that more than 13 percent of the projects shared parking among the tenants and with the public, with most of these projects in the suburban areas of the region (WSDOT 2002b)

Downtown *Bellevue, Wash.*, strongly encourages shared parking between commercial uses. Shared parking may get a FAR bonus (WSDOT 2002b)

3. MANAGEMENT OF ON-STREET PARKING

Jurisdictions need to manage carefully their existing and potential supply of on-street parking. Streets can be assessed for their potential to accommodate parking. Beyond adding to the overall supply of parking, on-street parking slows traffic, creates better pedestrian environments by buffering sidewalks from moving vehicles, increases the viability of retail shops and services, and contributes to reducing the amount of land used for off-street lots (figures IV.5 and IV.6). Typical barriers for implementing on-street parking requirements are street standards that prohibit backing movements onto major streets. Local jurisdictions, and especially newer suburban cities, can revise their street standards to consider on-street parking in commercial, retail, and residential areas.

Most suburban jurisdictions prohibit on-street parking on arterials and collectors. Increasingly, however, they allow on-street parking in their downtown and in some neighborhood commercial centers.

4. LOWER PARKING RATIOS FOR DEVELOPMENT NEAR TRANSIT

Areas well served by transit have reduced needs for parking. Jurisdictions can acknowledge this and take steps to reduce parking standards for development in and near transit stations or corridors.

Applications

In *Portland, Ore.*, maximum parking requirements vary according to distance from light rail stations. For example, maximum allowances for new office space on the light rail transit mall are 0.8 spaces per 1,000 square feet, and 2.0 spaces per 1,000 square feet for office space located in Goose Hollow, several blocks away from the transit mall. These maximum limits have not been problematic to developers. In fact, property values and customer volume in areas close to transit stations with limited parking are higher than in other areas. In a 1987 survey of 54 businesses located near light rail transit, 66 percent of the owners said that their businesses had been helped because they were located near public transit; 54 percent reported increased sales volumes as a result of being located near transit (Tri-County Metropolitan Transportation District of Oregon 1993).

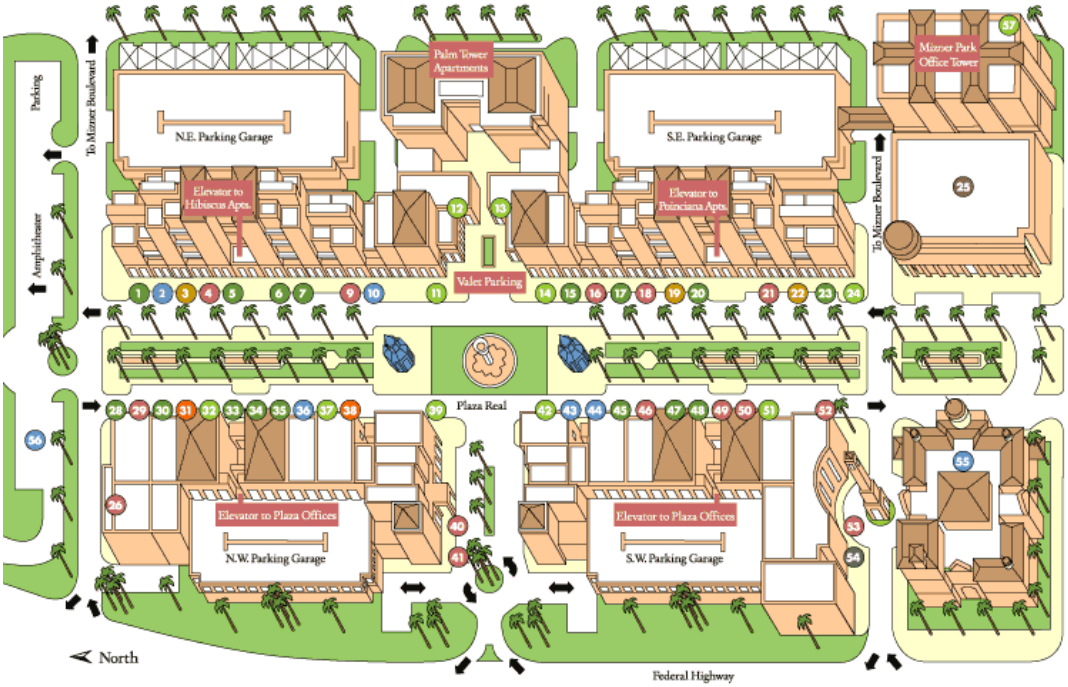


Figure IV.4: Mizner Park in Boca Raton, Fla. Shared parking for apartments, retail, and office uses.

Figures IV.5 and IV.6: Granville Island, Vancouver, B.C. On-street parking slows traffic, creates better pedestrian environments by buffering sidewalks from moving vehicles, increases the viability of retail shops and services, and contributes to reducing the amount of land used for off-street lots.

In *Arlington County, Va.*, transit overlay zones, office, retail, and service commercial parking may be approved within a range between the rate of one off-street parking space for each 530 square feet of gross floor area and the rate of one off-street parking space for each 1,000 square feet of gross floor area, depending on the adequacy of the transportation demand management plan in addressing the need for parking. One off-street parking space must be provided for each dwelling unit. Seven-tenths of an off-street parking space must be provided for each hotel guestroom (Mid-America Regional Council (MARC))

In *Mountain View, Calif.*, public officials assert that access to light rail permits developers to build 20 percent less parking than mandated for similar projects outside of a transit overlay zone (Mountain View Voice 2001)

5. RIDESHARE PARKING REQUIREMENTS

Rideshare programs encourage or require the provision of priority or preferential parking for van/carpool vehicles (these are HOV-reserved parking spaces, similar to handicapped spaces). Rideshare incentives and pricing strategies are parts of commute trip reduction programs (CTR) and result in time and cost savings, and improved congestion and air quality. Rideshare priority parking offers an additional incentive to van/carpooling by insuring low-cost or free parking near destinations (TransAct 2003). In employment and especially office zones, it can be effective in encouraging commuters to van/carpool. In retail development, however, it is considered less useful because shoppers often ride together and enforcement is problematic.

Many local jurisdictions provide preferential parking for van/carpools and have requirements or incentives in place for employers and property owners to accommodate HOV parking. Priority rideshare parking is often required along with bicycle parking as part of development mitigation negotiations.

Model Code Application

The City of *Portland, Ore.*, provides carpool permits for metered parking. A vehicle with such a permit may park without payment of the meter fee only at any long-term metered parking space, or at spaces reserved for carpool permit parking (16.20.670) (City of Portland Planning and Zoning Code Ch. 33.226. 2002)

6. IMPLEMENTING PARKING BEST PRACTICES

The VTPI Encyclopedia of Parking (Victoria Transportation Policy Institute 2001) lists the following best practices:

- Develop a comprehensive parking plan that identifies parking resources, problems, objectives, programs, and management strategies. Periodically review parking issues and modify plans and practices as appropriate.
- Develop a program to collect information on parking supply, demand, costs and prices, and if possible, incorporate it into a GIS database that integrates with other mapping and planning data systems.

- Consider a wide range of possible solutions to parking problems. Give as much consideration to strategies that encourage more efficient use of existing parking as to strategies that increase parking supply.
- Develop a comprehensive framework for evaluating parking solutions that accounts for direct and indirect impacts and strategic transportation and land use objectives.
  Rather than identifying a single solution to parking problems, develop combinations of solutions and use contingency planning. For example, identify solutions to implement first and additional solutions to apply if needed.
- Apply low-cost solutions that encourage efficient use of the existing parking supply. These include user information on parking availability and price, shared parking, regulations to prioritize use of the most desirable parking spaces, and pedestrian improvements to expand the geographic range of parking that serves a destination.
- Apply pricing strategies to manage parking demand, recover parking facility costs, and raise revenues for transportation programs. Use efficient pricing methods that minimize user inconvenience and transaction costs.
- Integrate parking management with TDM and Smart Growth planning.
- Use transportation management associations to provide parking and transportation management services to users, and to provide parking brokerage services to businesses.
- Develop overflow and spillover parking solutions.
- Use up-to-date design standards that make parking facilities safer and more convenient to users, and more attractive and less environmentally harmful to a community.

RESEARCH HIGHLIGHTS

On-site parking requirements can consume considerable site area (50 percent or more), depending on the type of use and local standards. Since the early 1990s, studies have found that typical parking requirements by local communities greatly exceed peak parking demand on a typical day (Commute Trip Reduction Task Force ca. 1996). Recent figures show that:

- The average parking requirement for office uses is 3.5 to 5.0 spaces per 1,000 gross square feet of building floor area, yet several studies have observed average peak parking use of between 2.0 to 3.0 spaces per 1,000 gross square feet (Shoup 1995).
- A study of 19 areas in King County, Wash., found an average of 3.5 spaces per 1,000 gross square feet was provided in single-use commercial and office projects, while mixed use projects averaged 2.75 (WSDOT, 2002).
- A parking utilization study of eleven relatively densely developed districts in the Puget Sound region showed occupancy rates not exceeding 76 percent, and ranging mainly between 45 and 65 percent in urban and suburban locations (Puget Sound Regional Council 2003)
- The Institute of Transportation Engineers (ITE) recently reported that actual demand for parking can vary from 1.0 space per unit in low-rise residential to 0.88 for high-rise residential development. ITE's Parking Generation standards will soon be revised to differentiate between parking demand in urban and suburban locations.
- Another study in Portland, OR showed the average number of vehicles per household in 2000 to be 1.37 in suburban locations, 0.67 downtown, and 1.17 in the central city outside of downtown (Dunphy 2003).

Parking availability is as much a matter of perception and expectations as it is one of actual supply. Studies show that parking utilization rates can be very high near certain uses (e.g., a small shopping center) in neighborhood centers, but the rates drop substantially within a block or two of

the 100 percent location (Snyder 1997). Similarly, moviegoers may lament lack of parking around the theater and not be made aware of the ample commercial parking supply available within a few hundred yards.

Pricing parking is an integral part of managing parking demand. A recent study showed significant drops in parking utilization where new parking was constructed in high priced areas (Puget Sound Regional Council 2003)

Table IV.1, based on a range of research efforts, summarizes parking management strategies and indicates the potential reduction in parking supply that they can typically provide.

Table IV.1: Typical parking demand reductions

Parking Management Strategy	Description	Parking Demand Reduction	Sources	Applications
Shared Parking	Share parking facilities among a group of users, rather than assign individual spaces.	15-40%	ITE 1995 ULI 2001	Urban center, TOD, Residential, Retail, Office
More accurate requirements	Reduce minimum parking requirements for land uses with lower parking demand.	10-30%	Shoup 1999a	Retail, TOD, Office
Trade-off with TDM strategies	Reduce parking requirements at facilities with TDM programs.	10-30%	Litman 1999	Urban , Office, TOD, Center Retail
Parking Pricing	Charge motorists for using parking facilities using cost recovery prices.	10-30%	Everett-Lee 2001	Urban center, TOD, Retail, Office
Favor short-term use	Avoid parking discounts for long-term leases.	Varies	Litman 1999	Retail, Urban center
Cashing Out	Provide the cash equivalent of free parking to commuters who use alternative modes.	10-30%	Shoup 1999b	Office, TOD, Urban Center
Unbundle parking	Rent and sell parking facilities separately, rather than automatically include them with housing and commercial leases and purchases.	Varies	Litman 1999b Bradley at al. 1998	Residential, Office
Location Efficient Development and Mortgages	Design and manage development at more accessible locations to encourage use of alternative modes.	20-50%	Litman 1999b Bradley at al. 1998	TOD, Urban Center (Residential Office)
Address spillover problems	Use management, pricing, and enforcement strategies to address spillover problems	Varies	ULI 2001	Office, TOD, Retail, Urban Center
Develop overflow parking plans	Use overflow parking plans, rather than provide excessive supply, to address occasional events.	Varies	Everett-Lee 2001	Retail
Regulating use of parking facilities	Use regulations to increase the efficient use of existing parking supply.	Varies	Litman 1999a	TOD, Urban Center
Parking maximums	Establish maximum parking supply in an area.	Varies	Shoup 1999a	TOD, Retail, Office, Urban Center
In lieu fees	Use developer fees to fund public parking instead of requiring off-street parking for each individual facility.	Varies	Shoup 1999b	Urban Center, Retail, TOD
Tax parking	Impose taxes on parking facilities and their use.	Varies	Everett-Lee 2001	Urban Center, Retail, TOD
Parking facility design	Design parking facilities with small stalls, stacked stalls, safe and pleasant walkways, etc.	Varies	Child 1998 Litman 2000	All

Source: Litman, 1999a

SUGGESTED RESOURCES

EPA, Parking Alternatives: Making Way for Urban Infill and Brownfield Redevelopment (1999). Available at http://smartgrowth.org/pdf/PRKGDE04.pdf

Institute of Transportation Engineers (1994). *Guidelines for Parking Facility Location and Design*. Washington, DC: ITE

Institute of Transportation Engineers (1995). *Shared Parking Planning Guidelines*. Washington, DC: ITE

Litman, T. (1999). Quantifying the Benefits of Non-Motorized Transport for Achieving TDM Objectives. Victoria, B.C, Victoria Transport policy Institute**.**) Available on www.vtpi.org.

Litman, T. (2000). Pavement Busters Guide: Why and How to Reduce the Amount of Land Paved for Roads and Parking Facilities. Victoria, B.C.: Victoria Transport Policy Institute**.** Available on www.vtpi.org.

Litman, T. (2000) Land Use Impact Costs of Transportation. Victoria, B.C., Victoria Tranport Policy Institute. (2000) Available on www.vtpi.org.

Seattle Strategic Planning Office (2001). *Seattle Comprehensive Neighborhood Parking Study*. Seattle, WA: City of Seattle

Shoup, Donald C. (1999a). The Trouble With Minimum Parking Requirements. *Transportation Research Part A*, 33: 549-574.

Shoup Donald C. (1999b). "In Lieu of Required Parking," *Journal of Planning Education and Research*, 18: 307-320.

Site Planning Roundtable (1998). *Better Site Design: A Handbook for Changing Development Rules in Your Community*. Baltimore, MD: Maryland.

Urban Land Institute (2001). *Shared Parking Summit Report*. Washington, DC: ULI

Willson, R. (1995). "Suburban Parking Requirements." *Journal of the American Planning Association* 61(Winter): 29-42.

WORKS CITED

Bradley, D. S., Nothaft, F. E., and Freund, J. L. (1998). "Financing Multifamily Property." *Urban Land*(November), 42.

City of Portland Planning and Zoning Code Ch. 33.226. (2002). "Parking and Loading."

Commute Trip Reduction Task Force. (ca. 1996).*CTR Task Force Guidelines*. http://www.wsdot.wa.gov/tdm/tripreduction/CTRguide/APPC.cfm.

Dunphy, R. (2000). "Parking Strategies." *Urban Land*(Oct.), 78.

Dunphy, R. (2003). "Making for Better Neighbors." *Urban Land*, 6(2), 34-37.

Everett-Lee, R. (2001). "Free Parking Tech Sheet." Congress of the New Urbanism.

Litman, T. (1999). "Quantifying the Benefits of Non-Motorized Transport for Achieving TDM Objectives." Victoria Transport policy Institute, Victoria, BC.

Litman, T. (2000). "Pavement Busters Guide: Why and How to Reduce the Amount of Land Paved for Roads and Parking Facilities." Victoria Transport Policy Institute, Victoria, B.C.

Mid-America Regional Council (MARC). (2003).http://www.qualityplaces.marc.org/5a_tools.cfm?Tool=37.

Mountain View Voice. (2001).

National Park Service. (2001). "Urban Park and Recovery Grants."

Nelessen, A. C. (1994). *Visions for a New American Dream: Process, Principles, and an Ordinance to Plan and Design Small Communities*, Planners Press, American Planning Association, Chicago, IL.

OTAK Associates. (2001). "Commercial and Mixed Use Development Handbook." Transportation and Growth Management Program., Portland, Oregon.

Portland Metro. (1997). "Shared Parking in the Portland Metropolitan Area: Model Shared Parking Ordinance."

Puget Sound Regional Council. (2003). "Parking Inventory for the Puget Sound Region 2002." Puget Sound Regional Council, Seattle.

Shoup, D. C. (1995). "An Opportunity to Reduce Minimum Parking Requirements." *Journal of the American Planning Association*, 61(1), 14-28.

Shoup, D. C. (1999a). "In Lieu of Required Parking." *Journal of Planning Education and Research*, 18(4), 307-320.

Shoup, D. C. (1999b). "The Trouble with Minimum Parking Requirements." *Transportation Research Part A*, 33(7/8), 575-599.

Snyder, M. C. (1997). "A study of parking supply and utilization in neighborhood commercial centers in the Puget Sound region," University of Washington, Seattle, Washington.

Texas Tech University. (2003).*Physical Plant: Building Maintenance and Construction*. http://www.physicalplant.ttu.edu/BMC/ProjStatus3.asp?PROJID=02626.

The Seattle Daily Journal of Commerce. (1997).*Design 1997*. http://www.djc.com/special/design97/10032237.htm.

TransAct. (2003).*Parking Management*. www.transact.org/reports/5yrs/park.htm.

Tri-County Metropolitan Transportation District of Oregon. (1993). *Planning and Design for Transit*, Tri-County Metropolitan Transportation District of Oregon, Portland, OR.

Urban Land Institute. "ULI Shared Parking Summit." 4.

Victoria Transportation Policy Institute. (2001).*Online TDM Encyclopedia*. www.vtpi.org/tdm/tdm45.htm. 2003.

Washington State Energy Office. (1994). *Municipal Strategies to Increase Pedestrian Travel*.

WSDOT. (2002a). "Implementing Transportation-Efficient Development: A Local Interview, Phase I of Integrating Land Use and Transportation Investment Decision-Making." WSDOT.

WSDOT. (2002b). "Study by the Planning & Policy Office." TDM Resource Center.

V. PEDESTRIAN ENVIRONMENT AND SAFETY

INTRODUCTION

Good pedestrian conditions along streets are essential for increasing the use of alternative travel modes, enhancing safety, and fostering vibrant and active communities (Figure V.1). Today, most street design standards achieve the contrary. As the automobile became the predominant mode of travel in the 1950s, street rights-of-way and lane widths expanded. Sidewalks and crosswalks became an outmoded element of street design. Even in residential areas, street standards eliminated sidewalks and widened rights-of-way and turning radii to speed the automobile along. The results are apparent today. While the number of people walking for transportation has dwindled over past decades, pedestrian safety has become a more significant issue, with pedestrian fatalities accounting for more than 12 percent of all deaths related to motor vehicle crashes in the country (Shankar 2003).

Urban and suburban streets must function well for *all* modes of travel in order to address the complex nature of travel in metropolitan areas, and especially to support transit-efficient development practices. Streets should be multimodal facilities that balance the needs of auto users with those of transit riders, pedestrians, and bicyclists. Providing seamless, continuous facilities for all modes and efficient connections between the different modes is key to achieving a successful multimodal transportation system.

In urbanized areas, streets function as both transportation facilities and as links to the uses along them. Street design that integrates activity and travel patterns contributes to the efficiency of the transportation system, since transportation options can be associated with trip origins and destinations. Specifically, auto trips can be more effectively substituted with transit or pedestrian transportation given shorter distances between and the availability of facilities linking activity locations (Holtzclaw 1994).

Four criteria can be used to evaluate pedestrian conditions in a multimodal environment: security, functionality, comfort, and aesthetics. These criteria apply to two aspects of street design: the street right-of-way, where the focus is on travel, and development along the right-of-way, focusing on land use and activities. Right-of-way design typically falls under the jurisdiction of public works and transportation departments, while development along streets is regulated by planning departments and implemented by private sector entities. While responsibilities for the two aspects of street design and construction are clearly defined from the regulatory and fiscal perspectives, implementation of street design requires a high level of collaboration among public sector agencies and between the public and private sectors. For example, while sidewalks are regulated by public works and planning departments, and can be built by private or public agents, they also serve the needs of transit and utility departments, as well as those of abutting property owners. As a result, sidewalks are filled not only with pedestrians but with electrical transformers, street and traffic light poles, trees, parking meters, mail boxes, newspaper vending machines, bus stops, benches, chairs and tables, and merchant vending signs.

Public works and transportation departments are developing a new approach to shaping multimodal street environments called *context sensitive design* (CSD). According to the Minnesota Department of Transportation, CSD is “the art of creating public works projects that

Clarendon 1980s, Arlington County, Va.

Clarendon Market Common Today, Arlington County, Va.

<u>Figure V.1</u>: A car-oriented strip commercial development transformed to create a pedestrian-oriented environment.

meet the needs of the users, the neighboring communities, and the environment. It integrates [transportation] projects into the context or setting in a sensitive manner through careful planning, consideration of different perspectives, and tailoring designs to particular project circumstances."

Context sensitive design uses a collaborative, interdisciplinary approach that includes early involvement of key stakeholders to ensure that transportation projects are not only "moving safely and efficiently," but are also in harmony with the natural, social, economic, and cultural environment. CSD requires an early and continuous commitment to public involvement, flexibility in exploring new solutions, and an openness to new ideas.

Context sensitive design promotes six key principles:

1. Balance safety, mobility, community, and environmental goals in all projects.
2. Involve the public and affected agencies early and continuously.
3. Use an interdisciplinary team tailored to project needs.
4. Address all modes of travel.
5. Apply flexibility inherent in design standards.
6. Incorporate aesthetics as an integral part of good design (www.vtpi.org)

For the purpose of clarity, the tools and applications in this section of the Resource Guide are divided into two sections: Those pertaining to the street right-of-way, and those directed at the built environment along the right-of-way. The first set of tools generally serves public sector agencies responsible for regulating street design and for maintaining streets, whereas the second aims at private development interests and related regulatory entities.

STREET DESIGN TOOLS AND APPLICATIONS

Streets are complex systems that support diverse travel modes, traffic movements, uses, activities and social interactions. In the process of creating and redesigning streets, it is necessary to properly define a street system.

Street rights-of-way include the street and the pedestrian zones. Streets generally consist of vehicle and bicycle travel lanes. The pedestrian zones include on-street parking, sidewalks, and planting strips. A pedestrian-supportive street may have as much as 35 percent of its right-of-way dedicated to non-auto uses (Jacobs 1993).

1. DESIGNING THE STREETS

Careful street design leads to a balanced transportation system that fully integrates automobile, public transportation, bicycle, pedestrian, and freight needs. Street design should minimize traffic hazards and emphasize safe travel for all modes.

Travel Lanes

Travel lane width is a function of the use of the lane, the type of vehicles served, and the desired vehicle speed. Travel lane width is also determined by the location of the travel lane within the roadway. Outside curb lanes may require a wider width to accommodate turning trucks and buses and reduce the effect of adjacent obstructions such as parked vehicles (Jacobs 2002). Wide travel lanes are therefore associated with higher traffic speeds. They also lengthen the street crossing distance for pedestrians. As a result, travel lane width needs to be carefully considered in

multimodal facilities, and compromises made between accommodating trucks and buses as well as non-motorized travelers.

Medians
Medians will vary in form depending on the purpose for which they are used. Raised concrete medians with plantings are most attractive and supportive of pedestrian and bicycle travel, best performing such functions as access control and refuge for cyclists or pedestrians. Landscaping, particularly tree planting, helps reduce the perceived (and actual) width of a street, slowing traffic. Simple raised concrete/asphalt medians without plantings generally serve to channel traffic and control left turns or U-turns and establish separation between directions of vehicular travel. Medians that are just painted on pavement, such as continuous one- or two- way, left-turn lanes, channel and remove turning traffic from through-lanes.

Medians should be used with caution in residential neighborhoods, commercial corridors, and main streets with low traffic volumes and speeds, and low site access demand (Municipal Research and Services Center of Washington 1995). Also, space allocated to medians can mean less space allocated to the pedestrian zone, specifically to sidewalks along streets. As pedestrians typically do not walk along medians, wider sidewalk areas may be preferable to medians where pedestrian traffic is substantial.

2. Reducing Street Width Standards on Neighborhood Streets and Collectors

Streets with wide rights-of-way and wide lanes were once presumed to help traffic flow, to accommodate fire trucks, and to facilitate civilian defense evacuation. However, several recent studies argue that narrower streets reduce through-traffic and accidents by forcing cars to slow down. Tests conducted in older neighborhoods confirm the workability of narrow streets, especially in residential areas. Municipalities are slowly backing off the expanded, 50- or 60-foot minimum width standards, and many new neighborhoods and planned communities have successfully adopted street widths of 28 feet or less (Tables V.1 and V.2).

The common misconception that narrow streets do not provide adequate access for emergency vehicles, particularly fire vehicles, has been challenged, and a number of local fire codes now permit roadway widths as narrow as 18 feet. Narrow streets have an intimate feel and contribute to neighborhood walkability. Many studies noted by the Institute of Transportation Engineers and the Urban Land Institute indicate that narrow street widths tend to reduce the speed at which drivers travel (Institute of Transportation Engineers 1999; Kulash 2001). Slower vehicle speeds also reduce the severity of injuries sustained in accidents.

Narrow streets are also feasible when higher housing densities benefit from on-street parking. “Queuing street design,” also called shared streets or yield streets, are common solutions where one lane is used for traffic, and parking lanes serve as queuing lanes for oncoming vehicles to pull over to, allowing another vehicle to pass by.

Because streets and parking tie up a large percentage of a site’s total land area, reducing excessive parking requirements also reduces development costs and allows for more intense uses of the land (Center for Watershed Protection 1998). Reducing the standard width of residential streets with one parking lane from 28 to 18 feet would decrease impervious surfaces by 35 percent, and similarly reduce not only the costs of clearing, grading, and constructing the facility, but also the long-term pavement maintenance and stormwater management costs.

In summary, the rationale for reducing street standards are that narrow streets

- Are less costly to build, and could contribute to housing affordability
- Consume less land and preserve vegetation
- Produce less storm water runoff
- Contribute to a more compact neighborhood, which encourages pedestrian trips instead of auto use
- Increase safety because they help slow traffic down.

Applications

Tables V.1 and V.2 list some of the cities that have implemented narrow street standards.

Table V.1: Cities with narrow roadway width standards

City	Total Width (feet)	Parking
Albany, Oregon	28	One side
Beaverton, Oregon	28	Both sides
Birmingham, Michigan	26	Both sides
Burlington, Vermont	18	None
Denver, Colorado	20	One side
Eugene, Oregon	21	One side
Forest Grove, Oregon	26	Both sides
Helena, Montana	33	Both sides
Loomis, California	24	One side
Mountain View, California	27	Both sides
Phoenix, Arizona	28	Both sides
Phoenix, Arizona (collector)	36	Both sides

Source: Urban Land Institute. Residential Streets. 2001(Kulash 2001)

Table V.2: Communities with narrow residential street standards

City	Street Type/ Development Density	ROW	Travelway Width	Parking	Lane Direction
Portland, OR	Dead End Streets <300' long	35'	18'	None	2-way
	< 9 units per acre	35'	20'	1-side	2-way
	Standard Residential	40'*	24'	2-sides	2-way
Madison, WI	<3 units per acre	40'	27'	2-sides	2-way
	3-10 units per acre	56'	28'	2-sides	2-way
Novato, CA	Serves 2-4 dwellings	25'	20'	2-sides	2-way
	Serves 5-15 dwellings	40'	28'	2-sides	2-way
San Jose, CA	Unspecified	50'	24'-36' **	2-sides	2-way
Dublin, CA	Unspecified	50'	26'-36'***	2-sides	2-way

*56' with sidewalks

** Narrows down to 24' at tree planters forming parking bays.

*** Two opposing five foot-wide tree planters located every 100' reduce the effective street width by 10 feet. Source: Litman, 1999

Research carried out by some of the communities featured in Table V.2 suggests that careful design of narrow streets can address community concerns about parking, safety, fire truck access, congestion, and other factors (see Research Section below).

Cost savings realized from narrow streets allowed the City of *Portland, Ore.,* to improve the reduced portions of the roadway, and, in turn, to encourage infill development.

Portland reduced the required width for streets with two parking lanes from 32 to 26 feet, and from 28 to 20 feet for streets with a single parking lane. Portland's Fire Bureau supported the reduction for through-streets that can be accessed from two directions, but argued for two travel lanes on cul-de-sac streets longer than 300 feet (Bray and Rabiner 1994).

Portland also adopted a "skinny street" ordinance in 1991 that applies to residential blocks in zones with minimum lot sizes of 5,000 square feet. The ordinance allows streets with only a single travel lane, and parking on one or both sides. Because these streets primarily provide local access to residences, two-way traffic can be reasonably accommodated. To work well, however, these streets must have adequate breaks in the curbside parking that yielding vehicles to pull over easily for oncoming traffic.

3. DESIGNING INTERSECTIONS THAT BALANCE PEDESTRIAN AND AUTO MOVEMENTS

The design of intersections helps to reduce conflicts between different modes of travel moving in different directions. This is obviously a complex task. While proper intersection design considers design elements and standards based on the design speed of the street and the expected mix of traffic, it should also address trade-offs between increasing vehicular capacity and improving pedestrian and bicycle mobility and safety (Jacobs 2002).

Most current intersection design standards aim to allow vehicles to move in different directions but to reduce conflicts between them. Designated turning lanes and signalization best address these goals but lead to long waits for vehicles unless a sufficient number of lanes is provided for each travel direction. These types of intersections also yield long waits for crossing pedestrians, with short timing for the actual crossing.

Application

Springfield Avenue in *Maplewood, N.J.,* experienced high traffic volumes that conflicted with pedestrian travel. In 1997, physical streetscape improvements made to address pedestrian safety included curb extensions, medians, street trees, better facades, and new lighting (Figure V.2). Although corner radii were increased to accommodate large vehicles turning, curb extensions reduced the overall crossing distance for pedestrians by 16 feet. Stop signs were also set back from the crosswalks and aligned with street trees or street furniture to give drivers a visual cue about where to stop at the intersection and to keep cars from blocking the crosswalks (Ewing 1995).

4. ROAD GEOMETRICS TO ACCOMMODATE TRANSIT ON ARTERIALS

Accommodating transit often requires streets with appropriate width and turning radii. Yet all roads need not be widened for at-grade transit to be viable. A safe network of local transit routes is possible if on-street parking near intersection corners is properly regulated and eliminated to allow appropriate turning radii for transit as well as safe pedestrian and bicyclist crossing. Transit priority (or transit only) lanes are most common to improve transit efficiency on commercial streets. However, enforcing the proper use of priority lanes can be challenging, as private vehicles often use reserved bus lanes when making right turns (Project for Public Spaces 1998).

Application

The downtown of *Portland, Ore.,* uses one dedicated lane for light rail only and one lane for auto travel, where two lanes of traffic on one-way streets formerly existed. (figures V.3 and V.4) (Project for Public Spaces 1998).

5. ACCESS MANAGEMENT

Access management is a term used by transportation professionals to mean coordination between roadway design and land use to improve traffic flow. It is defined as "the process that provides access to land development while simultaneously preserving the flow of traffic on the surrounding road system in terms of safety, capacity, and speed" (Center for Urban Transportation Research 1998).

Access management seeks to limit the number of driveways and intersections on arterials and highways by changing land use planning and roadway design practices. A recent report by the Urban Land Institute stated that cutting the number of access points by 50 percent can result in about a 30 percent decrease in the accident rates (Urban Land Institute 2001). Access management also involves constructing medians to control turning movements, encouraging clustered development, and creating more pedestrian-oriented streets. For transportation efficiency, access management can not only improve motor vehicle traffic flow but also increase pedestrian, bicycle, and transit accessibility by limiting the number of conflicts between vehicles and other users.

Strategies for access management are as follows *(Center for Urban Transportation Research 1998)*:

1. Lay the foundation for access management in your local comprehensive plan.
2. Limit the number of driveways per lot
3. Locate driveways away from intersections.
4. Connect parking lots and consolidate driveways (so vehicles can travel between parcels without reentering an arterial).
5. Provide residential access through neighborhood streets (individual residential driveways should generally not connect directly to arterials).
6. Increase the minimum lot frontage on major streets (minimum lot sizes on major arterials should be larger than on minor streets).
7. Promote a connected street system (avoid street networks that force all local traffic onto arterials).
8. Encourage internal access to outparcels.
9. Regulate the location, spacing, and design of driveways.
10. Coordinate with the Department of Transportation.

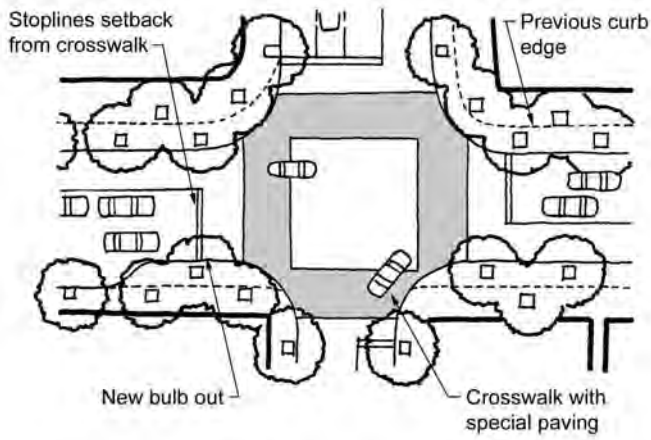


Figure V.2: Plan of intersection at Prospect and Springfield Avenue, Maplewood, N.J.

Figure V.3: Multimodal street in downtown Portland, Ore.

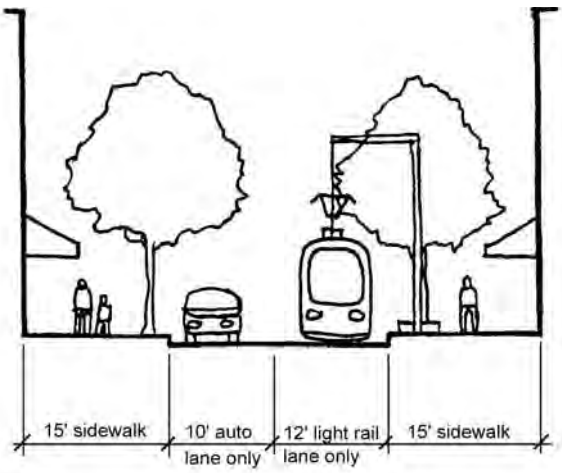


Figure V.4: Section of downtown Portland street, Ore.

Bulb-outs are placed on one side of the street to decrease the pedestrian crossing distance at intersections. The other side of the street has on-street parking restricted to the middle of the block.

Without proper consideration of transit use and non-motorized travel, however, these strategies can lead to switching local vehicular traffic away from arterials onto private development. Limited access to arterials means increased traffic in and between private at-grade parking lots unless local streets are provided. Access management may therefore mean additional demands on private landowners to provide local through-traffic facilities, as well as to encourage non-motorized travel for short distance trips within their project. Transit also needs to be an integral part of access management, in which local accessibility to transit is improved in the form of centrally located stations (Figure V.5).

Various publications and professional organizations provide information on *access management best practices*. Some recommendations include the following:

- Establish access management programs and policies, so they will be in place as specific projects are developed.
- Integrate access management with other transportation and land-use planning activities, and with TDM programs.
- Consider access management early during project planning.
- Use access management to improve transit and non-motorized travel, not just motor vehicle traffic.

Applications

The cities of *Seatac* and *University Place, Wash.*, have rebuilt the main arterials going through their centers (International Boulevard and Bridgeport Way West, respectively) using both access management and context sensitive design principles.

New Jersey and *Delaware* have instigated statewide programs that combine access management approaches to road and street design with context sensitive design principles. These programs seek to provide alternatives to street widening in order to preserve the character of small historic or suburban towns while improving conditions for traffic through the towns (Ewing 2001; Ewing and Surface Transportation Policy Project 1999b). A similar program is being developed in the state of Washington.

6. USE OF TRAFFIC CALMING TECHNIQUES

Traffic calming is similar to access management in that it uses road design approaches to manage the speed of vehicular traffic. However, while access management emphasizes safe and effective flow of vehicular traffic, traffic calming focuses on reducing vehicle speeds and volumes, making streets safer for residents, pedestrians, and bicyclists. Figure V.6 and Table V.3 describe some of the major traffic calming strategies, which can range from a few minor changes on neighborhood streets to major rebuilding of an entire street network.

<u>Figure V.5</u>: Local accessibility to transit. Top to Bottom: Sidewalks and transit access in Baltimore, Md.; Pedestrian environment for Kitsap Transit, Wash.; Land use and site design supporting transit in Maryland; and LYMNO Transit in Orlando, Fla.

(source: King Cushman's presentation, PSRC May 2002)

(source: http://www.walkinginfo.org)

<u>Figure V.6</u> Traffic calming and pedestrian environments. *Left to right, Top*: pedestrian crosswalks with a change of material or pattern in the road. *Second row*: Crossing island allows pedestrian to break in the middle of crossing busy street, Speed hump slows vehicular traffic. *Third row*: Traffic circle in residential neighborhood calms traffic at intersections, Roundabout slows traffic at intersection of major arterials. *Bottom:* Curb extension reduces turning speed at intersections, Woonerf is shared by pedestrians, bicyclists, and low-speed motor vehicles.

Table V.3: Traffic calming strategies and devices.

Type	Description
Curb extensions "pinch points"	Curb extensions, planters, or centerline traffic islands that narrow traffic lanes to control traffic and reduce pedestrian crossing distances. Also called "chokers."
Speed tables, raised crosswalks	Ramped surface above roadway, 7-10 cm high, 3-6 m long.
Mini-circles	Small traffic circles at intersections.
Median island	Raised island in the road center (median) narrows lanes and provides pedestrian with a safe place to stop.
Channelization islands	A raised island that forces traffic in a particular direction, such as right-turn-only.
Speed humps	Curved 7-10 cm high, 3-4 m long hump.
Rumble strips	Low bumps across road make noise when driven over.
Chicanes	Curb bulges or planters (usually 3) on alternating sides, forcing motorists to slow down.
Roundabouts	Medium to large circles at intersections
Pavement treatments	Special pavement textures (cobbles, bricks, etc.) and markings to designate special areas.
Bike lanes	Marking bikelanes narrows traffic lanes.
"Road diets"	Reducing the number and width of traffic lanes.
Horizontal shifts	Lane centerline that curves or shifts.
2-lanes narrow to 1-lane	Curb bulge or center island narrows 2-lane road down to 1-lane, forcing traffic for each direction to take turns.
Semi-diverters, partial closures	Restrict entry/exit to/from neighborhood. Limit traffic flow at intersections.
Street closures	Closing off streets to through vehicle traffic at intersections or midblock
Stop signs	Additional stop signs, such as 4-way-stop intersections.
"Neotraditional" street design	Streets with narrower lanes, shorter blocks, T-intersections, and other design features to control traffic speed and volumes.
Perceptual design features	Patterns painted into road surfaces and other perceptual design features that encourage drivers to reduce their speeds.
Street trees	Planting trees along a street to create a sense of enclosure and improve the pedestrian environment.
Woonerf	Streets with mixed vehicle and pedestrian traffic, where motorists are required to drive at very low speeds.
Speed reductions	Traffic speed reduction programs. Increased enforcement of speeding violations.

Source: www.vtpi.org [May 27, 2003]

Traffic calming has long been accepted by transportation professional organizations and urban planners (Ewing 1999 c; Homburger et al. 1989). Concerns focus on the specific devices that effectively reduce traffic speeds, such as speed humps or chokers, curb bulbs, pedestrian refuge islands, and mid-block connections. As a result, the range of strategies has been expanded over the years to address varied local needs (Figure V.7).

Applications

> "*Seattle*'s Neighborhood Traffic Control Program (NTCP) got its start as an outgrowth of programs to assist and improve deteriorating neighborhoods. Residents of Seattle approved the Forward Thrust Bond Issue in 1968 that included an emphasis on reducing traffic impacts and support for street improvements to re-vitalize deteriorating neighborhoods. Demonstration projects were instituted in 1973…testing a variety of traffic control devices. Temporary barriers were used to test traffic

Townson Business District—BEFORE

Towson Roundabout--AFTER

<u>Figure V.7</u>: A strategy to facilitate traffic calming and pedestrian activity at this busy intersection in Towson Business District, Md.

circles, star diverters, diagonal diverters, partial closures, and full closures on a system-wide basis. The experiences gained from these demonstration projects were used to establish the annual NTCP in 1978.

”The NTCP has grown into a popular program with its most successful device being the traffic circle. Of all the devices used in Seattle, traffic circles have proven to be the most effective at solving neighborhood concerns surrounding speeding and traffic accidents with a minimum of controversy. Since 1973, over 600 traffic circles have been constructed in Seattle and NTCP staff receives about 700 requests for traffic circles each year. The program is currently funded to construct 30 traffic circles per year” (Mundell 1997).

7. Regulations Focusing on Pedestrian Access and Crosswalk Requirements

“Transit, bicycle and/or pedestrian routes and facilities must offer an acceptable level of convenience if they are to provide a realistic travel alternative to the automobile. Walking or riding distance and time particularly influence how convenient a transportation alternative appears to the traveler. A well-connected network of pathways is essential to provide pedestrians and bicyclists the opportunity to walk or ride to various destinations” (Municipal Research and Services Center of Washington 1995). Ways to increase pedestrian access include limited curb cuts, wide sidewalks, through-block connections, frequent crosswalks, and a continuous network of sidewalks (Municipal Research and Services Center of Washington 1995). Recent studies are leading to systematic approaches to assess pedestrian route safety (Zeeger et al. 2003). As a result, many cities, including Seattle, Wash., are evaluating and redesigning their pedestrian crosswalk and network systems to enhance the quality and safety of pedestrian routes.

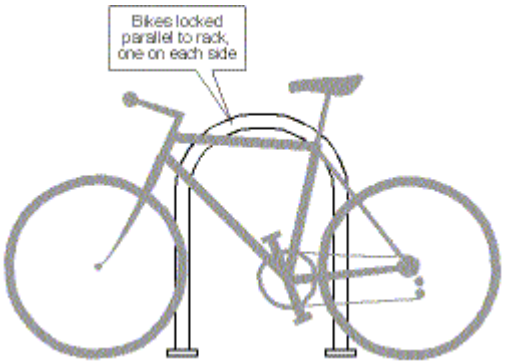
Model Code Example

Pedestrian circulation systems must be provided to facilitate movement within the urban planned unit development (PUD) and to ensure pedestrian access to adjacent walkways and residential streets and to public uses, including school, parks and transit facilities. The City Engineer may require the walkways to be within public right-of-way or easements dedicated to allow rights of passage. (Tri-County Metropolitan Transportation District of Oregon 1993)

8. Regulations Focusing on Bicycle Access

Bicycling is ideal for making short trips in low traffic areas. It is also a preferred mode of travel for children and adolescents, giving them a higher degree of mobility without a drivers’ license. The provision of continuous bikepaths linking complementary origins and destinations is essential to support this mode of transport. Bike lanes on existing streets make bicycle travel safer and can be expediently implemented, especially in the many communities that have a network of wide streets with low traffic volume.

Integrating transit and bicycle travel provides the opportunity to engage bicyclists in taking trips that are longer than they can travel on just their bike—or to eliminate barriers such as steep slopes or weather. Secure bicycle storage at transit stations and park-and-ride lots, and the provision of bike racks on buses and trains support linking bike travel with other efficient modes (Figure V.8).



<u>Figure V.8</u>: Secure bicycle storage and bicycle racks support a multimodal environment.

Facility improvements catering to bicycle travel often have low budgetary and management implications and include pothole filling, paving stretches of road shoulder, installing curb cuts, paving short paths, installing bicycle-friendly gutters, and smoothing railroad crossings. Arterial lanes can be converted to bicycle lanes with no reduction in traffic capacity (Burden and Lagerwey 1999). Many highway agencies and local governments now specify that all highways and arterials without curbs have a smooth shoulder of 1 to 3 meters wide wherever possible, to make biking safe (Khan and Bacchus 1995).

Application

> The *Tri-County Metropolitan Transportation District, Ore.*, has instituted the following regulation: "A system of interconnected bikeways, consistent with the Comprehensive Plan and any applicable Specific Plan or corridor plan, shall be provided. Designated bike lanes *(Class II or alternate designation*) shall be provided on collector and arterial streets that converge on light rail transit stations or transit centers. Bikeways shall be provided at ends of cul-de-sacs between subdivisions where the routes would otherwise require deviations of over 100-400 feet. Sidewalk bike paths shall be avoided because they put cyclists in conflict with pedestrians. Bikeways shall be constructed at the same time that new streets are improved, unless a deferred completion agreement is approved by *(cite appropriate reviewing authority*)." (Tri-County Metropolitan Transportation District of Oregon 1993)

BUILT ENVIRONMENT TOOLS AND APPLICATIONS

Design guidelines, a secondary process or a set of regulations that guides the appearance of new development, can help coordinate land use and transportation and provide a safe and livable environment for people. Such guidelines reinforce the characteristics and qualities of transportation-efficient development. Design guidelines cover not only the architectural design features of building façades but the relationships between built and open spaces, and the design of building fronts, signs, street furniture, and more.

Contemporary design and development often forego basic human social needs. Many suburban cities provide few, if any, spaces where people can enjoy the company of others and engage in basic social interaction. Even spaces that are commercial and employment centers often lack public gathering spaces. Typically, walking and gathering spaces are tightly controlled in many developments, with the ground floors of buildings often designed to virtually eliminate human activity.

Zoning regulations can help support pedestrian-friendly design by requiring certain urban design features in appropriate activity areas. Ordinances to require or encourage pedestrian-friendly design emphasize features that help people feel comfortable and safe in an active and visually interesting public realm (City Staff and Plater-Zyberk 2001). Pedestrian-oriented design is influenced by the placement of buildings and circulation spaces on a site, the location of building entrances, and by the design of building facades, plazas, and other site improvements.

It has been documented that commercial areas with buildings lining streets (without setbacks) and with numerous building entries along the street support an increased proportion of walk trips. On the basis of the assumption that buildings built before the 1950s were typically not set back from their street front, researchers documented the percentage of commercial buildings built before

that date in several study areas and correlated it with travel behavior. Controlling for several other variables, they concluded that "for every 30 percentage point increase in pre-1951 buildings, vehicle miles traveled per household [in the areas studied] decreased by almost 5 percent" (Cambridge Systematics 1994; Washington State Energy Office 1994).

1. BUILDING SETBACKS AND ORIENTATION

Regulating building setbacks and orientation seeks to reverse auto-dominated strip commercial development that seeks to make room for street-fronting parking lots. Direct and visible access to buildings along a street minimizes pedestrian travel distance. It encloses and defines street space, enhancing streetscape continuity and pedestrian comfort (Municipal Research and Services Center of Washington 1995).

Using buildings to define a street affects safety as well as aesthetics. A street enclosed by structures (as opposed to lined with parking lots) conveys narrowness to motorists, encouraging them to drive at slower speeds and pay attention to people along the roadway. Conversely, wide-open, unconstrained spaces invite high speeds, creating hazardous conditions for children at play, as well as for pedestrians and bicyclists (Jaskiewicz 1999).

Zoning regulations can address requirements for building setbacks, the proportion of lot lined with buildings along the street, the location of building entries, and driveways into parking lots.

Applications

Vancouver, Wash., – Primary ground floor building entrances shall have an entrance oriented to pedestrian-oriented streets, plazas, or parks. The building may also have other entrances as long as direct pedestrian access is provided from all entrances (Municipal Research and Services Center of Washington 1995).

N.J. Transit – Buildings, excluding parking structures and accessory structures, shall be located as close to the street lines of the lot as practicable while complying with the setback (yard) (Municipal Research and Services Center of Washington 1995).

2. BUILDING FRONTS AND ENTRANCES

Placing buildings up to the edge of the sidewalk zone helps to minimize travel distances for pedestrians and transit users and creates interest along a street. Most people don't feel comfortable walking in wide open areas with parked cars and busy traffic passing closely by. Pedestrians are drawn to streets with a feeling of intimacy and enclosure.

Locating shops along the street attract people to an area and help create a dynamic, lively, pedestrian-friendly environment. Store windows add interest to the street and draw people along their length. Retail destinations close to a bus or trolley stop are an added incentive for people to use transit. Storeowners near active transit stops also benefit from sales to the casual, walk-in buyer. (Zydofsky 2000)

3. BUILDING ARTICULATION/MODULATION

A fine-grained mix of activities along streets—such as diverse storefronts, houses, or open space—adds interest to the pedestrian experience through the varied application of materials, design, color, and décor. Historic town centers and close-in neighborhoods offer some of the best examples of articulated street frontages. Their narrow lots and buildings were originally designed to appeal to slow-moving pedestrians rather than high-speed automobile traffic (Jaskiewicz 1999).

A number of communities have developed provisions to reduce the effects of long, monotonous, featureless façades or other structures, which can often line the street. Façade articulation breaks down the scale of bulky buildings, making them less imposing.

Model Code Application

City of Kirkland, Wash.: Chapter 92.10.9

Table V.4: Kirkland's code for blank wall treatment.

a. **Each wall or portion of a wall that is closer than 50 feet** to any exterior property line of the subject property and is visible from any right-of-way or is adjacent to a through-block sidewalk must be screened or treated in at least one of the ways listed in subsection (9)(c) of this section if it meets the criteria for a blank wall under subsection (9)(b) of this section.

b. A blank wall is any wall or portion of a wall that meets either of the following criteria:

1) A wall or portion of a wall with a surface area of at least 400 square feet having both a length and a width of at least 10 feet without a window, door, building modulation at least one foot in depth or other architectural feature.

2) Any wall or portion of a wall between four feet and 13 feet above ground level with a horizontal dimension longer than 15 feet without a window, door, building modulation at least one foot in depth or other architectural feature.

c. **At least one of the following techniques must be used** to treat or screen blank walls:

1) By the installation of a vertical trellis with climbing vines or plant material in front of the blank wall.

2) By providing a landscaped planting bed at least five feet wide or a raised planter bed at least two feet high and three feet wide in front of the blank wall and planted with plant materials that will obscure or screen at least 50 percent of the blank wall within two years.

3) By providing artwork, such as mosaics, murals, sculptures or bas-relief on the blank wall.

4) By proposing alternative techniques as part of the Design Review.

Application

Caper's Block in *Vancouver, B.C.*, features a modulated building design broken into three sections separated by small courtyards (Figure V.9). These courtyards contribute to the street's pedestrian zone by providing a place to rest and people-watch. The reduced apparent bulk and length of the building is well integrated into the fine-scale character of the existing street, as spaces maintain the crucial retail continuity of a successful urban street. The retail ground floor is articulated as a series of diverse shops, using different materials, colors, and individual signage (Figure V.10). The individual expression of store tenants via unique storefronts adds to their distinctiveness and marketability, while creating a visual amenity along the standard width sidewalks. (City of Vancouver Planning Department 1999)

4. GROUND FLOOR WINDOW AND TRANSPARENCY REQUIREMENTS

Further façade transparency requirements serve to enrich the transition between the public space and private space. In business areas, transparency is created through the use of windows, outdoor displays, and sidewalk cafes. In residential areas, raised front porches, stoops, or patios are an essential transition between public and private space.

In areas where jurisdictions want to encourage pedestrian access, the façades of commercial buildings that face sidewalks should be encouraged to have at least 50 percent of the ground floor in windows, doors, or displays.

Applications

Numerous cities, including *Portland, Ore.*, *San Francisco, Calif.*, and *New York, N.Y.*, have adopted ordinances and design-review standards that prevent new buildings from facing the street with blank or otherwise visually impenetrable ground-level walls. Building fronts need to have "display windows wherever possible to keep the street interesting and inviting to pedestrians."

5. WEATHER PROTECTION REQUIREMENTS (AWNINGS, TRANSIT SHELTERS)

Exposure to weather is an unavoidable part of pedestrian and bicycle travel. However, simple facilities, such as awnings, can serve as protection from the wind, rain, and intense sun that can discourage walking and transit use. Frequent outdoor seating opportunities, restrooms, and other facilities can be provided to make travel by transit or foot more comfortable and enjoyable.

Applications

In its pedestrian-oriented districts, *Redmond, Wash.*, requires that buildings be designed to provide for weather and wind protection at the ground level (Figure V.11). Buildings fronting on a commercial district, pedestrian-oriented street should provide pedestrian weather protection by way of awnings (or) overhangs that are a minimum of 48 inches in depth. The elements should be complementary to the building's design and design of contiguous weather protection elements on adjoining buildings (Municipal Research and Services Center of Washington 1995).

Figure V.9: Caper's Block, Vancouver, B.C. The project features a modulated building design.

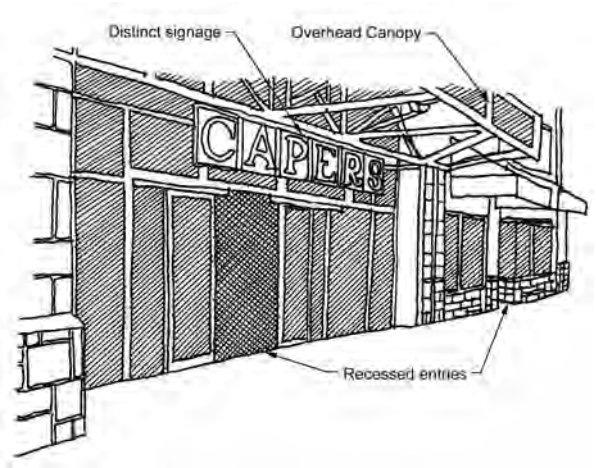


Figure V.10: Caper's Block. The retail ground floor is articulated for each shop.

Figure V.11: Redmond, Wash. Awnings and overhangs are complementary to building design and provide pedestrian weather protection.

Clark County, Wash., regulations state that if a development is located within 250 feet of an existing or proposed transit stop, the applicant shall work with the transit agency in locating a transit stop and shelter directly adjacent or as close as possible to the main building (Municipal Research and Services Center of Washington 1995).

6. ESTABLISHMENT OF MINIMUM LOCAL STANDARDS FOR PEDESTRIAN AND BICYCLE AMENITIES

Bicycle parking needs to be centrally located and easily accessible to building entries in commercial areas, employment sites, and close to public facilities. At employment sites, long-term parking must keep bicycles and accessories safe from theft and protected from weather. Convenient short-term parking is important near commercial areas. Racks must be well designed to hold the bike frame, rather than just the wheels, and accommodate a wide range of bicycles and lock types. Bicycle commuters may need showers and lockers, especially those who ride long distances in hot, humid, or rainy climates, and need to wear professional clothes during the day.

Application

Portland, Ore., has detailed requirements not only for automobile parking but also for bicycle parking that must be provided in addition to automobile parking spaces. The treatment of bicycles as an integral element of parking requirements is unusual and exemplary.

Table V.5. Extracts from Portland's code.

Residential Use Classifications:
Multi-family: 1 space per unit
Dwelling: (0.25 per unit if occupancy restricted to 55 years or older)

Public and Semi-public Use Classifications:
Colleges: 0.25 spaces per full-time equivalent student
Elementary Schools: 4 spaces per 4th, 5th and 6th grade classroom
Jr. High Schools: 4 spaces per classroom
High Schools: 8 spaces per classroom
Other Uses: As specified by conditional use permit. A requirement for annual or periodic review of bicycle usage may be imposed, and additional spaces may be required if demand warrants.

Commercial and Industrial Use Classifications:
5 percent of the requirement for automobile parking spaces, except for the following classifications, which are exempt:

A. Animal Sales and Service
B. Auto-related Uses
C. Warehousing: Wholesale and Distribution

Bicycle Parking Space and Aisle Dimensions:

1. Uncovered spaces shall be at least 6 feet long and 2 feet wide.
2. Covered spaces shall be at least 7 feet long and 2 feet wide.
3. A 5-foot wide aisle is required adjacent to each row of bicycle parking.

Design Requirements:
For each bicycle parking space required, a stationary rack shall be provided which can accommodate bicyclists' locks securing the frame and wheels, or a lockable enclosure in which the bicycle is stored.

1. All of the required bicycle parking for colleges, schools, multi-family residences, and industrial uses and at least 50 percent of the required bicycle parking for commercial uses shall be covered to provide rain protection.

2. If the required vehicle parking spaces are covered, then the bicycle parking spaces shall be covered.
3. Required bicycle parking shall be provided within a building or in well-lighted, secure locations within 50 feet of an entrance to a building occupied by the use served, but no further from the building entrance than the closest automobile parking space.
4. Bicycle parking may be provided within the public right-of-way in zoning districts where no front setback is required, subject to approval of (appropriate local official). (Tri-County Metropolitan Transportation District of Oregon 1993)

7. OPEN SPACE/PLAZA REQUIREMENTS

As density increases in centers and activity areas, the need for usable, publicly accessible open spaces also increases. Open spaces such as parks, plazas, or other informal gathering places are different from the protected natural areas that are withheld from development for environmental reasons, providing opportunities for recreation and adding to neighborhood vitality. In areas of intense development, open space should be thoughtfully planned to avoid creating wasteful landscaped areas with little more than visual appeal.

Urban open space regulations have long been in effect in the downtowns of large cities (Kayden 1989). Smaller cities have followed suit, with most pedestrian-oriented district regulations now providing incentives for developers to integrate such spaces in their projects (Hirshorn and Souza 2001).

Application

The Park at Post Office Square is an award-winning parking garage/open space project in the heart of *Boston, Mass.'s*, revitalized financial district. The original three-story concrete parking garage was replaced by an underground parking structure and topped by a park. The redevelopment was conceived by the Friends of Post Office Square, a non-profit group of businesses located in or near the site. The group worked with the Parks Department, the Boston Greenspace Alliance, a consortium of open space advocates, and the Boston Redevelopment Authority to secure development rights from the City of Boston. It took ten years to complete the project, which opened in the early 1990s (Project for Public Spaces 2003).

RESEARCH HIGHLIGHTS

A great deal of research is available on street design and building regulations that support pedestrian and bicycle travel. Associations between supportive environments and pedestrian and bicycle travel are well-known. Specific strategies shaping pedestrian-supportive streets and the built environment have a moderate but important effect on increasing the number of walk trips, as summarized in Table V.6.

- A *Portland, Ore.*, study found that "a 10 percent reduction in vehicle miles traveled (VMT) can be achieved with a region-wide increase in the quality of the pedestrian environment" to a level comparable to Portland's most pedestrian-friendly existing zones (Cambridge Systematics 1994; Washington State Energy Office 1994).

- Also, nearly all communities with high levels of bicycle transportation have extensive networks of bicycle paths and lanes. One study found that each mile of bikeway per 100,000 residents increases bicycle commuting 0.075 percent (Nelson and Allen 1997).

Table V.6: Travel impacts of strategies addressing pedestrian environments.

Strategy	Potential Travel Impacts
Land-Use Policy Reform	Can significantly reduce automobile trips over the long term.
Traffic Calming	Can induce a moderate reduction in automobile trips and increase non-motorized over the medium and long term.
Pedestrian and Bicycle Facilities	Can significantly increase walking and cycling over the medium term. Not all of the increased non-motorized travel substitutes for automobile trips.
Roadway Improvements	Can moderately increase walking and cycling over the medium term. Not all of the increased non-motorized travel substitutes for automobile trips.
Bicycle Parking and Showers	Can moderately increase cycling where implemented.
Encouragement and Safety Programs	Can moderately increase walking and cycling over the medium term. Not all of the increased non-motorized travel substitutes for automobile trips.
Bicycle-Transit Integration	Can moderately increase cycling where implemented.

"Significant" = greater than 5% , "Moderate" = 1-5%
Source: (Litman 1999)

RESEARCH ON STREET WIDTHS

Clearly, any effort to narrow streets will need to satisfy residents' and service providers' concerns about parking, safety, fire truck access, congestion, and other factors. The following highlights research addressing key safety and service delivery issues related to narrowing streets and traffic lanes. It points to associations between pedestrian friendly environments and high property values.

Narrow Streets and Safety
In *Longmont, Colo.*, over 20,000 police reports were examined to determine the relationship between street design and safety. The study focused specifically on residential streets with maximum ADTs of 2,500. Accidents attributable to poor road conditions or substance abuse were excluded from the study. Study results suggested that narrow residential streets are safer than wide streets. Specifically, streets between 22 to 30 feet wide were found to be the safest. The study further indicated that curvilinear streets are safer than straight streets. In general, the Longmount study suggests that narrow, curved streets can safely be used in residential developments (Center for Watershed Protection 1998).

Street Width and Parking
The need for on-street parking often justifies the use of wider residential and local streets. However, most communities now require a sufficient amount of parking to be provided off-street, as, for example, regulating 2 to 2.5 off-street parking spaces for each home. In most new developments as well, one or two additional visitor spaces can be provided in driveways. On-street parking (typically 20 feet long and seven feet wide) is therefore only needed if it can substitute for private parking. Otherwise, providing a continuous parking lane on both sides of streets is inefficient and expensive, with each on-street parking lane increasing the impervious cover by 25 percent. Queuing street designs allow both traffic movement and parking needs to be met on a narrow travelways.

The City of *Portland, Ore*., investigated the use of queuing streets, as described by the American Society of Civil Engineers (ASCE), to reduce street widths. The ASCE design assumes that cars will wait between parked cars, or "queue," while the approaching traffic passes. The new design reduces existing street widths by up to 8 feet. Prior to implementing the revised standard, the Portland Department of Transportation studied existing narrow streets to determine whether reduced street widths would endanger pedestrians and residents. The findings of this study were as follows (Center for Watershed Protection 1998):

- A bicycle and a car can fit down a 24-foot-wide street with parking on both sides.
- A dump truck can fit down a 24-foot-wide street with parking on both sides.
- Fire trucks can drive down 26-foot-wide streets with parking on both sides.
- A fire truck can make a turn from an 18-foot-wide to a 20-foot-wide road at slow speeds.
- Traffic engineers could point to no accident history relating to narrow street widths.
- The Portland fire chief was amenable to streets as narrow as 18 feet with parking on one side in grid pattern streets or on short cul-de-sacs.
- No citizen has charged that fire rescue time was impeded by skinny streets since the inception of this program in 1991.

Pedestrian Environment and Property Values

Reducing traffic noise, traffic speeds, and vehicle-generated air pollution can increase property values. A research study found that a 5- to 10-mph reduction in traffic speeds increased adjacent residential property values by roughly 20 percent. Another study found that traffic restraints that reduced volumes on residential streets by several hundred cars per day increased home values by an average of 18 percent (Local Government Commission 2000)

SUGGESTED RESOURCES

Jacobs, Allan B. (1993). *Great Streets*. Cambridge, Mass.: MIT Press.

Litman, Todd. (1996). *Whose Roads?*, VTPI (www.vtpi.org).

Metro Regional Services. (1997). *Creating Livable Streets: Street Design Guidelines for 2040*. Portland, Oregon.

Municipal Research and Services Center of Washington (MSRC) and King County Department of Metropolitan Services. (1995). Creating Transit Supportive Regulations: A Compendium of Codes, Standards, and Guidelines. Prepared for WSDOT Office of Urban Mobility.

Otak Associates. (2001). *Commercial and Mixed Use Development Code Handbook*. Prepared for the Oregon Transportation and Growth Management Program.

Southworth, Michael and Eran Ben-Joseph. (1997). *Streets and the Shaping of Towns and Cities.* New York: McGraw Hill.

Transportation Alternatives (T.A.). http://www.transalt.org/press/magazine/index.html

Transportation Research Board (1998). "Transit Friendly Streets: Design and Traffic Management Strategies to Support Livable Communities". *TCRP Report* No. 33.

Washington State Department of Transportation. (1997). *Pedestrian Facilities Guidebook*: Incorporating Pedestrians Into Washington's Transportation System.

Washington State Energy Office. (1994). *Municipal Strategies to Increase Pedestrian Travel.* Olympia, WA.

WORKS CITED

Bray, T., and Rabiner, K. (1994). "Report on New Standards for Residential Streets in Portland, Oregon." Portland Oregon Bureau of Transportation Engineering.

Burden, D., and Lagerwey, P. (1999). "Road Diets; Fixing the Big Roads." Walkable Communities.

Cambridge Systematics. (1994). "The Effects of Land Use and Travel Demand Strategies on Commuting Behavior."

Center for Urban Transportation Research. (1998). "Ten Ways to Manage Roadway Access in Your Community." Center for Urban Transportation Research, University of South Florida.

Center for Watershed Protection. (1998). "Better Site Design: A Handbook for Changing Development Rules in Your Community." The Center for Watershed Protection, Ellicott City, MD.

City of Vancouver Planning Department. (1999). "Vancouver's Urban Design: A Decade of Achievements." City of Vancouver, Vancouver.

City Staff, and Plater-Zyberk, D. (2001). "Traditional Neighborhood Development Code." Columbus, Ohio.

Ewing, R. (1995). *Best Development Practices: Doing the Right Thing and Making Money at the Same Time*, Dept. of Community Affairs, Tallahassee, FL.

Ewing, R. (1999 c). "Traffic Calming: State of the Practice FHWA-RD-99-135." *FHWA-RD-99-135*, Institute of Transportation Engineers, Washington, DC.

Ewing, R. a. M. K. (2001). "Flexible Street Design of New Jersey's Main Streets." Voorhees Transportation Policy Institute, Rudgers University.

Ewing, R. a. t., and Surface Transportation Policy Project. "Mobility-Friendly Street Standards for Delaware."

Hirshorn, J. S., and Souza, P. (2001). "New Community Design to the Rescue. Fulfilling Another American Dream." *ISBN 1-55877-348-7*, NGA Center for Best Practices, Washington, D.C.

Holtzclaw, J. (1994). "Using Residential Patterns and Transit to Decrease Auto Dependence and Costs." National Resources Defence Council, San Francisco, 16-23.

Homburger et al. (1989). *Residential Street Design and Traffic Control.*, Prentice Hall, Englewood Cliffs.

Institute of Transportation Engineers. (1999). "Traditional Neighborhood Development: Street Design Guidelines." *ISBN 0-935403-34-5*, ITE, Washington, DC.

Jacobs, A. (1993). *Great Streets*, MIT Press, Cambridge, MA.

Jacobs, A. B., Elizabeth Macdonald, and Yodan Rofé. (2002). *The boulevard book : history, evolution, design of multiway boulevards*, MIT Press, Cambridge, MA.

Jaskiewicz, F. (1999). "Pedestrian Level of Service Based on Trip Quality." Urban Street Symposium Conference Proceedings, Dallas, Texas.

Kayden, J. S., Charles M. Haar. (1989). *Zoning and the American dream : promises still to keep*, Planners Press, American Planning Association in association with the Lincoln Institute of Land Policy, Chicago, Ill.

Khan, A. M., and Bacchus, A. (1995). "Bicycle Use of Highway Shoulders." *Transportation Research Record*, 1502, 8-21.

Kulash, W. M. (2001). "Residential Streets." Urban Land Institute, Washington, DC.

Litman, T. (1999).*Traffic Calming Benefits, Costs and Equity Impacts*. http://www.vtpi.org/calming.pdf.

Local Government Commission. (2000). "The Economic Benefits of Walkable Communities." Local Government Commission Center for Livable Communities, Sacramento, CA.

Mundell, J. E. (1997). "Report prepared for the Institute of Transportation Engineers." *District 6 Annual Meeting, July 20-23*, Institute of Transportation Engineers, Salt Lake City, UT.

Municipal Research & Services Center of Washington. (1995). "Creating Transit Supportive Regulations: A Compendium of Codes, Standards, and Guidelines." MRSC, Seattle, WA.

Nelson, A. C., and Allen, D. (1997). "If You Build Them, Commuters Will Use Them; Cross-Sectional Analysis of Commuters and Bicycle Facilities." *Transportation Research Board*, 970132, 79-83.

Project for Public Spaces. (1998). "Transit Friendly Streets: Design and Traffic Management Strategies to Support Livable Communities." TCRP Report No.33, Washington D.C.: National Academy Press, Transit Cooperative Research Program.

Project for Public Spaces. (2003).*Success Stories*. http://pps.org//topics/. September 1.

Shankar, U. (2003). "Pedestrian Roadway Fatalities." National Center for Statistics and Analysis Advanced Research and Analysis.

Tri-County Metropolitan Transportation District of Oregon. (1993). *Planning and Design for Transit*, Tri-County Metropolitan Transportation District of Oregon, Portland, OR.

Urban Land Institute. (2001). "Ten Principles for Reinventing America's Strip Centers."

Washington State Energy Office. (1994). *Municipal Strategies to Increase Pedestrian Travel*.

Zeeger, C. V., Esse, C. T., Stewart, J. R., Huang, H. H., and Lagerwey, P. "Safety Analysis of Marked vs. Unmarked Crosswalks in 30 Cities." *Technical Conference*, Ft Lauderdale, FL.

Zydofsky, P. (2000).*Building Livable Communities with Transit*. http://www.lgc.org/freepub/land_use/articles/buildcomm.html.

VI. AFFORDABLE HOUSING

INTRODUCTION

Limited affordable housing affects transportation efficiency, as people typically trade lower housing costs for longer commutes to work. Affordable housing increases the job-housing balance in an area by giving people the option to live closer to where they work, if they choose, thereby shortening or potentially changing their commute.

Frequently, the practice of "fiscal zoning" leads to housing that is in short supply. Cities overzone for those land uses that will produce the highest property taxes and require the fewest services, namely commercial and industrial development. This same logic can also influence the type of residential zoning - with large lot zoning (which generates expensive housing, and thus higher property taxes) making up the majority of residentially zoned land. Not only does this practice lead to superfluous sprawling development, it limits total housing supply and fails to provide housing types that are affordable for moderate to low-income workers.

Affordable housing is defined as housing with rental or mortgage costs of no more than 30 percent of a household's gross monthly income (including utility payments). High income households typically have abundant choices for both housing type and residential location. These choices diminish progressively down to little, if any, choice for moderate to very low income households. Moderate income households are defined as those having incomes between 80 and 115 percent of the median household income, low income households have between 50 and 80 percent, and very low income households are at or below 50 percent of the median household income. People in the service employment sector, teachers, policemen, and firefighters typically fall into moderate and low income levels.

Compact development can facilitate the creation of affordable housing by increasing the housing supply and availability of different housing types, as well as reducing transportation costs to residents (by creating areas that can easily be served by transit). Strategies that increase the mix of land uses can provide options for people to bring their residences closer to jobs and services. However, without considering housing affordability, these strategies fall short. Higher-income people are able to afford close-in, convenient locations while people who work in those places, unable to afford to live there, must endure long-distance commutes from far-flung exurbs. Transportation-efficient communities must also be mixed income communities to minimize long-distance travel for populations at all income levels.

Housing costs are related to unit type and size, density of development, and location. Common residential development practices generate primarily large areas with homogeneous housing type and prices, which have a negative impact on transportation efficiency and housing affordability. Land use and other regulatory controls are necessary to encourage the mix of housing types and sizes within a development or district, which, in turn, can lead to a range of market-housing prices within an area: as houses, lots, apartments, or condominiums vary in size and location with respect to amenities (views, open space), they also vary in price, allowing people with different incomes to live in close proximity. Below-market housing, on the other hand, requires direct public subsidies to residents (via vouchers, tax breaks), or incentives to housing developers in the form of tax breaks or additional development capacity.

Strategies to increase affordable housing opportunities are particularly effective in close-in neighborhoods that have transit options for the elderly and handicapped population. Diversifying the housing supply of existing neighborhoods already served by transit and equipped with neighborhood retail offers the most promise for affordable housing. Infill development can help increase this diversity, providing, for example, studio apartments or mother-in-law units while increasing densities (figures VI.1 to VI.4).

Generally, transportation-efficient land use regulations can help local jurisdictions promote affordable housing. For example, some of the cost savings incurred by the reduced costs of infrastructure in compact development can be passed on to reduce housing development costs and, in turn, to building affordable housing. The same savings in infrastructure can apply to infill development. Further, as increased densities contribute to increasing housing supply, some of the added units can be targeted to lower-income households. Specifically, construction and infrastructure costs are proportionately lower for higher density developments with a greater portion of attached units, thereby increasing the potential for affordability (Burchell et al. 1998).

AFFORDABLE HOUSING TOOLS AND APPLICATIONS

1. INCLUSIONARY HOUSING PRACTICES IN ZONING AND COMPREHENSIVE PLANS

Inclusionary zoning requires or encourages housing developers to build affordable units in new development or contribute to an affordable housing fund. Programs may be voluntary or mandatory, with incentives such as density bonuses or fee waivers offered in exchange for the provision of affordable units. Typically, an inclusionary zoning ordinance sets a minimum percentage of units in a development that can be rented or purchased by households earning a predefined percentage of the median area income.

Most inclusionary housing programs rely on a combination of incentives, including density bonuses, financial subsidies, development fee waivers, options to produce off-site affordable units, relaxed development standards (such as parking spaces), reduced impact or other fees, and donations of land.

Inclusionary zoning has proved to be a critical means for creating a supply of affordable housing and for achieving a greater range of choices in housing type and location for below-median-income households. Inclusionary zoning can support the creation of mixed-income communities and, more generally, can augment opportunities for households to live near jobs, services, and other resources.

Inclusionary programs can address neighbors' concerns (and expressions of NIMBY: not-in-my-back-yard) by mixing only a few lower-income units within market-rate housing projects. Developers may resist inclusionary zoning as governmental interference in their business. They may also argue that the reduced income or losses incurred by providing below market rate housing are passed on to purchasers or renters of market rate housing in the form of higher prices, thus decreasing housing affordability for middle income people.

Figure VI.1: High quality design makes multi-family affordable housing attractive. (Photograph by Bambi LaPlante, courtesy of Solomon Architecture and Urban Design.)

Figure VI. 2: Affordable mixed-use housing with on-street parking. (Courtesy of Local Government Commission.)

Figure VI.3: Vermont Village. A mixed-use development of 36 affordable townhouses. Located amid a three-mile commercial strip, the project builds upon the stability of a well-kept neighborhood just a few blocks away. (Photograph by Grant Mudford, courtesy of Solomon Architecture and Urban Design.)

Figure VI.4: Vermont Village Plaza. (Photograph by Grant Mudford, courtesy of Solomon Architecture and Urban Design.)

http://www.cnu.org/resources/index

Applications

The City of *Palo Alto, Calif.'s,* Below Market Rate (BMR) Program requires new developments of ten or more units to provide at least 10 percent of the units at costs affordable to low- and moderate-income households. On sites greater than five acres, 15 percent of the housing units must be below-market-rate. The program is designed to spread affordable housing units throughout the city and in all projects. It is particularly encouraged in areas of the city that are well served by transit, schools, and other public services. As an alternative to building affordable units, developers can pay in-lieu fees, which are deposited into the city's Housing Development Fund. Because of the high costs of land and development, the city typically prefers housing construction over payment of in-lieu fees. Sales and resales of BMR units are administered by the private non-profit Palo Alto Housing Corporation, which requires BMR housing to remain owned and occupied by low- and moderate-income people.

Bellevue,Wash.
Bellevue enacted a mandatory inclusionary housing program under the mandate of the State Environmental Policy Act and Washington State's Growth Management Act that requires jurisdictions to consider the housing needs of all economic segments of the community. The inclusionary housing requirements apply to all new residential development, all subdivisions, and all rezone applications.

2. USE OF DENSITY BONUSES TO ATTRACT NEW AFFORDABLE HOUSING

Density bonuses are often given in exchange for certain benefits or amenities to ensure that new development makes a net positive contribution to its neighborhood. Density bonuses can serve as incentives to encourage affordable housing development, as well as to encourage infill development in targeted growth areas.

Applications

Facing rising housing prices, *Montgomery County, Md.,* adopted an inclusionary housing program that requires developers of 50 or more units of housing to make 12.5 percent to 15 percent of the units affordable. In return, developers receive a density increase of up to 22 percent. The county controls the selling price of the units for 10 years and the rental rate for 20 years, to ensure that they remain affordable. After that time, the units may be resold at market rates, with the county sharing in the profits. In addition, the County Housing Authority and a nonprofit clearinghouse can purchase up to 40 percent of the affordable units built through this program. The program was recently modified to create a sliding scale of density bonuses to encourage and reward projects with higher proportions of affordable housing.

A *King County, Wash.,* Density Bonus program encourages developers to build affordable ownership and rental housing. Density bonuses are also provided for such public benefits as open space, trails, and parks; historic preservation; and energy conservation. The concept is that for every affordable unit that a developer promises to build, he or she can build a calculated number of market-rate units greater than

would be normally allowed. For example, on a site zoned for a maximum of 30 rental units, the developer may offer to produce 10 units affordable to households at or below 50 percent of median income in exchange for the total number of units allowed to be increased to 35. Limits are imposed on both the zones where density incentives can be earned and on the number of density bonuses allowed.

Clackamas County, Ore., has had provisions in its zoning code since 1980 that allow an increase in density if affordable housing is provided. The percentage increase in density varies with the Comprehensive Plan category as follows:

- up to 5 percent increase for low-density (Fader) zones
- up to 8 percent for medium or high-density (TOD Communities) zones. The increase is allowed at a rate of one additional unit per assisted housing unit provided, up to the maximum allowable density increase (Clackamas Regional Center Zone District).

Redmond, Wash., requires 10 percent of units to be affordable for projects built in downtown that have 10 units or more. For those projects built at a density of 55 dwellings per acre or less, the city gives a 10 percent density bonus as a reward for providing those affordable units (WSDOT 2002).

3. ACCESSORY DWELLING UNITS

Allowing accessory dwelling units (ADUs) is an effective technique for providing affordable housing because it uses surplus space in existing single-family neighborhoods. An accessory dwelling unit is an additional living unit, including separate kitchen, sleeping, and bathroom facilities, attached or detached from the primary residence, on a single-family lot. Accessory units are also called "mother-in-law apartments," "accessory apartments," or "second units." They typically involve the renovation of a garage, basement family room, attached shed, or a similar space in a single-family home.

The need for affordable housing is probably the single most important reason for sustained interest in accessory dwelling units over the past few decades. Several studies by both public and private housing groups that documented the nature and extent of the affordable housing crisis in Washington State recommend facilitating the development of ADUs in single-family areas. (Municipal Research and Services Center of Washington 1995). ADUs rely on existing housing resources, and as such, are a simple and inexpensive way for communities to address the affordable housing crisis. ADUs typically cost 25 to 40 percent less to build than new, comparably sized housing units because they do not require the acquisition of new land. Nor do they typically involve major foundation work or exterior construction. Also, ADUs are often much less expensive to rent, because homeowners are less interested in maximizing their return than they are in finding a compatible tenant.

Applications

Bellevue, Wash., allows the development of accessory dwelling units (ADUs). The ADU must be attached to the primary residence, and either the ADU or the primary residence must be occupied by the property owner (Stroh 2000). The city only requires a very low registration fee of $25 for homeowners retrofitting their house with an ADU.

In *Portland, Ore.*, ADUs can be created via the following strategies (Bureau of Development Services 2001):

- Building a new house with an ADU
- Converting an existing living area
- Finishing an existing basement or attic
- Making additions to an existing house
- Converting an attached garage (garage shares common wall with living area of house)
- Converting a detached garage (except in some overlay zoned sites)
- Building an ADU detached from the main house (except in some overlay zoned sites).

ADUs can be detached or attached units. For the ADU to be considered detached, there must be an open space between the buildings from the ground to the sky, and there must be at least 6 feet between the house and the detached ADU. When a detached garage is converted (for sites outside of the "a" overlay zone), it must be located outside of the required side, front, and rear setbacks. An attached ADU is a part of the main house, with the living space of both the house and the ADU abutting (on opposite sides of the same wall). Incidental and accessory features such as trellises, breezeways, and patios will not be considered an attached structure.

4. ADAPTIVE REUSE OF BUILDINGS

Adaptive reuse can help bring diversity in land type and mix of existing neighborhoods. In its broadest application, adaptive reuse aims at conserving, preserving, and recycling older “surplus” or unused property by adapting existing structures to meet current market needs. It involves the conversion of such buildings as old school houses, hospitals, train stations, warehouses, and factories to economically viable new uses. Many adaptive reuse projects have produced new office and retail space, food markets, restaurants, and other commercial developments. The reuse of older structures also tends to produce innovative new housing (with unusual apartments, studios, and townhouses fitted into special spaces).

Downtown areas house many older buildings that may be adapted to residential uses and offer residents convenient access to transportation, shopping, and employment centers. Renovation and reuse of previously vacated or deteriorated buildings can be competitively priced with new construction since infrastructure and other site improvements are already in place. Lower construction costs associated with renovation, as well as special incentives related to historic preservation can help developers produce affordable living units (Municipal Research and Services Center of Washington 1992).

Applications

Seattle, Wash., has many adaptive reuse housing complexes. Some of the most well known include the Wallingford Center and several properties in the Pike Place Market. Examples abound in other cities as well (Salvesen 1999), and opportunities remain great as cities grow “older” and the rate of building use obsolescence is increasing.

5. CHANGING PARKING STANDARDS TO REFLECT THE ACTUAL NEEDS OF A CITY OR DISTRICT

Parking is a large component of the cost of developing any housing project, especially where land values are high. Parking is also expensive to build, with structured parking in high density areas adding from $20,000 to over $30,000 to the cost of a housing unit (Millard-Ball 2002).

Suburban development typically has surface parking, which costs less to build but lowers development densities and contributes negatively to the pedestrian environment. Minimum parking requirements in suburban areas contribute to increasing the cost of individual units by decreasing the amount of land available for housing. Nonprofit developers estimate that parking adds 20 percent to the cost of each unit in a development. Also, it reduces the number of units that can be built on a site by 20 percent (Millard-Ball 2002).

Certain types of housing justify lower parking requirements without adding to spillover parking in adjacent neighborhoods. Assisted housing for seniors, many of whom do not drive, and housing for people with certain disabilities typically need a small number of spaces for residents and guests. Additionally, housing located in neighborhoods well served by transit can justify lower minimum parking requirements. Examples of such projects are shown in Chapter IV, Section 5.

RESEARCH HIGHLIGHTS

A study by Gary Pivo and Lawrence Frank found that census tracts with a balance of jobs and housing had work trips that were about 30 percent shorter in time and distance than those trips generated by unbalanced census tracts (Frank and Pivo 1994). Even though regional travel patterns, two-worker households, and greater incidence of job changes make the jobs-housing balance of an area somewhat less relevant than it was earlier in the century, this study has shown it to be effective in reducing auto travel.

In his article *Jobs-Housing Balancing and Regional Mobility* (Cervero 1989), Robert Cervero states that the service industry sector in fast-growing suburban areas can experience severe labor shortages because of the lack of affordable housing in those areas. Unable to afford nearby housing, and unwilling or unable to endure the commute, workers find employment elsewhere. Cervero cites a survey by Sachs (1986) that finds employees in lower paying jobs have longer average commutes than white-collar workers.

In the same article, an analysis of 28 census tracts in the Bay Area found housing affordability and the presence of residentially zoned land near workplaces to be significant locational determinants—with housing affordability pushing people farther away from their jobs, and residentially zoned land having the opposite effect. Cervero also found a weak positive relationship between jobs/housing balance and nonmotorized commute trips. These findings in tandem suggest that the presence or lack of affordable housing near workplaces impacts people's locational choice, and thereby their travel behavior (affecting at least the distance, if not the mode, of travel).

SUGGESTED RESOURCES

Litman, T. (1999), Parking Requirement Impacts on Housing Affordability. Victoria, B.C: Victoria Transport policy Institute. Available on www.vtpi.org.

Morris, M. (2000). Incentive Zoning: Meeting Urban Design and Affordable Housing Objectives. Chicago, IL, *APA Planning Advisory Service*.

MRSC (1992). *Affordable Housing Techniques: A Primer for Local Government Officials*. Seattle, WA: Municipal Research and Services Center.

WORKS CITED

Burchell, R. W., Shad, N. A., Listokin, D., and Philips, H. (1998). "The Costs of Sprawl-Revisited." Transportation Research Board, National Research Council, Washington, D.C.

Bureau of Development Services. (2001). "Can I add a rental unit to my house?"

Cervero, R. (1989). "Job-Housing Balance and Regional Mobility." *Journal of the American Planning Association*, 55(2), 136-150.

Clackamas Regional Center Zone District. *Summary of Special Zoning Districts in Clackamas County*. http://www.co.clackamas.or.us/dtd/zoning/htmls/sum_spe.html.

Fader, S. (2000). "By Design." *Urban Land*(July), 54-58, 112.

Frank, L. D., and Pivo, G. (1994). "Impacts of Mixed Use and Density on Utilization of Three Modes Of Travel: Single-Occupant Vehicle, Transit, Walking." *Transportation Research Record*, 1466, 44-52.

Millard-Ball, A. (2002). "Putting on Their Parking Caps." *Planning*, April, 16-21.

Municipal Research & Services Center of Washington. (1992). "Affordable Housing Techniques: A Primer for Local Government Officials." *22*, Municipal Research and Services Center,
Seattle, WA.

Municipal Research & Services Center of Washington. (1995). "Creating Transit Supportive Regulations: A Compendium of Codes, Standards, and Guidelines." MRSC, Seattle, WA.

Salvesen, D. (1999). "A Catalyst for Redevelopment." *Urban Land Archives*.

Stroh, D. (2000). "STATUS REPORT 2000:on Key Housing Strategies." Bellevue.

TOD Communities. *Multi-Family Tax Abatement*. http://www.todcommunities.org/incentives.htm.

WSDOT. (2002). "Study by the Planning & Policy Office." TDM Resource Center.

PART B:
FINANCIAL STRATEGIES AND TOOLS TO IMPLEMENT TRANSPORTATION-EFFICIENT LAND USE

INTRODUCTION TO PART B

This part of the Manual focuses on four strategies that provide financial benefits to landowners or developers implementing transportation-efficient projects or otherwise affect the financial viability of transportation-efficient development. They are:

- *Public/Private Financing*, involving associations of private property owners working with the public sector that gather and raise funds to maintain or improve a neighborhood or district. Public/private financing strategies are also common at the project level. Four tools relating to different organizational structures are associated with this strategy. The typically unique characteristics of public/private development make it impractical to include in the Manual (Suchman 2002).
- *Tax-Based Public Financing*, addressing public sector generated ways to redirect, reduce, or eliminate the property tax burden in order to foster transportation efficiency. Six tools are associated with this strategy.
- *Public Sector Incentives*, or strategies that require little capital outlay from or loss in revenue by the public sector but provide financial benefits to the private sector. Eight tools are associated with this strategy. This strategy addresses ways the public sector can facilitate and reduce the length of the development process, thereby saving private sector money. Also included are tools that increase development rights, which allow the private sector to increase return on their investments.
- *Private Sector Support*, or private sector-initiated financial arrangements that support and facilitate transportation-efficient development. Two tools are associated with this strategy.

The four groupings of financial strategies and tools derive from a common understanding of interactions between the public and the private sectors in land use matters. As mentioned in the introduction to the Manual, land use in an area results from a combination of public and private actions. While the private sector generally implements actual development, public sector entities set policies about how land should and will be used, and establish regulations to guide policy implementation. As reviewed in the first part of this Manual, those regulatory frameworks can be used to either constrain or encourage certain types of land uses and development patterns.

Financial strategies used by public sector entities are another powerful means to influence private sector actions. Financial strategies always take place within such regulatory frameworks as local zoning codes, growth management directives, and others, but it is possible and often desirable to combine regulatory and financial strategies to shape land use and development. For this reason there is an overlap with the regulatory strategies described in Part A, in that the financial strategies rest on regulatory changes. In this section of the Manual, however, the focus is on the financial impact of the tools on development rather than the land-use impacts.

Table B.1 below explains how the financial strategies and tools described in this part of the Manual relate to the regulatory strategies—and associated tools—covered in Part A. Generally, Public/Private Financing strategies are used primarily to improve the pedestrian environment and to manage parking supply. Most other financial strategies can be used in conjunction with most of the regulatory strategies of Part A.

Table B.1: Impacts of financial strategies and tools on transportation-efficient land use and development practices.

FINANCIAL STRATEGIES AND TOOLS	MIXED USE	COMPACT	CONNECTIVITY	PED ENVIRONMENT	PARKING SUPPLY	AFFORDABLE HOUSING
I. PUBLIC/PRIVATE FINANCING						
1. Local improvement districts				√	√	
2. Benefit assessment districts				√	√	
3. Business improvement districts				√	√	
4. Public development authorities	√	√	√	√	√	√
II. TAX-BASED PUBLIC FINANCING						
1. Land value taxation	√	√				
2. Tax abatement programs	√	√	√	√	√	√
3. Multi-family tax abatement zones						√
4. Tax increment financing	√	√	√	√	√	√
5. Revenue sharing	√	√	√	√	√	√
III. PUBLIC-SECTOR INCENTIVES						
1. Land assembly/banking	√	√	√	√	√	√
2. Transfer of development rights	√	√	√	√	√	√
3. Use of density in target areas	√	√	√	√	√	√
4. Impact fee waivers/reductions	√	√	√	√	√	√
5. Streamlined review of permits	√	√	√	√	√	√
6. Design review and guidelines	√	√	√	√	√	√
7. Programmatic environmental impact statements	√	√	√	√	√	√
8. Interlocal agree'ts and memoranda of understanding	√	√	√	√	√	√
IV. PRIVATE-SECTOR SUPPORT						
1. Location-efficient mortgage programs						√
2. Financing for mixed-use development	√	√		√		√
3. Community land trusts						√

FORMAT

Table B.2 summarizes the strategies and tools described in Part B. As in Part A, each strategy is presented in a separate chapter that includes an introduction to the approach, tools for accomplishing the strategy, applications, supportive research, and suggested resources. The information is provided in the following format:

Introduction to Strategy

Each strategy is briefly described to show why it is relevant and how it is used to meet the goals of transportation efficient land use and development. The social, economic, and environmental benefits to a community are discussed, as are obstacles in meeting this strategy. This includes working with existing planning processes, land-use regulations, and market approaches in place.

Tools and Applications

Tools are selected from a range of tools that have been used around the country to implement the strategies. Each jurisdiction will have unique requirements and will need to determine how the tools can be adapted to local conditions. Specific applications, such state and local laws and practices, are discussed to illustrate the effects of tools. Selected case studies explain how a tool was used, what it achieved, and lessons learned. Example applications and case studies are from local governments and various agencies in the United States, as well as in Washington State.

Research

Recent research results testing the impact of each strategy are included to provide evidence of the effectiveness of the strategy on land use and urban development patterns, travel behavior, transportation systems, or market preferences.

Suggested Resources

Appropriate sources in the literature are quoted for further reference and work on each strategy.

Table B.2: Summary of financial strategies, tools, and applications to implement transportation-efficient land use

I. PUBLIC/PRIVATE FINANCING

1. Local improvement districts
2. Benefit assessment districts
3. Business improvement districts
4. Public development authorities

II. TAX-BASED PUBLIC FINANCING

1. Land value taxation
2. Tax abatement programs
3. Multi-family tax abatement zones
4. Tax increment financing
5. Revenue sharing

III. PUBLIC-SECTOR INCENTIVES

1. Land assembly/banking
2. Transfer of development rights
3. Use of density bonuses to stimulate development in target areas
4. Impact fee waivers/reductions
5. Streamlined review of permits
6. Design review and guidelines
7. Programmatic environmental impact statements
8. Interlocal agreements and memoranda of understanding

IV. PRIVATE-SECTOR SUPPORT

1. Location-efficient mortgage programs
2. Financing for mixed-use development
3. Community land trusts

WORK CITED

Suchman, D. R. (2002). *Developing Successful Infill Housing*, Urban Land Institute, Washington, DC.

I. PUBLIC/PRIVATE FINANCING

INTRODUCTION

Area-based joint public and private approaches are useful to address the maintenance and improvement of existing transportation infrastructure, as well as to create an administrative and financial environment conducive to transportation efficiency. Strategies and tools that involve both the private and the public sector address primarily office and commercial uses rather than residential districts. The associated tools address primarily the quality of an area's pedestrian environment, access to transit, and in some cases, the parking supply. Because they facilitate cooperation between businesses, the strategies provide ample opportunities to encourage private-sector involvement in transportation-related issues.

1. LOCAL IMPROVEMENT DISTRICTS

"The LID process is about financing infrastructure improvements, not constructing them" (Carpita 2002). When buying a property, a new owner inherits the responsibility and cost of maintaining sidewalks, curbs, water mains, utility service lines, and storm drainage systems. that are adjacent to the property. LIDs are formed to simplify the process of improving this infrastructure on a district level by coordinating the efforts of the various property owners. Property owners in the area being improved are responsible for the initiation of the process, for forming the improvement district as well as for covering the costs incurred. LIDs are generally administered through the local government, which takes on the tasks of planning the project, hiring the contractors, and putting up the initial funds for the project. Property owners are typically given the option of either paying the total cost of the project within 30 days with no interest, or of paying it over a 10-year period with an interest rate that is generally below market rate. Individual property owners are charged on the basis of the added value that the improvements impart to their property.

Applications

In *Downtown Hillsboro, Ore.*, the city council approved a petition by the Hillsboro Downtown Business Association for the creation of a local improvement district in August 1996. The project is to implement the Association's plan to create a transportation-oriented development. Construction began in summer 1997, with new sidewalks, curbs, decorative paving, street lamps, and greenery designed to complement other light rail street improvements (Hillsboro Public Works Department 1999).

With *Portland MAX*, local improvement districts were established to improve the environment for pedestrians, bicyclists, and transit users in business districts around station areas in Downtown and in the Lloyd District. These LIDs generated tax funds for use in beautification and circulation improvement efforts, such as pedestrian walkways, plantings, bike racks, and public art. These improvements followed existing development guidelines and a public art program for the pedestrian environment around transit station areas (Seattle Station Area Planning 2002).

2. BENEFIT ASSESSMENT DISTRICTS

Benefit assessment districts (BADs) enable local government agencies to raise money for specific projects ranging from road maintenance to the provision of new streetlights. Only those owners who benefit from the services can belong to a benefit assessment district, which must, in turn, consist of at least a majority of those being assessed to pay the associated fees. The fees are based not on the value of individual properties but on the amount assessed for the projected benefits to each property. The fee can be collected in one lump sum, or over a period of time, which can be as long as ten years, depending on the size of the project and the financial status of the district. The fees are usually added onto the property owners' tax bill. The financial basis of benefit assessment districts permits individual property owners to pay for improvements as they directly affect their own property. They therefore provide flexibility as to where improvements are made unrelated to the size of properties or the intensity of development (Puget Sound Regional Council 2001).

Applications

> In 1985, the Southern California Rapid Transit District, one of the predecessor agencies for the Los Angeles County Metropolitan Transportation Authority, formed two benefit assessment districts. Assessments received from these districts are used to pay off bonds issued to pay a portion of the station construction costs of the first segment of the Metro Red Line. Assessments will terminate in 2008-2009. BAD members supply 9 percent of the funds required, complementing federal, state, county, and city funding sources. Residential, non-profit owned/used, and publicly-owned/used are exempt from the tax (Metropolitan Transportation Authority 2003).

3. BUSINESS IMPROVEMENT DISTRICTS

Business improvement districts (BIDs) are voluntary business associations that tax each member to pay for district-wide maintenance and improvements. BIDs have become common in many cities as a way to break away from traditional tax supported urban revitalization programs imposed by government. BIDs are formed and run directly by those who will be taxed. Their organizational and financial structure vary from state to state, but typically both the local government having jurisdiction over the district and those property owners controlling more than 50 percent of the land within a district must approve the formation of a BID. Generally, a public agency levies the fees, collects the money, and returns it to the BID. The members can elect a professional manager and a board of directors to make budgeting decisions.

The cost of BIDs to individual members can vary widely and depends upon the reach of the district plans and programs and the types of businesses included in the BID. Typically, commercial BID members pay 10 to 15 cents per square foot of property, and total annual assessments usually equal 5 to 6 percent of the yearly property tax bill.

Once a BID is created, payment by members is mandatory. As most BIDs require support of those owning the majority of the land, not very BID member may be cooperative. The additional taxes may strain some of the businesses' finances. A New York-based study showed that 31 percent of the landlords in all the city's BIDs thought that the investment was not worthwhile, and only 45 percent believed that they were getting their "money's worth." Some of the owners reported not being aware of belonging to a BID until they received their first bill (Adler 2000).

Services and programs provided by BIDs often replace or supplement those understood as being the government's domain. Inadequate or scarce municipal budgets have led to a reduction in traditional government services, such as street sanitation, security, landscaping, and signage. BIDs can take these tasks over and improve on the quality and types of services provided, including continual trash and graffiti removal, business marketing and promotion programs, visitor guides and information kiosks, as well as organizing "outreach" programs for the homeless. Large BIDs also focus on parking supply and costs and improving connections to transit.

Advantages provided by BIDs include members getting "what they pay for," independence from traditional public service providers, and focus on what is needed (Mitchell 1999). Funds invested in the BID are controlled by the member businesses. As a result, BID members do not have to deal with the extensive red tape imposed by, and preexisting contracts made with, municipal governments. This situation can encourage original and unique approaches to addressing on-going needs in a district.

Debates about the nature of BIDs relate to the distribution of wealth and private control of public space. Because it is clearly easier for wealthy areas to form BIDs, BIDs can lead to widening the gap between poor and rich areas of cities. Yet BIDs also increase the value of properties, which in turn benefits a city's tax base (MacDonald 1996). Successful BIDs may see government shifting money slated for the maintenance of their streets to other districts in the city (MacDonald 1996). Also, government resistance to cooperative arrangements may occur as agency staff experience a loss of control of the BID area (Feldmann 1997).

BIDs in New York have also been accused of depressing wages by using Work Experience Program workers who cost only $3 a day to the BID but continue to receive government support for the remainder of their compensation as welfare recipients. In one of the city's BIDs, half of the street cleaners are parolees who get minimum wage (Adler 2000). Large BIDs typically need to address the homeless. While most programs claim to help this population, advocates worry that the real effect is to push it away from the BID area. Nationwide, the experience with BIDs has been mixed. Homeless have been arrested in Atlanta, while New York's Times Square BID has a well functioning drop-in homeless center (Feldmann 1997).

The success of BIDs in cleaning up the areas in which they operate sometimes also mean loss in the character of the district. Strict design and building codes, as well as the propagation of chain stores, may eradicate the diversity and uniqueness of an area (Actman 1999). On the other hand, BIDs have led businesses to be active in the preservation and beautification of the city.

Applications

The Downtown *Seattle* Association manages a BID it calls the Metropolitan Improvement District that includes over 700 properties and has an annual budget of approximately $3 million. It employs more than 30 people on a block watch program, as well as a cleaning staff that works seven days a week. It has also created a "downtown economic profile" with useful statistics such as employment and transportation demographics. Recently it innovated a "Clean and Safe Management System" that tracks trends of its safety and maintenance programs.

> "BID assessments are tiny compared with the city's own tax burden. Real estate taxes in midtown Manhattan run between $6 and $14 a square foot compared with the Grand Central Partnership's assessment of 14 cents per square foot. BID assessments range from a few hundred dollars a year for small buildings to $500,000 for the Empire State Building"(MacDonald 1996).

4. PUBLIC DEVELOPMENT AUTHORITIES

Originally developed to disburse federal funds, PDAs have evolved into the tool of choice for municipalities implementing projects for which they do not want direct responsibility and in which they want increased private participation. These projects run the gamut of urban development and management issues, from historical preservation to urban trail maintenance. As the name implies, PDAs are dependent upon public budgets. They also rely heavily on private sector volunteers to constitute their board and to raise support independently.

PDAs are uniquely suited to completing non-standard projects. Their structure allows them to operate efficiently and utilize streamlined procedures. Each PDAs budget is developed through a public process. Community participation in PDAs tends to be very high. True to their original purpose, PDAs are able to administer federal funds in addition to collecting public taxes and private donations. Tax-exempt borrowing rates may also be available to PDAs.

Application

> The City of *Seattle, Wash.,* alone has nine public development authorities: Capitol Hill Housing Improvement Program, Elevated Transportation Company, Burke-Gilman Public Development Authority, Historic Seattle Preservation and Development Authority Museum Development Authority, Pacific Medical Center, Pike Place Market Public Development Authority, Seattle Chinatown-International District Preservation and Development Authority, and Seattle Indian Services Commission. These PDAs combined have over $192 million in assets, have built 13 new buildings, have remodeled 52 buildings, and own and manage over 1,287 housing units, health clinics, community space, commercial and office space, and parking garages. These PDAs are virtually all self-sufficient and require no funding from the city general fund (City of Seattle Strategic Planning Office 1999).

SUGGESTED RESOURCES

Hoch, C., and Dalton, L. C. (2000). "The Practice of Local Government Planning." International City/County Management Association.

Porter, D. R., Ed. (1996). *Profiles in Growth Management*. Washington, DC, Urban Land Institute.

Porter, D. R. (2000). Making Smart Growth Work: Draft Report. Washington, DC, Urban Land Institute.

Porter, D. R. (2001). *Smart Growth Guide*. Washington, DC, Urban Land Institute.

Puget Sound Regional Council. (1994). Creating Transit Station Communities in the Central Puget Sound Region: A Transit-Oriented Development Workbook.

Suchman, Diane R. (2002) *Developing Successful Infill Housing*. Washington, DC: Urban Land Institute.

VTPI Online Encyclopedia. (2002). Smart Growth Policy Reforms: Changing Planning, Regulatory and Fiscal Practices to Support More Efficient Land Use. www.vtpi.org

WORKS CITED

Actman, L. (1999).*Critical Issues for Discussion*. http://www.unc.edu/depts/dcrpweb/courses/261/actman/discus.html.

Adler, M. (2000). "Why BID's Are Bad Business." The New York Times, New York.

Carpita, J. (2002). "Local Improvement Districts: "Are We Having Fun Yet?"".

City of Seattle Strategic Planning Office. (1999). "Report on Seattle's public development authorities." City of Seattle Strategic Planning Office, Seattle, WA.

Feldmann, L. (1997). "Cities Seek Disney-Style Cleanliness and Safety." *The Christian Science Monitor*(August), 1.

Hillsboro Public Works Department. (1999). "Hillsboro Local Improvement District." *Community Building Source Book*.

MacDonald, H. (1996). "BIDs Really Work." *City Journal*, 6(2), 29-42.

Metropolitan Transportation Authority. (2003). "Benefit Assessment Districts." Benefit Assessment Districts Program Office.

Mitchell, J. (1999). "Business Improvement Districts and Innovative Service Delivery." Baruch College, The City University of New York, New York.

Puget Sound Regional Council. (2001). "Destination 2030, Metropolitan Transportation Plan for the Central Puget Sound Region." Puget Sound Regional Council, Seattle, WA.

Seattle Station Area Planning. (2002). "Portland MAX Case Study." Station Area Planning, Seattle.

II. TAX-BASED PUBLIC FINANCING

INTRODUCTION

Taxes on land and improvements have a substantial effect on the economic feasibility of new development. The public sector can effectively use property taxation as a tool to affect the characteristics of new projects or to entice development in designated areas. In Washington State, property taxes amount to 30 percent of all state and local taxes (McIntire 1999). In 1995, 27 percent of these revenues went to the state, 29 percent to the school districts, 14 percent to the counties, 6 percent to county roads, and 24 percent to local municipalities. Generally, suburban properties have lower assessed values than comparable urban properties, thus enjoying a favorable tax treatment (McIntire 1999).

Property taxation can be a powerful strategy for fostering transportation-efficient land use. Specific tools available range from changing the ways in which property values are assessed to cutting or postponing the actual tax levied on given properties. Taxation approaches can address the impact of infrastructure and particularly transportation investments on the value of land, as well as encourage land improvements in areas targeted for transportation investments. Tax benefits can, for instance, lure development on properties located in urban centers or transit oriented development (TOD) areas. They also can favor certain land uses, such as dense or affordable residential or mixed-use development.

1. LAND VALUE TAXATION

Current property tax structure in Washington State distinguishes the value of the land from that of improvements (i.e., buildings) made to the land. However, the same tax rate must, by law, be applied to both assessments. This setup has ramifications that shape the way land is utilized. Generally, it acts as an incentive to keep land idle, or as a disincentive to making improvements. As landowners make improvements, they must not only pay for them but also face tax increases related to the improvements.

An alternative is land value taxation (LVT), in which only the value of the land is taxed. The LVT principle is that "land derives value from both explicit public investment (sewers, water lines, streets), and from the aggregate of private human activities that go on and around it… [LVT relies on] the ‘socially created value’ of land ”(Kunstler 1998). LVT “functions as a user fee for what is essentially common heritage resources” (Harzok 2000).

When land and improvements are taxed at the same rate, even if assessments are separate, land with a high socially created value may cost a lot of money up front, but without large-scale improvements it is relatively cheap to hold. This fuels land speculation, or holding land until it can be sold for profit. Taxing only the land value provides an incentive to use the land and develop it proportionately with the value of the land. This in turn leads to development related to levels of existing infrastructure and to a reduction in sprawl. The same forces that reduce sprawl add incentives to maintain properties and get vacant properties back in use. In a simplified model of LVT, cities would be "mapped as gradients of land value, similar to a topographical map. The highest gradients would be where there are high public amenities or investments, such as transportation systems, parks and well-designed neighborhoods”(Neary 1999). Since the highest taxes would be paid on urban land, LVT acts as a powerful incentive for infill development and redevelopment for landowners to generate revenues. A reduction in land speculation means that more land is available, reducing what some perceive as an artificial land scarcity.

"Fear has been voiced that site-value taxation [LVT] would be harmful to farmers, who…own large amounts of land. In point of fact, 90 percent of land values are in cities. Site-value taxation would encourage more compact town and city development, and would take the development pressure (demand) off property in the hinterlands. There would also be less tendency to run highways, sewer lines, and other public 'improvements' out to rural lands and their site value would be proportionally much lower, which would be reflected in lower taxes paid by farmers" (Kunstler 1998). Similar issues arise with respect to historic preservation and large industrial land uses, both of which have lower rates of return on investment than their properties are likely to be taxed for. Additions to legislation can overcome such difficulties.

"The reason the old system of taxing buildings is not overthrown altogether is due to the reasonable fear that a sharp drop in land prices resulting from so much property coming onto the real estate market might destabilize a local economy, causing, in effect, a local depression" (Kunstler 1998).

Switching to an LVT can be a significant undertaking as well. A middle ground is the adoption of split-rate taxes in which the rate of taxation on certain types of lands is higher than that on improvements. Split-rate taxes are a step toward the principles of land value taxation.

Applications

Stephen Cord compared *Scranton, Pa.*, and neighboring *Wilkes-Barre, Pa.*, cities with nearly equal revenue per capita, as well as similar ethnic characteristics. In 1979, Scranton nearly doubled the tax rate on land and removed the property tax from new construction, while Wilkes-Barre kept the standard flat-rate property tax. In the two years following the tax change, average annual building permits increased 22 percent in Scranton and decreased 44 percent in Wilkes-Barre from the three previous years.

In 1980, *McKeesport, Pa.*, increased the tax rate on land, decreased the tax rate on buildings, and offered three-year tax abatements for new construction. Cord found that construction in McKeesport rose in 1980-81 relative to the preceding three years but fell in two neighboring cities that maintained the standard property tax (Neary 1999).

2. TAX ABATEMENT PROGRAMS

Tax abatement programs are an economic development strategy used to mitigate the costs associated with the construction of a new facility or expansion of an existing one. These programs forgive a portion of taxes owed, usually property taxes, for a given period of time. This time period can vary from one year to the life of the property as long as it retains its use. The amount of the tax break is also flexible, ranging from less than ten to 100 percent of the value.

Cities use various forms of property tax abatement to encourage desired development. In recent years, tax abatements have been increasingly used to spur infill and redevelopment of housing, as well as employment-generating uses (Porter 2000). Some programs have policies and procedures that assist developers in the acquisition of properties encumbered with tax liens.

Generally, tax abatement programs are effective where (1) development costs are high and 2) there is a need to stimulate rehabilitation and new construction. In some jurisdictions, preservation of residential properties will automatically qualify developers for tax abatements. However, because property tax revenue is the means to provide vital community services, tax abatements need to be utilized sparingly.

Federal tax credit programs for historic preservation and low-income housing production are also effective tax abatements. Many complex projects involving preservation and new construction combine federal, state and local government abatements of property taxes with low-interest construction financing and subsidies in meeting the costs of infrastructure improvements.

Applications

Abilene, Texas
The city adopted its current tax abatement policy on June 14, 2001. The policy document providing criteria for eligibility and aspects of implementation as adopted by the city council is known as the Property Redevelopment and Tax Abatement Act. It governs property tax abatement agreements. Further, any business located or relocating within one of Abilene's three enterprise zones may benefit from an additional, individually negotiated 5 to 10 percent abatement, for a total abatement not to exceed 100 percent.

Uses eligible to apply for tax abatement include industrial, manufacturing, distribution, service facilities, retail operations located in an enterprise zone or designated development area, multi-family residential properties on a limited basis in a specific zone, and properties subject to a voluntary cleanup agreement.

Atlanta, Ga., and *Baltimore, Md.*
Atlanta offers a ten-year tax exemption within its urban enterprise zones on housing developments in which 20 percent of the units are set aside for low-income residents. Baltimore has a ten-year abatement for Class B office space that is converted to housing.

3. MULTI-FAMILY TAX ABATEMENT ZONES

Multi-family tax abatement programs encourage new multi-family housing by forgiving part, or all, of the property tax payments for a period of time. Applying such a program to designated urban centers, and transit station areas can foster housing development. Washington State passed legislation in 1995 authorizing use of multi-family tax abatement, which is successfully used by cities.

Applications

The State of *Washington* currently provides tax breaks for the construction or rehabilitation of multi-family housing near transit corridors in urban areas with populations of over 50,000. New units or rehabilitation of four or more units in an urban area may be exempt from *ad valorem* (according to assessed value) property taxation for ten years. The tax deferral does not include the value of the land, non-

qualifying improvements, or improvements made prior to application for the tax deferral.

Requirements pertaining to the type of housing provided include the following: (1) the housing must be in a residential targeted area; (2) it must meet all local requirements; (3) projects associated with existing housing must either add four additional units or have been vacant for a minimum of 12 months and fail to comply with either a state or local housing code; (4) the project must be completed within three years.

Requirements for the target area include the following: (1) the area must be in a transit corridor; (2) the area must lack sufficient available housing; (3) the area must be within one-quarter mile of a transit or bus stop, or be within one-half a mile of a transit facility; (4) the area must be zoned for a density of at least 20 dwellings per acre; (5) the area must have pedestrian amenities; (6) public hearings are required before an area may be designated a target area (Puget Sound Regional Council 1999).

In the *central Puget Sound*, Wash., Destination 2030 suggested extending multi-family tax abatement to all officially designated urban centers in the region, to transit-oriented development areas, and even to cities with populations below the required threshold (Puget Sound Regional Council 2001).

A 1999 program adopted by the city of *Seattle, Wash.,* provides a 10-year tax exemption on new and rehabilitated housing. Aimed primarily at stimulating development of market-rate units, the program also requires a percentage of units to be rented at rates affordable by families with income less than the median income for the region. Targeted to nine neighborhoods, the program has produced rental developments totaling 673 units in its first year of operation (Porter 2000).

The city of *Tacoma, Wash*., offered the tax incentive for multi-family housing development in 1996, after the December 1995 approval by the State legislature. Six projects were approved in the program's first year, totaling 250 units of housing and more than $11 million dollars of investment. Two of the projects are completed and occupied, a 60-unit low-income project and a 16-unit market rate apartment complex.

The Tax Incentive Program for Multi-family Housing has been an extremely successful program during its first three years, resulting in the development of more than 700 units of housing and an investment of more than $33 million dollars. Most of the projects are located in the city's downtown or immediate vicinity. Because the new housing units are in mixed-use centers, the program also contribute to adding employment opportunities in the city.

While the properties impacted by the tax incentive program are currently producing minimal tax revenues, the program has not reduced the existing taxes base because it only exempts taxes on new improvements, not on land or existing building(s). As the properties' full improvement value is taxed at the end of the ten-year exemption period, revenues will be higher than would be realized had the properties remained unimproved for ten years (City of Tacoma 2002).

The State of *New Jersey* provides a dollar-for-dollar reduction in federal tax liability in a program that acts as a catalyst to attract private investment into the affordable

housing market. The additional capital mitigates the debt burden incurred in the construction and rehabilitation development process. Tax credits are available through competitive rounds each year. Once credits are allocated, the project must maintain continuous compliance with the affordability restrictions of the program for a minimum of 15 years (New Jersey Department of Community Affairs 2003).

4. TAX INCREMENT FINANCING

Tax increment financing (TIF) is a redevelopment tool allowing local governments to target private investment in areas with properties that are vacant, underdeveloped, or in disrepair. A TIF typically works by making initial public investments such as streetscape improvements and land assembly that will attract private investors. New private-sector investment helps increase tax revenues. The tax revenue garnered before improvements are made to an area is known as the base revenue. The base revenue (the amount of tax collected for the general fund) is frozen when the TIF is formed. The increase in tax revenue generated by new investments is the tax increment. The tax increment is used to cover the costs of the initial public improvements and, in some instances, to make additional improvements after private development has taken place. Cities usually put up tax-exempt governmental revenue bonds to garner startup capital for the initial improvements.

Criteria for TIF approval vary from state to state, usually based on the assumption that the redevelopment of an area would not occur without initial investment made by local government. Once public improvements are paid for, the area's property taxes are added to the city's tax base, often amounting to significant increases.

TIFs are attractive because they not take existing tax revenue away from government services such as schools, fire, and police. They do take away revenues that could have been gained on new private-sector investments. As TIF districts grow and prosper, their need for services may outgrow funds available for providing the services. To address this issue, special provisions have been devised to ensure continual growth of funding out of the tax increment.

TIFs allow a city to target redevelopment efforts to specific areas identified in the comprehensive planning process. They can enable cities to compete with more distant greenfield communities and with cities in other states (Andrews 1999). Because TIFs do not necessarily foster new development but help direct investments to specific parts of cities, they may exacerbate competition between neighboring cities and states vying for the same market. Further, the success of the tool is based on relatively large profit margins that can significantly affect the incremental tax increase. As a result, programs such as low-income housing are de-emphasized in favor of commercial or office developments (King County Council Central Staff 1993).

Most states allow the creation of TIF districts, but the tool's popularity varies greatly. Washington State only recently allowed the formation of TIF districts. Although state planners, and business and community leaders have been committed to creating an effective TIF program with legislative proposals introduced every year since the 1990s, the law continues to be refined. Proponents are looking for innovative ways to meet state statutes while also creating a robust economic package.

TIFs encounter difficulties when the returns are slower or smaller than predicted. In Kansas City, for example, 24 TIFs recouped only $12 million of a projected $52 million (Andrews 1999). Because TIFs are market driven, their outcomes are not always predictable (Puget Sound

Regional Council Staff 2000). Identifying target areas where TIFS will be most effective can be delicate. Developers may seek to get assistance for projects that can be implemented without the designation of a TIF district. It appears that in Minnesota more than one third of the cities with TIF plans created at least one unnecessary tax increment district to capture taxes from developments that would have occurred without a TIF (King County Council Central Staff 1993).

The internal structure of TIFs also can create problems. For example, a vague definition of target areas can exacerbate speculative action and poorly conceived development proposals. Only detailed pre-planning can protect cities from TIF abuse (Puget Sound Regional Council Staff 2000).

Applications

In the states of *California and Minnesota*, TIFs have been a primary funding source for urban development and redevelopment. California has 361 active TIFs, with 780 additional TIF districts in the works. The State of Minnesota found that cities with TIF plans experienced an increase in assessed land value that is 70 percent higher than that of cities without TIF programs (King County Council Central Staff 1993).

The City of *Chicago, Ill.*, reports that a $300 million outlay through TIFs has garnered an investment of $1.8 billion from the private sector (Andrews 1999).

5. REVENUE TAX SHARING

Revenue tax sharing is a tool that enables jurisdictions within a region to share some amount of taxes collected. Regional intergovernmental tax-sharing arrangements reduce tax disparities between jurisdictions and attenuate the potentially negative fiscal impacts of one jurisdiction's land-use decisions on others (Porter 2001).

Competition between jurisdictions in the same metropolitan area over a limited tax base leads to public actions to attract development through marketing and development incentives. Many planning and zoning decisions made by local officials are influenced by opportunities to lure tax revenue generators. Uses such as shopping centers and industrial facilities are much more attractive to a local jurisdiction than such “revenue absorbers” as housing or other uses that produce relatively low tax revenues and require a high level of public services (American Planning Association 1998). “Developers [may] benefit from this system as they can pit one local government against another by searching for the most favorable terms, including public subsidies and a relaxation of land-use standards. [As a result, t]tensions escalate among neighboring jurisdictions” (American Planning Association 1998).

Fiscal disparities continue to pitch older urban centers against newer suburban ones. Businesses moving from high-tax urban centers to low-tax suburban areas have intensified demand for greenfield development. Fiscal disparities also often derive from the unequal distribution of the benefits of economic development. For example, individual jurisdictions often garner tax-revenues from new development that affects the larger regional transportation system.

Revenue tax sharing programs focus on reducing competition between jurisdictions and enabling the distribution of adequate public facilities as needed throughout a region instead of just where the taxes are collected. The shared tax usually represents a portion of the incremental growth in revenue after the program takes effect. Revenue tax sharing can be used to build and fund

schools and other public works such as regional road networks. "Multi-party regional revenue sharing has generally occurred in places with prosperous, growing suburbs and a growing (or declining) central city" (BBC Research & Consulting 2001; Dinndorf and Gander 1993).

Applications

The Metropolitan Council in *Minneapolis/St. Paul, Minn.*, adopted a regional tax-sharing program that earmarks 40 percent of any property tax increases resulting from new development for a regional pool that is redistributed to jurisdictions according population and other factors (Porter 2001).

Kitsap County, Wash., and the cities of *Bainbridge Island, Bremerton, Port Orchard,* and *Poulsbo* use an interlocal agreement concerning revenue sharing upon annexation and in conjunction with major land use decisions within a city's urban growth area. The agreement focuses on major retail and other commercial development that have significant fiscal impacts. These agreements aim at the coordinating the distribution of revenues during the annexation process. Similar agreements are being worked out regarding infrastructure improvements made by the county. The jurisdictions involved agree to share revenues for three years covering the period before and after annexation. Revenue sharing includes three sources of revenue: the local retail sales tax, ad valorem property tax for establishment and maintenance of county transportation systems, and the admission tax, all levied by the county (Kitsap Regional Coordinating Council 2003).

SUGGESTED RESOURCES

Andrews, J. H. (1999). "The TIFS Go On." *Planning.* 8-11

International City/County Management Association. (2000). The Practice of Local Government Planning

Porter, D. R., Ed. (1996). *Profiles in Growth Management*. Washington, DC, Urban Land Institute.

Porter, D. R. (2000). Making Smart Growth Work: Draft Report. Washington, DC, Urban Land Institute.

Porter, D. R. (2001). *Smart Growth Guide*. Washington, DC, Urban Land Institute.

Puget Sound Regional Council (1999), Creating Transit Station Communities in the Central Puget Sound Region: A Transit-Oriented Development Workbook.

WORKS CITED

American Planning Association. (1998). "Chapter 14: Tax Equity Devices and Tax Relief Programs." American Planning Association, Chicago.

Andrews, J. H. (1999). "The TIFS Go On." *Planning*, January, 8-11.

BBC Research & Consulting. (2001). "Local Revenue Sharing Methodologies." Rural Resort Region, Denver, CO.

City of Tacoma. (2002).*Tax Incentive for Multifamily Housing*. http://www.cityoftacoma.org/default.asp?main=/34housing/TaxIncentives.htm.

Dinndorf, J., and Gander, M. (1993). "Regional Revenue Sharing: A Discussion Paper." Puget Sound Regional Council, Seattle, WA.

Harzok, A. (2000).*Land Value Taxation And Resource Rent Approach To Financing For Development.* found at http://www.earthrights.net/docs/fin4devt.html.

King County Council Central Staff. (1993). "Tax Increment Financing: Analysis of the City of Seattle Test Case." King County Council, Seattle.

Kitsap Regional Coordinating Council. (2003). "Proposed Revisions to Kitsap Countywide Planning Policies."

Kunstler, J. H. (1998).*A Mercifully Brief Chapter on a Frightening, Tedious, But Important Subject.* http://www.earthrights.net/docs/kunstler.html.

McIntire, J. L. a. T. G. (1999). *Equity, Land Use, and Resource land Impacts of Land Value Taxation in Washington State*, Lincoln Land Institute, Cambridge, MA.

Neary, P. (1999).*OutLANDish TAXes?* http://www.newrules.org/resources/outland.html.

New Jersey Department of Community Affairs. (2003). "Programs Book."

Porter, D. (2000). "Making Smart Growth Work: Draft Report." Urban Land Institute, Washington, D.C.

Porter, D. (2001). *Smart Growth Guide*, Urban Land Institute, Washington, DC.

Puget Sound Regional Council. (1999). "Creating Transit Station Communities in the Central Puget Sound Region: A Transit-Oriented Development Workbook." Puget Sound Regional Council, Seattle.

Puget Sound Regional Council. (2001). "Destination 2030, Metropolitan Transportation Plan for the Central Puget Sound Region." Puget Sound Regional Council, Seattle, WA.

Puget Sound Regional Council Staff. (2000). "Compilation of Papers on Tax Increment Financing written by PSRC staff."

III. PUBLIC SECTOR INCENTIVES

INTRODUCTION

Many types of public sector incentives can provide direct financial advantages to developers and enable local jurisdictions to promote and encourage transportation-efficient land use. Various tools are described below, which include preparing land for development, addressing development rights, waiving special fees, and making the permitting process easy and inexpensive. Many of these tools can and should be used together to ensure success. Following this principle, the City of *Austin, Texas*, has a "primary employer" incentive that is used to guide large employers to build within a "desired development zone" (DDZ). These incentives are aimed at employers who generate significant levels of growth, both within their specific project and in the surrounding area. By directing these employers to the DDZ, the city can have a significant impact on long-term growth patterns. A variety of incentives are considered under the primary employer incentives. These include fee waivers, new water and sewer lines, transportation improvements and expedited processing of development application. Primary employer incentives require city council review and approval (Hirshorn and Souza 2001).

1. LAND ASSEMBLY/BANKING

The size of development and redevelopment projects has increased over the past decades, particularly that of commercial and mixed-use projects. In older areas, individual land parcels are often too small to accommodate projects, and land assembly is typically a lengthy and costly process involving many landowners. Public parcel assembly can provide an incentive for new development. Many infill and redevelopment projects also involve the assembly of parcels with absentee owners or with title or tax problems.

Local jurisdictions can help developers acquire properties that are ripe for development, either directly or by negotiating for acquisition on the developer's behalf. They can assist in removing legal barriers to acquisition, forgiving tax liens (if allowed by state law), and clearing titles to property. Cities can use condemnation or eminent domain to obtain and reuse abandoned properties. Eminent domain is used on a selective basis to assemble land, typically when plans for a new project are well defined, because public authorities are reluctant to increase their inventory of underused properties. Finally, jurisdictions can buy property, write down its cost, and then sell it to a developer. All of these approaches facilitate the acquisition of key parcels for developments that will generate public benefits. Often, the mere possibility that such powers may be used is sufficient to persuade owners to sell underused property.

Cities can also create a land bank authority to hold redevelopable properties and dispose of them when appropriate proposals are made. Land banks help put underutilized or encumbered properties to productive use. They are created to acquire and hold property for later sale or transfer to new owners. Typically, cities or states may endow land banks with certain powers, such as the authority to waive liens. Jurisdictions often dispose of the land in the bank at less than market value or city cost to further encourage development (International City Management Association 1999). Community development corporations are the principal beneficiaries of land banking programs.

Applications

A long-term effort to regenerate inner-city commercial and industrial properties in *Cleveland, Ohio,* employed land banking as a core tactic to build a competitive market for redevelopment. Land assembly took place in three stages as approaches evolved in response to difficulties, partnerships expanded, and public leadership changed. The current land banking initiative, Midtown Cleveland, is a nonprofit development corporation created by business leaders. Its land banking strategy resorted to the city's selective use of eminent domain and to acquiring available federal loans instead of grants. On the basis of their experience, Midtown Cleveland recommended the following steps for successful land banking: understanding the long-term nature of land assembly; implementing an effective funding system based on significant public subsidies; designating a central authority to finance, own, and operate the land banking program; empowering the land bank to use eminent domain; consolidating environmental regulations and increasing funding for the remediation of brownfields; and regarding inner-city land as an extension of public infrastructure.

The City of *Houston, Texas,* created a land banking program for the redevelopment of tax-delinquent properties into market-rate housing. State legislation passed in 1997 waiving state tax liens on foreclosed properties. Foreclosed properties are in the hands of the city's new redevelopment authority. The authority will act as broker for re-sale to home builders (Murphy 1998).

The City of *Renton, Wash.*, has actively used parcel assembly in the development of its downtown. It partnered with King County to redevelop the Renton Transit Center. It was able to move auto dealerships out of the downtown area by creating a special auto mall zone adjacent to Grady Way along I-405. The city waived street vacation fees for alleys in the auto mall area, which enabled the auto dealerships to assemble land in their new location at reduced costs. The city also purchased the dealerships downtown and re-sold them to a developer who built a four-story, mixed-use development and park-and-ride (WSDOT 2002).

2. TRANSFER OF DEVELOPMENT RIGHTS

Transferring development rights (TDR) is a market-based approach used by municipalities to preserve sensitive areas, while at the same time allowing new development to take place. As a tool to transfer density from one type of area to another, TDR does not add development density or capacity, as do the various strategies that entice development by increasing allowable densities. In TDR, properties that give up their development rights are known as "sending areas," and properties that take them are called "receiving areas." Sending areas typically consist of historically significant properties and open, undeveloped and agricultural lands. Receiving areas are those where increased density is desired or acceptable. After sending areas sell their development rights, they must remain as they are (open or working landscapes). Conservation easements or other clauses are attached to the sending properties' title to limit their development rights.

For landowners in sending areas, TDRs are much preferable to downzoning because the loss of development rights is compensated. It is also advantageous to local government because developers buying the rights and owners of the sending area must voluntarily agree on a price for

the rights (Lane 1998). The costs of TDR to municipalities are limited to those of administering the program. From a public sector perspective, TDR as a tool accomplishes more than zoning: "by lessening the economic impact of protectively zoned property and enabling the owner to recoup the economic value of the property's frozen potential, the TDR is designed to minimize the objections to such zoning" (Lawrence). Because the municipality has control over establishing sending and receiving areas, as well as over the way the property rights purchased will be applied, TDR is relevant in a wide range of situations.

As a market-based tool, the success of a TDR program depends on the ups and downs of demand for development. Programs also need to address local conditions. Some metropolitan areas may have greater availability of development rights to be transferred than demand for them. Further, the voluntary nature of TDR makes it difficult to guarantee the viability of a program. In general, successful TDR programs follow and reinforce comprehensive or general land-use plans. Sending and receiving areas must correspond to priorities set in the plans to create density where it is needed and desirable, and to protect properties accordingly. Strict enforcement of zoning laws is also necessary to ensure the orderly transfer of development rights. It may be helpful to ease possible concerns over increased densities in receiving areas by coordinating new development with such added amenities as streetscape and open space improvements. On the sending area side, incremental payments on development rights adjusted with the changing value of the land over time may help convince property owners to sell their rights at the appropriate time.

It is possible for jurisdictions to create a TDR "bank" or center that can bring together developers and land owners. Educating all parties in a community is important to popularize the process.

Applications

Montgomery County, Md., has been using TDRs since the early 1980s. Lying just northwest of Washington, D.C., the county has a population of 800,000 yet has managed to preserve 39,000 acres, nearly one third of its land area, for agriculture and open space. Seventy-five percent of this area was protected through TDRs (James 1994). To date, over 12,000 acres have been permanently deed restricted under the program.

In 1985, *New Jersey* created a Pinelands Development Credit Bank, which can buy and sell credits, guarantee loans using credits for collateral, and maintain a registry of credit owners and purchasers. Burlington County also established a county-wide Pinelands Development Credit exchange in 1981 (New Jersey Pinelands Commission n.d.).

The City of *Seattle, Wash.,* has used transferable development rights in many different situations. It maintains a TDR Bank and acts as broker for TDR sending and receiving sites. Receiving sites include Benaroya Hall, the Washington Mutual Tower, the Millennium Tower, Nordstrom Office Tower, the Starwood Hotel, the YMCA, and Madison Financial. Priority sending sites are Seattle's watersheds. Overall, sending sites in Seattle have sold TDRs for an average price of $11.46 per square foot, and receiving sites have purchased TDRs for an average price of $10.92. The difference can be attributed to the intermediary market provided by the city's TDR Bank (King County 2002)

King County, Wash.'s, TDR Program only applies principally to the unincorporated areas of the county. Eligible sending areas are agricultural production and forest production district lands; selected lands within the rural forest focus area and rural properties designation; habitats for threatened or endangered species; and designated urban separators. Receiving sites include unincorporated King County urban areas zoned for higher density residential, commercial, and office development; incorporated cities as allowed by the local jurisdiction; and a few rural areas.

Special provisions exist to protect regionally or locally significant resource areas and environmentally sensitive areas. Also, the TDR program will not be associated with requests to extend public services and facilities and to introduce new patterns of smaller lots (King County 2002).

3. Use of Density Bonuses to Stimulate Infill Development in Target Areas

As noted in the first part of this manual, providing density bonuses is a common, long-standing tool used to implement a variety of land-use policies. This tool was reviewed in the sections on Mixed Land Uses, Compact Development, and Affordable Housing as regulatory strategies. Providing additional density is an obvious way to entice the private sector to create compact or mixed-use communities. However, the tool can be used to achieve many additional outcomes. Because they do not require outlay of public dollars, density incentives or bonuses are indirect ways for the public sector to help finance new private development without affecting public budgets. Density bonuses translate into added revenues for private developers who, in turn, can afford to take more risk than they would by doing conventional development. Mixed-use, infill development, affordable housing, as well as the provision of public space and amenities or even shared parking are all good outcomes of density bonus incentives. Special zoning provisions in target areas may allow increases in development density that make specific developments more profitable on the condition that they reinforce linkages between land use, development patterns, and transportation.

4. Impact Fee Waivers/Reductions

Impact fees are payments required by local governments of new development to provide new or expanded public capital facilities to serve that development. Advance cash payment is typically required, with fee amounts levied on the basis of a pre-established calculation method based on the cost of the facilities and the nature and size of the development. Some fees are charged to finance improvements away from, but related to, the development site.

Local communities use impact fees to finance a variety of public facilities. The most widespread use of impact fees is for sewer and water facilities, parks, and roads. They may also apply to schools, libraries, and other public services.

Local governments throughout the country have increasingly relied on impact fees to supplement shrinking budgets because of diminishing state and federal transfers of funds. Kirkland, Wash., for example, projects that $1 million out of a total of $2.4 million needed yearly for new transportation projects comes from impact fees. Local impact fees also serve to delay or substitute for general property tax increases (American Planning Association 1997). Overall, impact fees

indicate a shift in financing the costs of public facilities away from the general taxpayer to the beneficiaries of new facilities.

Impact fees are effective when based on a comprehensive plan and used in conjunction with a suitable capital improvement plan. If jurisdictions have the appropriate tools to plan and implement new development, impact fees help ensure adequate infrastructure to accommodate growth where and when it is anticipated.

Critics argue that impact fees are an inequitable means to finance public facilities. It is unfair to ask landowners, developers, and new residents to bear a large share of public facilities that add to the community as a whole. Also, by requiring new development to pay for most of the new public facilities, local governments may be bypassing the traditional practice of intergenerational contribution toward public facilities (American Planning Association 1997). However, little proof exists that the imposition of a fee system has stifled development.

Jurisdictions have also used impact fee reductions and waivers as a tool to foster specific kinds of development, and specifically to encourage affordable housing development.

Applications

Two suburban communities near *Denver, Colo.*, have successfully used impact fee waivers. *Arvada* (population 103,700) has an ordinance that provides for a development fee waiver "for all housing developments which will be granted a federal subsidy for rent or mortgage payment" (Section 25-17). *Longmont* (population 58,000) also offers an up to 100 percent waiver of certain fees, using a five-year affordability period for single-family development, and a ten-year period for multi-family.

Hillsborough County, Fla., (Tampa area) has an Impact Fee Relief Program that waives fees for water, sewer, rights-of-way, parks, and transportation. In one affordable apartment development project, almost $500,000 was saved, greatly enhancing the ability to offer low-cost rents (American Planning Association 1997).

Santa Fe, N.M., offers fee waivers to development proposals offering 75 percent of units to those at or below 80 percent of median family income (From Town of Cary, Affordable Housing Toolkit, 1999).

Lancaster, Calif., established a method for assigning development fees that encourage development near downtown. The fees increase in concentric circles out from the center of the downtown. Projects located within the close-in areas pay a minimal percentage of total fees, but projects near the edge of the urbanized area pay maximum fees. This fee reduction helps even out the land cost differential between infill and outer-edge sprawl sites.

A study including other Bay Area jurisdictions determined that a 50 percent to 75 percent reduction in fees for an infill project could mean could translate into "savings" of $7,000 to $10,000 (Sargent 1994).

Kirkland, Wash., uses impact fee waivers very selectively, when, for example, the developer of a mixed-use development also sets up an agreement with the city that limits the maximum number of trips that the development is allowed to produce.

Such an agreement, called multi-tenant averaging agreement, gives the developer flexibility to move the uses around within the project (Mathur 2000)

Issaquah, Wash., uses transportation impact fees to manage growth. Residential uses close to I-90 may be assessed at about $1,000 per 1,000 sq, feet of use. The fee increases as development moves out and away from the freeway, impacting local roads. Development at the southern boundary of the city may be assessed at over $4,000 per 1,000 sq. feet. Fees also differ greatly for single and multi-family development: single family residences pay more than $6,000 for schools and up to $4,000 for transportation, while units in multi-family development pay $1,400 for schools and up to $3000 for transportation (Mathur 2000).

5. STREAMLINED PERMIT REVIEW

Development review refers to the administration and enforcement of local codes and land-use regulations such as zoning and subdivision ordinances, environmental health standards, public works standards, and building codes. These regulations directly influence a development's location, type, size, density, mix, and site design. Development review is a cumulative process in which proposals from developers are granted successive permits and ultimately full project approval once all applicable regulations and standards are met.

The aim of streamlining the permitting process is to reduce application review time and increase certainty and predictability. Development review has become increasingly complex and time-consuming in recent decades, so streamlining can be a significant incentive for developers. By allowing developers to move quickly from design to construction, streamlining reduces project preparation time and costs, thus, ideally, freeing up funds for site improvement and design costs. For the public sector, streamlining can be a powerful tool to bring in desirable new development.

Streamlining can also help regulators achieve such public goals as affordable housing, mixed land uses, and infill development, while leveraging developers' desire for certainty and low up-front project costs. Streamlining can also involve simplifying the various layers of state and federal regulatory requirements.

Washington State legislation for streamlined review of permits (ESHB 1724) requires that local regulations limit the amount of time taken to process project permit applications. Together with SHB 2386, the law mandates a number of measures intended to clarify the steps in the local permit processes and to reduce misunderstanding and confusion (Metro Regional Services 1997).

Applications

Clark County, Wash.'s, regulatory reform program illustrates many of the types of measures that can reduce unnecessary delay and costs associated with the permit review process. Its permit review and public hearing procedures incorporate a number of effective measures to meet the ESHB 1724 legislation. The county requires a pre-application conference between staff and developers. The conference takes place before an official permit application is filed and serves to discuss issues and clarify requirements before the project is fully planned. The conference aims to reduce expenses involved in making potentially major changes to a proposed project. County staff use a checklist to provide quick (typically, same-day) feedback about

obvious application deficiencies at the permit counter. In a next step, the applicant receives notices whether the application is technically complete, within as few as five working days, a significantly shorter time than the 28 days required by state statute. Also, applicants work with one specific planner, who coordinates all department comments on the project. A review team with representation from different departments is first convened to identify issues immediately after submission of the application. The same team convenes again as issues are addressed.

The City of *Seattle, Wash.,* worked to streamline the permitting process in response to increasing demands for new housing. While only 30 percent of construction applications were reviewed within 24 hours in 1998, a year later, 65 percent enjoyed this service.

The Albina neighborhood in *Portland, Ore.,* has a "two track" review procedure, which provides applicants with a choice of adhering to very specific standards in order to receive an expedited, staff-administered project review, with great certainty for approval. Alternatively, applicants who wish to have flexibility and to vary from the standards can elect to have a hearing with the design commission. The commission review process can accommodate development on difficult sites while assuring neighborhood compatibility (Portland Bureau of Planning, 1993).

The City of *Vancouver, Wash.,* established an expedited development review process within designated transit overlay districts in order to further encourage infill development and redevelopment in these areas. The expedited process places an applicant on a priority list, effectively bumping ahead of other applications awaiting review and decision.

The City of *Renton, Wash.,* made drastic reductions in the length of time needed to go through the permit process. Approval of land-use permits takes between 6 and 12 weeks (reduced from 26 weeks), and approvals of full subdivisions take an average of 34 weeks (down from 80).

Tampa, Fla., has raised its permitting fees by 15 percent and used the additional revenue to acquire technology to speed up plan reviews. This includes the capacity to receive fully electronic applications, cell phones for all inspectors, and e-mail.

Chicago, Ill., allows developer self-certification for pre-approved home designs, which enables developers to bypass steps in the normal administrative review.

Cleveland, Ohio, and *Baltimore, Md.,* each have hired a full-time downtown housing coordinator to shepherd plans through the permit process and act as an ombudsman (Urban Land Institute 1999).

King County, Wash., has streamlined the permit process by completing the transportation concurrency analysis up front. A map shows which areas of unincorporated King County can accept development, so developers do not have to go through a lengthy application process only to find out at the end of it that levels of service will not allow more building (WSDOT 2002).

6. DESIGN REVIEW AND GUIDELINES

Many communities require that proposed development conform to specific, non-discretionary design standards. Design guidelines typically serve to clarify those aspects of the community's existing character that are of value and to make explicit a community's expectations for the quality of new development. They ensure that new development complements rather than disrupts existing neighborhood character. They also serve to motivate developers interested in getting quick approval for their project to incorporate in their designs features that are important to the community.

A comprehensive set of design guidelines will seek to relate new development to the surrounding context at several levels. Design guidelines typically address aspects of site design that improve the relation of buildings to streets, specify landscaping, and parking design. They also focus on building design, including scale, proportions and massing, window patterns and shape, roof shape, building materials, and façade features such as porches.

Design review can be administrated in a couple of ways. Local staff can administer a design review process without adding significant time for permit review. In most instances, however, staff cannot exercise broad discretion. Alternatively, a design commission can decide whether a proposal meets the intent of the guidelines. This process typically reduces the certainty of approval but allows greater flexibility in the interpretation of guidelines.

Some jurisdictions have successfully used design guidelines to accommodate increased densities or affordable housing by ensuring that building scale and appearance fit an existing area. Indianapolis and Marion County combine design review with financial incentives (residential tax abatements or grant eligibility) for certain types of developments that conform to design guidelines in target areas (Department of Metropolitan Development, 1993).

Applications

The City of *Gig Harbor, Wash.'s,* Design Manual (1996) contains a comprehensive set of specific, well-illustrated design guidelines addressing commercial, multi-family, single family, and historic district situations. The guidelines focus on site design and architectural compatibility. They also treat design elements beyond the individual parcel, including considerations of visual and functional links between districts and parcels, of transitions between dissimilar uses or between zone designations, and of image cohesiveness, rights-of-way, and common area improvements.

Gig Harbor also provides for a choice of review processes. The planning staff may approve an application that conforms to the specific standards in the design manual. Alternatively, a design review board can waive specific requirements of the project design if it provides an equivalent or superior solution to the intent of the requirement.

A recent study of *King County, Wash.*, showed jurisdictions using a wide variety of approaches to the design review process (WSDOT 2002). In *Kirkland*, a design review process is in place for Downtown and the Juanita neighborhood. A design review board oversees larger projects (taller than one story and greater than 10,000 sq. ft.), while smaller projects go through administrative design review. *Redmond*'s

design review board reviews all projects but single family. In *Renton*, overlay zones include design guidelines in Downtown and the Renton Highlands. Design review and guidelines are used in *Snohomish County's* Planned Residential Development and Urban Centers Demonstration Project Ordinances.

In *Seattle, Wash.*, design review is required of new development in multi-family, neighborhood commercial, and downtown zones, and commercial zones in urban villages when SEPA thresholds are exceeded. The city now has seven design review boards. An administrative design review process is in place for smaller projects to encourage applicants of small multi-family and commercial projects to opt for the design review process (WSDOT 2002).

7. PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

A programmatic environmental impact statement (EIS) is a strategic environmental assessment tool directed at policies, plans, and programs. The impacts assessed are similar to those used in a regular EIS, but they apply to entire areas subject to future development. They are broader in scope than individual EIS and include possible cumulative impacts. The purpose of a programmatic EIS is to reduce paperwork and to facilitate the permitting process related to individual projects within the area considered. Developers welcome programmatic EISs, and local communities find that they provide a clearer picture of the big-picture impacts of new development than project-specific EISs. They also help define effective mitigation measures.

Applications

In the mid 1990s, *Olympia, Wash.*, prepared an EIS focused on its North Downtown Planning Area. The purpose of the EIS was to encourage the type and mix of development envisioned in the city's comprehensive downtown plan. The EIS consolidates and discloses known information about the study area. As such, it reduces the time and expense of finding information and provides greater certainty for the developer about what may be involved in developing a property. Also, the EIS focuses on four development scenarios, examining market feasibility and identifying mitigation measures that will be needed under each scenario. Finally, it suggests key actions the city may want to take to further ready the area for desired development and redevelopment (Municipal Research and Services Center of Washington 1997).

The City of *Mill Creek, Wash.*, prepared a plan for a 151-acre area north of the new Town Center. Previously zoned for light industrial development, the area was deemed appropriate for high-density residential and mixed-use development to complement and support the Town Center. The SR 527 Subarea Plan consists of several elements, including a land-useplan, planned action ordinance, a zoning ordinance, design guidelines, a fiscal impact analysis, and an EIS. Thresholds for various environmental measures such as transportation and parkland concurrency and wetland mitigation were set as part of the plan. The plan has allowed developers to apply for permits without project-level SEPA review if their proposals fit the plan's requirements and environmental thresholds, and if they sign a letter of "Planned Action Consistency and Mitigation," thus saving them both time and money. The Plan Action Consistency/Mitigation letter establishes the specific conditions for

development approval. Five projects have been approved within a few years of the plan's approval, for a total of 1,100 residential units, more than half of which are currently being constructed, along with a community park.

8. INTERLOCAL AGREEMENTS AND MEMORANDA OF UNDERSTANDING

Coordination between jurisdictions is a key component for managing growth, as typically multiple agencies and jurisdictions make land use, transportation, and urban service policy decisions. The issue of intergovernmental coordination takes on greater significance in areas that use one or more special districts to provide urban services, or in those urban growth areas that include more than one city or county (Oregon TGM 2000). Often actions or policies taken by one jurisdiction may be inconsistent with the plans of neighboring jurisdictions.

In large urban areas with a number of agencies and districts affecting transportation and land use, a regional approach to coordination may be needed. Creating a regional approach where local jurisdictions can direct their efforts toward a common goal is one of the most important steps in ensuring success.

Memoranda of understanding between agencies or jurisdictions establish general guidelines for coordination. MOUs usually focus on specific issues and are relatively easy to implement because they are not legally binding.

Intergovernmental agreements, on the other hand, are legal agreements that establish specific roles and responsibilities between two or more jurisdictions. Generally, local governments (counties, cities, and special districts) should strive to formalize their relationships through the adoption of intergovernmental agreements. Parties to the agreement should include all of the local governments within an urbanized area. For example, an interlocal agreement could be among a city and a county, one county and several cities, or adjacent counties and cities within a regional urban growth area.

Special districts that provide urban services can be parties to such agreements, or have separate agreements with each jurisdiction (Oregon Transportation and Growth Management Program n.d.).

Applications

Portland Metro devised a Model Shared Use Agreement for Parking Facilities as part of a Model Shared Parking Ordinance for the region ((Stein Engineering 1997).

The cities of *Bellevue* and *Redmond, Wash.*, have an interlocal agreement regarding land-use planning and the funding and construction of transportation improvements in the Bel-Red/Overlake Transportation Study Area (BROTS). Several studies have been carried out to coordinate transportation issues, including transportation demand management.

SUGGESTED RESOURCES

Hoch, C., and Dalton, L. C. (2000). "The Practice of Local Government Planning." International City/County Management Association.

Porter, D. R. (2001). Smart Growth Guide. Washington, DC, Urban Land Institute.

WORKS CITED

American Planning Association. (1997). "Policy Guide on Impact Fees." (April).

Hirshorn, J. S., and Souza, P. (2001). "New Community Design to the Rescue. Fulfilling Another American Dream." *ISBN 1-55877-348-7*, NGA Center for Best Practices, Washington, D.C.

International City Management Association. (1999). "A Mixed Use Ordinance to foster smart growth." *Public Management*, 81(9), 3.

James, R. (1994).*Transfer of Development Rights: A Market Approach to Preserving Farmland and Open Space*. http://www.islandnet.com/ITE_BC/NO94_TDR.HTML.

King County. (2002).*Transfer of Development Rights Program*. http://dnr.metrokc.gov/wlr/tdr/.

Lane, R. (1998). "Transfer of Development Rights for Balanced Development." Cambridge, MA.

Lawrence, T. J. (n.d.).*Transfer of Development Rights CDFS-1264-98 Land Use Series Fact Sheet*. http://ohioline.osu.edu/cd-fact/1264.html.

Mathur, S. (2000). "Land Use, Growth Management and Environmental Planning." University of Washington Department of Urban Design and Planning.

Metro Regional Services. (1997). "Creating Livable Streets." METRO Regional Services, Portland,OR.

Municipal Research & Services Center of Washington. (1997). "Infill Development Strategies for Shaping Livable Neighborhoods." *38*, Municipal Research and Services Center, Seattle, WA.

Murphy, M. L. (1998). "A Private Sector Model for Rebuilding Inner-City Competitiveness: Lessons form MidTown Cleveland." The Brookings Institution.

New Jersey Pinelands Commission. (n.d.).*Pinelands Development Credits*. http://www.state.nj.us/pinelands/cmp.htm#pdcs.

Oregon TGM. (2000). "Neighborhood Street Design Guidelines-An Oregon Guide to Reducing Street Widths."

Oregon Transportation and Growth Management Program. (n.d.).*Oregon Transportation and Growth Management Program Overview*. www.lcd.state.or.us/tgm.

Sargent, T. (1994).*Infill in the Marketplace: Alternatives to Sprawl*. www.sustainable.doe.gov/articles/infillalt.htm. 1.

Stein Engineering. (1997). "Shared Parking in the Portland Metropolitan Area." Portland Metro, Portland.

Urban Land Institute. (1999). "Smart Growth: Myth and Fact." Urban Land Institute, Washington, D.C.

WSDOT. (2002). "Implementing Transportation-Efficient Development: A Local Interview, Phase I of Integrating Land Use and Transportation Investment Decision-Making." WSDOT.

IV. PRIVATE SECTOR SUPPORT

INTRODUCTION

Many urban infill developers find that obtaining private sector financing can be challenging. Generally, lenders are reluctant to invest in unique types of projects or pioneering locations for which developers cannot demonstrate a proven record for acceptable risk. Mixed uses within a building can raise red flags with the banking community. Also, the idiosyncratic nature of infill projects means that financing must be customized for each project, which runs counter to the lending industry's preference for standardization. Other key financing issues include comparatively high development costs of infill, higher-density, or mixed-use projects; the lender's lack of familiarity and experience with the products; a lack of good market research; environmental problems that necessitate expensive cleanup; and the absence of comparable development types on which to base appraisals.

1. LOCATION-EFFICIENT MORTGAGE PROGRAMS

Car ownership is one of the largest household expenses. The average American household spends between 15 and 22 cents out of every dollar on transportation (McCann 2000). Reducing the number of cars per household, and to a lesser degree substituting car trips with walking, bicycling, and public transit trips can mitigate these costs. Although non-motorized modes compete most successfully with the automobile in developed urban areas with stores and good public transit, such areas often lack affordable housing. Location-efficient mortgage (LEM) programs help people purchase homes in urban areas with good transit service by increasing their buying power. It enables families that are able to reduce their transportation costs to qualify for a larger mortgage than a conventional financing program.

The savings realized through living in a transportation-efficient location is called the location-efficient value (LEV). The LEV is the difference in transportation costs associated with living in an urban versus a suburban environment—which can amount to $200 a month. LEMs work by adding the calculated LEV to the borrower's qualifying income (National Housing Institute 1999; National Resources Defense Council 2001). "In…metro areas that were found to be the most sprawling, households devoted 20 percent more of their spending dollar to transportation than did [households in the] metro areas with the fewest sprawl characteristics" (McCann 2000). Factors for determining the LEV of a particular area vary, but can include neighborhood density, pedestrian friendliness, and access to public transportation.

LEM programs are promising because they link a region's housing and transportation resources, make the monetary trade-offs between residential location and transportation explicit, and increase opportunities for people to choose close-in locations (Journal Staff 2000). They do involve some risk on the part of lending institutions, which need to build a track record of successful LEMs. This tool is not expected to make wholesale changes in travel behavior, but it addresses the needs of those households that already have low travel costs and will attract other households interested in and willing to change their travel habits. The success of LEM programs could result in as much as a 5 percent increase in the homeownership rate in regions where they are offered (McCann 2000).

The concept of LEMs was developed by the Center for Neighborhood Technology and Fannie Mae. The first program began in Seattle in 1998. Regions now offering a LEM Program are Chicago, Seattle, the San Francisco Bay Area, and Los Angeles County.

"The marketplace needs to recognize and give value to these location efficiencies, so that capital and resource flows are targeted to already developed communities and to transit hubs within them, rather than to the urban fringe. The proper valuing of location efficiency can offset historical redlining of urban communities and urban disinvestments" (Perkins and Bernstein 1997).

Applications

> *Chicago, Ill.,* was one of the first cities offering location -efficient mortgages. The LEM started in 1999 with a $21 million commitment was given from Fannie Mae. Lenders in the Chicago area have used the LEM to help households qualify for housing in transit-rich areas. A two-person household with a $60,000 per-year income living in the city's Edgewater neighborhood would qualify for a $212,218 home under LEM—$53,854 more than allowed by traditional underwriting guidelines (Smart Growth Network 2002)

2. FINANCING OF DEVELOPMENT

Numerous factors make financing transportation-efficient projects difficult. With mixed-use development, for example, each product—residential, retail, or commercial—comes under different financing criteria. Lenders tend to evaluate each use separately, making a mixed-use project seem small and uninteresting. In addition, the pedestrian-oriented or mixed-income elements of many infill projects do not fit into a standardized financing category. In the end, such projects are often considered risky, and financing, if available, is often more costly.

Small projects in general are more difficult to finance, because national lenders often require minimum loans of $10 million to generate enough fees to cover their transaction costs. Many small developers wanting to stay or expand in an urbanized area are not able to acquire long-term capital or construction loans at any price. Additional institutional barriers to financing mixed-use development exist—for example, the Federal Housing Administration limits commercial activity to 10 percent of the square footage of a residential project it supports. The Federal National Mortgage Association allows only up to 25 percent of a residential project to be in commercial use.

The key to putting together functional financing packages for mixed-use projects is to understand how the elements of the project can be made to conform to standard residential or commercial lending practices. Lenders often don't have the workforce or expertise to evaluate unusual facets of a project's economics. Developers who do their homework and provide well-documented, clear explanations will enable a loan officer to better evaluate their projects. Researchers at the University of Colorado Real Estate Center have conducted in-depth lender interviews on the subject of infill financing. Their research shows that lenders have confidence in projects that can do the following:

- demonstrate the strength of the location and neighborhood context
- show pent-up demand in the market
- pre-lease over 60 percent of the project

- include an experienced developer as a principal in the project team
- incorporate excellent access to jobs, and include transit availability
- show that the city has adopted policies that will support the project
- incorporate tax incentives (Northeast-Midwest Institute and Congress for the New Urbanism 2001).

3. COMMUNITY LAND TRUSTS

Community land trusts (CLTs) constitute a long-term, often permanent mechanism to provide affordable housing and to expand the range of housing choices available. CLTs are typically nonprofit organizations that hold a piece of land for a long period of time and make the use of the land available to residents via long-term leases. CLTs therefore contribute to lowering the cost of a house by retaining ownership of the land, making housing affordable to lower-income households over a long period of time. There are 83 CLTs nationally and 23 under development currently (Peterson 1996; Planning Commissioners Journal).

The long-term leases made by CLTs are typically associated with equity limitations: residents often do not benefit directly from increases in property values over time. However, the leases protect low-income residents from displacement in gentrifying neighborhoods. The partnership between the CLT and the homeowners also helps preserve existing housing stock, enhance community character, and contribute to a sense of place.

Traditional subsidies for home ownership, such as downpayment assistance or first-time home buyer subsidies, can be administered through CLTs so that the benefits become permanently tied to the property and accrue to both existing and future low-income house purchasers. For example, down payment assistance in the amount of a grant of $5,000 can be used to assist the CLT in purchasing the land portion of a targeted property. When directed through a CLT, the same grant can serve to lower acquisition cost for future owners. Communities should work to educate lenders about the concept of CLTs to ensure that future CLT homebuyers will be able to access conventional sources of financing. Such approaches are critical to ensuring that a sufficient range of housing types and costs exist, allowing a variety of households to find their place in a smart growth community (International City/County Management Association 2001).

SUGGESTED RESOURCES

International City/County Management Association. (2000). The Practice of Local Government Planning

Porter, D. R. (2001). Smart Growth Guide. Washington, DC, Urban Land Institute.

WORK CITED

Actman, L. (1999).*Critical Issues for Discussion*. http://www.unc.edu/depts/dcrpweb/courses/261/actman/discus.html.

Adler, M. (2000). "Why BID's Are Bad Business." The New York Times, New York.

American Planning Association. (1997). "Policy Guide on Impact Fees." (April).

American Planning Association. (1998). "Chapter 14: Tax Equity Devices and Tax Relief Programs." American Planning Association, Chicago.

Andrews, J. H. (1999). "The TIFS Go On." *Planning*, January, 8-11.

BBC Research & Consulting. (2001). "Local Revenue Sharing Methodologies." Rural Resort Region, Denver, CO.

Carpita, J. (2002). "Local Improvement Districts: "Are We Having Fun Yet?"".
City of Seattle Strategic Planning Office. (1999). "Report on Seattle's public development authorities." City of Seattle Strategic Planning Office, Seattle, WA.
City of Tacoma. (2002).*Tax Incentive for Multifamily Housing*. http://www.cityoftacoma.org/default.asp?main=/34housing/TaxIncentives.htm.
Dinndorf, J., and Gander, M. (1993). "Regional Revenue Sharing: A Discussion Paper." Puget Sound Regional Council, Seattle, WA.
Feldmann, L. (1997). "Cities Seek Disney-Style Cleanliness and Safety." *The Christian Science Monitor*(August), 1.
Harzok, A. (2000).*Land Value Taxation And Resource Rent Approach To Financing For Development.* found at http://www.earthrights.net/docs/fin4devt.html.
Hillsboro Public Works Department. (1999). "Hillsboro Local Improvement District." *Community Building Source Book*.
Hirshorn, J. S., and Souza, P. (2001). "New Community Design to the Rescue. Fulfilling Another American Dream." *ISBN 1-55877-348-7*, NGA Center for Best Practices, Washington, D.C.
International City Management Association. (1999). "A Mixed Use Ordinance to foster smart growth." *Public Management*, 81(9), 3.
International City/County Management Association. (2001). "Getting to Smart Growth: 100 Policies for Implementation."
James, R. (1994).*Transfer of Development Rights: A Market Approach to Preserving Farmland and Open Space*. http://www.islandnet.com/ITE_BC/NO94_TDR.HTML.
Journal Staff. (2000). "New Program Links Home Mortgage with Traffic Reduction." Seattle Daily Journal of Commerce, Seattle.
King County. (2002).*Transfer of Development Rights Program*. http://dnr.metrokc.gov/wlr/tdr/.
King County Council Central Staff. (1993). "Tax Increment Financing: Analysis of the City of Seattle Test Case." King County Council, Seattle.
Kitsap Regional Coordinating Council. (2003). "Proposed Revisions to Kitsap Countywide Planning Policies."
Kunstler, J. H. (1998).*A Mercifully Brief Chapter on a Frightening, Tedious, But Important Subject.* http://www.earthrights.net/docs/kunstler.html.
Lane, R. (1998). "Transfer of Development Rights for Balanced Development." Cambridge, MA.
Lawrence, T. J. (n.d.).*Transfer of Development Rights CDFS-1264-98 Land Use Series Fact Sheet*. http://ohioline.osu.edu/cd-fact/1264.html.
MacDonald, H. (1996). "BIDs Really Work." *City Journal*, 6(2), 29-42.
Mathur, S. (2000). "Land Use, Growth Management and Environmental Planning." University of Washington Department of Urban Design and Planning.
McCann, B. (2000). "Driven to Spend." Surface Transportation Policy Project and Center for Neighborhood Technology.
McIntire, J. L. a. T. G. (1999). *Equity, Land Use, and Resource land Impacts of Land Value Taxation in Washington State*, Lincoln Land Institute, Cambridge, MA.
Metro Regional Services. (1997). "Creating Livable Streets." METRO Regional Services, Portland,OR.
Metropolitan Transportation Authority. (2003). "Benefit Assessment Districts." Benefit Assessment Districts Program Office.
Mitchell, J. (1999). "Business Improvement Districts and Innovative Service Delivery." Baruch College, The City University of New York, New York.
Municipal Research & Services Center of Washington. (1997). "Infill Development Strategies for Shaping Livable Neighborhoods." *38*, Municipal Research and Services Center, Seattle, WA.
Murphy, M. L. (1998). "A Private Sector Model for Rebuilding Inner-City Competitiveness: Lessons form MidTown Cleveland." The Brookings Institution.
National Housing Institute. (1999). "Special Issue: Sustainability." 103(January/February).
National Resources Defense Council. (2001).*Location Efficient Mortgages*. http://www.nrdc.org/cities/smartGrowth/qlem.asp.
Neary, P. (1999).*OutLANDish TAXes?* http://www.newrules.org/resources/outland.html.
New Jersey Department of Community Affairs. (2003). "Programs Book."
New Jersey Pinelands Commission. (n.d.).*Pinelands Development Credits*. http://www.state.nj.us/pinelands/cmp.htm#pdcs.

Northeast-Midwest Institute and Congress for the New Urbanism. (2001). "Successful Infill Development."
Oregon TGM. (2000). "Neighborhood Street Design Guidelines-An Oregon Guide to Reducing Street Widths."
Oregon Transportation and Growth Management Program. (n.d.).*Oregon Transportation and Growth Management Program Overview*. www.lcd.state.or.us/tgm.
Perkins, S., and Bernstein, S. (1997). "Toward an Alternative Economics for the Metropolitan Chicago Region."
Peterson, T. (1996). "Community Land Trusts: An Introduction." *Planning Commissioners Journal*, 23(Summer).
Planning Commissioners Journal.
Porter, D. (2000). "Making Smart Growth Work: Draft Report." Urban Land Institute, Washington, D.C.
Porter, D. (2001). *Smart Growth Guide*, Urban Land Institute, Washington, DC.
Puget Sound Regional Council. (1999). "Creating Transit Station Communities in the Central Puget Sound Region: A Transit-Oriented Development Workbook." Puget Sound Regional Council, Seattle.
Puget Sound Regional Council. (2001). "Destination 2030, Metropolitan Transportation Plan for the Central Puget Sound Region." Puget Sound Regional Council, Seattle, WA.
Puget Sound Regional Council Staff. (2000). "Compilation of Papers on Tax Increment Financing written by PSRC staff."
Sargent, T. (1994).*Infill in the Marketplace: Alternatives to Sprawl*. www.sustainable.doe.gov/articles/infillalt.htm. 1.
Seattle Station Area Planning. (2002). "Portland MAX Case Study." Station Area Planning, Seattle.
Smart Growth Network. (2002).*Smart Growth Network Home Page*. http://www.smartgrowth.org/.
Stein Engineering. (1997). "Shared Parking in the Portland Metropolitan Area." Portland Metro, Portland.
Suchman, D. R. (2002). *Developing Successful Infill Housing*, Urban Land Institute, Washington, DC.
Urban Land Institute. (1999). "Smart Growth: Myth and Fact." Urban Land Institute, Washington, D.C.
WSDOT. (2002). "Implementing Transportation-Efficient Development: A Local Interview, Phase I of Integrating Land Use and Transportation Investment Decision-Making." WSDOT.