THE COSTS OF SPRAWL - REVISITED

TCRP PROJECT H-10
LITERATURE REVIEW

APRIL 22, 1997

Rutgers University
The Brookings Institution
Parsons Brinckerhoff Quade and Douglas
ECO Northwest
LITERATURE REVIEW AND ASSESSMENT

TCRP PROJECT H-10

"The Costs of Sprawl—Revisited"

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WORK IN PROGRESS—NOT FOR QUOTATION OR ATTRIBUTION

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INTRODUCTION
AND
BACKGROUND
INTRODUCTION

The literature review that follows is an analysis of the writings and studies concerning a pattern of land development in the United States termed "sprawl." Sprawl is the spread-out, skipped-over development that characterizes the non-central city metropolitan areas and non-metropolitan areas of the United States. Sprawl is two-story, single-family development on one-quarter to one-acre lots, accompanied by strip commercial centers and industrial parks of a similar number of stories and amount of land takings (Ewing 1997).

Sprawl occurs because local government in the United States encourages this form of development via zoning and subdivision ordinances which, in turn, are reflective of the desires of their citizens. This type of development is sought by the public at large because it (as well as a combination of other factors): (1) manages congestion while accommodating unlimited use of the automobile; (2) distances new development from fiscal and social problems of older core areas; (3) provides a heterogeneous economic mix; (4) ensures neighborhoods in which housing will appreciate and schools that provide both education and appropriate socialization for youth; and (5) generates property taxes that pay for local and school district operating expenses that are less expensive per $1,000 of property value than locations closer in (Burchell 1997a).

Sprawl works so well in terms of acceptance by the public that the AAA-rated locations for both residential and nonresidential development are increasingly farther out rather than closer in, and more rather than less segregated by type of land use (Gordon and Richardson 1997). Gated communities, farmettes, research parks, law offices, medical groups, hardware and home improvement stores, theatrical and comedy clubs, new and used car lots, and restaurants all now seek peripheral locations in pursuit of their markets. Starting with single-family subdivisions, then shopping centers and garden apartments, then research and industrial parks, then restaurants and entertainment facilities, and finally, discounters of every form, all of these enterprises have made their way increasingly far out into the metropolitan area. The unique aspect of all of this is that few entities have ever failed because their locational decisions were in the wrong direction. Occasionally a retailer or a residential development went under because an exit on the interstate or beltway wasn't developed as planned, but rarely has an economic entity failed in the United States because it was developed too far out. The newest and soon-to-be one of the most successful airports in the United States is 33 miles from the city of Denver—a $40 taxi ride from the airport baggage claim to the downtown Hyatt. Is the above an anomaly? No—Cincinnati's new airport is so far from the downtown that it is not even in the same state!

If all of the above is true, why should the citizens of the United States accept anything else? The answer is that they no longer can pay for the infrastructure that is necessary to keep the current system of development going. In the state of South Carolina, statewide infrastructure costs for the period 1995 to 2015 are estimated at more than $56 billion. This is equivalent to raising $1,000 from every citizen every year for the next twenty years. In addition to a massive infrastructure conservation program and the adoption of numerous technological cost savers, funding infrastructure in this state could require an increase in the gasoline tax of 2¢, an increase in the state sales tax of 0.5%, an increase in property taxes of 12.5%, the tolling of all interstates at 30-mile intervals, impact fees on residential and nonresidential development of $2,000 per unit and per 1,000 square
feet, respectively, and a mandatory 10 percent set-aside for infrastructure in all state, county, municipal, and school district general fund and intergovernmental transfer revenues (Burchell 1997b).

What is the big-ticket item for the above infrastructure? The answer: primarily roads. Roads will cost $25 billion of the more than $56 billion. Roads will cost 2.5 times what will be spent on primary/secondary and higher education infrastructure, three times what will be spent on health infrastructure, including all hospitals and institutions and all wastewater treatment systems, ten times what will be spent on public safety, administration and justice infrastructure, fifteen times what will be spent on environmental protection infrastructure, and twenty-five times what will be spent on all cultural and recreational infrastructure.

Dually maintaining and underutilizing two systems of infrastructure—one that is being abandoned in and around central cities and close-in suburbs, and one that is yet to be used fully in rural areas just beginning to be developed—is causing governments to forego the maintenance of all infrastructure and not to provide other than growth-related infrastructure. The costs of infrastructure just cannot be paid for (Downs 1994).

Employing new forms of technology, dedicating infrastructure funding from general fund budgets and from intergovernmental transfers, and relying on new sources of revenue allow a state potentially to meet its infrastructure needs. Doing with less infrastructure and developing differently further allow infrastructure costs to be met. But even these are not being done on a regular basis.

And by no means is an alternative to the current pattern of land development the ultimate panacea. If South Carolina were to go to compact development and managed growth measures to curtail spread development, the state would be able to save only about 10 percent of the $56 billion, or approximately $5.6 billion. This is because about 40 percent of public infrastructure costs are not growth-related, one-third of the remainder is not new growth-related, and when development pattern savings are applied to the appropriate portion of infrastructure costs, the saving is only 12–15 percent. Conversely, raising the gasoline tax by 2¢ raises only $56 million in new revenues statewide—one-thousandth of total required infrastructure costs—and one-hundredth of the amount that potentially can be saved by altering land development patterns (Burchell 1997b).

In sum, the current way of developing in metropolitan areas is not disliked by the majority of the American public—it simply can no longer be afforded. Thus, the primary concern about sprawl development, at a time when the average American is satisfied with its outcome, is cost. In addition to financial concerns about capital facilities, other resource depletion is also causing public concern. Land is being consumed at triple the percentage of household formation rates, automobile use is growing at twice the increase in population, and prime agricultural land, forests, and fragile lands encompassing natural habitats are decreasing at comparable reciprocal rates (Landis 1995).

The above situations have caused the professional transportation and city planning communities to begin to look at sprawl to determine whether an alternative to this growth pattern can be conceived, and even more importantly, whether it makes sense to pursue this alternative. What is the alternative, if any, and does this alternative pose a viable option to current methods and forms of metropolitan development? A significant literature has developed in this area and is discussed in detail below.
BACKGROUND

“Sprawl,” in its broadest sense, has long been an American zeitgeist. Alexis de Tocqueville, touring the United States in the early 1800s, observed “no urban growth boundaries,” but rather marveled at “America . . . where everything is in constant motion . . . and where no boundaries were set to the efforts of man.” Today’s sprawl is the “frontier” of long ago, or more recently the post-war suburb, both of which have been extolled as defining American influences.

Yet values are subject to change. While some view contemporary development patterns as a reflection of the invisible but sure hand of the market (Gordon and Richardson 1997), the unbridled movement outward of leapfrog, low-density development is increasingly being viewed as an American ill. Sprawl has taken on both a pejorative as well as a descriptive connotation, an intermixing that makes a balanced discussion which disentangles the costs and benefits of sprawl that much harder.

To begin to set the context, criticisms of suburban sprawl are not necessarily criticisms of all suburbanization. The shift to the suburbs has been manifest for more than half a century. In 1940, only 15 percent of the United States population was in suburbia—defined as metropolitan areas outside of central cities. As we approach the millennium, about 60 percent of the population is suburban. Even the most vehement critics of sprawl recognize that suburban growth has been and will continue to be inescapable in the United States. With a recent population increase of some 20 million people per decade—a gain likely to continue for at least the next quarter-century—a great deal of that addition will continue to be in suburbs. It would be totally unrealistic to expect even a large share of growth to occur solely in already built-up neighborhoods in cities or in close-by communities. To call all suburban settlements sprawl is a meaningless exercise.

Cross-cultural and place-oriented differences factor into what is meant by sprawl. Density, or more specifically, low density, is one of the cardinal defining characteristics of sprawl. But density has to be set in context. Densities in the United States overall are roughly one-tenth that found in Western Europe, and in turn Western European density is much lower than that of Japan and a fraction of that found in such locations as Hong Kong and Indonesia (Jackson 1985). And in all of the above-named places, suburban densities are lower relative to the densities of central cities. Sprawl is not simply development that is at less than maximum density, but rather development that, given a national and regional framework (e.g., suburbs in the United States), is at a low density (specific threshold to follow) and one that may be too costly to maintain.

Sprawl is often (yet probably should not be) equated with such loosely defined terms as “social malaise.” This is not to say that sprawl does not affect quality of life—it may—but sprawl has “taken it on the chin” in terms of its description as either “meaningless development” or more polemically, a “geography of nowhere” (Kunstler 1993). Like it or not, sprawl is a purposeful path en route to a specific place.

Sprawl refers to a particular type of suburban peripheral growth. It involves very low-density development that expands in an unlimited and noncontiguous way outward from the solidly built-up core of a metropolitan area. In terms of land-use coverage, such
development contains primarily housing, including significant numbers of distant units scattered in outlying areas at extremely low densities. Sprawl also includes shopping centers, strip retail outlets along arterial roads, industrial and office parks, freestanding industrial and office buildings and other workplaces, as well as schools and other public buildings. These different types of land uses are, for the most part, spatially segregated from one another. The components of this development are individually located in small subdivisions and nonresidential tracts in zoning districts. Within each district, usually only one type of use is permitted. Examples are single-family residential districts, shopping center districts, strip commercial districts, and industrial or office park districts.

Sprawl’s other distinguishing traits include the consumption of exurban agricultural and other frail lands in abundance because at the periphery this is the cheapest land available. Under sprawl conditions, there is almost total reliance upon the automobile as a means of accessing the individual land uses.

Some analysts also include the small developer and a lack of integrated development planning as important aspects of suburban sprawl. The result is relatively small residential subdivisions and nonresidential site plans created by individual developers operating independently of each other, within the zoning districts of the 10,000 local governments found in the United States, with almost no ability to control tempo and sequence of development. It is different, therefore, from the development of large tracts of land, each owned by a single developer, or under controlled development conditions in a municipality wherein tempo and sequence of land use can be controlled by phase. The legal framework within which sprawl occurs is fragmented into many relatively small units separately controlled by different local governments with differing rules and regulations. These localities have very different fiscal resources (assessed valuation of residential and nonresidential properties) per capita: some are quite wealthy, but others have very limited ability to pay for local services. These latter units of government are placed at a severe disadvantage.

Sprawl is a complex phenomenon with attributes and consequences that have been both embraced and condemned. To aid in the study of what sprawl is and what its attendant costs and benefits are, first a historical overview of the literature on the subject for the past half-century is presented. This overview does not go into the detail of sprawl’s effects—e.g., how low-density development affects transit use or disuse—but rather notes more generally how sprawl’s attributes have been viewed and the term defined: what the recurring topical areas of discussion are, and what common data are accessed and analytical methods applied. Once the literature is analyzed and topical areas are framed in Part One, a second portion of the literature review considers in greater detail the subsumed alleged costs and benefits of sprawl. Under the topic of land/natural habitat preservation, for instance, an alleged cost of sprawl is that it consumes more land generally and especially greater quantities of agricultural and environmental sensitive acreage than other forms of development. Under the topic of transportation and travel costs, one alleged benefit of sprawl is the decreased suburb-to-suburb travel time, because outward suburbanization has brought all uses within the suburban realm. An
alleged cost is the greater number of vehicle miles traveled (VMT) due to enhanced deconcentration. (That, in turn, raises the issue of what is more significant—travel time or VMT). Each of these alleged costs and benefits is considered in turn below and relevant literature synthesized that bears on the subject.

Both the historical overview of the literature and the topical synthesis are based on the research team’s review of hundreds of relevant studies. This full file is contained in a comprehensive bibliography with key studies annotated by topic area. The bibliography and annotations are found in an appendix, or third part of this literature search.
Part One

HISTORICAL OVERVIEW AND ANALYSIS OF THE LITERATURE ON SPRAWL
HISTORICAL OVERVIEW OF THE LITERATURE ON SPRAWL

Sensitivity to the consequences of sprawl-like settlement long predates the coinage of the term. The 1929 Regional Plan of the New York Metropolitan area, for instance, warned of a steady decrease in farms and open-space acreage in the region and underscored the need for settlement patterns that encouraged, rather than discouraged, "the face to face association that characterized the old village community" (Regional Plan 1929, 23 and 216). At the same time, the Regional Plan spoke approvingly of "many carefully planned outer subdivisions with good features" (Regional Plan 1929, 1).

It was not until roughly the late 1950s and early 1960s, however, that sprawl as a planning term entered the literature, with the pattern it depicted typically criticized. In 1956, a Canadian planning study described urban sprawl as "scattered building development" that led to "inconveniences in the placement of public and business facilities" (Lower Mainland Regional Planning Board 1956). A year later, William H. Whyte, describing urban sprawl as leapfrog, scattered development, spoke of it as a problem that had reached national proportions (Whyte 1957).

Soon others entered the discussion; Marion Clawson, in 1962, described sprawl as a "lack of continuity in expansion" and noted it both was fostered by and contributed to land speculation (Clawson 1962). Somewhat more contemporary literature such as Lessinger (1962), Harvey and Clark (1965), and Bahl (1968) viewed sprawl as characterized by such features as low-density, scattered, and leapfrog development. Harvey and Clark (1965) identified the three cardinal traits of sprawl as: low-density development, ribbon development, and leapfrog development.

Even at this early stage, pundits acknowledged the difficulty in defining sprawl. Writing in 1972, David McKee and Gerald Smith observed that:

Urban sprawl is rather difficult to define. In some circles the term is thought to be synonymous with suburbia. Certainly the problem exists in suburbia but suburbia itself is not the problem. Some equate sprawl with expansion. But this type of definition is not too helpful. (McKee and Smith 1972, 181-182)

McKee and Smith went on to describe sprawl in four forms: 1) very low-density development (e.g. two- to five-acre zoning); 2) ribbon-variety development extending along access routes; 3) leapfrog development; and 4) a "haphazard intermingling of developed and vacant land" (McKee and Smith 1972). The authors claimed that sprawl aggravated suburban problems (e.g. automobile dependence and the high cost of services and infrastructure) and also deleteriously affected cities by, among other things, depressing property values there.

Discussion of sprawl's effects transcended economics. Although the 1973 Rockefeller Brothers Task Force publication *The Use of Land* did not speak of sprawl per se, it concluded that the dominant pattern of "unrestrained, piecemeal urbanization" was leading citizens to ask how such growth affected their "quality of life" (Reilly 1973, 33). In a similar vein, *The Language of Cities* defined sprawl (Abrams 1971, 293-294):

Sprawl, the awkward spreading out of the limbs of either a man or a community. The first is a product of bad manners, the second of bad planning.
Sprawl is a by-product of the highway and automobile, which enabled the spread of development in all directions. As builders scramble for lots to build on, the journey to work is lengthened and green spaces are consumed by gas stations and clutter.

Professional work began to be undertaken in numerous fields relevant to the study of sprawl. Examples include the 1963 Innovation Versus Tradition in Community Development (the effects of development patterns on road lengths); the 1967 Howard County Study (comparative, county-wide costs for roads, utilities, schools and open space under sprawl versus more planned scenarios); the 1967 Urban Form and the Cost of Public Services (public service costs at different densities); the 1970 Planned Residential Environments, (different overall development patterns influence trip generation rates and distances); the 1972 Total Energy Demonstration (savings in energy consumption are likely in planned communities); and the 1972 Land Use Planning for Air Quality (development planning can affect air pollution on a regional basis). While not articulated, already the substantive foci in analyzing sprawl versus alternatives—namely issues of transportation, infrastructure, public service costs, and land and environmental issues—were being evidenced.

Many of these studies were referenced by the bellwether The Costs of Sprawl authored by the Real Estate Research Corporation in 1974 (RERC 1974). As summarized by the RERC:

This analysis presents a complete and internally consistent set of estimates for direct costs and adverse effects resulting from prototypical housing types and land development patterns at neighborhood and community levels. Six neighborhood prototypes—differing in housing type and density—are analyzed, along with six community prototypes which represent different degrees of community-wide planning. . . . Stated in the most general form, the major conclusion of this study is that, for a fixed number of households, sprawl is the most expensive form of residential development in terms of economic costs, environmental costs, natural resource consumption, and many types of personal costs. (RERC 1974, 2-7)

The Costs of Sprawl did not explicitly define the term “sprawl.” However, its analysis of six community-level growth patterns implies that sprawl development has at least two major traits: low average residential density (3 units per net residential acre or less), and a lack of overall planning at the regional or even community level. RERC did not define sprawl’s gross density (population per square mile including all nonresidential uses) because RERC did not relate residential to nonresidential development in its analysis.

The RERC considered approximately 20 individual effects—e.g., “costs,” “lands required,” and “principal environmental impacts” (see Table 1). But as can be seen in Table 2, these can be grouped into four overall categories encompassing 1. public-private capital and operating costs; 2. transportation and travel costs; 3. land and natural habitat preservation; 4. quality of life. Not considered in The Costs of Sprawl, and not part of its research charge, was any examination of sprawl’s social effects, such as its impact on cities.
### TABLE 1

The Costs of Sprawl: Summary of Findings

<table>
<thead>
<tr>
<th>Category</th>
<th>Community Prototypes (10,000 units)</th>
<th>Neighborhood Prototypes (1,000 units)</th>
<th>Capital costs per unit</th>
<th>Annual non-residential operating and maintenance costs per unit (in year 10)</th>
<th>Land required (for 10,000 units)</th>
<th>Principal environmental impacts (for 10,000 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low-density Sprawl (1,000 units)</td>
<td>Low-density Planned Mix</td>
<td>Low-density Planned Mix</td>
<td>Low-density Planned Mix</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$268</td>
<td>$297</td>
<td>$268</td>
<td>$297</td>
<td>$220</td>
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<td>$268</td>
<td>$297</td>
<td>$268</td>
<td>$297</td>
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<td>$274</td>
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<td>$268</td>
<td>$297</td>
<td>$220</td>
<td>$274</td>
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<tr>
<td></td>
<td>$5,354</td>
<td>$5,354</td>
<td>$4,538</td>
<td>$4,538</td>
<td>$1,464</td>
<td>$801</td>
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<tr>
<td></td>
<td>$1,662</td>
<td>$1,626</td>
<td>$1,645</td>
<td>$1,622</td>
<td>$1,630</td>
<td>$1,579</td>
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<td>$3,797</td>
<td>$3,377</td>
<td>$3,235</td>
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<td>$6,197</td>
<td>$4,744</td>
<td>$3,868</td>
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<td>$16,462</td>
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<td>$34,994</td>
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<td>$23,266</td>
<td>$17,711</td>
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<td></td>
<td><strong>Total Unit Costs</strong></td>
<td>$51,456</td>
<td>$37,283</td>
<td>$28,706</td>
<td><strong>$48,911</strong></td>
<td><strong>$46,258</strong></td>
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<tr>
<td></td>
<td>Public Proportion</td>
<td>19%</td>
<td>12%</td>
<td>24%</td>
<td>16%</td>
<td>18%</td>
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<td>Public Costs</td>
<td>$9,777</td>
<td>$5,878</td>
<td>$8,948</td>
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<td><strong>Operating Costs</strong></td>
<td>$2,111</td>
<td>$2,067</td>
<td>$1,937</td>
<td>$1,873</td>
<td>$1,937</td>
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<td>Public Proportion</td>
<td>57%</td>
<td>51%</td>
<td>61%</td>
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<td>Public Costs</td>
<td>$1,203</td>
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<td></td>
<td><strong>Land</strong></td>
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<td>NA</td>
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<td>NA</td>
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<td>Developed Acres</td>
<td>4,590</td>
<td>4,113</td>
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<td></td>
<td>Vacant, Improved Acres</td>
<td>459</td>
<td>206</td>
<td>152</td>
<td>326</td>
<td>109</td>
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<td></td>
<td>Vacant, Semi-improved Acres</td>
<td>951</td>
<td>617</td>
<td>1,390</td>
<td>456</td>
<td>326</td>
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<td>Vacant, Unimproved Acres</td>
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<td>1,064</td>
<td>1,552</td>
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<td>Total Vacant Acres</td>
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<td>1,887</td>
<td>3,220</td>
<td>2,960</td>
<td>3,827</td>
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<td></td>
<td><strong>ENVIRONMENT</strong></td>
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<tr>
<td></td>
<td>Non-auto Air Pollutants**</td>
<td>1,420</td>
<td>1,420</td>
<td>1,034</td>
<td>1,034</td>
<td>809</td>
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<td>Sewage Effluent**</td>
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<td>Water Use**</td>
<td>1,170</td>
<td>1,100</td>
<td>910</td>
<td>910</td>
<td>760</td>
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<td>Non-auto Energy Use**</td>
<td>2,355</td>
<td>2,355</td>
<td>1,750</td>
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<td>1,400</td>
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<td>Notes:</td>
<td>All dollar figures are per dwelling unit in 1973 dollars.</td>
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<tr>
<td></td>
<td>NA = Not applicable</td>
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<td></td>
<td>Includes construction cost of the unit and other expenses such as land dedication.</td>
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<td>Lbs. per day.</td>
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<td></td>
<td>Billion liters per year.</td>
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<td>Million gallons per year.</td>
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<td>Billion BTU's per year.</td>
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</tbody>
</table>
The RERC study evoked a flood of commentary—much praise as well as some criticism. Two of the better known criticisms were articulated by Altshuler (1977) and Windsor (1979). (These are considered subsequently in detail.) Among other points, Altshuler argued that RERC underestimated the demand for services by higher-density development and commingled the effects resulting from high-density versus smaller-unit size. Windsor, in parallel, criticized RERC for not disentangling density from other factors, and among other shortfalls, argued that RERC ignored the benefits of sprawl, such as its “response to consumer preference” for single-family detached homes.

Although *The Costs of Sprawl* dominated the literature for some time, new analyses continued to be published. Examples include David Popenoe’s (1979) depiction of sprawl as low-density, scattered strip development with adverse sociological implications, and David Mills’s (1981) discussion of how sprawl—described by him as scattered, leapfrog development—both abetted and

<table>
<thead>
<tr>
<th>Topics Considered By RERC (1974)</th>
<th>Public-Private Capital and Operating Costs</th>
<th>Transportation and Travel Costs</th>
<th>Land and Natural Habitat Preservation</th>
<th>Quality of Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Costs”</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infrastructure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Recreation</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Schools</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Public Facilities</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Utilities</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Road/streets</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Operating Costs</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>“Land Required”</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>• Total acres</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>• Developed acres</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>• Vacant, improved/semi-improved acres</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>• Improved acres</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Vacant unimproved acres</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>“Principal Environmental Impacts”</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>• Nonauto air pollutants</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Sewage effluent</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Nonauto energy use</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Water use</td>
<td>X</td>
<td></td>
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</tr>
</tbody>
</table>
resulted from land speculation. Receiving much acclaim was Kenneth Jackson's *Crabgrass Frontier: The Suburbanization of the United States*, published in 1985.

Although sprawl per se was not mentioned in this monograph, numerous traits attributed by Jackson to the "crabgrass frontier" were clearly "sprawl-like" in character. These attributes were: 1) low residential density with the absence of sharp divisions between town and country; 2) the socioeconomic distinction between the center and the periphery; and 3) a lengthy journey to work in terms of distance and time. Jackson attributed the permanence of the "crabgrass frontier" to physical as well as socioeconomic factors (e.g., America was land rich and had fragmented local governments), and he noted its problems (e.g., high local public service costs and increased automobile dependence) as well as its benefits (high housing amenity and individual open space).

All in all, with some exceptions (including those studies cited above), in the decade following *The Costs of Sprawl*, the literature on this subject was relatively quiescent. This trend has reversed itself in the last decade; there has been, as shall be seen, an outpouring of studies. These are subsequently reviewed by substantive area. To give a sense of the current literature, with a focus on the definition of sprawl and its alleged costs and benefits, a sampling is discussed here.

In 1993, a study conducted for the Chesapeake Bay Program defined sprawl as "residential development at a density of less than three dwelling units per acre." This definition does not have a "locational component" and is a modified definition of one presented in an earlier draft: i.e., "developments having gross development densities of less than three or four dwelling units per acre or minimum lot sizes of at least one-quarter of an acre, and frequently of at least one acre." The latter definition had been criticized by Uri P. Avin (1993) as too high a density, since it would encompass many existing subdivisions in both Maryland and Virginia.

Sprawl, and more generally, suburbanization, were condemned in a polemical book by James Kunstler (1993). The title of the book, *The Rise and Decline of America's Man-Made Landscape*, conveys his message. The strident tone of the message is reflected by the following statement:

We have become accustomed to living in places where nothing relates to anything else, where disorder, unconsciousness, and the absence of respect reign unchecked. (Kunstler 1993)

Peter Calthorpe's 1993 book *The Next American Metropolis* offered a method for computing population densities in an idealized form of modern settlement. He presented a scheme for clustering housing and other improvements around transit stops at specified densities which could be used to compute overall densities for ideal future metropolitan settlements. His scheme essentially involved creating Transit Oriented Developments (TODs) around the stations in a system of radial fixed-rail transit lines emanating from the region's major downtown. This approach was a method of quantifying aspects of a form of future growth alternative to sprawl. However, Calthorpe did not present any method of measuring the costs and benefits of sprawl or of the alternative form he suggested. Nor did he present any database to use in carrying out such measurements.
In his 1994 book *New Visions for Metropolitan America*, Anthony Downs adopted a broader approach of defining sprawl that primarily related to density but included other characteristics as well. According to Downs, sprawl encompassed five major elements: (1) low-density, primarily single-family residential settlement (without any numerical density specified); (2) heavy dependence upon private automotive vehicles for all types of travel; (3) scatteration of job locations widely across the landscape in mainly low-density establishments (also without any numerical density specified); (4) fragmentation of governance authority over land uses among many relatively small localities; and (5) widespread reliance on the filtering or “trickle down” process to provide housing for low-income households.

*New Visions for Metropolitan America* posed a basic method for analyzing sprawl by comparing its results to the results that might arise from alternative forms of metropolitan growth. Downs described a way of formulating alternative outcomes through an analysis of the basic traits of different growth strategies. Downs’s approach is incorporated later in this study and is described further there.

As is apparent, even the most current literature on sprawl tends to describe its attributes rather than quantifying them. No quantified analyses of sprawl’s relationship to other variables appears anywhere in the literature and, in turn, no one has mathematically or statistically linked sprawl to other conditions or metropolitan traits. The closest thing to quantification is the 1995 work of David Rusk in *Cities Without Suburbs*. He calculates an “index of elasticity” which measures the ability of cities to extend their boundaries to encompass surrounding urbanized development. “Elasticity” is not the same as sprawl but comes the closest to a surrogate that has been found. Rusk claims that cities with high indices of elasticity are superior to those with low indices of elasticity as they pertain to such traits as income distribution, racial integration, population growth, and economic development. The best cities are “elastic” cities because they have encompassed their suburbs. His index is applied both to the cities themselves and their metropolitan areas.
Rusk did not perform any mathematical or statistical analyses relating the variables just described, but three reviewers of his book did. John P. Blair, Samuel R. Staley, and Zhongcai Zhang (1996) used a multiple regression format on variables measuring growth and economic welfare over the period 1980–1990 (as dependent variables) against Rusk’s index of elasticity (as an independent variable). These reviewers concluded that Rusk’s index of elasticity had statistically significant effects of the expected types on city employment, population, poverty, and per capita income growth and of the expected types on metropolitan-area population and employment growth—but not of the expected types on metropolitan-area per capita income or poverty growth. However, even where the regression equations identified statistically significant effects, they had low R² squares (low explanatory power), indicating possibly that other unspecified variables were not included in the equation. An implication of the Blair, Staley and Zhang analysis is that Rusk’s index of elasticity is probably not a useful indicator of the degree of sprawl that might be employed in this study.

City-suburban relationships were also considered by Jonathan Barnett in his 1995 The Fractured Metropolis. This analysis of metropolitan area trends is strictly narrative and advances the thesis that U.S. metropolitan areas are splitting into “old cities” and “new cities.” Barnett proposes that more future growth be redirected into the “old cities.” Much of this work is skewed toward physical design and planning; it favors compact development over sprawl and relatedly encourages commercial development within, and the creation of urban growth boundaries around, old metropolitan cities.

A critique of strip commercial development permeates the current literature from the National Trust for Historic Preservation. Richard Moe (1994), President of the National Trust, defines sprawl as “poorly planned, land-consumptive, automobile-dependent [development] designed without regard to its surroundings.” He identifies two types:

“sellscape” retail development frequently spurred by major discount chains such as Walmart and Kmart, occurring along major arteries and at highway interchanges; and spread out residential development, usually consisting primarily of single-family detached houses, located on the edges of existing communities or “leapfrogging” into previously undeveloped areas. (Moe 1994, 3)

This view identifies commercial strip development as the manifestation of nonresidential sprawl, in addition to low-density single-family subdivisions as the residential manifestation.

A much more comprehensive view of the components of sprawl is offered in Henry Richmond’s 1995 Regionalism: Chicago as an American Region. Richmond’s conceptualization of sprawl includes eight components. (1) low residential density; (2) unlimited outward expansion of new development; (3) leapfrog development; (4) spatial segregation of different land uses; (5) decentralized land ownership; (6) primacy of automobile transportation; (7) fragmentation of governmental land use authority; (8) disparity in the fiscal capacity of local government.
Richmond offers a wide-ranging critique of sprawl and includes numerous carefully culled statistics supporting his allegations against sprawl, many which are focused on the immediate subject of his analysis—the Chicago metropolitan area. Two aspects of his thinking, the components and critique of sprawl, are as one, since his criticisms are the ingredients he uses for his definition. Richmond’s specification of sprawl is clear and most useful and is turned to elsewhere in this study. In defining sprawl, however, Richmond does not present specific alternative forms of growth, either conceptually or in terms of quantified analysis. Instead, he presents a long agenda of specific policy actions that would encourage a regional approach to managing future growth. Therefore, his analysis does not provide either a method for measuring the costs of sprawl or a specific alternative development form that would provide a better outcome.

Some of the most extensive quantitative work in formulating both the methods and data to address the costs and benefits of sprawl has been done at the Center for Urban Policy Research at Rutgers University and at the University of California, Berkeley. Starting in the early 1990s, Rutgers University researchers, led by Robert W. Burchell, began to quantify the relative impacts of alternative patterns of development. One or two years later, under John D. Landis, similar efforts were being undertaken at the Institute of Urban and Regional Development at Berkeley. Both research organizations have looked at the prospective impacts of alternative development patterns. Both research organizations have comprehensive land-use models to carry out these analyses (Burchell 1992a, 1992b; Landis 1994, 1995).

The Rutgers effort involved an analysis of the differing effects of “trend development” (sprawl-like) versus “planned development” (with compact form and managed growth attributes) in New Jersey. The results obtained are shown in Table 3. This Rutgers study was followed by other similar studies in Lexington, Kentucky (1994), the Delaware Estuary (1995), and the states of Michigan (1997) and South Carolina (1997). In all instances, polar development patterns were contrasted—“current” or “trend,” versus “compact,” or “planned.” The exact nomenclature is unimportant; what is important are the differing land-use configurations and their impacts, which are indicated below (Burchell 1997, A-1):

Current, or trend, development is historical development in an area. The land-use literature describes this type of development as skipping over existing development; land-consumptive and inefficient use of available land at or near the core of the metropolitan area; and requiring significant accompanying infrastructure in the form of roads, water and sewer lines, public buildings, and the like. Compact, or a more managed type of development attempts to direct growth to already existing locations of development while preserving yet-to-be developed areas. Nationally, the land-use literature portrays compact development as more efficient in its land-use patterns and thus less land-consumptive. Accordingly, it often requires somewhat less development infrastructure. Compact development is also viewed as not limiting or restricting population or employment growth at the county, regional or state levels.
Burchell developed a series of quantitative models relating to land consumption, road, transit, water/sewer infrastructure, fiscal impacts, housing cost, and quality of life to examine the relative effects of the alternative development patterns. Application of these models across the aforementioned jurisdictions indicated comparable order-of-magnitude findings. For instance, a shift away from sprawl to compact growth was projected by Burchell to save water/sewer utility infrastructure costs by 8 percent in New Jersey, 7 percent in Lexington, 8 percent in the Delaware Estuary, 4 percent in Michigan, and 13 percent in South Carolina. Table 4 summarizes the array of findings from the various Burchell studies (1992-1997). Table 5 groups the effects of sprawl, some dozen in all, into five overall categories.

The Berkeley effort employs the California Urban Futures (CUF) model of the San Francisco Bay Area to tabulate land consumed under (a) "business as usual," (b) "maximum environmental protection," and (c) "compact cities" scenarios. These scenarios are differentiated, respectively, by (a) not restricting development either within the city or within unincorporated areas, (b) applying a range of environmental restrictions to both locations, but not restricting growth per se, and (c) restricting growth to acknowledge some environmental limitations and countywide minimum population projections. The two latter alternatives showed considerable overall and sensitive environmental land savings relative to the business as usual scenario. Total land saved in the final two scenarios (b and c) were 15,000 and 46,000 acres, respectively. Scenario B saved nearly 60,000 acres of prime agricultural land, 10,500 acres of wetlands, and 8,000 acres of steep-sloped lands (Landis 1995).

There are two final references in this historical overview of sprawl. The first is what has been referred to as the Bank of America study (Bank of America et al. 1995). The name that became associated with this study is more important than its position in alphabetical order because although four groups actually sponsored the study (Bank of America, California Resources Agency, Greenbelt Alliance, and Low-Income Housing Fund), only California’s largest bank is ever associated with the study’s results. This is because those who champion land development approaches other than sprawl point to this study as the work of one of the private sector’s most influential members. If the banks are finally recognizing that sprawl can no longer be tolerated, the impacts of differing land development patterns on society’s resources has indeed hit the big time.

The Bank of America study summarized changes in population, demographics, and employment that had taken place over the two decades prior to 1990. It also referenced a land-use pattern that had taken place during this same period of time: the study termed it "sprawl." Sprawl was decentralized employment centers and residential tracts accessed almost exclusively by the automobile. These decentralized locations were safer and cheaper to locate in and had plucked all fiscal and physical benefits from the central city. Further, this was aided and abetted by the federal subsidies given to the automobile. The Bank of America report was criticized for its inability to adequately interpret the long-standing criticisms of the RERC Costs of Sprawl report and the fact that its own study seemed to buy into every argument that
### TABLE 3

Burchell (1992)—New Jersey Impact Assessment: Summary of Impacts for Trend versus Planned Development

<table>
<thead>
<tr>
<th>Growth/Development Impacts</th>
<th>Trend Development</th>
<th>Planned Development</th>
<th>Trend Versus Planned Development Difference</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. POPULATION GROWTH (persons)</td>
<td>520,012</td>
<td>520,012</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>II. HOUSEHOLD GROWTH (households)</td>
<td>431,000</td>
<td>431,000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>III. EMPLOYMENT GROWTH (employees)</td>
<td>653,600</td>
<td>653,600</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>IV. INFRASTRUCTURE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. ROADS ($ millions)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td>$2,197</td>
<td>$1,630</td>
<td>$567</td>
<td>25.8</td>
</tr>
<tr>
<td>State</td>
<td>727</td>
<td>595</td>
<td>132</td>
<td>18.2</td>
</tr>
<tr>
<td>Total Roads</td>
<td>$2,924</td>
<td>$2,225</td>
<td>$699</td>
<td>23.9</td>
</tr>
<tr>
<td>B. UTILITIES—Water ($ millions)</td>
<td>$634</td>
<td>$550</td>
<td>$84</td>
<td>13.2</td>
</tr>
<tr>
<td>C. UTILITIES—Sewer ($ millions)</td>
<td>$6,790</td>
<td>$6,313</td>
<td>$477</td>
<td>7.0</td>
</tr>
<tr>
<td>Total Utilities</td>
<td>$7,424</td>
<td>$6,863</td>
<td>$561</td>
<td>7.6</td>
</tr>
<tr>
<td>E. SCHOOLS ($ millions)</td>
<td>$5,296</td>
<td>$5,123</td>
<td>$173</td>
<td>3.3</td>
</tr>
<tr>
<td>F. ALL INFRASTRUCTURE (sum of A–E in $ millions)</td>
<td>$15,644</td>
<td>$14,211</td>
<td>$1,433</td>
<td>9.2</td>
</tr>
<tr>
<td>V. LAND CONSUMPTION</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Overall Land (acres)</td>
<td>292,079</td>
<td>117,607</td>
<td>174,472</td>
<td>59.7</td>
</tr>
<tr>
<td>B. Frail Lands (acres)</td>
<td>36,482</td>
<td>6,139</td>
<td>30,343</td>
<td>83.2</td>
</tr>
<tr>
<td>C. Agricultural Lands (acres)</td>
<td>108,000</td>
<td>66,000</td>
<td>42,000</td>
<td>38.9</td>
</tr>
<tr>
<td>VI. HOUSE PRICE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Median Cost per Unit (1990 $)</td>
<td>$172,567</td>
<td>$162,162</td>
<td>$10,495</td>
<td>6.1</td>
</tr>
<tr>
<td>B. Housing Index (higher is more affordable)</td>
<td>118</td>
<td>126</td>
<td>8</td>
<td>6.7</td>
</tr>
</tbody>
</table>

Source: Robert W. Burchell et al., 1992a, b

### TABLE 4


<table>
<thead>
<tr>
<th>Area of Impact</th>
<th>Lexington, KY and Delaware Estuary</th>
<th>Michigan</th>
<th>South Carolina</th>
<th>New Jersey</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Public-Private Capital and Operating Costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Infrastructure Roads (local)</td>
<td>14.8-19.7%</td>
<td>12.4%</td>
<td>12%</td>
<td>26%</td>
</tr>
<tr>
<td>2. Utilities (water/sewer)</td>
<td>6.7-8.2%</td>
<td>13.7%</td>
<td>13%</td>
<td>8%</td>
</tr>
<tr>
<td>3. Housing Costs</td>
<td>2.5-8.4%</td>
<td>6.8%</td>
<td>7%</td>
<td>6%</td>
</tr>
<tr>
<td>4. Cost-Revenue Impacts</td>
<td>6.9%</td>
<td>3.5%</td>
<td>5%</td>
<td>2%</td>
</tr>
<tr>
<td>II. Land/Natural Habitat Preservation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Developable Land</td>
<td>20.5-24.2%</td>
<td>15.5%</td>
<td>15%</td>
<td>6%</td>
</tr>
<tr>
<td>2. Agricultural Land</td>
<td>18-29%</td>
<td>17.4%</td>
<td>18%</td>
<td>39%</td>
</tr>
<tr>
<td>3. Frail Land</td>
<td>20-27%</td>
<td>20.9%</td>
<td>22%</td>
<td>17%</td>
</tr>
</tbody>
</table>
TABLE 5

Burchell (1992-1997)
ANALYSIS OF TREND VERSUS PLANNED DEVELOPMENT
Substantive Areas of Inquiry

<table>
<thead>
<tr>
<th>Topics Considered By Burchell (1992-1997)</th>
<th>Public-Private Capital and Operating Costs</th>
<th>Transportation and Travel Costs</th>
<th>Land and Natural Habitat Preservation</th>
<th>Quality of Life</th>
<th>Social Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Water/ sewer infrastructure</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• School capital facilities</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Housing cost</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Fiscal impacts</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Roads</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Transit</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Land capacity</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Agricultural lands</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Frail lands</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Quality of life</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Intergovernmental coordination</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Effects to urban and rural centers</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

favor the anti-sprawl position without even looking at contrary evidence. Those who championed the study as a summary of the ills of sprawl used the Bank of America’s logo to promote the position that the business community, at long last, was calling for managed growth to conserve national resources.

The final reference in this historical overview of the literature on sprawl consists of two recent (1997) “point and counterpoint” articles in the American Planning Association Journal. The point article by Peter Gordon and Harry W. Richardson (1997) critiques the arguments and evidence frequently presented to make the case for compact development (e.g., energy, transportation, and infrastructure efficiencies) and argues that the decentralized suburban pattern of development in fact offers many advantages, such as reduced travel times, higher consumer satisfaction, and reduced housing costs. In counterpoint, Reid Ewing (1997) claims a strong case for the adverse effects of sprawl (as opposed to the benefits of compactness). For the purposes of this review, their respective definitions of terms bear note. For Ewing, sprawl is defined both by a series of three characteristics—
(1) leapfrog or scattered development,
(2) commercial strip development, and
(3) large expanses of low-density or single-use developments—as well as:
such sprawl indicators as low accessibility and lack of functional open space (Ewing 1997, 108-109). Gordon and Richardson do not specifically define sprawl (or compactness for that matter); instead, they reference its various traits.

Sprawl is alternatively denoted by Gordon and Richardson as low-density,
dispersed, or decentralized development, whereas compactness is associated with higher densities and a downtown or central-city spatial pattern versus a polycentric (or dispersed) spatial pattern (Gordon and Richardson 1997, 95).

Although the point-counterpoint authors address roughly 15 different subjects in discussing sprawl and its alternatives, the subjects can actually be grouped into five broader areas as shown in Table 6.

In sum, since sprawl first entered the planning lexicon almost half a century ago, there has been an outpouring of literature on the subject. The prior discussion has presented an overview of an admittedly vast body of monographs, articles and reports. It has noted how sprawl has been defined and indicated the major topical areas of discussion with respect to sprawl’s costs and benefits. There are five such groupings: 1) public-private capital and operating costs, 2) transportation and travel costs, 3) land and natural habitat preservation, 4) quality of life, and 5) social effects. These individual categories obviously contain significant overlap. The objective is not to define mutually exclusive groups but to begin to point out and synthesize the major concerns of the literature.

This will be done in stages. First, the literature on the five substantive areas by each of the categories will be overviewed. Second, this literature will be analyzed and deficiencies noted. Third, individual alleged costs and benefits subsumed under these five topical areas will be considered. Finally the pertinent literature will be reviewed and synthesized.
<table>
<thead>
<tr>
<th>Author</th>
<th>Topics Considered By Authors</th>
<th>Public-Private Capital and Operating Costs</th>
<th>Transportation and Travel Costs</th>
<th>Land and Natural Habitat Preservation</th>
<th>Quality of Life</th>
<th>Social Effects</th>
</tr>
</thead>
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<td>Ewing (1997)</td>
<td>• Infrastructure costs</td>
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<td>• Public service costs</td>
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<td>• Transit</td>
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<td>• Vehicle miles traveled</td>
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<td>• Loss of resource lands</td>
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<td>• Energy consumption</td>
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<td>• Psychic and social costs</td>
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<td>• Impact on central cities</td>
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<td>• Infrastructure and Operating Efficiency</td>
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<td>Gordon and Richardson (1997)</td>
<td>• Transit</td>
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<td>• Economical resource allocation</td>
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<td>• Congestion</td>
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<td></td>
<td>• Open space and agricultural land</td>
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<td>• Energy glut</td>
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<td>• Density preferences</td>
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<td>• Downtown impacts</td>
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TOPICAL REVIEW OF THE LITERATURE ON THE COSTS AND BENEFITS OF SPRAWL

1. Public-Private Capital and Operating Costs

Public capital and operating costs of sprawl refer to the construction of roads, water and sewer infrastructure, and public buildings, as well as the annual expenditures to maintain them (in both small enclaves in remote locations of the metropolitan areas where population is growing, and in central cities from which some of the population growth is being drawn). Private capital and operating costs of sprawl refer to the construction and occupancy costs of private housing and commercial and industrial development. Most of the literature discusses how metropolitan location and density/form of development cause these costs to vary.

Subsets of this literature group—"engineering-per capita cost," "alternative growth," "regression," and "retrospective" studies—are described below.

The engineering-per capita investigations examine the costs of different types of development by applying such factors as cost per linear foot of roadway, expense per gallon of treated sewage, and municipal police cost per resident or per employee. The classic example of such a study is The Costs of Sprawl (RERC 1974). This analysis of neighborhood and community prototypes (Table 1) applied a wide variety of engineering-per capita factors ranging from BTU consumption per square foot to school and fire/police station capital standards per increment of new population. This was the first glimpse of capital cost variation by type of development and was well received at a time when resource conservation was on every American citizen’s mind. As noted, however, RERC’s application of these simple engineering and per capita standards was criticized by a number of reviewers. Altshuler (1977) argued, for instance, that a uniform per capita public safety cost applied by RERC to all neighborhood prototypes ignored the fact that demand for public safety services was affected by density and would rise as density increased in the various prototypes.

Despite such criticisms, many engineering-per capita cost studies have been undertaken examining the capital and operating expenses of varying patterns of development. This is the most common method used in the literature from the 1950s to the 1980s and cited by Frank (1989) in The Costs of Alternative Development Patterns. The consensus of that literature, according to Frank, was that capital costs were highest in situations of low density and for development located a considerable distance from central facilities. Other examples of studies applying the engineering-per capita approach include Downing (1977) (an extension of the RERC analysis that estimates the public service costs per mile of distance from centrally located facilities is about $500 per unit) and Fodor (1995) (analysis of the per unit capital costs of single-family residential development).

Drawing in part upon the engineering-per capita approach, but using land use and other models to encompass much larger geographic areas, are the alternative growth analyses examining public-private capital and operating costs. These are best exemplified by the Burchell et al. (1992-1997) studies in Maryland, New Jersey, the Delaware Estuary, Michigan, and South Carolina. The much broader scale of these investigations is immediately
evident; in *The Costs of Sprawl*, only a handful of hypothetical neighborhoods were examined. The Burchell analyses range from large subregions of states to entire states. They also are more interrelated, with a series of land use, transportation, and infrastructure models applied across a broad spectrum of substantive concerns to examine the effects of two differing development patterns. These models employ per capita averages but go beyond them. For instance, water consumption is related not only to population growth, but also to housing type, density, and the intensity of occupation of structures; water pollution is related to population growth and influences such as density, housing type, and local soil conditions. Yet even Burchell’s multi-layered modeling approach to specifying impacts has been criticized by some as oversimplifying a more complex development reality (Gordon and Richardson 1997, 99).

Regression analyses apply multivariate statistical tools to further refine the linkage between growth and public-private capital and operating costs. Ladd (1992) used this approach to show how density would affect such public costs as public safety, utility delivery, and traffic management. Ladd found these costs to increase initially as densities rose from very low levels (from 100 to 250 persons per square mile); the increase was due to development threshold costs. For instance, while septic systems could be relied upon at very low densities, as density began to increase, more expensive sewage systems were needed. But at moderate levels of density (200 to 1,750 persons per square mile), Ladd found that costs would decrease as efficiencies of scale were realized—central sewage treatment facilities would replace individual subdivision-level package plants. Yet costs rose once again at higher densities (2,000 to 3,000 persons per square mile), as demand for such services as police and full-time fire protection grew. Ladd is cited by both the defenders and critics of sprawl, with the former referring to the cost declines at mid-range densities (Ewing 1997, 115), and the latter noting that costs rise with the initial increase of density and increase again at higher densities (Gordon and Richardson 1997, 99).

A multiple regression analysis linking population growth and tax rates was performed by the DuPage County Development Department (1991). This study was conducted in communities in the suburbs of Chicago, many of which were experiencing sprawl in the form of nonresidential strip development and industrial parks. The DuPage County study showed that property tax rates, entered as the dependent variable, rose with nonresidential growth, entered as one independent variable—a finding contrary to the conclusions of many other studies. Although pointing the field in new directions, the DuPage analysis was significantly criticized. One reviewer concluded that there was some evidence for findings in the direction of the DuPage County results, but they were not nearly as strong as had been presented in the report (McDonald et al. 1992). Other critics of the analysis included (a) those who believed both sides of the regression equation formed an identity (whose intercorrelation prevented solution), (b) those who thought the research design should undergo significant alteration, and (c) those who thought both dependent and independent variables should be recast (Mills et al. 1991). Most believed that this study, as most of its genre, suffered from the inability to standardize for the quality and quantity of services delivered.

A final group of studies bearing on the issue of how development patterns influence public-private capital and
operating costs include a number of retrospective studies considering the effect of the overlay of regulations inherent in managed growth on the cost of housing. A number of investigations reveal that in the immediate areas where there are managed growth restrictions, housing prices increase (Fischel 1990). Schwartz, Hansen, and Green (1981), for instance, followed the effects over time of the Petaluma (California) growth control plan and found that after several years, Petaluma’s housing prices had risen 8 percent above those of a control community with no growth restrictions. A similar study of the growth limitations in Davis, California (Schwartz, Zorn, and Hansen 1989) found housing prices to be 9 percent higher there. Katz and Rosen (1987) analyzed 1,600 sales transactions of single-family houses in communities throughout the San Francisco Bay Area. Of these 1,600 transactions, almost 200 involved houses located in communities where a building permit moratorium or binding rationing system was recently or currently in effect, and housing prices in these areas were higher than in communities without such growth controls. According to Fischel (1990), this study is particularly valuable since, unlike other studies such as the Petaluma and Davis investigations, the Katz-Rosen analysis did not focus on just a single community. This series of studies linked growth controls (as opposed to growth management) with increases in consumer housing costs.

2. Transportation and Travel Costs

Transportation is a discipline unto itself with a vast number of monographs, articles, and other publications devoted to it. The body of literature considered here includes key studies relevant to the current investigation of the costs and benefits of sprawl (see Table 7 for summary). Many of these studies are not about sprawl per se but contain information on changes in travel over time, which are then associated with coterminous development (e.g., decentralized suburbanization) or associated with characteristics linked to coterminous development (e.g., low-density and segregation of land uses), which in turn are related to travel criteria. Costs of travel are considered as well.

The changes in travel studies report on such characteristics as the number of total trips, the number of trips by type (e.g., work versus nonwork), and commutation distances and time. Critics of sprawl cite such changes in travel as the increase in the vehicle miles traveled (VMT), which rose as sprawl became the dominant development form (Ewing 1997). This claim is debunked by others who claim that VMT is not the important variable, but rather commuting time. They point to stabilizing, if not declining, commuting times, and assert that this benefit is due to the decentralization of both residences and jobs, which further reduces core and inner-suburb traffic congestion (Richardson and Gordon 1989). For example, Gordon, Richardson, and Jun (1991) observed that commuting times of residents of the core counties in the 20 largest metropolitan areas in the United States declined or remained constant between 1980 and 1985—even as their populations increased. The authors hypothesize that the commuting results observed were brought about by commuters changing residences and jobs so that either their origins and destinations were closer to each other or they could travel faster on less congested routes.
TABLE 7
SUMMARY OF TRANSPORTATION STUDIES RELEVANT TO THE EXAMINATION OF SPRAWL

<table>
<thead>
<tr>
<th>Author</th>
<th>Setting</th>
<th>Finding</th>
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<tbody>
<tr>
<td>Cambridge Systematics (1994)</td>
<td>Los Angeles, CA suburban work sites</td>
<td>Of the three site variables—1. level of mixed use; 2. access to services; and 3. urban design features (e.g., providing shade trees and sidewalk), only urban design coupled with TDM materially increased commuting by transit.</td>
</tr>
<tr>
<td>Cervero (1989)</td>
<td>57 national “Suburban Employment Centers”</td>
<td>Center higher density and greater land use mix resulted in more commuting by transit, ride-sharing, and walking—but the denser, more mixed centers had slower travel speeds because of congestion.</td>
</tr>
<tr>
<td>Cervero (1991)</td>
<td>83 buildings in 6 suburban activity centers</td>
<td>Strong relationship between density and transit use</td>
</tr>
<tr>
<td>Cervero (1996)</td>
<td>Dispersed subcenters in San Francisco Bay area</td>
<td>Significant (23 percent) 1980-1990 increase in the commuting VMT because of longer distances and a greater use of SOVs, with 80 percent of the VMT gain attributed to the longer distances between home and work.</td>
</tr>
<tr>
<td>Davis (1993)</td>
<td>Portland, Oregon</td>
<td>Average exurban home buyer had a commuting trip 6-7 minutes longer than his counterpart in suburbia—controlling for occupation, income, and other household and jobs characteristics. Average exurbanite appeared to trading off longer travel times for more space, a rural environment, lower housing prices, or better places to raise their children.</td>
</tr>
<tr>
<td>Downs (1992)</td>
<td>Hypothetical urban area (simulation)</td>
<td>Density of growth at the urban fringe has a significant impact on commuting distances with a move from very low to medium densities having the greatest impact.</td>
</tr>
<tr>
<td>Ewing, Haliyur and Page (1994)</td>
<td>Six Palm Beach County communities</td>
<td>Mixed use as important as design in influencing travel.</td>
</tr>
<tr>
<td>Frank and Pivo (1994)</td>
<td></td>
<td>Density, land-use mix (LUM), and jobs-housing (JH) balance affect travel behavior. At higher densities, trips are shorter, take longer (congestion) and there are fewer auto trips (especially SOVs). At higher LUMs, trip distances, travel times and auto dependence decrease. As JH is more balanced, trip distance and travel time decrease.</td>
</tr>
<tr>
<td>Gordon and Richardson (1997)</td>
<td>20 largest metropolitan areas</td>
<td>Commuting times declined or remained constant between 1980 and 1985 despite population increases—a result linked to commuters changing residences and jobs so that their origins and destinations were closer to each other or so that they could travel faster on less congested routes.</td>
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<td>Author</td>
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<tr>
<td>Handy (1992)</td>
<td>Matched &quot;traditional&quot; and typical suburban San Francisco neighborhoods</td>
<td>Urban Design—more shopping trips in traditional neighborhoods (but see Handy 1995).</td>
</tr>
<tr>
<td>Handy (1995)</td>
<td>Matched &quot;traditional&quot; and typical suburban San Francisco neighborhoods</td>
<td>Urban Design—more shopping trips by foot in traditional neighborhoods but unclear if these trips replace auto trips.</td>
</tr>
<tr>
<td>Holtzclaw (1990)</td>
<td>5 communities in San Francisco Bay area</td>
<td>Higher residential densities and better transit access decreased VMT.</td>
</tr>
<tr>
<td>Holtzclaw (1994)</td>
<td>28 California communities</td>
<td>Neighborhood density is negatively related to automobile ownership and VMT.</td>
</tr>
<tr>
<td>Kitamura (1994)</td>
<td>5 San Francisco neighborhoods with similar incomes and access to transit</td>
<td>Density (most important); transit use greater at higher-density locations.</td>
</tr>
<tr>
<td>Levinson and Kumar (1994)</td>
<td>Washington, D.C. metropolitan area</td>
<td>Average times for home-to-work and work-to-home trips remained stable from 1968 to 1988 despite this area's significant growth. Author concluded that a greater dispersion of activities has helped keep travel time constant.</td>
</tr>
<tr>
<td>Metro (1994)</td>
<td>Portland, Oregon metropolitan area (simulation)</td>
<td>Development scenario of keeping growth within urban growth boundary and increasing densities and multi-family housing produced highest transit and greatest VMT reduction.</td>
</tr>
<tr>
<td>Newman and Kentworthy (1989)</td>
<td>10 large U.S. and international cities</td>
<td>Low densities are associated with high automobile dependence.</td>
</tr>
<tr>
<td>One Thousand Friends of Oregon (1996)</td>
<td></td>
<td>Transit-oriented development and supportive strategies (e.g., design and investment to improve the pedestrian environment) realized transit gains, such as a doubling of work trips by transit and a reduction in auto ownership, SOV, and vehicle trips per household.</td>
</tr>
<tr>
<td>Parsons et al. (1996)</td>
<td>National</td>
<td>Residential densities have a significant influence on transit (light rail).</td>
</tr>
<tr>
<td>Parsons et al. (1996)</td>
<td>1) 11 large metropolitan areas nationally; 2) Greater Chicago area; and 3) Traditional versus suburban San Francisco neighborhoods.</td>
<td>Mixed use—higher transit, walking, and bicycling; lower car commuting. Density—(most important). Transit use greater at high density locations. Urban design—traditional neighborhood more non-auto modes, but not significant difference.</td>
</tr>
</tbody>
</table>
The "facts" of the change in travel statistics are themselves subject to dispute.
Critics of sprawl indicate that suburban versus urban commuting times have been increasing—thus taking issue with the assertion that suburbanization means less congestion (Ewing 1997). Others cite statistics that suburban versus urban commuting times now tend to be lower for suburbanites—purportedly an outgrowth of the freer flow of traffic with deconcentration (Gordon and Richardson 1997).

In addition to the study and deciphering of gross travel statistics, the transportation literature looks at characteristics that both define development type and affect travel behavior. The characteristic most studied in this regard is density, particularly how density affects trip length, mode choice, and other transportation decisions. Critics of sprawl point out that residents of lower density residential environments use automobiles more and transit less, and have longer work trips than residents in higher density areas. The low-density areas are also more costly to serve with transit (Ewing 1997).

Studies of this type include hypothetical simulations. Downs (1992) showed that density of development at the urban fringe has a significant impact on commuting distances, with a move from very low to medium densities having the greatest impact on reducing commuting distance. Examination of density's influence also includes numerous empirical investigations of communities of varying residential densities (higher versus lower) and their travel behavior. Holtzclaw (1990) examined five communities of differing densities in the San Francisco Bay area and found that those with higher residential densities had lower average vehicle miles traveled (VMTs).

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<th>Author</th>
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<tr>
<td>Pisarski (1987, 1992)</td>
<td>National</td>
<td>While average miles of travel to work increased, travel times for work gained only 40 seconds—attributed to an increase in single-occupant vehicle trips (the fastest mode of travel). Other findings—a stabilizing in the number of people using transit and average commuting times by late 1980s greater in suburbs than in central cities.</td>
</tr>
<tr>
<td>Richardson and Gordon (1989)</td>
<td>82 SMSAs</td>
<td>Polycentric or dispersed development reduces commuting times. Lower residential densities are associated with shorter commuting times by car or transit and the clustering of commercial activities (e.g., CBD) produces congestion that increases commuting times.</td>
</tr>
<tr>
<td>Rossetti and Eversole (1993)</td>
<td>39 large metropolitan areas</td>
<td>Commuting times in 34 out of 39 areas increased from 0.5 to 14 percent with very significant increase, of 10 percent or more, in sunbelt locations.</td>
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</tbody>
</table>
The hegemony of density is challenged, however, by those claiming that it is the "bottom line" effect of commuting time plus congestion that matters, and that decentralized suburbs fare better on these measures (Richardson and Gordon 1989).

To a much lesser extent, land-use characteristics other than density are examined with respect to their travel influences. Davis (1993) considered how leapfrog development increased commuting times in Oregon suburbs. Cervero (1989, 1996), Handy (1992, 1995), Cambridge Systematics (1994), and Parsons (1996) examined how the integration (rather than the separation) of different land uses resulted in such travel effects as enhanced walking for internal trips and enhanced transit for external trips.

A final component of the transportation literature considered here establishes baseline figures on the cost of travel. There are numerous site-specific investigations including investigations in such places as Madison, WI (Apogee 1994) and Denver (Parsons 1996). User, governmental, and societal costs of travel were identified in these locations, and the respective costs were then found to vary by travel mode (e.g., auto, transit, walking), type of trip (e.g., commuting versus multipurpose shopping), time (off-peak versus at-peak hours), the physical environment (higher- versus lower-density) and other factors (e.g., single-occupancy vehicle [SOV] versus high-occupancy vehicle [HOV] trips). Total automobile costs in the United States are provided by Voorhees (1992) and Delucchi (1996) and are estimated at $1.15 trillion and $2.36 trillion, respectively. Voorhees includes direct expenses and some indirect costs, including wages lost from accidents. Delucchi includes a broader inventory of expenses such as the cost of travel time, and such far-reaching externalities as global warming. This broader accounting explains Delucchi’s much higher cost estimate.

Neither author includes the costs of sprawl in his tallies. In Delucchi’s case this is because he views sprawl as a result of locational decisions, not motor vehicle use. Voorhees does not tally sprawl expenses because the cost is unknown and is at least partially factored indirectly in some of his calculations (e.g., higher fuel costs because of dispersed land uses).

Mackenzie (1992) focuses on the subsidy to automobiles in the United States—estimated at $254 billion yearly—and includes many externality costs in his tally (e.g., U.S. armed forces providing security to Middle East oil shipments). Hanson (1992), who includes fewer externality costs than Mackenzie, estimates the automobile subsidy at $100 billion annually. Others rebut that, per user, it is transit, not the automobile, that is the most heavily subsidized mode of travel (Gordon and Richardson 1997).

Studies on the cost of travel are important to an analysis of the costs of sprawl for several reasons. First, they allow the analysis to make use of a “full cost” framework, in which the researchers attempt to quantify and account for a much wider range of costs than may be typically included in discussions of public infrastructure costs or private housing costs. These include user costs, governmental costs, and costs to society at large.

Second, the research indicates the magnitude of many of these costs and reveals that the estimates, particularly for social costs, vary widely.

Third, the research indicates the incidence of the costs. It emphasizes the need to
consider both government and societal costs in the debate about the costs of sprawl.

Fourth, the research deals with the costs of different modes of travel. Evidence presented in the transportation literature makes clear that travel behavior varies in different built environments, both with regard to the mode of travel and distances traveled. In order to estimate the costs of the set of travel behaviors associated with different spatial patterns of settlement—and ultimately sprawl and its alternatives—it is necessary to introduce the findings of the literature regarding the costs of different travel modes.

3. Land and Natural Habitat Preservation

This subset of the literature includes, as a starting point, investigations on the overall trends on land consumption and on the threats to such frail lands as wetlands and prime agricultural acreage. Illustrative is a recent (1997) study by the American Farmland Trust (AFT) entitled Farming on the Edge that noted that:

Between 1982 and 1992, every state lost some of its higher quality farmland, prime or unique, to urban development. Texas lost more prime and unique farmland than any other state (489,000 acres), accounting for 11.5 percent of the total loss in the United States. Other leading states with farmland lost to urban development were North Carolina, Ohio, Georgia, Louisiana, Florida, Illinois, Tennessee, Indiana, and California (AFT 1997, 2)

Numerous studies deal specifically with how different development patterns bear on land and natural habitat preservation.

The Costs of Sprawl (RERC 1974) examined land consumption in its different neighborhood prototypes (Table 1). Burchell (1992–1997) and Landis (1994, 1995) apply land consumption models to analyze compact versus trend development scenarios in six locations across the United States and fourteen counties in California, respectively. Burchell's analysis (Tables 3 and 4) and Landis's studies both show that the compact dwelling approach saves more land generally and especially targets agricultural and fragile environmental lands for saving.

A subject of the literature that cross-links the issues of land and natural habitat preservation and public-private costs is that of the fiscal effects of open space. Tischler & Associates (1989) find that improved open space (for recreational uses) does not pay its way. RKG Associates (1989) indicate that higher growth rates, given the medium-term introduction of marginal costs, are more costly to local government in the long term than lower growth rates; however, growth rates can be attained by the purchase of developable land and holding this land off the market in perpetuity. The Vermont League of Cities and Towns and the Vermont Natural Resources Council (1990) caution against assuming that approving development is a fiscally positive act. Receiving considerable attention are AFT "cost of community service (COCS)" studies, which find that predominantly agricultural properties provide more revenues than costs—as opposed purportedly to all other land uses. The AFT studies have received considerable attention, but they have been critiqued (Burchell and Listokin 1995) as understating farm-related costs (e.g., municipal and school costs engendered by farm families and municipal costs imposed by workers are not charged to
the farm sector) while overstating costs to other land uses.

4. Quality of Life

This subset of the literature, like the preceding, consists of general investigations on the concept of “Quality of Life” (QOL) and how can it be measured—as well as specific studies that attribute both positive and negative QOL qualities to sprawl and its alternatives.

When Schopenhauer cynically stated that there are only two sources of human unhappiness—“not having what you want and having what you want”—he may have been alluding to the dilemma of quantity versus quality (Environmental Protection Agency 1973, 1-2). The aspiration of the past for quantities of things is rapidly giving way to a rising concern for quality of life. This shift is precipitating new attempts by individuals and by government to ascertain just what will bring a sense of well-being to people.

As one would expect, there is no consensus on what QOL entails, so the review of the literature includes numerous studies that grapple with defining the concept and monitoring its attributes. These studies come from various spectrums of the literature.

A good place to start is with the QOL rankings of cities in the popular literature, including the Places Rated Almanac (Savageau and Boyer 1993), Money magazine’s “Best Places to Live in America” (Fried et al. 1996), and Fortune magazine’s “Best Cities: Where the Living is Easy” (Precourt and Faircloth 1996). These rankings all use similar categories of QOL life measures such as:

1. cost of living (cost of food, housing, utilities, taxes, insurance, and transportation); 2. jobs and economic well-being (number of new jobs); 3. housing costs (cost of the average home); 4. transportation (average time commute, availability of public transportation, and number of airline flights); 5. crime (violent and property crime rates); and 6. climate (number of sunny days and average temperatures).

One ranking with an environmental focus is Hall and Kerr’s (1991) 1991-1992 Green Index. Drawing from a variety of public and private data sources, the Green Index uses 256 indicators to measure and rank each state’s environmental health. The indicators encompass a broad range of environmental conditions including air quality, water pollution, toxic waste, community health, forests, and congressional leadership (Andrews 1996; Meyers 1987).

In addition, many states, cities, and other jurisdictions have started to use indicators (also called report cards, benchmarks, or vital signs) to track changes. Indicators are sets of specific measures for which data are available, grouped into categories. The specific measures are usually identified through a public process in which participants are asked to identify what aspects of their area (neighborhood, city, region, state) they care about most, and then to develop specific measures for those aspects. Illustrative are the Oregon Benchmarks—measurable indicators that the state of Oregon uses to assess its progress toward broad strategic goals (Oregon Progress Board 1994). Categories of Oregonian benchmark measures, under the heading Benchmarks for Quality of Life, are:

- Unspoiled natural environment: air, water, land, plants/fish/wildlife, and outdoor recreation.
- Developed communities that are convenient, affordable, accessible,
and environmentally sensitive: community design, transportation, housing, access for persons with disabilities, access between communities, and emergency preparedness.

- Communities that are safe, enriching, and civic minded, with access to essential services: public safety, justice, access to cultural enrichment, sense of community, access to health care, and access to child care.

The social sciences add to the literature on the quality of life. Maslow (1970) and Zinam (1989), for instance, present a psychological hierarchy of needs ranging from the physical (safety of natural habitat) to the physiological (material well-being) to collective self-actualization (cultural heritage and consensus on values). Economists (Gabriel et al. 1996; Roback 1982 and 1992; and Rosen 1979) have developed QOL estimates and have entered into the discussion the concept of a “first paycheck” (e.g., monetized wages and jobs) and “second paycheck” (QOL concepts of livability and urban and environmental amenity), with interactive effects between these “paychecks” and urban form (Whiteslaw and Niems 1989).

This review of the popular, “benchmark,” and social science literature on QOL provides a large number of potential QOL measures to be considered for incorporation in this study. These are listed in Table 8. (A subsequent section in the current investigation distills these measures for application to the sprawl and development alternatives.)

While the vast majority of the literature on QOL deals generally with the overriding issue of what QOL is, a smaller number of studies specifically concern themselves with the QOL–sprawl nexus.

The previous discussion about the “first and second paychecks” and their association with urban development form is illustrative. Studies by Dowell Meyers (Meyers 1989, 1988, and 1987), also bring together issues of QOL and urban planning—urban form that are particularly germane to this project. Another illustrative article is one by David Popenoe (1979) entitled “Urban Sprawl: Some Neglected Sociological Considerations.” Popenoe defines sprawl as very low-density urban development, oriented to the automobile, with detached single-family houses on relatively large lots—a pattern which, as he sees it, implies scatteration, a scarcity of open-green spaces, and a scarcity of community focus in both the physical and social sense. Popenoe argues that sprawl leads to such negative QOL features as “intensifying residential segregation by race and class,” which is “destructive to the central city,” and leads to the “proliferation of fragmented and overlapping governmental units.

Some current studies often add as a QOL critique that contemporary, single-use residential subdivisions, accessible primarily by the automobile, have lost their sense of “place.” The idea of a multi-use village with people biking and walking has been replaced by row upon row of houses without sidewalks and bike paths. Instead they offer multiple off-street parking spaces to accommodate the automobile. According to the authors of these studies, most Americans would prefer to return to more traditional urban forms (Krieger 1991; Calthorpe 1993; Nelessen 1994; Duany and Plater-Zyberk 1995).
In opposition are those who claim that for the last twenty years Americans have repeatedly indicated their preference for—and satisfaction with—suburbs and suburban living (Gordon and Richardson 1997). The suburbs offer predictability in the realms of enhanced public safety, public education, and housing investment. The suburbs also contain the single-family detached housing so desired by most Americans (Dyckman 1976; Goldberg and Mercer 1986; Audirac et al. 1990; Fannie Mae 1992, 1994). Components of this debate are mirrored in an important subset of the literature—location choice and decision making for households and businesses.

5. Social Issues

There are many social issues related to sprawl; assembled for this review is literature focusing on how sprawl affects cities. This includes, as a starting point, studies on how to measure the “condition or health” of a city, especially relative to suburban communities. Examples are the “intrametropolitan hardship index” developed by Nathan and Adams (1976); the Bradbury, Dunne and Downs (1982) static and dynamic measures of “urban decline,” “urban distress,” and “city disparity”; and various economic-social ratios of urban versus suburban conditions in State of the Nation’s Cities (Glickman, Lahr, and Wyly, 1996).

Next is a group of studies considering the historical development of suburbs with a recurring leitmotif of separation of, and exclusion from, the older urban center. This theme is expounded upon by Fishman (1987) in Bourgeois Utopia (both historical and more modern “technoburbs” were designed to house the more mobile elite and to keep the less mobile poor and minorities in the cities), and in Jackson (1985) in Crabgrass Frontier (suburbanization led to the “polarization of the metropolis” [Jackson 1985, 274] that segregated the advantaged suburbs from distressed cities). Also considered are numerous recent studies that link the welfare of cities to the economic and social health of the overall metropolitan area (Downs 1994; Ihlanfeldt 1995; Ledebur and Barner 1992; Rusk 1995) and propose, in turn, that urban revitalization is futile without a closer integration of cities with their suburbs (Calthorpe 1993; Richmond 1995).

Conditions in cities and the interconnections between cities and suburbs are cited by Ewing (1997) in his discussion of the costs of sprawl. According to Ewing, cities are not only important in their own right for retaining “higher order central place functions,” but reflecting the work of Downs, Ihlanfeldt, Rusk and others, cities and suburbs are “inextricably linked within the metropolitan economy” (Ewing 1997, 117). Accordingly, Ewing asserts that sprawl, which encourages outward movement of population and functions from cities, is a detriment both to cities and ultimately to suburbs as well.

There is an alternative view, however. An early expression of this was by Sternlieb and Beaton (1972). Sternlieb viewed cities as relics that had lost much of their economic reason to exist as populations and employment suburbanized; this dysfunction was expressed by Sternlieb in his depiction of “cities as a sandbox” (Sternlieb 1964). Yet, for the urban poor and minorities, there was hope in the form of “zones of emergence” (Sternlieb and Beaton 1972). These were inner-ring suburbs which, as their more mobile populations left for the more vigorous outer-
TABLE 8
Potential Quality of Life Measures

<table>
<thead>
<tr>
<th>Cost of Living</th>
<th>Health Care</th>
<th>Recreation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of living index</td>
<td>Doctors per capita</td>
<td>18-hole golf courses</td>
</tr>
<tr>
<td>Economic</td>
<td>Availability of advanced hospital facilities</td>
<td>Number of quality restaurants</td>
</tr>
<tr>
<td>- Number of new jobs</td>
<td>Crime</td>
<td>Opportunities for shopping</td>
</tr>
<tr>
<td>- Unemployment rate</td>
<td>Violent crime rate</td>
<td>Zoos, aquariums, theme parks</td>
</tr>
<tr>
<td>- Median household income</td>
<td>Property crime rate</td>
<td>Proximity to oceans, lakes, and public land</td>
</tr>
<tr>
<td>Housing</td>
<td>Arts/Culture</td>
<td>Climate</td>
</tr>
<tr>
<td>- Cost of average home</td>
<td>Museums</td>
<td>Number of sunny and rainy days</td>
</tr>
<tr>
<td>- Appreciation of home value</td>
<td>Resident arts companies</td>
<td>Average temperature</td>
</tr>
<tr>
<td>- Residential densities</td>
<td>Live music</td>
<td>Temperature variation</td>
</tr>
<tr>
<td>Transportation</td>
<td>Education</td>
<td>Environment</td>
</tr>
<tr>
<td>- Average commute time</td>
<td>Student/teacher ratios</td>
<td>Level of air and water pollution</td>
</tr>
<tr>
<td>- Level of traffic congestion</td>
<td>Quality of K-12 schools</td>
<td>Energy use</td>
</tr>
<tr>
<td>- Ease of mobility</td>
<td>Social Characteristics</td>
<td>Auto use</td>
</tr>
<tr>
<td>- Level of airline service</td>
<td>% of population with bachelor's degree</td>
<td>Farms</td>
</tr>
<tr>
<td>- Flight times to specific destinations</td>
<td>% employed in managerial positions</td>
<td>Forests</td>
</tr>
<tr>
<td>- Passenger rail service</td>
<td>Ethnic diversity</td>
<td>Scenery</td>
</tr>
<tr>
<td></td>
<td>Open social structure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pace of life</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social harmony and justice</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Freedom, human rights, and dignity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Level of psychological stress</td>
<td></td>
</tr>
</tbody>
</table>

ring suburbs, offered themselves as places for the disenfranchised to "emerge."

The analogy was to filtering in housing. Filtering provides housing to the poor in the form of modest housing that is vacated over time as previous occupants seek housing with more amenities. Similarly, more affordable inner-ring suburbs are filtering down to become, over time, the suburban zone of emergence to urbanites and minorities. In this view, an unrestrained ability to move to the suburban outer ring—one of the characteristics of sprawl—is essential to allow inner-ring neighborhoods and communities to filter down, much as the ability to consume better housing is the linchpin that makes housing filtering work.

Shades of Sternlieb's perspective on cities are observed in the current writing by Gordon and Richardson (1997). Suburban development in the form of low-density settlement and the like is viewed by these authors as the choice of the marketplace. This is mirrored in the fact that growth is concentrated in the suburbs, especially the outer-ring communities. By contrast, according to Gordon and Richardson, central cities are waning in economic importance, and city redevelopment efforts will often be futile in the face of continued market decentrali-
zation and dispersion. In a variation on the zone of emergence concept, Gordon and Richardson propose that minorities and those of modest income are, in fact, seeking to live in inner-ring suburbs (Gordon and Richardson 1997, 102).

Gordon and Richardson do not accept the contention that cities and their suburbs are inextricably linked. In this opinion they are joined by numerous academics (Fishman 1987; Hartshorn and Muller 1989) as well as writers in the popular press (Turque and Washington 1991), who argue that suburbs are no longer dependent on central cities (authors cited by Ihlanfeldt 1997). Yet, as noted, there is a contrary view by many authors (Downs 1994; Ewing 1997; Rusk 1995) who argue that city-suburban fates are linked, and that one of the most deleterious effects of sprawl is harm first to the cities, and then ultimately to the entire metropolitan area.

ANALYSIS OF THE LITERATURE ON THE COSTS AND BENEFITS OF SPRAWL

Topical Coverage

One logical starting point for analyzing this literature is to overview the distribution of the studies by topic and to see where there is more or less topical coverage. This can be done quantitatively, that is, by examining bibliographies on the topic—such as that assembled by the current authors (see appendix), as well as by others (e.g., Ewing 1997; Gordon and Richardson 1997; the Growth Management and Research Clearinghouse 1993)—and to count the numerical distribution of studies by subject type. This raises its own issues, however, such as bias in the respective bibliographies (e.g., those emphasizing studies critical versus supportive of sprawl) and differences reflecting the varying professional orientations of the bibliophiles (e.g., traffic engineer or historic preservationist).


Yet another issue in doing a numerical census of the literature is whether all entries are weighted similarly. Do The Costs of Sprawl (RERC 1974) and the New Jersey impact assessment (Burchell et al. 1992a, 1992b)—both influential analyses of hundreds of pages each—“weight” the same as briefer and less substantive discussions?

Over and above these questions, an attempt to quantify the topical coverage of the literature on sprawl is frustrated by such fundamental issues as what is meant by sprawl and what counts as literature on this subject. The former is no small matter given that sprawl is often not defined nor its full elemental characteristics agreed upon. The latter involves the question of whether this literature consists only of materials on sprawl per se (e.g., examining sprawl’s
effects on infrastructure costs), or more broadly on topics relevant to a discussion on sprawl. The quality of life (QOL) subset is illustrative, for there is very little literature directly dealing with QOL and sprawl, yet there are many studies more generally on QOL.

For these many reasons, the topical literature coverage will not be analyzed quantitatively (e.g., so many studies of a certain type representing a given percentage of the literature) but rather qualitatively, that is, which subsets of the literature are more or less frequently considered. By literature is meant those studies relating sprawl with a substantive attribute of public-private capital or operating costs, transportation, land consumption/preservation, quality of life, and social issues.

Without providing a statistical count, it is clear that the literature on sprawl focuses on the infrastructure and transportation issues—the “hard, physical” side of the subject. The classical and still repeated areas of greatest attention concern how development patterns affect demand for arterial and local roads, sewer and water distribution lines, and transit and road systems. The measures focused on are the barometers of infrastructure and transportation, such as linear feet of roads, vehicle miles traveled, and vehicle hours of delay. The operating costs of the infrastructure, once installed, are given much less attention. Thus, although there are numerous studies relating density to the linear extension of roads and utility lines, there is scant attention paid to how density affects their operating expenses, such as the relative public safety (e.g., police patrol) expenses of police departments under sprawl versus more compact development patterns.

Also, at the core of the sprawl literature is examination of how this development pattern influences land consumption—both total acreage and acreage of specific categories, such as agricultural or forest resources. This attention is the mirror of sprawl’s defining characteristics, many of which are land-based traits: low density, leapfrog development, and segregation of land uses. The land consumption of sprawl is a topic commonly referred to, yet interestingly there aren’t nearly as many analytical studies dealing with land as with the classic concerns of infrastructure and transportation.

With respect to QOL and the social aspects of sprawl, there is a paucity of literature. Part of the difficulty is that it is more challenging to agree on the social parameters to be examined and agree to disagree on the appropriate social measures. In contradiction is the consensus among transportation engineers that the appropriate measures are roadway congestion (vehicle hours of delay), VMT, and the like. Although there is burgeoning recent interest in sprawl’s psychological and social effects, such as its inability to instill a “sense of community” (Nelessen 1994; Etzioni 1993) and its consequence to cities (Downs 1994; Rusk 1993), this area of the literature is relatively lightly explored.

Databases

The five substantive literature categories apply both common and subject-distinctive data sources. Across categories, socioeconomic information from the decennial census (population and housing), the triennial American Housing Survey (AHS), and similar bases are frequently tapped. Both published (e.g., printed census reports) and computerized (e.g., Public Use Microdata Sample of the decennial
census) sources are accessed. Land-use information of different types is also considered across all literature categories. This includes both descriptors of a gross or aggregate nature, such as population density derived from the *City-County Data Book*, and finer-grained land-use information, such as the neighborhood mix of land uses and urban design features, that are found as part of local records (e.g., zoning maps) and individualized study surveys.

Supplementing this common socioeconomic and land-use information are data specific to the five literature categories. For the public-private capital and operating costs group, this includes both an array of engineering-infrastructure as well as financial information. Examples of the former category include the Institute of Transportation Engineers (1984) *Recommended Guidelines for Subdivision Streets*; DeChiara and Koppelman's (1975) *Manual of Housing Planning and Design Criteria* (1975); and the Urban Land Institute, National Association of Home Builders, and American Society of Civil Engineers' (1976) *Residential Streets*. Examples of the latter type of resource include the quinquennial *Census of Governments* as well as local operating budgets from municipalities, counties, and school districts.

The other literature categories draw on, in parallel, sources pertaining to their respective disciplines and interests. As examples, for transportation and travel costs, the *National Personal Transportation Survey* is accessed; for land/natural habitat preservation, data from the U.S. Census of Agriculture; for quality of life, such guides as the *Places Rated Almanac* (Savageau and Boyer 1993); and for city conditions examined under social issues, the *City-County Data Book*, and specific city distress measures from Downs et al. (1982) to Rusk (1995).

This overview does not convey the variety and richness of the data sources that are tapped by the subsets of the literature. To convey that better, the information accessed by one of the categories—transportation and travel costs—is described in greater detail here. This body of literature draws upon databases relating to travel as well as information on social and land-use characteristics. Travel sources typically relied on include, as noted, the *National Personal Transportation Survey* (Pisarski 1992; Richardson and Gordon 1989, as examples); travel and commuting information from the decennial census and *American Housing Survey* (Gordon and Richardson 1991; Parsons 1996); and a variety of other sources such as *Highway Statistics* (Dunphy and Fischer 1994); travel diaries kept by households being surveyed (Kitamura 1994); and automobile odometer readings from California smog inspections (Holtzclaw 1994).

Household information such as that related to age, income, and occupation of residents is derived from the decennial census and the *American Housing Survey* (Gordon and Richardson 1989; Parsons 1996; Pisarski 1992). Household surveys may supplement/update those national and regional data bases.

Land-use information comes from local planning and zoning records as well as from other sources. Gordon and Richardson (1989) for instance, measured density from the U.S. Geological Survey LANDSAT files.

The costs of travel investigations incorporate a broad array of data sources on topics ranging from accident-related medical expenses, to armed forces...
spending (e.g., for providing security for overseas petroleum sources), to global warming.

One final note with respect to the data in the sprawl literature is that much is of a secondary nature—that is, collected by one party and then reanalyzed or just cited by another. This is exemplified by The Costs of Sprawl neighborhood prototype data originally assembled by RERC in the early- to mid-1970s (Table I) and still being relied upon some two decades later by today’s commentators on the subject of sprawl (Altshuler and Gomez-Ibanez 1993; Ewing 1997; Gordon and Richardson 1997).

Study Type and Methodology

There are various dimensions in considering methodology. One is whether a study is empirical—that is, examining something actual as opposed to a simulation, where events are modeled rather than observed. Both types are found, with the incidence varying by subject. In the public-private capital and operating costs literature, because development’s effect on infrastructure is often not readily observed, many such studies are simulations. Illustrative is The Costs of Sprawl (RERC 1974); Downing’s (1977) capital extension supplement to RERC’s original work; and Peiser’s (1984) analysis of infrastructure costs in a hypothetical large subdivision. Operating costs, such as operating expenses per capita, are more readily observed (albeit not necessarily linked to development pattern), as are other financial parameters, such as tax rates, and these are often looked at mathematically. Examples are Ladd’s (1991) regression analyses relating density to per capita government spending and the DuPage County (1992) regression of observed nonresidential development to observed tax rates.

With respect to transportation and travel costs, because actual travel is routinely studied and indeed counted, much of this literature is empirical. Examples include Pushkarev and Zupan (1977), linking density and transit use in 100 urbanized areas; Cervero (1989), examining density and modal choice in 57 “suburban employment centers”; and Parsons et al. (1996), examining the effects of density, urban design, and mixed use on the demand for transit in various locations ranging from 11 metropolitan areas to individual Chicago and San Francisco communities. At the same time, the transportation literature, reflecting the underlying discipline of transportation engineering with its modeling prowess, also incorporates some large-scale simulations, such as the 50-year simulation by Metro (1994) and Downs’s (1992) Stuck in Traffic modeling.

The remaining literature categories, while applying some simulations, such as The Costs of Sprawl modeling of land consumption in alternative neighborhood prototypes, are largely empirical. The Green Index of locations (Hall and Kerr 1991), incorporated in quality-of-life measurement, thus encompasses more than 250 indicators related to environmental health (e.g., air and water pollution and community and workplace health statistics). City socioeconomic health focuses on such observed characteristics as unemployment and property tax rates (Bradbury, Downs, and Small 1982).

Much of the empirical work tends to be descriptive. A common style is a case study of what occurred at one or a limited universe of locations. Examples include Duncan’s (1989) analysis of infrastructure costs in a number of Florida developments; Ewing’s (1995) analysis of household travel patterns in a Florida county; and Ewing, Haliyur and Page...
(1994) and Cambridge Systematics (1994), examining travel in Palm Beach County (FL) and Los Angeles (CA), respectively. Not coincidentally, the case analyses are focused on locations experiencing rapid growth—often sunbelt locations. In fact, so many of the investigations of travel profile related to urban design have taken place in California, especially around San Francisco and Los Angeles, that questions about the replicability of the results observed to the rest of the country are beginning to be raised by the research community at large.

Various quantitative skills are incorporated in the literature. The per capita infrastructure studies, for instance, are essentially arithmetic compilations, but higher-order applications are found, especially with the transportation and travel costs analyses. Here, for instance, are found such statistical tests as analysis of variance (e.g., comparing travel behavior in auto-oriented versus transit-oriented neighborhoods [Handy, 1995] and multivariate regression (e.g., Pushkarev and Zupan [1977] using regression to show that much of the variation in transit use is explained by density).

It must be remembered, however, that even the most “statistical” of studies are still cross-sectional. They show in the travel literature, for example, the correlation between current urban form (e.g., low to high densities, and segregated or mixed uses) and current travel behavior (e.g., mode choice or VMT) but do not show how changes in urban form have influenced changes in travel choices. This is one of numerous deficiencies in the literature noted below.

Deficiencies in the Literature on Sprawl

1. Almost no analyses of sprawl adequately define it. Most commentators on sprawl do not define it explicitly. This was the case, surprisingly, in The Costs of Sprawl (RERC 1974), and the omission of a definition continues throughout the literature. Where sprawl is defined, or at least characterized, reference is often made to a limited number of traits such as low density or leapfrog scattered development (Ewing 1997, 108). Many studies, however, omit several other defining traits that cause many of the alleged negative impacts of sprawl, such as dependence on the automobile and fragmentation of governmental land-use authority. This leads to the second major deficiency in the literature.

2. Most analyses of sprawl focus too narrowly on only a few of its key aspects. An adequate definition of sprawl must include the causal elements that underlie all of sprawl’s many alleged negative impacts in order for subsequent analysis to respond to those impacts effectively. Therefore, a key part of this study is exploring the linkages between the many alleged negative and positive impacts of sprawl and its defining characteristics.

3. There are other definitional cum measurement questions. Take, for instance, “density.” Numerous studies focus on the density of the region and relate certain characteristics, such as travel behavior or infrastructure costs, with the region’s density. However, densities vary widely within regions and the real question is “How does the density of the specific places
where people live and work affect, say, their travel choices?" The densities of these places may be substantially different from region-wide averages. For instance, Gordon and Richardson (1989) use SMSAs as the unit of measurement in their analysis of densities and commuting times in 82 SMSAs. But is this meaningful given that no SMSA has uniform density throughout? And at an SMSA level perhaps density is a proxy for age of development, city size, or some other factors that affect travel behavior (e.g., transit use), as opposed to the variable density per se.

In parallel are the definition and measurement of "segregation of uses." But which uses, and separation or integration, at which geographic scale? Cervero (1996), for instance, found that the job-housing (JH) balance at the city level was not significantly associated with the variation in external (to the community) commuting. Does this mean that land-use integration as reflected in the JH ratio does not affect travel behavior, or that it really does—but that the measure of land-use integration is lost when the JH is scaled at the community-wide, as opposed to a neighborhood, level? There are other definitional and measurement issues. The quality of life definitional conundrum immediately comes to mind, but other seemingly easier-to-ascertain effects pose issues of their own. Take, for instance, land consumption. While it is a tautology that development consumes land, does, for instance, a single-family home built on a 50-acre farm "consume" all of those 50 acres, and if a fraction, on what basis is that fraction apportioned?

4. Most critics of sprawl do not recognize that it provides substantial benefits to many households; hence, they do not take account of those benefits in their analyses. Several critics of sprawl, such as Kunstler (1993), engage in rhetorical exaggeration to emphasize their negative views of it. This polemic rhetoric cannot be classified as a scientific—or accurate—observation about the reality of American suburbs. Yet, Kunstler and many other opponents of sprawl continually use exaggeration—or at least one-sided presentation—rather than balanced and factually accurate descriptions of sprawl. Significant exaggeration is also employed by some defenders of sprawl, such as Gordon and Richardson (1997).

5. There are limited comprehensive empirical analyses. There is much discussion on sprawl but far fewer "facts" in the form of empirical, quantitative studies. The paucity of data is illustrated by the frequency of studies using "secondhand" or once-removed information. This is exemplified, as noted, by the reanalysis of The Costs of Sprawl (RERC 1974) neighborhood and community prototypes some 20 to 30 years after the fact by Altshuler and Gomez-Ibanez (1993). Frank’s 1994 review and reorganization of prior studies conducted over three decades in his Costs of Development is another example. It is not that the reanalysis or categorization is unimportant—on the contrary, it is quite valuable—but rather it points to the dearth of new empirical research. In a parallel vein is the tendency of the empirical research to be of a case study nature. Case studies provide valuable insight, but as they are place-
specific, the ability to generalize from them is limited.

6. Even when a quantitative analysis is attempted, the topical coverage is uneven, with much more attention paid to the "physical side" of infrastructure—transportation and land—underemphasizing service and social costs. The reason for such a focus is simple: far more complete and reliable data are available for physical costs (e.g., development-generated costs for roads, water systems, and sewer systems) than for service costs. An engineering manual, for instance, can inform the cost per linear mile of road, but there is scant literature on how road mileage affects police patrolling costs. There is an even larger gap in our knowledge concerning social costs. Discussions of sprawl's effects on quality of life are often superficial if not polemic, and there are large gaps concerning sprawl's effects on cities. What is the true social cost of higher unemployment rates in inner-city areas, or the exclusion of low-income households from outlying suburbs—if such unemployment or exclusion is sprawl-related? Measuring such costs is extremely difficult. Nevertheless, some attempt at doing so must be made in order to include such costs in the overall analysis of sprawl.

7. Most discussions of sprawl focus almost entirely on new growth areas. This may result from the fact that sprawl itself occurs almost entirely in new-growth areas around the metropolitan periphery. True, recent discussions of sprawl, such as those described earlier by Downs (1994) and Rusk (1995), have begun to recognize that draining valuable resources away from close-in areas has serious negative impacts upon these areas—and, therefore, upon society generally. But no quantitative analyses of sprawl have attempted to estimate the size of these social costs, and most analyses simply ignore them conceptually.

8. The extant literature also has limited scope in the time frame of analysis—looking at effects over a few years rather than a longer span. The concatenation of limitation in analysis related to geographic scale noted earlier (i.e., focusing only on newly developing areas) and analysis of a limited time span and time may very well lead to an overestimation by the literature of the costs of leapfrog development. As noted by Altshuler and Gomez-Ibanez (1993, 72):

Estimates probably overstate the added costs of leapfrog development in communities that expect continued growth and eventual infill development on the vacant land. Compared with the planned communities, the sprawl communities contain substantially more vacant land that is improved or semi-improved by some road and utility access. Developing improved vacant land in the future presumably would cost less than developing unimproved land. If infill development is expected, then a portion of the added costs of leapfrogging eventually will be recouped—the costs of sprawl would be the costs of supplying some infrastructure in advance of its eventual need and would be lower the more rapidly infill was expected.

9. Most commentators do not recognize that two types of fragmented governance—those over land uses and over fiscal resources—are
fundamental causes of many of the most widely attacked alleged negative results of sprawl. The main reason for this failing is that the analyses are not comprehensive enough. They focus on a few of the most obvious elements of sprawl and the consequences of these elements, rather than looking at the entire relevant spectrum of elements and consequences. In addition, they may hesitate to recommend changes in such fundamental American institutions as fragmented control over land uses and separation of each community’s fiscal resources from those in other communities. Several recent opponents of sprawl have recognized these connections quite explicitly, however, such as Anthony Downs (1994), Henry Richmond (1995), and David Rusk (1993).

10. Most opponents of sprawl fail to describe realistically feasible alternative forms of metropolitan settlement that would remedy the negative conditions they attribute to it. Like most social critics, they concentrate on describing what they dislike, not on how to remove those faults in a realistic manner. But the aspects of society they want to change are inextricably bound up with other fundamental elements—such as fragmented governance. The changes they call for might have much more basic and widespread repercussions than their analyses recognize. In fact, every critic’s call to radically change social condition X implies the following conditions:

a) X is socially undesirable because it imposes unacceptable costs on some people.

b) Therefore, society should greatly alter or eliminate X in the future.

c) X resulted from forces that could have been channeled differently; it was not an inevitable outcome of irreversible or uncontrollable forces.

d) We know what those changeable forces are, and we know how to handle them differently to avoid X in the future.

e) It is politically feasible to adopt those other methods of handling the forces concerned in the future.

f) We know what the disadvantages of using those other methods are, and how large the costs are, even if the disadvantages and costs are wholly unrelated to X.

g) The future benefits of eliminating, or substantially altering, X are significantly larger than the costs and disadvantages of using those other methods of handling the forces that generated X.

All critics of sprawl postulate conditions 1 and 2, but many stop there. Some proceed through conditions 3 and 4 as part of their prescriptions for change. But few deal with condition 5, and almost none address conditions 6 and 7—which require the ability to measure both the costs and benefits of X and its elimination. Yet, realistic social analysis requires meeting all seen conditions.
Even the most detailed quantitative analyses of sprawl's costs tend to define only one alternative to it, and then compare the costs of future development in just those two future scenarios. That is true, for example, in the series of analyses directed by Robert W. Burchell (1992–1997). Sprawl is a complex phenomenon containing multiple future development scenarios, not just two; therefore, an adequate analysis of sprawl's costs compared to the costs of alternative forms of settlement must allow for more than two alternatives. Conversely, no analysis can be useful if it presents dozens or hundreds of alternatives as equally plausible. The best approach is to define three or more major alternative settlement patterns (but less than ten), and to conduct multiple sensitivity analyses concerning key elements in each of those patterns.

11. The modeling of the analysis is often overly simplistic. For instance, the per capita engineering studies have been criticized (rightly) as relating capital/operating costs linearly to lane-miles of roads and related factors, which tend to be greater under sprawl, but not incorporating how costs can increase with thresholds of density because of congestion, public safety needs, and the like—a dimension that would increase the cost of compactness (Altshuler and Gomez-Ibanez 1993).

Oversimplification also underlies the critique that comparisons of sprawl and its alternatives have not sufficiently included the qualitative differences in housing amenity—allegedly superior for the detached units that characterize sprawl (Gordon and Richardson 1997; Windsor 1979).

Limited depth also incorporates questionable associations that are drawn. This is in part a matter of an inadequately specified model or controls. For instance, Newman and Kentworthy (1989) applied only a single variable—urban density—to explain automobile use, whereas other factors are clearly involved. These two authors (Newman and Kentworthy 1989), in analyzing per capita automobile dependence, used gasoline consumption per capita as a proxy measure of automobile dependence. That equivalence is questionable given the fact that many factors, such as gas prices and fuel efficiency characteristics, affect per capita gasoline consumption—not automobile dependence alone. Holtzclaw (1990) related density to VMT without controlling for income levels or other characteristics of households that influence VMT. Cervero’s (1989) analysis of 57 suburban employment centers did not control for the centers’ transit availability and the quality of the pedestrian environment. Similarly, the Cambridge Systematics (1994) study of suburban work sites did not control for these sites’ levels of transit service.

The difficulty in extrapolating the factors that influence these dynamics, and to that end incorporating controls, is illustrated by the examination of the effect of urban design. Many researchers are interested in whether neotraditional design features (combined with a greater mix of uses) will result in travel behavior different from patterns observed in typical suburban development. To date, there has been too little experience with these new types of suburban development to answer the question. Therefore, studies look at older neighborhoods
that have a more pedestrian-friendly environment and a finer-grain mix of uses. But it is not clear whether behavior of residents of long-standing older neighborhoods accurately predicts the behavior of residents of new neighborhoods, who in all likelihood are more accustomed to using cars. Holding aside that, the matched pairing of existing neighborhoods into “transit versus auto-oriented” or “traditional versus suburban” to test the effects of alternate design patterns on travel runs head-on into the practical difficulty of coming up with these pairings. First, neighborhoods often don’t slot that neatly into two polar categories. Second, even if this demarcation can be realized, there are variables other than overall design that can affect the travel behavior equation: resident income, occupation, and age, for example. This matching is a difficult exercise to accomplish, since design preferences and household profiles often inter-relate.

The problem of understanding the relationships is underscored by the cross-sectional nature of many of the studies. Infrastructure costs rise as development is effected in a sprawl pattern; thus, sprawl is tagged with the heightened capital expenses. Clearly, however, many other factors, from rising income to changing amenity levels, are at work (Altshuler and Gomez-Ibanez 1993). Gordon, Richardson, and Jun (1991) link decreasing commuting time to the suburban deconcentration of job and residences that has occurred at the same time; but does the former cause the latter, or is it merely coterminous? Similarly, Richardson and Gordon (1989) hypothesize that increases in nonwork trips are due to suburban decentralization occurring at the same time. Again, that could be true or could be unrelated to the spatial pattern but rather fostered by such influences as rising incomes, greater participation of women in the work force, and societal changes in leisure activities. In short, there is much peril in drawing conclusions from cross-sectional research; yet that characterizes many sprawl studies.

The obverse of these deficiencies helps guide the current research. As detailed elsewhere, sprawl and its alternatives are explicitly and formally defined. This effort, in fact, builds from the literature. As noted in the overview to the literature, some of the more recent studies on sprawl have differentiated it from other types of development on numerous fronts. In New Visions for Metropolitan America, Anthony Downs (1994) indicates five elements from low-density, primarily single-family development, to widespread reliance on filtering to provide low-income housing. Henry Richmond’s Regionalism: Chicago as An American Region (1995), brought forth eight components of sprawl (listed earlier). To Richmond’s sound base, this study adds two more—(1) the commercial strip development described by Richard Moe (1994), and (2) a dependence on the filtering process to provide housing for low-income households as indicated by Downs (1994). Altogether, then, sprawl is a form of urban development that contains the following ten elements:

1. Low residential density. (This is detailed elsewhere in this study at 3.0 units per net residential acre or less.)
2. Unlimited outward extension of new development.
3. “Leapfrog” development.
4. Spatial segregation of different types of land uses through zoning regulations.
5. No centralized ownership of land or planning of development.

6. All transportation dominated by privately owned motor vehicles.

7. Fragmentation of governance authority over land uses among many local governments.

8. Great variations in the fiscal capacity of local governments because the revenue-raising capabilities of each are strongly tied to the property values and economic activities occurring within their own borders.

9. Widespread commercial strip development along major roadways.

10. Major dependence upon the filtering or "trickle-down" process to provide housing for low-income households.

This definition both builds from the literature on sprawl and stands in marked contrast to prior studies that either do not define sprawl or else characterize it too simply (e.g., "lack of continuity in expansion" [Clawson 1962] or "low-density ribbon or leapfrog development" [Harvey and Clark 1965]) and/or pejoratively (e.g., "awkward spreading out of a community" [Abrams 1971]).

In addition to defining sprawl, detailed elsewhere in this study is specification of alternatives to sprawl. These include "loosely bounded growth" and "tightly bounded growth" (see "Definition of Sprawl and Its Alternatives," Task 1 of the present study, for details on the attributes of sprawl and alternative development patterns.)

The literature review underscores the need for a comprehensive look at the effects of sprawl. To this end, 1) a full menu of benefits as well as costs of the different development scenarios must be considered; 2) these benefits and costs must span the range of physical as well as social consequences; 3) the benefits and costs analysis must be territorially complete—encompassing urban, suburban, and exurban locations and developing and developed areas; 4) the span of analysis must be long enough to encompass the dynamic of shifts over time, such as areas initially leapfrogged under sprawl subsequently being "filled-in" by development; 5) analysis of costs and benefits must incorporate the complexity of influences (e.g., varying threshold influences of density on capital-operating costs, and recognition that varying density thresholds, as well as other factors, affect travel); and 6) caution must be exercised in not ascribing causality when the underlying evidence is merely cross-sectional.

To further this expansive consideration of the costs and benefits of sprawl and its alternatives, the literature on the subject—with its acknowledged deficiencies—can be tapped. This is accomplished in the following portion of the literature discussion.
Part Two

LITERATURE SYNTHESIS OF
THE COSTS AND BENEFITS OF SPRAWL
RELATING SPRAWL’S DEFINING ELEMENTS TO ITS ALLEGED IMPACTS

A search of the literature reveals that various commentators have attributed nearly two dozen negative and about one-half this level of positive impacts to sprawl. These impacts are set forth in Table 9. The list is not a scientific taxonomy; it does not include all the alleged effects of sprawl but rather is inclusive, in the judgment of the research team, of some of the most significant impacts. Further, not all of the allegations are correct, nor are all those that are correct of equal importance. In fact, deciding which ones are valid, and estimating the importance of each, are major purposes of the study that will follow this literature search. However, this inventory presents a comprehensive set of allegations based on the relevant literature for discussion here.

The allegations have been classified into the five substantive categories of the literature: 1) public-private capital and operating costs; 2) transportation and travel costs; 3) land and natural habitat preservation; 4) quality of life; and 5) social issues.

Collecting and Sorting the Literature

Before considering what the literature informs us on each of those alleged negative and positive effects, it is instructive to link these consequences to sprawl’s defining traits. Tables 10 and 11 evaluate the causal importance of each of sprawl’s ten alleged defining traits in relation to each of its 25 negative and 12 positive impacts. In each matrix, sprawl’s ten defining traits are set forth from left to right as vertical columns. The alleged impacts are set forth from top to bottom as horizontal rows, grouped into the five categories. The Table 10 matrix contains only alleged negative impacts; Table 11 contains only alleged positive impacts.

Each cell in the matrix indicates a “score” that represents the authors’ subjective judgments concerning the degree of influence each defined trait (at the top of the column) has upon producing each alleged impact (at the left of the row). The “scores” are reflected by the following symbols:

+ 2 Indicates that the trait has a major influence in causing the alleged impact.

+ 1 Indicates that the trait has a moderate or minor influence in causing the alleged impact.

0 Indicates that the trait has no influence in causing the alleged impact.

− 2 Indicates that the trait has a negative influence in causing the alleged impact; that is, the trait tends to reduce the incidence of the impact.

As noted above, the “scores” reflect subjective judgments made before most of the research on the study has been carried out. Therefore, these “scores” are subject to future revision. However, the matrices have been designed and presented in a manner to make it relatively easy for other observers to substitute their own subjective judgments for those of the authors.

Determining, in a rough manner, the relative overall significance of each trait to all of its alleged impacts can be accomplished by examining the total scores of each trait in the matrix. For example, the column labeled “Low Density” in the
<table>
<thead>
<tr>
<th>Substantive Concern</th>
<th>Alleged Costs/Negatives</th>
<th>Alleged Benefits/Positives</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Public-Private Capital and Operating Costs</td>
<td>1. More infrastructure costs</td>
<td>1. Lower public operating costs</td>
</tr>
<tr>
<td></td>
<td>2. Higher public operating costs</td>
<td>2. Less expensive private residential/nonresidential costs</td>
</tr>
<tr>
<td></td>
<td>3. More expensive private residential/nonresidential costs</td>
<td>3. Fosters efficient development of “leapfrogged” areas</td>
</tr>
<tr>
<td></td>
<td>4. Worse public fiscal impacts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Higher aggregate land costs</td>
<td></td>
</tr>
<tr>
<td>II. Transportation and Travel Costs</td>
<td>6. More VMT</td>
<td>4. Less VMT</td>
</tr>
<tr>
<td></td>
<td>7. More automobile use</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8. Longer travel/commuting times</td>
<td>5. Shorter travel/commuting times</td>
</tr>
<tr>
<td></td>
<td>9. More personal transportation spending</td>
<td>6. Reduced transit subsidies</td>
</tr>
<tr>
<td>III. Land/Natural Habitat Preservation</td>
<td>10. Loss of agricultural land</td>
<td>7. Enhanced personal and public open space</td>
</tr>
<tr>
<td></td>
<td>11. Reduced farmland productivity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12. Reduced farmland viability (water constraints)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>13. Loss of fragile environmental lands</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14. Lessened regional open space</td>
<td></td>
</tr>
<tr>
<td>IV. Quality of Life</td>
<td>15. Aesthetically displeasing</td>
<td>8. Preference for low-density living</td>
</tr>
<tr>
<td></td>
<td>16. Lessened sense of community</td>
<td>9. Less concentration-associated crime</td>
</tr>
<tr>
<td></td>
<td>17. Greater stress</td>
<td>10. Reduced costs of goods and services</td>
</tr>
<tr>
<td></td>
<td>18. Higher energy consumption</td>
<td></td>
</tr>
<tr>
<td></td>
<td>19. More air pollution</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20. Lessened historic preservation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>22. Fosters spatial mismatch</td>
<td>12. Enhances municipal diversity and choice</td>
</tr>
<tr>
<td></td>
<td>23. Fosters residential segregation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>24. Worsens city fiscal stress</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25. Worsens inner-city deterioration</td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 10

Relationships Between Characteristics of Sprawl and Its Negative Effects

<table>
<thead>
<tr>
<th>NEGATIVE IMPACTS (25) TOTAL CAUSAL POINTS</th>
<th>DEFINING CHARACTERISTICS OF SPRAWL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LOW DENSITY</td>
</tr>
<tr>
<td>I. PUBLIC-PRIVATE CAPITAL AND OPERATING COSTS</td>
<td></td>
</tr>
<tr>
<td>1. More infrastructure costs</td>
<td>2</td>
</tr>
<tr>
<td>2. Higher public operating costs</td>
<td>2</td>
</tr>
<tr>
<td>3. More expensive private residential/nonresidential costs</td>
<td>2</td>
</tr>
<tr>
<td>4. Worse public fiscal impacts</td>
<td>2</td>
</tr>
<tr>
<td>5. Higher aggregate land costs</td>
<td>2</td>
</tr>
<tr>
<td>II. TRANSPORTATION AND TRAVEL COSTS</td>
<td></td>
</tr>
<tr>
<td>6. More VMT</td>
<td>2</td>
</tr>
<tr>
<td>7. More automobile use</td>
<td>2</td>
</tr>
<tr>
<td>8. Longer travel/commuting times</td>
<td>2</td>
</tr>
<tr>
<td>9. More personal transportation spending</td>
<td>2</td>
</tr>
<tr>
<td>III. LAND/NATURAL HABITAT PRESERVATION</td>
<td></td>
</tr>
<tr>
<td>10. Loss of agricultural land</td>
<td>1</td>
</tr>
<tr>
<td>11. Reduced farmland productivity</td>
<td>1</td>
</tr>
<tr>
<td>12. Reduced farmland viability</td>
<td>0</td>
</tr>
<tr>
<td>13. Loss of fragile environmental lands</td>
<td>2</td>
</tr>
<tr>
<td>14. Lessened regional open space</td>
<td>1</td>
</tr>
<tr>
<td>IV. QUALITY OF LIFE</td>
<td></td>
</tr>
<tr>
<td>15. Aesthetically displeasing</td>
<td>0</td>
</tr>
<tr>
<td>16. Lessened sense of community</td>
<td>1</td>
</tr>
<tr>
<td>17. Greater stress</td>
<td>0</td>
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<tr>
<td>18. Higher energy consumption</td>
<td>2</td>
</tr>
<tr>
<td>19. More air pollution</td>
<td>1</td>
</tr>
<tr>
<td>20. Lessened historic preservation</td>
<td>0</td>
</tr>
<tr>
<td>V. SOCIAL ISSUES</td>
<td></td>
</tr>
<tr>
<td>21. Fosters suburban exclusion</td>
<td>1</td>
</tr>
<tr>
<td>22. Fosters spatial mismatch</td>
<td>1</td>
</tr>
<tr>
<td>23. Fosters residential segregation</td>
<td>0</td>
</tr>
<tr>
<td>24. Worsens city fiscal stress</td>
<td>0</td>
</tr>
<tr>
<td>25. Worsens city deterioration</td>
<td>0</td>
</tr>
</tbody>
</table>

Key: 2 = Major causal relation
1 = Moderate or minor causal relation
0 = No causal relation
-2 = Negative causal relation
## TABLE 11
Relationships Between Characteristics of Sprawl and Its Positive Effects

<table>
<thead>
<tr>
<th>NEGATIVE IMPACTS (25)</th>
<th>LOW DENSITY</th>
<th>UNLIMITED OUTWARD EXTENSION</th>
<th>LAND USES SPATIALLY SEGREGATED</th>
<th>LEAPFROG DEVELOPMENT</th>
<th>NO CENTRAL OWNERSHIP OR PLANNING</th>
<th>TRANSPORT DOMINANCE BY MOTOR VEHICLES</th>
<th>HIGHLY FRAGMENTED LAND-USE GOVERNANCE</th>
<th>GREAT VARIANCES IN LOCAL FISCAL CAPACITY</th>
<th>WIDE SPREAD COMMERCIAL STRIP DEVELOP</th>
<th>USE OF FILTERING FOR LOW-INCOME HOUSING</th>
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<tbody>
<tr>
<td>TOTAL CAUSAL POINTS</td>
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<tr>
<td>I. PUBLIC-PRIVATE CAPITAL AND OPERATING COSTS</td>
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<td></td>
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<tr>
<td>1. Lower public operating costs</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td></td>
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<td></td>
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<tr>
<td>2. Less expensive private residential/nonresidential costs</td>
<td>2</td>
<td>2</td>
<td>0</td>
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<tr>
<td>3. Fosters efficient development of &quot;leapfrogged&quot; areas</td>
<td>1</td>
<td>1</td>
<td>0</td>
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<tr>
<td>II. TRANSPORTATION AND TRAVEL COSTS</td>
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<tr>
<td>4. Less VMT</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>5. Shorter travel/commuting times</td>
<td>2</td>
<td>2</td>
<td>0</td>
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<td>6. Reduced transit subsidies</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td></td>
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<tr>
<td>III. LAND/NATURAL HABITAT PRESERVATION</td>
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<tr>
<td>7. Enhanced personal and public open space</td>
<td>2</td>
<td>2</td>
<td>0</td>
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<tr>
<td>IV. QUALITY OF LIFE</td>
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<tr>
<td>8. Preference for low-density living</td>
<td>2</td>
<td>1</td>
<td>0</td>
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<td></td>
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<td>9. Lessens concentration-associated crime</td>
<td>2</td>
<td>1</td>
<td>0</td>
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<tr>
<td>10. Reduces costs of goods and services</td>
<td>2</td>
<td>1</td>
<td>0</td>
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<td>11. Fosters greater economic well being</td>
<td>0</td>
<td>1</td>
<td>1</td>
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<td></td>
<td></td>
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<td></td>
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<tr>
<td>V. SOCIAL ISSUES</td>
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<tr>
<td>12. Fosters home rule</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>13. Enhances municipal diversity and choice</td>
<td>0</td>
<td>1</td>
<td>0</td>
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</tbody>
</table>

**Key:**
- 2 = Major causal relation
- 1 = Moderate or minor causal relation
- 0 = No causal relation
- -2 = Negative causal relation
negative impact matrix (Table 10) contains eleven “major influence ratings,” seven “moderate or minor influence ratings,” and seven zero scores. Similar observations have been carried out for the other nine defining traits.

Based on these calculations, three of sprawl’s defining traits appear to be especially important in causing alleged negative impacts. These are low density, unlimited outward extension, and leapfrog development. Two others—the spatial segregation of land uses and variances in local fiscal capacity—seem to be of relatively weak significance. Among the remaining traits, widespread commercial strip development and the use of filtering for low-income housing seem slightly more significant than lack of central ownership or planning, transport dominance by motor vehicles, and highly fragmented governance over land uses.

The analysis suggests (Table 11) that the same three defining traits—low density, unlimited outward extension, and leapfrog development—appear to be the most important in causing alleged positive impacts as well. Next in relative importance are transportation dominance by private motor vehicles and highly fragmented land-use governance. Least significant are the use of filtering for low-income housing, the spatial segregation of land uses, and widespread strip commercial development.

These relative evaluations are merely suggestive. Since they do not apply in the same manner to specific alleged negative impacts, not too much significance should be placed upon this overall evaluation.

More important conclusions can be drawn from these matrices concerning vital causal linkages between certain categories of alleged impacts of sprawl and particular elements of its definition. Certain categories seem to be more heavily influenced by certain defining traits than others. The linkages for both the alleged negative and positive impacts of sprawl follow in Table 12.

Clearly, there is a great deal of similarity between the positive and negative matrices in Table 12. Paradoxically, the traits that seem key causes of many of sprawl’s negative impacts also appear to be key causes of many of its positive impacts—in such categories as public-private capital and operating costs, transportation and travel costs, land and natural habitat preservation, and the quality of life. The fact that sprawl can simultaneously be associated with both costs and benefits in relatively narrowly defined fields shows how complex the phenomenon is, and how difficult it will be to design policies that reduce its negative impacts without also reducing its positive effects.

To begin the process of better understanding the numerous negative and positive impacts of sprawl, these are considered on an item-by-item basis drawing on the discussion in the literature. The review of costs and benefits is grouped by the five substantive categories of public-private capital, transportation and travel costs, land and natural habitat preservation, and so on.
TABLE 12

<table>
<thead>
<tr>
<th>Categories of Alleged Negative Impacts</th>
<th>Key Defining Traits Underlying Those Impacts</th>
</tr>
</thead>
</table>
| I. Public-Private Capital and Operating Costs | Low Density  
Leapfrog Development  
Unlimited Outward Extension |
| II. Transportation and Travel Costs | Low Density  
Leapfrog Development  
Unlimited Outward Extension  
Transport Dominance by Motor Vehicles  
Commercial Strip Development |
| III. Land/Natural Habitat Preservation | Leapfrog Development  
Unlimited Outward Extension  
Low Density |
| IV. Quality of Life | Widespread Commercial Development  
Leapfrog Development  
Transport Dominance by Motor Vehicles  
Unlimited Outward Extension |
| V. Social Issues | Use of Filtering for Low-Income Housing  
Highly Fragmented Land-Use Governance  
Great Variances in Local Fiscal Capacity  
No Central Ownership or Planning |

<table>
<thead>
<tr>
<th>Categories of Alleged Positive Impacts</th>
<th>Key Defining Traits Underlying Those Impacts</th>
</tr>
</thead>
</table>
| I. Public-Private Capital and Operating Costs | Leapfrog Development  
Low Density  
Unlimited Outward Extension |
| II. Transportation and Travel Costs | Low Density  
Leapfrog Development  
Transport Dominance by Motor Vehicles  
Unlimited Outward Extension |
| III. Land/Natural Habitat Preservation | Low Density  
Unlimited Outward Extension  
Leapfrog Development |
| IV. Quality of Life | Low Density  
Unlimited Outward Extension  
Leapfrog Development  
Transport Dominance by Motor Vehicles |
| V. Social | Highly Fragmented Land-Use Governance  
No Central Ownership or Planning  
Great Variances in Local Fiscal Capacity |
Each of the alleged negative and positive impacts under these five substantive groupings is individually considered following a common presentation format as follows:

1. **Topic.** What is the specific subject matter of the alleged cost or benefit?

2. **Allegation/Basis.** Synopsis of the alleged cost or benefit and the basis or logic of the supposed effect.

3. **Literature Synthesis.** Pertinent studies on the allegation are cited, either supporting or rebutting it. The presentation of the literature synthesis is accomplished through both text and a matrix.

   The matrix distinguishes between whether “the literature agrees” about 1. whether or not the alleged factual condition exists under conditions of sprawl (or more generally whether development pattern affects the item in question), and 2. whether or not the alleged factual condition—if it exists—has been significantly linked to sprawl. For example, concerning the allegation that “sprawl generates more total travel than higher-density forms of development,” it is first noted whether there is agreement among observers who comment on this subject that low-density settlements in fact generate more total travel (in person miles traveled) than higher-density settlements. There is mostly agreement in this regard.

   The next observation concerns whether there is agreement in the literature that the presence of greater travel time in low-density settlements is significantly linked to sprawl. There is, again, mostly agreement on the second count; however, there remains the question whether the amount of travel is as significant an impact as the time of travel. For simplification, these judgments in the above example would be shown in the form of a simple matrix, as shown:

<table>
<thead>
<tr>
<th></th>
<th>General Agreement</th>
<th>Some Agreement</th>
<th>No Clear Outcomes</th>
<th>Substantial Disagreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does this condition notably exist?</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is it strongly linked to sprawl?</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   An “x” placed in a matrix cell indicates that it contains the appropriate answer to the question on that line.

   The matrix is not a scientific measuring instrument. It could have been organized in multiple alternatives ways. Even as currently structured, there was not always consensus among the research team on how to “score” an item, such as whether there is “mostly agreement” or “some agreement” in the literature, or for that matter how convincing the literature is on any given subject.

   The purpose of the matrix and the accompanying discussion is to synthesize in a systematic way, at the onset of the research, the important studies on sprawl. This effort informs us as to what prior researchers on the subject have considered and debated, what data have been used and how data have been analyzed, where there are gaps in the state of knowledge, and so on.

   The literature synthesis is summarized in Table 13. It indicates the following:

   **Extent of the Literature.** As noted earlier, the literature on sprawl clusters in the topical areas of public–private capital and operating costs, transportation and travel costs, and to a lesser extent, land and natural resources preservation. There are far fewer studies specifically relating sprawl to quality of life or social effects. Within these respective clusters, certain topics have received more attention than others. In the public–private capital and operating costs group, the issue of development patterns and infrastructure expenses has been far more frequently
<table>
<thead>
<tr>
<th>Substantive Concern</th>
<th>Extent of Literature</th>
<th>Does</th>
<th>Condition</th>
<th>Notably Exist?</th>
<th>Is It Strongly Linked To Sprawl?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2=most 0=least</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I. Public-Private Capital and Operating Costs Negative Impacts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• More infrastructure costs</td>
<td>2</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Higher public operating costs</td>
<td>1</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• More expensive private residential/nonresidential costs</td>
<td>1</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Worse public fiscal impacts</td>
<td>0</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Higher aggregate land costs</td>
<td>0</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive Impacts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Lower public operating costs</td>
<td>0</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Less expensive private residential/nonresidential costs</td>
<td>1</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Fosters efficient development of &quot;leapfrogged&quot; areas</td>
<td>0</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II. Transportation and Travel Costs Negative Impacts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• More VMT</td>
<td>2</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• More automobile use</td>
<td>2</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Longer travel/commuting times</td>
<td>2</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• More personal transportation spending</td>
<td>1</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive Impacts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Less VMT</td>
<td>0</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Shorter travel/commuting times</td>
<td>1</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Reduced transit subsidies</td>
<td>0</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extent of Literature</td>
<td>Does Condition</td>
<td>Notably Exist?</td>
<td>Is It Strongly Linked To Sprawl?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------</td>
<td>----------------</td>
<td>---------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>+2 General Agreement</td>
<td>+1 Some Agreement</td>
<td>0 No Clear Outcome</td>
<td>-2 Substantial Disagreement</td>
<td>+2 General Agreement</td>
</tr>
<tr>
<td>Substantive Concern</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>III. Land/Natural Habitat Preservation Negative Impacts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss of agricultural land</td>
<td>2</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Reduced farmland productivity</td>
<td>1</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Reduced farmland viability</td>
<td>0</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Loss of fragile environmental lands</td>
<td>2</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Lessened regional open space</td>
<td>0</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Positive Impacts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enhanced personal and public open space</td>
<td>0</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV. Quality of Life Negative Impacts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aesthetically displeasing</td>
<td>1</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Lessened sense of community</td>
<td>1</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Greater stress</td>
<td>0</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Higher energy consumption</td>
<td>2</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>More air pollution</td>
<td>1</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Lessened historic preservation</td>
<td>0</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Positive Impacts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preference for low-density living</td>
<td>1</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Less concentration-associated crime</td>
<td>0</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Reduced costs of goods and services</td>
<td>0</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Fosters greater economic well being</td>
<td>0</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>V. Social Issues Negative Impacts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fosters suburban exclusion</td>
<td>1</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Fosters spatial mismatch</td>
<td>1</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Fosters residential segregation</td>
<td>1</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Worsens city fiscal stress</td>
<td>1</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Worsens inner-city deterioration</td>
<td>1</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Positive Impacts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fosters home rule</td>
<td>0</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Enhances municipal diversity and choice</td>
<td>0</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
studied than the issue of how sprawl influences operating costs or housing expenses, and especially the subject of development patterns and public fiscal impacts (public service costs less public revenues). Similarly, much more attention has been paid to how development affects the amount, and mode, of travel than the translation of that to household spending or, for that matter, national transportation spending.

Also evident from Table 13 is that the literature tends to the more prolific on the criticism leveled at sprawl rather than its defense. Across the topics, there are more studies alleging negative impacts on costs rather than positive impacts on benefits.

"Agreement" in the Literature. As noted earlier, this evaluation is a judgment call by the research team. Having said that, there are discernible areas of greater or lesser consensus in the literature. There is greater agreement that certain "physical" characteristics exist under sprawl (e.g., "Does condition notably exist?"), than quality of life and social effects. These physical characteristics are more travel, especially by automobile; greater consumption of land; and higher infrastructure costs. By contrast, there is much less agreement on such matters as the quality of life attributes of whether there is "greater stress" or "lessened sense of community" under sprawl.

With respect to the issue of whether certain alleged costs and benefits are "strongly linked to sprawl" (holding aside the issue of causality), there are few areas of high consensus. There are, as examples, sprawl's link to greater automobile travel and consumption of more farmland and frail lands. By contrast, there is "substantial disagreement" on many fronts, such as whether housing is more expensive under sprawl and, relatedly, whether land is more costly and if travel/commuting times are longer or shorter.

The literature points to what might be some of the research thrusts of the current investigation. On the physical-engineering side of sprawl—that is, the issues of infrastructure, transportation, and land—the studies to date point to many appropriate measures to be considered (e.g., vehicle miles traveled [VMT] and congestion), and the relationships to be examined (e.g., density's effect on modal choice and travel time). However, these must be brought together more definitively by the research team and areas of outstanding disagreement from prior work (e.g., are commuting times shorter or longer under sprawl) empirically examined so that answers can be had. This and more need to be done where there are lingering gaps in our knowledge concerning the effect of development patterns on operating costs, productivity of farmland, and so on.

On remaining topical concerns—quality of life and social effects—the challenge to the research team is even more formidable, because here interrelationships are more complicated, yardsticks of measurement less agreed upon, and association with development pattern—whether sprawl or otherwise—more obtuse.

The research design being developed addresses these issues. It builds from the expertise of the research team and is informed by the literature review, such as the overview that has preceded this discussion and the costs and benefits itemized in the discussion that follows. This item-by-item analysis is organized by the five topical areas of the literature. For each topic, first the relevant costs on negatives of sprawl are presented, followed immediately by sprawl's alleged benefits. The discussion builds from the annotation of key studies and the comprehensive bibliography found in the appendix.
DETAILED ANALYSIS OF COSTS AND BENEFITS OF SPRAWL

The Costs and Benefits of Sprawl:
Alleged Negative Public-Private Capital and Operating Costs

Topic: More Infrastructure Costs

Allegation/Basis

Infrastructure of a wide scope—local and regional roads, utilities (e.g., water and sewer systems), schools, and other purposes—is more expensive under sprawl than under compact development. This allegation alludes to infrastructure that is primarily public (e.g., state, county, and local government roads; public utility systems; and public schools) and occasionally private (e.g., privately owned utility systems and subdivision-level roads that are not dedicated to the public sector).

The effect of sprawl on the cost of infrastructure allegedly occurs for several reasons. At sprawl's lower development densities, various components of infrastructure that are linearly related (e.g., sidewalks, curbs, subdivision-level roadways, and water and sewer mains) serve a lesser increment of development than this infrastructure would serve at higher levels of density.

The segregation of land uses associated with sprawl further increases infrastructure costs. Segregation of land uses by residential and nonresidential types often means that parallel infrastructure systems have to be provided to individual residential and nonresidential locations. Further, sprawl's leapfrog development, which locates growth away from existing development, does not capitalize on pockets of surplus infrastructure capacity that may already be present in and around existing development. Finally, fragmented governance, a seeming natural accompaniment of sprawl, often leads to duplicative city halls, police stations, courts, fire houses, schools, water/sewer treatment facilities, and so on.

Literature Synthesis

As shown earlier in Table 1, *The Costs of Sprawl* (RERC 1974) found that capital costs per unit were higher in the "low-diversity sprawl" and "sprawl mix" neighborhood prototypes than they were in the "planned mix" and "high-density planned mix" prototypes. *The Costs of Sprawl* also found that capital expenses per unit were higher in detached housing (more pronounced under sprawl) than they were in attached housing (more pronounced under compact development). The first finding of *The Costs of Sprawl*, although criticized, has basically stood the test of time (Altshuler 1977); the second finding proved to be the undoing of the study (Windsor 1979).

Frank (1989) reanalyzed (including using current cost numbers) several studies conducted from the 1950s to the 1980s that examined relationships between land use and infrastructure costs (including *The Costs of Sprawl*). Accounting for the limitations of the *Costs of Sprawl* study, he concluded that infrastructure costs were highest in situations of low density and for development located a considerable distance from centralized public services (conditions of sprawl). Infrastructure costs were lowest in situations of higher density and for development that was centrally and/or contiguously located (conditions of compact development). Duncan (1989) analyzed the infrastructure costs of multiple Florida residential and nonresidential developments with varying patterns of development. Costs were higher for those with sprawl characteristics than for those with...
TABLE 14

Duncan (1989)—Florida Growth Pattern Study: Capital Facility Costs under Sprawl versus Compact Development (per dwelling unit; 1990 dollars)

<table>
<thead>
<tr>
<th>Category of Capital Costs</th>
<th>Average of Case Studies under Sprawl Development</th>
<th>Average of Case Studies under Compact Development</th>
<th>Sprawl Versus Compact Development</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average of Case Studies under Sprawl Development</td>
<td>Average of Case Studies under Compact Development</td>
<td>Difference</td>
</tr>
<tr>
<td>Roads</td>
<td>$ 7,014</td>
<td>$ 2,784</td>
<td>(+) $4,230</td>
</tr>
<tr>
<td>Schools</td>
<td>6,079</td>
<td>5,625</td>
<td>(+) 454</td>
</tr>
<tr>
<td>Utilities</td>
<td>2,187</td>
<td>1,320</td>
<td>(+) 867</td>
</tr>
<tr>
<td>Other</td>
<td>661</td>
<td>672</td>
<td>(-) 11</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$15,941</td>
<td>$10,401</td>
<td>(+) $5,540</td>
</tr>
</tbody>
</table>

Notes: 1. Sprawl development as defined here include the following patterns of “urban form” analyzed by the Florida study: “scattered,” “linear,” and “satellite.” The capital cost figures shown in this table are averages of the Florida case studies characterized by the scattered, linear, and satellite patterns (e.g., Kendall Drive, Tampa Palms, University Boulevard, and Cantonment).

2. Compact development as defined here includes the following patterns of “urban form” analyzed by the Florida study: “contiguous” and “compact.” The capital cost figures shown in this table are averages of the Florida case studies characterized by the contiguous and compact patterns (e.g., Countryside, Downtown Orlando, and Southpoint.)

Source: Memorandum from James Duncan and Associates to Robert W. Burchell and David Listokin, May 8, 1990; and James Duncan et al., The Search for Efficient Urban Growth Patterns. Report prepared for the Governor’s Task Force on Urban Growth Patterns and the Florida Department of Community Affairs (Tallahassee, July 1989).

compact development characteristics (see Table 14).

The longest run modeling of infrastructure costs under different development scenarios has been performed by Burchell et al. (1992-1997) both in New Jersey and in other locations. The infrastructure models applied by Burchell related development density and housing type to the demand for local/state roads and water/sewer infrastructure. The studies found that the amount of land consumed for development was directly related to lane miles of road required for two-lane (local) and four-lane (state) roads. Thus, density of development was found to be inversely related to lane miles of local and state roads and their attendant infrastructure costs. Housing type, and to a lesser extent density, was related to the amount of water and sewer services consumed (in gallons) by development. Almost all of the difference in residential water usage related to whether or not occupants of residential and nonresidential facilities watered their lawns. Lawn watering takes place primarily in single-family detached residences and high-value research and headquarters commercial uses. In the latter, the difference in water usage between various commercial and
industrial uses is also related to the service or product that is generated by the facility.

Larger and more significant than water/sewer usage are differences observed in water/sewer infrastructure, particularly as related to the number of feeder hookups from the trunk line that an individual land use requires. Higher density, the clustering of land uses, and attached housing and linked nonresidential uses all contributed to a reduced number of infrastructure feeder lines and reduced costs. A model sensitive to these differences, applied in New Jersey to alternative growth scenarios differentiated by a sprawl-like versus more compact development patterns, showed the former’s infrastructure costs to be considerably higher. The findings were basically similar in order of magnitude across most subsequent locations analyzed by Burchell et. al. (Burchell and Listokin 1995) (see earlier Tables 3 and 4), and were also very comparable to the findings reached by Frank and Duncan in their studies (see Table 15 below).

**TABLE 15**

Relative Infrastructure Costs Of Sprawl Versus Compact Development From Three Major Studies

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Roads (local)</td>
<td>100%</td>
<td>40%</td>
<td>73%</td>
<td>74-88%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Burchell et. al. (1992-1997)</td>
<td>=75%</td>
</tr>
<tr>
<td>Schools</td>
<td>100%</td>
<td>93%</td>
<td>99%</td>
<td>97%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Burchell et. al. (1992-1997)</td>
<td>=95%</td>
</tr>
<tr>
<td>Utilities</td>
<td>100%</td>
<td>60%</td>
<td>66%</td>
<td>86-93%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Burchell et. al. (1992-1997)</td>
<td>=80%</td>
</tr>
</tbody>
</table>

Source: Burchell and Listokin (1995) and Table 4.

Other relevant research indicating higher infrastructure costs under conditions of sprawl include Archer (1973) and Duensing (1977). Base data on infrastructure and its costs, not related to development pattern, such as the average capital outlays per single-family house, or costs per linear foot of roadway, are provided by Fodor [1995], Nichols et al. [1991], Nelson [1988], FACIR [1986], OP&R [1982]).

The above body of research reflecting, in part, an approach dating to *The Costs of Sprawl*, has been criticized on several counts by the same author (Altshuler 1977 and Altshuler and Gomez-Ibanez 1993) as follows:

1. The higher infrastructure costs found in instances of lower versus higher density (i.e., sprawl versus compact development) is not meaningful because the housing units and their attendant scale found under the different development alternatives (i.e., more detached housing under sprawl and more attached housing under compact development) are not comparable.

2. The higher infrastructure costs attributed to sprawl due to its leapfrog patterns will essentially be neutralized...
as areas that were initially passed over are ultimately developed. The next wave of growth will capitalize on the infrastructure in place. Thus, the higher initial cost will be recouped—“the cost of sprawl is the cost of supplying some infrastructure in advance of its eventual need and will ultimately be lower the more rapidly that infill takes place” (Altshuler and Gomez-Ibanez 1993, 72-73).

3. The higher infrastructure costs (under sprawl) attributed to the distance of development from central facilities does not consider potential economies of scale that could be realized in regionalized, over-sized trunk lines or similarly located water/sewer treatment plants (Altshuler and Gomez-Ibanez 1993, 73). In other words, the added “costs of distance” because feeder lines are longer under sprawl are not significant if these feeder lines are attached to regionally located (and oversized) trunk lines and water/sewer plants.

Holding aside the above considerations which relate to whether significant cost differences are valid, the cost difference in infrastructure between sprawl and compact development patterns is found by at least one researcher to be quite slight. Peiser (1984) is often cited in this regard (Gordon and Richardson 1997). Peiser (1984) examined infrastructure costs for new residential development in two Texas “prototype” communities, one planned, the other unplanned. The planned and unplanned developments were located on 7,500-acre sites in Houston. The planned community was designed to accommodate a population of about 80,000 residents in 26,500 dwelling units and a workforce of 72,000 in 24 million square feet of office and industrial space. The development was largely self-contained and near existing development in the form of a large center. The unplanned development was located in a primary growth corridor at the urban fringe, typical of Houston’s sprawl pattern (100 to 500-acre subdivisions and strip malls and shopping centers), and scaled to accommodate a similar number of residents (80,000) and workers (72,000) as the planned development. In Peiser’s model, the difference in capital expenses for the planned and unplanned scenarios was about 5 percent in favor of the planned development. The finding in the Peiser study that contradicts other findings in the field is the inclusion in overall planned development infrastructure savings, of higher road costs associated with planned as opposed to unplanned development (Table 16).

<table>
<thead>
<tr>
<th>TABLE 16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peiser Model</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Infrastructure Costs Component</th>
<th>Planned Development (for 80,000 residents) ($ in millions)</th>
<th>Unplanned Development (for 80,000 residents) ($ in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roads</td>
<td>$10.0</td>
<td>$8.0</td>
</tr>
<tr>
<td>Sewer</td>
<td>4.3</td>
<td>4.7</td>
</tr>
<tr>
<td>Water</td>
<td>9.2</td>
<td>11.8</td>
</tr>
<tr>
<td>Drainage</td>
<td>16.3</td>
<td>17.4</td>
</tr>
<tr>
<td></td>
<td><strong>$39.8</strong></td>
<td><strong>$41.9</strong></td>
</tr>
</tbody>
</table>
In sum, while there is general agreement that development density is linked to infrastructure costs, there is less agreement concerning the inter-relationship between sprawl (as a less carefully defined development form) and infrastructure costs.

### Literature Synthesis Matrix

<table>
<thead>
<tr>
<th></th>
<th>+2 General Agreement</th>
<th>+1 Some Agreement</th>
<th>0 No Clear Outcome</th>
<th>-2 Substantial Disagreement</th>
</tr>
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### The Costs and Benefits of Sprawl: Alleged Negative Public Service Costs Effects

#### Topic: Higher Public Operating Costs

**Allegations/Basis**

*Sprawl generates higher local/school district operating costs than higher density forms of development.* This relates to splintered public local and educational agencies providing duplicative administrative and operating services.

**Literature Synthesis**

Operating costs are those costs that accrue on a day-to-day basis and form the annual expenses of local government. These costs include public workers’ salaries and benefits; normal expenditures for supplies, repairs, and replacement items; and debt service for capital facilities purchased or contracted for at the local government level (municipal and county). There is a rich literature which describes variations in local (county and municipal) costs as a function of jurisdiction size, wealth, growth rate, and density of development. Generally speaking, per capita local costs are “U” shaped as a function of population size—expensive for jurisdictions under 2,500 and over 50,000 in population, with points of most efficiency in those locations of 10,000-25,000 in population. School district per pupil costs vary only slightly with school district size. Districts in excess of 3,000 pupils spend 20 to 30 percent more per pupil than districts of fewer than 1,000 pupils; districts of 1,000-3,000 pupils spend 10 percent more than districts of fewer than 1,000 pupils (Sternlieb and Burchell 1975; Burchell and Listokin, 1996).

Both local (municipal and county) public service costs per capita and school district public service costs per pupil also vary directly with the wealth of the public jurisdiction. The citizens of wealthier jurisdictions demand greater qualities and quantities of local and educational public services and are willing to pay for them (Burchell and Listokin 1996).

Per capita local and school district costs also have been found to vary directly with density, and inversely with the growth rate of the jurisdiction. Generally speaking, the higher the density, the higher the per capita and per pupil costs; the faster the growth rate, the lower the per capita and per pupil costs (Ladd 1992). Two caveats are of note here. The first is that comparisons almost always are made between suburban- and urban-level densities and rarely between densities that reflect more versus less intense suburban development. Second, none of the analyses performed to date standardize for the quality or quantity of public services delivered (Altshuler and Gomez-Ibanez 1993).

Thus, buried in the above findings is the fact that public services that are delivered in very large and dense local (municipal and county) jurisdictions are more
complex and more individualized than those delivered in smaller, less-dense jurisdictions. Foot patrol or two-person automobile police patrol versus one person automobile police patrol, fully paid fire departments versus volunteers, significant numbers of special education teachers versus contracted-out special education services, all complicate differentiating the costs encountered in more intensely versus less intensely populated jurisdictions.

Local government costs nationally average about $700 per capita; school district costs average about $7,000 per pupil (Census of Governments 1992). Of the former, about 60 percent is for salaries and wages, 35 percent for other expenses, and 5 percent for capital purposes. For the latter, 70 percent is for salary and wages, 20 percent for other expenses, and 10 percent for capital purposes.

The opposite of sprawl development, compact or managed growth, impacts on operational costs primarily by encouraging more regionalism in school systems and more sharing of non-police local public resources and finally by reducing the amount of local roads and water/sewer utility lines and hook-ups that are constructed and paid for by local debt service and maintained and paid for out of annual operating budgets.

Burchell, in his analysis of the growth alternatives in the Impact Assessment of the New Jersey State Development and Redevelopment Plan, found that combined municipal and school district operational costs could be reduced by 2 percent annually under planned (compact) as opposed to trend (sprawl) growth (Burchell 1992a). While the percentage seems small, these are annually occurring as opposed to one-time savings, and these could be potentially applied to local budgets nationally that sum to $175 billion per year and school district nationally budgets that sum to $500 billion annually.

In similar type studies in the Delaware Estuary, and in the state of Michigan, municipal costs were found to be 5-6 percent less annually due to compact as opposed to sprawl development.

Basically equivalent findings have been found by James Duncan in Florida (Duncan 1989). Conflicting findings have been suggested but not empirically tested, by Altshuler and Gomez-Ibanez (1993) and Gordon and Richardson (1997). Altshuler and Gomez-Ibanez indicate that the inability to control for the quality and quantity of services under comparison renders most of these studies at best “time and locational bound” by who is providing what types of public services when, and at worst unable to be used to draw appropriate conclusions from, given their inability to differentiate between levels of service provided (Altshuler and Gomez-Ibanez 1993).

Gordon and Richardson indicate that Burchell’s prospective alternative development scenarios allow no ability for the trend scenario (sprawl) to improve over time and similarly no ability for the plan scenario (compact growth) to be worse than envisioned due to lack of full compliance with this alternative (Gordon and Richardson 1997).

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The Costs and Benefits of Sprawl:
Alleged Negative Public/Private Capital and Operating Costs

Topic: Residential and nonresidential development costs

Sprawl causes residential and nonresidential building and occupancy costs to rise due to larger lot sizes and structure sizes in locations where land is less expensive.

Literature Synthesis

Development costs are the costs to develop residential and nonresidential properties. They involve land and improvement costs and are impacted by the scale of each. Spacious single-family dwellings on large lots are usually the most expensive types of housing; spread-out, low rise nonresidential development on large parcels of land are the most expensive type of commercial and industrial development. They are both low density examples of their respective development forms.

To the degree that density increases for residential development and floor-area-ratios increase for nonresidential development, holding all other structure/environmental amenities constant, residential and nonresidential development costs will decrease. Similarly, to the degree that structure size is less, holding all other structure/environmental amenities constant, residential and nonresidential development costs will also be less.

Other factors affecting the costs of residential and nonresidential development are: 1) the amount of zoned land available for development as determined by the local zoning ordinance, and 2) the time it takes development to engage and clear the permitting process—also largely determined by local land-use regulations. If land is limited or inappropriately zoned, residential and nonresidential development costs will rise; if government regulations are excessive, permitting time will increase, and the costs of development will also rise.

In the Impact Assessment of the New Jersey State Development and Redevelopment Plan (1992a), Burchell found that if development under the plan alternative is contained around existing development and is also increased somewhat in density and floor-area-ratio, that even with significant decreases in density to preserve lands at the periphery, overall residential and nonresidential development costs will be approximately 10 percent less per unit and per 1,000 square feet under this scenario. Somewhat less savings (6-8%) emerged from studies conducted by Burchell in Lexington, Kentucky, (1993), the Delaware Estuary (1995), and the State of Michigan (1997).

Other studies of residential development have produced essentially parallel findings as they relate to the effects of increased lot and structure size on housing costs. Seidel (1980), Downs (1973), Schafer (1975), and others have found that large lot zoning and minimum building size increase the costs of new housing. This same type of analysis applied to nonresidential development, although not often looked at by researchers in the field, has produced similar types of findings.

Others have found that large lot single-family zoning and minimum building size are associated with sprawl development, and smaller lot sizes (zero lot line) and different types and intensities of development (single-family attached and multifamily development) are associated.
with compact development (CH2M Hill 1994 and Avin 1996). Linking the above two sets of findings, the savings noted by housing type would extend to these two polar development forms.

One important caveat is well worth noting. One cannot assume that housing preference changes will accompany development pattern shifts. In other words, if compact development is opted for, and more dense forms of housing comprise this type of development, it cannot be assumed that market preferences will correspondingly shift and families previously occupying less dense types of housing under sprawl will opt for the more intense development forms under compact development. Further, if there is a cross over between housing types, one must carry the occupancy profile of the former to the new type of housing unit. Otherwise false conclusions could be drawn with regard to development cost savings associated with the often-smaller, and less intensely occupied housing of compact development as well as with the annual fiscal impact savings resulting from this development form. A critical error was discovered by Windsor in his review of the Costs of Sprawl (Windsor 1979). The Costs of Sprawl study failed to account for the fact that the change in characteristics of new townhouse occupants switching from single-family occupancy (if they could be assumed to do so) would be closer to the characteristics of occupants of the units of housing that they left than they would be to the historical characteristics of units that they were seeking. This lack of realization led to the erroneous conclusion that compact development (containing a larger percentage of townhouses) was less expensive to service than sprawl development (containing a larger percentage of single-family homes) when the same households that occupied the former would undoubtedly be the ones moving to the latter.

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**The Costs and Benefits of Sprawl:**

**Alleged Negative Public/Private Capital and Operating Costs**

**Topic:** Worse Public Fiscal Impacts

**Allegation/Basis**

*Sprawl generates worse fiscal impacts because public operating costs are significantly higher with residential uses and attendant revenues do not compensate for these costs. Further, fragmented governments compete for land uses according to these land uses’ fiscal superiority. Most economic uses are withdrawn from central cities but only the choicest suffice for suburban jurisdictions. There are not enough “good” land uses to go around and only a few jurisdictions truly benefit fiscally from their presence.*

**Literature Synthesis**

In analyzing the impacts of land uses, it has become accepted that, generally speaking, some types of land uses are better fiscally than others. Nonresidential land uses, for the most part, have been shown to be more profitable; most standard forms of residential land uses, less profitable (Table 17). Further, within the residential and nonresidential sectors, there are varying degrees of profitability. Profitability means that some land uses produce more revenues than costs, i.e., if
Table 17

The Hierarchy of Land Uses and Fiscal Impacts

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| EXPENSIVE SINGLE-FAMILY HOMES  |
|  (3-4 BEDROOMS)                |

| INEXPENSIVE SINGLE-FAMILY HOMES |
|  (3-4 BEDROOMS)                 |

| MOBILE HOMES                   |
|  (UNRESTRICTED AS TO OCCUPANCY LOCALLY) |

Note: The above list contains too many disclaimers to include here. Suffice it to say that specific fiscal impacts of a land use must always be viewed in the context of other land uses' impacts and within the fiscal parameters of the jurisdiction in which the land use is being developed.
service levels are maintained at the same level after development, taxes could be decreased. On the other hand, the reverse is also true. In some cases, costs exceed revenues and, all things being equal, taxes might have to be increased (Burchell and Listokin 1994a).

Position on the fiscal impact hierarchy depends on type of unit (reflecting size or intensity of use) within both residential and nonresidential classifications.

Fiscal position also depends on the service district in which it is being viewed. Often, for instance, a small condominium or age-restricted housing may break-even or be just positive or negative in the municipal service jurisdiction, yet both may be very positive fiscal ratables in the school district. On the other hand, larger townhouses may be just below break-even in the school district yet significantly negative in the municipal jurisdiction.

Fiscal impacts and observed differences under sprawl versus compact growth are dependent upon two different influences from development patterns. The first is the ability to influence type of development by compact versus sprawl growth. To the degree that dwelling type can be changed by compact development in sub-state settings, the demographics and, resultantly, the public service costs of development will change. The second is the ability of compact development to influence the intensity of development and geographic spread of new neighborhoods. If compact development can provide tighter development patterns, infrastructure provision will be less. So too will the annual debt service on capital costs for roads, water/sewer lines, and so on, as well as the annual costs of maintenance associated with these new facilities. Related to this is the location where development takes place. If located near existing development, excess service capacity may be drawn upon. If development is skipped over, public service infrastructure will almost always have to be provided at costs greater than extending existing facilities.

Burchell’s Impact Assessment of the New Jersey State Development and Redevelopment Plan (Burchell et al. 1992a) employed a fiscal model to view the effects of trend versus plan development. The Rutgers fiscal impact model estimated the number of people, employees, and students that were generated by development under each of the development scenarios and projected their future costs and revenues to host public service jurisdictions. While at the regional and state levels, population and employment projections did not vary between alternatives, at the municipal level there were significant differences. In the compact development case, urban communities with slack service capacity receive more growth than rural areas with lesser amounts of public service infrastructure. With reduced infrastructure provision and potentially reduced annual maintenance on this infrastructure, this lead to diminished fiscal impacts for this alternative.

Burchell’s study in New Jersey found that:

By containing population and jobs in already developed areas and by creating or expanding centers in newly developing areas, the State Plan offers an annual $112 million [or 2 percent] fiscal advantage to municipalities. This advantage reflects the ability under plan to draw on usable excess operating capacity in already developed areas as well as efficiencies of service delivery. For instance, fewer lane-miles of local roads will have to be built under plan, thus saving municipal public works maintenance and debt service costs. Public school districts will realize a
$286 million [or 2 percent] annual financial advantage under the State Plan, again a reflection of drawing on usable excess public school operating capacity and other service and fiscal efficiencies realized due to the redirection of population under the plan alternative. Thus, municipal and school district providers of public services could be ahead fiscally by close to $400 million annually under plan compared to trend, while meeting similar population demands for public services.

Under trend, the state's school districts will have to provide 288,000 net pupil spaces to the year 2010 (365,000 gross need less 77,000 usable excess spaces); for plan, the net need is lower at 278,000 pupil spaces based on excess space available in central cities. Overall, if new space had to be built to accommodate net new students, costs of new school facilities would be approximately $5.3 billion under trend and $5.1 billion under plan. Thus, $200 million [or approximately 3 percent] is potentially saved due to more excess capacity in closer-in areas being drawn upon by plan as opposed to lesser amounts of excess capacity available to trend in suburban and rural areas.

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**The Costs and Benefits of Sprawl: Alleged Negative Public/Private Capital and Operating Costs**

**Topic:** Higher Aggregate Land Costs

**Allegation/Basis**

*Total land costs of urban settlements are higher under sprawl.* This occurs even though the average price of land per acre may be lower because a given total population occupies more suburban land than under higher density urban forms of growth.

**Literature Synthesis**

Most of the modeling efforts to date that involve prospective development futures have found that alternatives to "status quo" development pattern which is usually sprawl, consume less overall land than this development pattern does. In New Jersey, Lexington, Kentucky, the Delaware Estuary, and Michigan, alternatives to sprawl consumed 20-40 percent less overall land (Burchell 1992-1997). In the San Francisco Bay area, alternatives to sprawl consumed 10-25 percent less overall land than did sprawl (Landis 1995). Thus, land consumed under sprawl has almost always been shown to be more than land consumed under compact growth patterns.

Further, in the Burchell (1992-1997) studies because densities were increased to design levels under compact growth, housing costs were less due to the reduction in land costs associated with this alternative. In other words, in situations where there were no growth restrictions, housing costs were more under sprawl because land costs were more. Thus in the above four Burchell study locations, housing costs under sprawl development were more due to the land component of these costs. This was true because under compact development the majority of development taking place closer-in was subject to density increases of 10 to 30 percent. Total land costs of urban settlements have been found to be generally higher under the sprawl alternative. (See Negative Land/Natural Habitat section.)
The Cost and Benefits of Sprawl: Alleged Positive Public-Private Capital and Operating Cost

Topic: Lower Public Operating Costs

Allegation/Basis

Local land school district operating costs are lower under sprawl development because service demands and the costs of meeting these demands increase with higher densities (such as those associated with compact development).

Literature Synthesis

Gordon and Richardson (1997) express this argument, citing the research of Ladd (1992).

Ladd (1992) argued that except within a range of very low densities, per capita public service costs for traffic management, waste collection and disposal, and crime control, increase with higher densities (Gordon and Richardson 1997, 99).

Again, this is the type of research that has not standardized for the quality and quantity of public services delivered in jurisdictions of varying densities. What the above research indicates is that not taking into account what services are delivered or who delivers them in a service district, operating costs, whatever they are comprised of, appear to be less in jurisdictions of low density than in jurisdictions of high density.

Further, the comparisons that are made are usually between locations of rural-suburban (1 to 3 units per acre) density and those of urban density (16 to 30 or more units per acre). These studies may well be measuring the differences in range and complexity of public services delivered in densely populated urban areas versus the very limited and much simpler public services delivered in rural-suburban areas. (See Operating Costs in the Negative Impacts Section.)

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the Petaluma (California) Plan. This plan severely limited building permits, favoring dwellings with costly design features and developer-provided amenities and services to the community. Using a statistical (i.e., hedonic) pricing technique, the authors compared the price of a standard bundle of housing characteristics to the corresponding price in nearby Santa Rosa, which had not adopted growth controls during the period. The authors found that after several years, Petaluma’s housing prices had risen 8 percent above those of Santa Rosa.

Schwartz, Zorn, and Hansen (1989) did a similar study of the growth controls in Davis, California, comparing house prices in Davis to those in a control sample of other Sacramento suburbs. They found that growth controls caused house prices in Davis to be nine percent higher in 1980 than they would have been without them.

In Petaluma (Schwartz, Hansen, and Green 1981) and in Davis (Zorn, Hansen, and Schwartz 1986), the effects on the housing stock affordable to low- and moderate-income households relative to control areas were also monitored. In Petaluma, the authors found that the percentage of the housing stock that was affordable to low- and moderate-income households had dropped significantly below that of a control group (Fischel 1990).

In Davis, on the other hand, growth controls required that those who received building permits to construct some units earmarked for low-income occupants. Thus, the limited growth that did occur in Davis contained both low-income and high-income housing. According to Fischel (1990), however, an unanticipated offset to this apparent success occurred. The authors noted that existing housing in Davis increased not only in price but in quality. Fischel’s interpretation of this outcome is that older housing was filtering up rather than down.

Katz and Rosen (1987) analyzed 1,600 sales transactions of single-family houses during 1979 in 64 communities in the San Francisco Bay Area. Of these transactions, 179 involved houses located in communities where a building permit moratorium or binding rationing system was recently or currently in effect. According to Fischel (1990), this study is particularly valuable since, unlike the above California studies, it does not focus on just a single community. The authors found that the price of houses sold in the growth-controlled communities was higher than those sold in other communities. Where growth is controlled as opposed to managed, housing costs are higher.

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The Costs and Benefits of Sprawl: Alleged Positive Public-Private Capital and Operating Costs

Topic: Fosters Efficient Development of Leapfrogged Areas

Allegation/Basis

_Sprawl fosters efficient in-fill development._ Sprawl permits appropriate, relatively high-density development of still-vacant, close-in sites late in the development period of a metropolitan area, without having either
to demolish existing improvements on those sites at great cost, or to expend public funds buying such sites in advance and reserving them for later development. This occurs because the "leapfrogging" aspect of sprawl leaves sizable tracts of land vacant and undeveloped. Parcels remain vacant long after the wave of current growth has passed them by. These parcels can be developed later as "in-fill" sites at relatively high densities, which are more appropriate to their more-central locations. This process of deferred development is more efficient than first developing all peripheral land at low densities, and then tearing down the existing structures when the development market, reflecting the preferences of structure occupants, shifts to higher densities.

**Literature Synthesis**

This point is considered by Peiser (1984) and is also discussed by Altshuler and Gomez-Ibanez (1993). It is often a highly neglected component of the analysis of infrastructure costs related to sprawl. Just as those who call for full costing methods to expand and account for costs of sprawl to the private sector and to society as a whole, there are those who believe that the secondary costs of sprawl must be adequately tabulated in any accounting scheme related to this and other development alternatives.

In an accounting system, those land areas that are skipped over and initially not used, become reasonably inexpensive to access and service secondarily. Further, the potential of ultimately using these skipped-over lands for inner ring open space also becomes apparent. Only Altshuler and Gomez-Ibanez (1993) have begun to address these issues.

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**The Costs and Benefits of Sprawl: Alleged Negative Transportation/Travel Cost**

**Topic:** More Vehicular Miles of Travel

**Allegation/Basis**

*Sprawl generates more total miles of travel than higher-density forms of development.* Sprawl generates more travel because its lower density residences and its scattered workplaces and public service buildings are spread over a much larger total area.

**Literature Synthesis**

Numerous studies indicate an increase in the amount of travel per person in the U.S., measured either in number of trips or vehicle miles of travel. Pisarski (1992), for instance, examining such sources as the *Nationwide Personal Transportation Study*, found that between 1980 to 1990 the average miles of travel to work per capita increased significantly nationwide.

At issue is how to relate the differences in the amount of travel to the development characteristics defining sprawl and its alternatives. Several studies show an association between decreasing travel (e.g., in the form of lower vehicle miles traveled [VMT] per person) and such development characteristics as higher density and broader mix of land uses—characteristics of compact development as
opposed to sprawl. These studies encompass both simulation models and empirical investigations.

In *Stuck in Traffic* (1992), Downs developed a “what if” scenario testing model to evaluate how changes in the density of development would affect commuting distances. Downs found that the density of growth at the urban fringe has a significant impact on commuting distances; further, shifts from very low to medium densities have the greatest impact. Increasing exurban densities from 886 to 2,800 persons per square mile decreases commuting distances by 8 percent; an increase from 886 to 4,353 persons per square mile decreases commuting distances by 14 percent. Beyond this, further increases in density only shorten trips by a small amount.

In *Metro* (1994), a simulation was conducted for the Portland Oregon metropolitan area to examine how trip behavior would be affected by alternative development patterns. Among others, the patterns included “Growing Out”—allowing lower density single-family growth beyond the current urban growth boundary (UGB) and “Growing Up”—keeping all growth within the UGB, increasing densities of single-family housing and introducing more multifamily housing. The Metro simulation found that the concentrated development of the “Growing Up” scenario produced the greatest reduction in vehicle miles traveled over the base case (16.7 percent).

Several empirical studies have also shown that VMT decreases with higher density. In both a 1990 analysis of commuting in the San Francisco Bay area, and a 1994 study of 28 California communities, Holtzclaw found that neighborhood density was negatively related to VMT. (Holtzclaw also noted that other factors, such as transit access, affect VMT). There is evidence that the mixing of uses shortens trip lengths because of the greater interspersing of residence, employment, shopping and other functions. Frank and Pivo (1994) and the Middlesex, Somerset, Mercer Regional Planning Board (1990) (central New Jersey) found that with greater land-use mixes (and with a higher jobs-housing balance), trip distances decreased.

Segregation of uses and a dispersed, leapfrog development pattern—both characteristics of sprawl—were linked to increased travel in a recent Cervero (1996) study of dispersed subcenters in the San Francisco Bay area. Between 1980 and 1990 these centers experienced a significant (23 percent) increase in the commuting VMT—with 80 percent of the increase attributed by Cervero to the longer distances between home and work.

Gordon and Richardson, however, citing research by Crane (1996) hypothesize that the mixing of land uses (and other features of planned unit development and/or neotraditional neighborhoods) make trips cheaper because origin-destination distances are reduced. Therefore, a broad mix of uses “mean(s) more vehicle trips, and it is conceivable, perhaps more probable than not, that total VMT may increase” (Gordon and Richardson 1997, 987). This is a minority viewpoint, however, and is clearly put forth by Gordon and Richardson as a hypothesis, as opposed to an empirical finding. (See also “Amount of Travel” and “Travel Time” sections under the positive impacts.) By contrast, much of the transportation literature associates mixing of uses with lessened, rather than heightened, VMT.
In short, both simulations and empirical studies show that sprawl’s defining characteristics—low-density, leap-frog development and spatially segregated land uses—are associated with increased travel.

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**The Costs and Benefits of Sprawl: Alleged Negative Transportation/Travel Cost**

**Topic:** More Automobile Use

**Allegation/Basis**

*Under sprawl a higher fraction of total travel must be made in automobile vehicles as opposed to using transit or walking.* This assertion is almost true by definition, since one of the defining characteristics of sprawl is that motor vehicles are the dominant mode of transportation. Sprawl, with its low densities and spatial segregation of uses requires that virtually all trips be made in an automobile, while residents of areas with higher densities and a greater mix of uses have the option of riding transit, biking, or walking.

**Literature Synthesis**

The relevant literature relates modal choice (i.e., election to use an automobile versus transit, walking, biking, and other alternatives) to development density and development pattern.

Density has a major impact on travel behavior. Residents of lower-density residential environments use automobiles more and transit less (and often have longer work trips). Low density environments are also more costly to serve with transit. Numerous researchers have identified threshold levels of residential density for various types of transit to be viable for work trips. Frank and Pivo (1994) put the base level at 9 to 13 persons per acre. Employment density also matters. Compact downtowns support higher use of transit for work trips. Employment densities at work destinations, for example, need to be around 50–75 employees per acre for bus transit to begin to be feasible. Both light rail and commuter rail transit are more cost effective and efficient with dense central business districts which assemble numerous employment destinations very close together.

Development pattern outside the central business district also affects travel. Unlimited expansion of the urban fringe leads to lower densities and an increase in the number of locations that require automobile access. Segregation of uses also results in greater use of the automobile (and more travel). On a stretch of Route 1 in New Jersey, between the Woodbridge and Menlo Park Malls, there are 100 parcels of strictly commercial office or retail development. Only the malls are a mixed use. To go to lunch for any of the office users requires a vehicular trip to either mall or a retail facility—virtually none are conducive to walking and most are not within walking distance. Lunch hour on this section of Route 1 is as busy as prime commuting time.

Simulations of growth in regions have demonstrated that mixing uses in transit corridors results in less dependence upon the automobile and greater use of transit. At the activity center or neighborhood level, a mix of uses encourages walking...
for short trips and transit use for longer trips. (It is not clear, however, whether walking trips replace automobile trips or are in addition to them).

Not all observers agree with the above statements linking lower density and land use segregation with heightened travel. Gordon and Richardson (1997) argue that mixing of uses and other neotraditional design motives may increase rather than reduce automobile use (see Table 16). Yet there is an abundance of literature to support the initial view. Examples include the classic study of Pushkarev and Zupan (1977) which claims that population density explains much of the variation in transit use; a more recent investigation such as Metro (1994), which argues that a development scenario of higher density and containment within an UGB has the highest transit use; Cervero (1989), which shows that suburban centers with higher density and greater land use mix have higher commuting by non-auto modes; Kitamura (1994), which claims that density is the most important variable in influencing non-motorized travel; and Parsons (1996), which argues that higher density and mixed use—not urban design—are significantly related to other-than-automobile modal choice. Other studies reaching similar conclusions include Parsons (1996), Cervero and Gorham (1995), Handy (1994 and 1995), Holtzclaw (1990 and 1994), Cervero 1991) and Newman and Kentworthy (1989).

In short, the preponderance of the literature associates sprawl’s characteristics of low density, segregation of uses, and other traits with increased automobile use.

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**The Costs and Benefits of Sprawl: Alleged Negative Transportation/Travel Cost**

**Topic:** Longer Travel/Commuting Times

**Allegation/Basis**

*Residents in sprawl locations spend more time commuting as well as in other forms of travel.* Travel commuting time is greater under sprawl because its low-density, leapfrog pattern of development, and segregation of uses enhance the separation of residence, place of employment, retail, and other functions.

**Literature Synthesis**

Gordon and Richardson (1991, 1997) have argued that the suburbanization of jobs has reduced commuting times. In their words: “suburbanization has been the dominant and successful mechanism for reducing congestion. It has shifted road and highway demand to less congested routes and away from core areas. All of the available recent data from national surveys on self-reported trip lengths and/or duration support this view” (Gordon and Richardson, 1997, 98).

Other researchers have reached similar conclusions. Levinson and Kumar (1994), for instance, found that the
average commuting times in the Washington, D.C. metropolitan area remained stable from 1968 to 1988—despite this region’s significant growth—because a greater dispersion of activities helped keep travel time constant.

There is contrary evidence, however. Vincent et al. (1994) analyzed the National Personal Transportation Survey Data for 1990 and found that commuting times for residents of urbanized areas outside of central cities were longer than those of central city residents. The average peak period commute for the suburbanites was 21 minutes compared to 19 minutes for central city residents. Likewise, off-peak commutes of suburbanites were 19.7 minutes long compared to 17.2 minutes for central city residents. Pisarski (1992) further reports that based on census data, suburbanites had larger increases in commute times between 1980 and 1990 than central city residents. The average travel time for suburban residents that commuted either to suburban or central city locations increased by 14 percent, while the average commute time for a central city resident increased by only 5 to 7 percent.

Ewing (1995) argues that it is regional accessibility, not density or mix of uses, that determines total travel times. He found in a Florida study that residents in neighborhoods where jobs, schools, shopping, and other services were most accessible spent 40 minutes less per day in vehicular travel than residents of neighborhoods where these activities were least accessible. Shorter automobile trips, not use of other modes, makes the difference here.

Some simulations show less congestion (measured in vehicle hours of delay) with sprawl than with more dense development. Others show the reverse. Cambridge Systematics (1994), for instance, found almost a 20 percent reduction in vehicle hours of delay under a “highway only” scenario versus an alternative which clustered jobs, housing and shopping near transit lines.

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**The Costs and Benefits of Sprawl: Alleged Negative Transportation/Travel Cost**

**Topic: More Personal Transportation Spending**

**Allegation/Basis**

*Households living in sprawl developments must spend higher fractions of their incomes for transportation.* Households under sprawl spend more for transportation than those in higher-density forms of development because the former travel more and have less access to public transportation. This reduces the income available to spend on other life necessities, including housing.

**Literature Synthesis**

That household spending on transportation is higher under sprawl would appear to be a logical consequence of the two preceding alleged negative impacts—i.e., that travel mileage is greater under sprawl and more of this travel is by automobile. Only a few studies, however, directly address the issue of household costs for transportation under different development scenarios. The studies that estimate costs, such as Holtzclaw (1994)
conclude that residents of denser, more transit-friendly neighborhoods (as opposed to sprawl locations) should be able to spend a smaller share of their budgets on travel. However, because household characteristics, such as family size and lifestyle, can affect both travel behavior and budget allocations, it is unclear whether households in sprawl development configurations spend a higher fraction of their budgets on transportation due to sprawl or for other reasons.

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The Costs and Benefits of Sprawl: Alleged Positive Transportation/Travel Cost

**Topic:** Less Vehicular Miles of Travel

**Allegation/Basis**

*Sprawl generates less travel* versus other land use development patterns because residences and businesses ultimately "self correct" (Gordon and Richardson 1997) to be in proximity to one another. Other factors (see below) also contribute to sprawl’s lessened travel.

**Literature Synthesis**

Gordon and Richardson (1997) argue that the market forces embodied in sprawl may realize reductions in travel as residences and businesses ultimately spatially locate near one another. (See “Travel Time” under positive impacts.) In addition they hypothesize that the mixing of uses and other features of planned unit developments and/or neotraditional neighborhoods as compact development forms may increase VMT. From another perspective, while there may be more non-automobile travel in areas with mixed use—this travel may not replace but may be in addition to necessary automobile trips.

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**The Costs and Benefits of Sprawl: Alleged Positive Transportation/Travel Cost**

**Topic:** Shorter Travel/Commuting Times

**Allegation/Basis**

*Sprawl shortens travel/commuting time,* because suburban-to-suburban work trips, which characterize sprawl are shorter in average duration than commuter trips between central cities and suburbs. Moreover, automobile vehicle commuting trips are much shorter in average duration than public transit commuter trips, and the former predominate in sprawl. Thus, even though sprawl may cause average commuting trips to be longer in vehicle miles traveled (and even this is arguable), they are shorter in the amount of time consumed. Under sprawl there are also more single-occupant vehicle trips undertaken—the fastest and most direct mode of travel.
Literature Synthesis

See “Amount of Travel” in the negative impacts section. This is the same statement in reverse. Gordon and Richardson (1997, 98) argue as follows: “Industry moves to the suburbs, following the labor force, which allows many workers to enjoy a shorter work trip in time if not in distance and reduces congestion pressures in traditional centers.”

Although the adjustment is not instantaneous, and there are inevitable short-term disequilibria, the important point of the Gordon and Richardson argument is that the self-corrections are made relatively fast. Most available recent data from national surveys on self-reported trip lengths and/or durations corroborate the view that suburbanization has been a dominant force in shifting road and highway demand to less congested routes and away from central areas. The findings from all seven recent large-scale national household surveys present a consistent story of the containment of metropolitan area commuting times (Gordon and Richardson 1994b). Evidence from NPTS reports (Nationwide Personal Transportation Study) (1977, 1983, 1990); a commuting questionnaire included in the American Housing Surveys (1985, 1989); and the two decennial Census reports (1980 and 1990) make the same point.

See also “Amount of Travel” and “Travel/Commuting Time” in the negative impacts and “Amount of Travel” in the positive impacts sections.

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The Costs and Benefits of Sprawl: Alleged Positive Transportation/Travel Cost

Topic: Reduced Transit Subsidies

Allegation/Basis

Sprawl is associated with less capital spending and generates fewer operating losses for transit because a much higher percentage of all travel under sprawl is undertaken by the private automobile. Alternative forms of development that rely more on public transit, especially fixed-rail transit, must rely on large amounts of public subsidy to build transit facilities and to operate them, since such systems almost never recoup their costs from the farebox.

Literature Synthesis

Gordon and Richardson (1997) argue that the auto subsidy is less than that of the transit subsidy (Pucher 1995 and Ewing 1997) in turn rebut that the auto subsidy is in fact quite significant when a full cost accounting is done.

There is general agreement that the automobile dominance of sprawled regions results in less extensive, bus-only transit systems that primarily serve a small share of transit-dependent households. (Although some regions typically associated with sprawl, such as Los Angeles, have rail transit). There is also general agreement that bus-only systems require less capital outlay than rail systems but higher operating costs. There is little disagreement about whether sprawl results in less cost-efficient or effective transit systems. Sprawl is associated with very cost-effective commuter intercept lots located on or near major interstates or freeways. Less sprawl appears to enhance the use of local
bus systems and reduce the use of regional bus systems (Burchell 1992a). For agreement with the former statement, see Ewing 1997. Both historical and recent research shows that residential and employment densities are positively related to light rail and commuter rail cost-efficiency (annual operating costs plus depreciation per vehicle mile) and effectiveness (passenger-mile per line-mile). Similar studies have not been done for bus systems.

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**The Costs and Benefits of Sprawl: Alleged Negative Land/Natural Habitat Impact**

**Topic:** Loss of Agricultural Land

**Allegation/Basis**

*Sprawl removes more prime agricultural land from farming use than other more compact forms of development.* This happens for three reasons. First, low density uses inherent in sprawl’s residential development patterns require more space for the direct placement of dwelling units than higher-density uses under compact development. Second, the scatteration of dwelling units across the landscape far from the edges of built-up settlements renders the agricultural use of much of the land adjacent to the scattered dwellings inefficient and in competition. Third, the prospect of obtaining high prices for land motivates farmers and land speculators to assemble large parcels from prior farm use because these lands are contiguous and can be bought in bulk.

**Literature Synthesis**

Multiple studies have documented the significant losses of agricultural lands to the current development process. These studies range from national reviews of the loss of farmlands and farms over time, such as the National Agricultural Lands study (1981) and the American Farmland Trust’s *Farming at the Edge* (1997), to regional/state investigations of a similar type (e.g., Nelson [1992] in Oregon and Adelaga [1991] in New Jersey). There is substantial disagreement, however, about whether this loss of agricultural land creates significant social costs. To some observers, it appears that there is no shortage of prime agricultural land in the United States, since the nation has often produced crop surpluses (Gordon and Richardson 1997). Yet demands for food are rising sharply throughout the world, as living standards increase in once-poor nations and the world’s total population expands. Prices of major agricultural crops have already increased substantially in the last few years. Hence, in the long run, the world will need all the food production capacity it can muster. (Ewing 1997).

Further, there are widespread policy initiatives to try to preserve farmland. Many states, (e.g., Maryland, New Jersey and Vermont) and other levels of government (e.g., Lancaster County, PA) have adopted programs in recent years, ranging from the purchase of development rights to the enactment of “right to farm” laws, in order to foster land and farmland preservation. (Nelson, 1992)

Land development patterns are related to farmland loss. Numerous growth management plans—attempting to reverse sprawl—include farmland preservation as
an objective (New Jersey, 1991; Vermont, 1988; Maine, 1988). These are couched in goals of planned development as opposed to sprawl’s taking of farmland. The limited empirical investigations of sprawl’s impact on “consuming” farmland—and in opposition, the impact of alternatives to sprawl on farmland were performed by Burchell et al (1992-1997) in New Jersey, Lexington, Kentucky, the Delaware Estuary, Michigan, and South Carolina, and by Landis (1995) in the San Francisco Bay area. These analyses employed land consumption models at the minor civil subdivision level to look at differences between trend development or “business as usual’’ scenarios, and more environmentally conscious land development approaches. The former embodied sprawl-like characteristics; the latter, more compact and planned development characteristics. These models allowed future projections of households and jobs to be converted to the demand for residential and nonresidential structures, and ultimately to demand for residential and nonresidential land, with rules for spillover to adjacent municipalities and to unincorporated areas. In both the Burchell and Landis studies, historical rates of farmland takings were applied to land consumed under existing development patterns, and goals of farmland retention were applied under the alternatives. (A similar procedure was used for environmental land consumption comparisons.) In the Burchell study, agricultural lands included such categories as cropland that is harvested, pastured lands in permanent pasture, and woodlands that could be used for agricultural purposes. Fragile environmental lands encompassed floodplains and wetlands, acreage with steep slopes or with critical habitat designation, aquifer recharge areas and critical sensitive watersheds, and steam buffers.

The models, employing different densities, development locations, and occasionally different housing types under the alternative futures, calculated the total agricultural (and fragile environmental lands) that would be consumed. Burchell’s results showed savings in agricultural acreage consumed of roughly 20 percent in South Carolina, Michigan and Lexington under trend versus plan; about 30 percent in the Delaware Estuary; and 40 percent in New Jersey. (See tables 2 and 3 for details.) Landis’ results in the San Francisco Bay Area were even more pronounced. Scenario C (compact growth) saved nearly 50% in farmlands and steep sloped areas and close to 100% in wetland areas (Landis, 1995, 449).

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**The Costs and Benefits of Sprawl: Alleged Negative Land/Natural Habitat Impact**

**Topic:** Reduced Farmland Productivity

**Allegation/Basis**

The productivity of land being farmed near scattered sprawl settlements is reduced by the difficulty of conducting efficient farming operations near residential subdivisions. Subdividing land into small lots for residential purposes inhibits farmers’ ability to operate on large contiguous land parcels,
thereby reducing the efficiency of mechanized agricultural operations. Furthermore, under sprawl development, subdivisions and farms are typically interspersed and residents often object to the smell, noise, truck traffic, and other local conditions associated with active agricultural uses. Further, when this contiguous development situation occurs, local governments often impose restrictions on farming. These conditions bring about an “impermanence syndrome,” (see below) that is antithetical to sustained farmland productivity.

**Literature Synthesis**

There is an extensive literature on constraints to farming in urbanizing locations (Lisansky 1986; Lopez et al. 1988; and Nelson 1992). In rural areas that can be readily developed, high land values shift the farmers’ “objective function” from agricultural operations to capital gains from real estate sales. Real estate sales, in turn, reduce average farm size, thus limiting the realization of economies of scale—a characteristic of U.S. agriculture. To this are added a variety of restraints ranging from restrictive regulations to recurring vandalism. All of these factors foster an “impermanence syndrome”—a reluctance of the farmer to invest in new technology and farm infrastructure with land idle, awaiting conversion to real estate use. Numerous studies related to sprawl allege that the impermanence syndrome is deleterious to farmland productivity (AFT 1997).

The direct relationship of sprawl development patterns to farmland consumption was examined by Burchell et al. (1992a) for the state of New Jersey. In addition to projecting the total farmland that would be lost under trend versus plan development, the New Jersey analysis identified the quality of farmland that would be consumed—”prime,” “marginal” and “poor.” The New Jersey analysis showed that not only would trend development draw down more farmland, but since the better quality farmland is the most amenable for development (in that it is flatter, drains better, and so on) trend’s farmland loss was concentrated in the “prime” and “marginal” categories while plan’s farmland consumption would be overall less and wholly contained in the subprime “poor” farmland category.

The Burchell et al. New Jersey study thus considered the association of farmland quality and development patterns—but only from a farmland consumption perspective. No analysis to date has examined how development pattern (i.e., sprawl versus compact) would affect the productivity of farmland that remains in agricultural use.

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**The Costs and Benefits of Sprawl: Alleged Negative Sprawl Effects**

**Topic:** Reduced Farmland Viability (water constraints)

**Allegation/Basis**

*Growth through sprawl causes great expansion in the demand for water for urban uses, thereby reducing the amount of water available for agriculture. This is especially significant in those southwestern regions where sustained shortages of water exist. Agriculture uses much more water than urban settlements*
in many states where farming depends upon irrigation, such as Texas, Arizona, California, and Colorado. Therefore, as urban settlements expand in these areas, more water must be diverted from agriculture to supply the basic human needs of the resident population. This restricts the operation of farming in such areas. Furthermore, single-family property owners and corporate commercial facilities use water for lawn sprinkling, which appears to be an excessive use of this natural resource.

**Literature Synthesis**

Multiple studies have examined generally how development in more arid locations, especially in the West and Southwest United States, is drawing down the water supply, with potential conflict with the irrigation needs of agriculture. The literature, however, has not examined the specific association of sprawl and farmland viability with respect to water supply. This would involve a multi-linked analysis of:

1) how development affects water demand;
2) whether development’s consumption of water would differ under sprawl versus other forms of development in these areas; and
3) the relationship of steps (1) and (2) to the amounts of water supply for agricultural and residential settlements in given locations compared to the total supply available there.

Although a fully linked analysis such as the one described above has not been undertaken, an extensive literature exists on water demand relevant to steps (1) and (2). For instance, the Army Corps of Engineers incorporates in its water demand forecasting model, among other factors, the magnitude of lawn sprinkling, which is likely to be higher under sprawl versus compact development (NJDEP 1980). The Hittman water demand model includes housing density as one factor—a variable clearly different under sprawl versus more forms of compact development (NJDEP 1980). In a similar vein, the multivariable IWR-Main water forecasting model (Bauman and Dziegelewski 1990) incorporates in its multiple coefficients development density and the number of housing units by type (detached versus attached)—variables different under sprawl versus compact development.

The Burchell et al. (1992) analysis of trend versus plan development in New Jersey considered how water demand influenced water consumption under these two scenarios and incorporated some of the variables (e.g., housing type) noted above. Burchell found only small differences in water demand by development scenario; from 1990 to 2010 the increase in water demand statewide was projected to be 60.1 million gallons per day (MGPD) for trend versus 58.0 MGPD for plan. This analysis did not, however, relate this 2 MGPD variation finding to the demands on water supply for residential development versus agricultural uses in New Jersey. Water supply is not a development constraining issue in New Jersey—as it is in more arid regions of the United States.

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The Costs and Benefits of Sprawl: Alleged Negative Land/Natural Habitat Impact

Topic: Loss of Fragile Environmental Lands (e.g., acreage in wetlands, forests, flood plains and steep slopes)

Allegation/Basis

More frail lands are destroyed by sprawl than under more compact settlement patterns. Because sprawl spreads urban development over a much larger area than more compact settlement, it inherently consumes more land. Because land development under sprawl is not centrally planned or supervised, there is a greater probability that fragile environmental lands will be converted to residential and other uses. Local governments are likely to misjudge the consequences of environmental degradation because they are not concerned with the overall balance between environmentally sensitive lands and developing land uses in the region as a whole.

Literature Synthesis

Several studies document losses of and threats to fragile lands. Dahl (1990) estimates that since colonial times the United States (48 lower states) has lost about 110 million acres of wetlands—about 55 percent of the starting wetlands inventory. The Michigan Society of Planning Officials (MSPO) estimates that 20 percent of Michigan’s forested, wetland, and steeply sloped areas were lost between 1970 to 1990 (MSPO 1990).

Numerous growth management plans—attempting to reverse sprawl—have evaluated how managed versus traditional development patterns affect fragile lands. These include the Orlando, Florida Urban Area Growth Management Program (Orlando FL 1981), the Evaluation of City of San Diego Growth Management Program, and the Report of the Year 2020 Panel of Experts (Chesapeake Bay Executive Council 1988). The Orlando study examined how managed growth versus a “continuation of past trends” would affect the preservation of wetlands and flood plains. It projected under managed growth a saving of almost 20 percent in the inventory of these fragile environmental lands, (i.e., 20 percent less acreage lost).

Analyses of sprawl’s impact on fragile lands has been conducted by Burchell et al. (1992–1997) in New Jersey, Lexington KY, Delaware Estuary, Michigan, and South Carolina, and by Landis in the San Francisco Bay area. Burchell et al. found that plan (compact) versus trend sprawl-like) development would reduce consumption of fragile environmental lands by almost one-fifth. The range of the saving was from 12 to 27 percent, depending on the starting level and location of wetlands, forests and lands of steep slope in these jurisdictions (See Tables 2 and 3). Landis’ findings were even more pronounced, favoring the compact growth scenario and were calculated separately for steep slopes and wetland areas (Landis 1995).

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The Costs and Benefits of Sprawl: Alleged Negative Land/Natural Habitat Impact

Topic: Lessened Regional Open Space

Allegation/Basis

The setting aside of open spaces for public uses by residents of the entire region may be "under-funded" in sprawl-dominated areas, compared to those with more regionally oriented governance structures. Municipal governments motivated by fiscal pressures to provide benefits only for their own residents may be unwilling to devote resources to creating facilities for use by persons throughout the region.

Literature Synthesis

There is scant literature dealing with this issue explicitly to determine whether a substantial consensus exists. The only literature that does exist is that very large scale developments and conservation developments, both often of a nonsprawl nature, frequently have significant set-asides for contiguous open space. Arendt (1994) points to a movement from golf course communities to open space communities so that the private and public sectors have a greater chance to share in the land resources. The Sterling Forest Corporation, developing a 12,000-acre development in Tuxedo, NY, prior to land buyout by the federal government, pledged 75% of the land to remain in some definition of private/public open space (Sterling Forest Corporation 1993).

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occupants not wanting to pay community association maintenance fees, but at least some of this is related to the desire for more rather than less personal open space (NAHB 1995).

There is a very small literature that indicates that the skipped-over development patterns of sprawl create parcels of land that can be used for inner-suburban or urban open space as this becomes a local priority. Except in the wealthiest and most resilient of inner suburbs, this almost never is a choice or option of local government. Most governments in these localities feel pressed for fiscal resources and dispose of these land parcels to the highest bidder. Thus, the opposite to what is popularly suggested often takes place. Through the local variance process these lands frequently are given a higher intensity residential or nonresidential use. Those abutting properties rather than getting permanently improved open space receive more intensive and occasionally neighborhood disruptive land uses. This is because these uses can pay more in taxes than existing neighboring uses and the previously undeveloped vacant land. Thus, although there appears potential for inner open space to be the result of skipped-over lands, rarely does this happen (Downs 1994).

### Allegation/Basis

Low-density patterns are less pleasing aesthetically and provide fewer cultural opportunities. An important element of the quality of life of any community is the aesthetic and cultural satisfaction of its residents in daily life. If the environment they normally encounter is dominated by the homogeneous architecture of subdivisions and “strip” malls, the absence of quality civic spaces and landmark buildings, and a lack of pedestrian-scale amenities, the aesthetic satisfaction people derive from their surroundings is reduced. Moreover, sprawl does not easily lend itself to the formation of communities that have a feeling of cohesiveness and can organize to support the arts or other cultural institutions.

### Literature Synthesis

The aesthetically less pleasing aspects of sprawl, such as visual uniformity, are often cited as a cost of this form of development (Nelessen 1994). Critics of sprawl often decry its ugliness. For example, Shore (1995) maintains that “spread city” is inherently ugly because the settlement pattern has no clear form; retail businesses located along highways must use “raucous” signs to attract passing motorists; and a significant portion of the land is given over to the automobile. James Kunstler in a public presentation in Lansing, MI in 1996 described U.S. suburbs as “useless and without purpose and occupied by people of the same make-up” (Kunstler 1996).

Low-density developments, however, are not necessarily less pleasing aesthetically than more compact forms of development. The aesthetics vary from development to development. Some low-density residential developments, particularly high-income ones, may have
much more open space and elaborate landscape designs than high-density residential areas. In fact, defenders of sprawl often contend that the open spaces of sprawl make it more attractive than compact forms of development.

The literature reflects these two conflicting opinions. There is little evidence within the literature, however, to suggest that Americans find sprawl less attractive than more compact forms of development or that low-density living provides them with fewer cultural opportunities. Visual preference surveys have been used to gauge the reaction of Americans to sprawl, but such studies are often criticized for failing to make a distinction between sprawl and factors not typically associated with that form of development, (e.g., architectural design). Moreover, survey research does not consistently indicate that Americans overwhelmingly find sprawl to be aesthetically less pleasing than compact forms of development. While some surveys have revealed that when shown images of both sprawl and traditional communities, individuals favor the latter by a wide margin (Neuman 1991), some aspects of sprawl appear to appeal to Americans. Individuals were found to favor homogeneous neighborhoods over mixed neighborhoods by a margin of two to one (Bookout 1992). Survey research in Florida has suggested that individuals there have a strong preference for low-density or exurban living (Audirac and Zifou 1989).

On the subject of cultural activities, Shore (1995) contends that sprawl does not allow for the formation of communities that easily organize to support activities such as the arts. As a result, low-density residential communities may have fewer and lower quality cultural activities than urban areas. Shore argues that a movement away from “spread city” and toward the restoration of downtown areas would result in more cultural activities and other services that are supported by large communities.

In general, few will argue with the belief that an attractive and aesthetically pleasing community increases its overall quality of life. Within the economics and migration literature, it has been well documented that a community viewed as having a high quality of life will attract and retain individuals. Studies of migration patterns find that a community's scenery, natural environment, and outdoor recreational opportunities are important factors in attracting and retaining individuals. A survey study of migrants to and residents of 15 wilderness counties found that scenery and environmental quality were more important factors in attracting individuals than employment opportunities or cost of living (von Reichert and Rudzitis 1992). Two of the most important conditions that “lone eagles” (individuals who are able to live anywhere and telecommute to work) cited as influencing their decision to move to the state of Washington were the quality of the natural environment and the outdoor recreational opportunities there (Salant et al. 1996). Cushing (1987) demonstrated that proximity to mountains and coastlines influenced population migration due to the aesthetic qualities and additional recreational opportunities that such features provided. Empirical results indicated that interstate migrants are attracted to hilly terrain and major coastlines.

As noted, however, there is only some agreement over whether low-density developments are aesthetically less pleasing than more compact development patterns. In particular, the literature fails to indicate a significant causal relationship between sprawl and aesthetically less pleasing low-density development. What
the literature does indicate, however, is that the aesthetics of low-density areas will vary from place to place and that the preferences of individuals will vary from person to person.

**Literature Synthesis Matrix**

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**The Costs and Benefits of Sprawl: Alleged Negative Quality Of Life Impact**

**Topic:** Lessened Sense Of Community

**Allegation/Basis**

*Low-density development weakens households’ connections* to both their immediate neighbors and to the larger metropolitan community, and encourages unsocial values. Sprawl weakens the linkages of residents—both between nearby neighbors, and among all other residents of their metropolitan area. Linkages with neighbors are reduced because the low residential density, the heavy orientation towards moving by car rather than on foot, and the lack of neighborhood retail outlets and other meeting places diminish interpersonal contacts. Linkages with other residents throughout the metropolitan area are also diminished by the fragmentation of governance and fiscal resources that prevent a commonality of purpose, and by the extreme diffusion of households and jobs throughout an area. The resultant loss of a sense of community makes it difficult to generate support for region-wide attacks on social and other problems which cannot be solved by purely local policies and actions. Finally, because sprawl in its most pejorative manifestations is wasteful, unaesthetic, and antisocial, it is not an environment that nurtures the important social values of ecology, sustainability, and community.

**Literature Synthesis**

Critics of sprawl often claim that a loss of “sense of community” is one of its greatest social costs (Ewing 1997). Defenders of low-density settlements, however, deny that residents experience any less “sense of community” than residents in big cities or more compact settlements (Gordon and Richardson 1997). In fact, the evidence from as far back as Herbert Gans (as cited in Jacobs 1961) indicates that some dense areas lack community, while some suburban areas have it. Much of the controversy arises because “sense of community” is difficult to define and even more difficult to measure.

In his review of the literature on “sense of community” Cochrun (1994) finds that the term has been used to describe a number of things, but that the most comprehensive definition was developed by McMillan and Chavis (1986). McMillan and Chavis identified four factors that contribute to sense of community: (1) membership; (2) influence; (3) integration and fulfillment of needs; and (4) shared emotional connection. Cochrun (p. 93) offers a definition of “sense of community” that incorporates the four factors identified by McMillan and Chavis:

> "People who have a strong sense of community feel like they belong in their neighborhoods, they believe they exert some control over what happens in their neighborhoods while also feeling influenced by what happens in them, and they believe that their needs can be met through the"
collective capabilities of their neighborhoods."

In *Edge City: Life on the New Frontier*, Garreau (1991) searches for a definition of community, particularly within Edge Cities, and reaches the conclusion that community and neighborhood no longer mean the same thing. Instead, Garreau maintains that "mobility" and "voluntary" are two important terms that help to define community—individuals want to be able to both join and leave communities at their choosing. Moreover, Garreau contends that a community should be a social grouping that is readily available to individuals and does not interfere with individual freedoms.

In partial contradiction, in an article examining changes in suburban Illinois, Lemann (1989) found that community building efforts in Naperville, a fast-growing suburb of Chicago, were hindered by the high rate of turnover of residents.

Critics of sprawl argue that residents in mixed-used neighborhoods have more sense of community and social interaction than do residents living in low-density developments because they are more likely to walk from place to place and, consequently, they are more likely to have contact and interaction with others. Residents in low-density areas, on the other hand, rely more on their cars for shopping and recreation trips and, hence, are less likely to develop contacts and friendships with their neighbors (Nasar and Julian 1995). Drawing on the work of Glynn (1981), Nasar and Julian assessed the psychological sense of community across different neighborhoods and housing conditions in northwest Columbus, Ohio. They found that residents of mixed-used areas had significantly more sense of community than residents of single-use neighborhoods.

Opponents of sprawl also maintain that low-density development weakens a "sense of community" by segregating residents (Duany and Plater-Zyberk 1995; Kelbaugh 1993). According to Kelbaugh (p. 24), suburban insularity breeds "ignorance, misunderstanding, and ultimately builds tension" among residents. Kelbaugh prefers high-density, mixed socioeconomic, racial, and ethnic neighborhoods because they allow individuals to "rub shoulders" with fellow residents on a daily basis and work out differences. Similarly, Duany and Plater-Zyberk contend that suburban housing fosters a breakdown of the larger community because it segregates residents by income into enclaves.

Kunstler (1996) attacks suburban sprawl and the zoning laws that have created it. The allegation that low-density residential living lowers "sense of community" may be inferred from his remark that "The model of human habitat dictated by zoning is a formless, soul-less, centerless, demoralizing mess... It corrupts and deadens our spirit." Like Duany and Plater-Zyberk (1995), Kunstler argues for development patterns that are mixed-use and provide housing for people with different incomes.

Sprawl may weaken not only households' connections to neighbors and the larger community, but it may also weaken connections between family members who occupy the same residence. Some contend, for example, that sprawl reduces the amount of time parents spend with their children because more households must have two people working outside the home in order to pay for the multiple automobiles required by...
daily life.1 This need to support the household's transportation facilities may, in fact, even reduce the quality of child care provided by parents. Some contend that mothers working outside the home provide lower quality child care than those who stay at home. The subject is fraught with controversy (Joseph 1992). Meanwhile, Kelbaugh (1993) examines another potential non-economic social cost associated with sprawl—the tensions that result from parents spending long hours commuting instead of with their children or each other.

The literature does not readily provide support for the opposite allegation: i.e., low-density development strengthens households' connections to both their neighbors and larger community. Ewing (1994a) suggests, however, that low-density development does not provide residents with any less "sense of community" than higher-density development. After reviewing extensive literature on sprawl, he concludes that there is not enough evidence to determine whether a lack of an identifiable community is associated with sprawl.

One further issue related to a lack of "sense of community" is the "throw-away mentality" or, more elegantly, the lack of value for ecology and sustainable life styles. Some argue that sprawl encourages the "throw-away" mentality among households.

In a sense, sprawl development may be seen as a continuation of the "frontier mentality" of early American settlers who believed they could change their current situation by leaving existing homes and problems behind and moving west onto vacant land. More recently, millions of American households have moved out of central cities and older inner-ring suburbs for the same reason—to escape the problems of those areas, leaving the problems behind for others to solve. Few, if any, studies of sprawl have dealt with this issue and none have proposed any way to measure the "throw-away mentality."

### Literature Synthesis Matrix

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### The Costs and Benefits of Sprawl: Alleged Negative Quality Of Life Impact

#### Topic: Greater Stress

#### Allegation/Basis

*Because people spend more time driving, they have less free time and more stress.*

This allegation has two components; first, that sprawl increases the time people spend in cars relative to higher-density forms of development and, second, that increased travel time leads to stress and other impacts. It has also been alleged that commuting through the aesthetically unattractive environments of commercial strip development that are typical of sprawl produces more psychological stress on commuters than would commuting through environments dominated by trees and open space.

### Literature Synthesis

Here, as with many of the topics evaluated in this report, there is substantial overlap with other topics and
alleged effects. In this case, the overlap is with transportation effects, which include allegations about traffic congestion and travel times. The reader is referred to those sections for more details on points discussed here.

Much of the debate about commute time has been based on data that compare travel times for residents of suburbs and central cities. There is little data on the travel times associated with the density of development. Ewing (1997) in his analysis of household travel patterns in a sprawling Florida county purports to show that households living in the most accessible areas spend about 40 minutes less per day traveling by vehicle than do households living in the least accessible locations (Ewing 1995; Ewing et al. 1994). Ewing states that this savings in travel time is due almost entirely to shorter auto trips, and that the significant land-use variable affecting travel times is regional accessibility, not local density (Ewing 1997).

There is evidence that increased commuting time increases the stress of commuters. Novaco et al. (1990) found that increased travel impedance, as measured by commuting distance and time, is associated with increased measures of stress. Travel impedance was also found to have statistically significant effects on job satisfaction, work absences due to illness, and overall incidence of colds or flu. Subjective or perceived conditions of travel impedance were found to have statistically significant effects on mood at home in the evening and chest pain. Consequently, the study found that job change in the sample was primarily related to commuting satisfaction. This study validated results from the authors’ previous work, which found that impedance characteristics of commuting are stressful, as measured by effects on blood pressure, tolerance for frustration, negative mood, and overall life satisfaction. This earlier work also found that the desire to change residence because of transportation conditions was related strongly to high impedance (Novaco et al. 1979; Stokols and Novaco 1981; Stokols et al. 1978). The physical stress effects of impedance have been corroborated by a study of the effects of average commuting speed on blood pressure and proofreading measures (Schaeffer et al. 1988).

Koslowsky and Krausz (1994) directly addressed the links among commuting time, stress, and workers’ attitudes toward their jobs, based on a statistical analysis of survey responses from the over 600 nurses that participated in their study. The researchers found that commuting is a possible source of recurrent stress that can lead to undesirable organizational consequences. This study also found that the correlation between commuting time and stress was stronger for those who drove to work compared to those using public transit, but the authors do not rigorously explore the reasons for this difference. Koslowsky and Krausz (1994) also cite prior literature that found a relation between the commuting experience and such organizational outcomes as: absenteeism (Taylor and Pocock 1972), lateness (Gaffuri and Costa 1986), and turnover (Seyfarth and Bost 1986).

The literature on the stress effects of commuting does not rigorously address the link between commuting stress and the density of development or urban form. Novaco et. al. (1990) address this link by stating their finding that stress effects are strongly associated with freeway travel and with road exchanges; they also assert that freeway travel in southern California has become increasingly congested because roadway
capacity has not kept pace with continued growth.

It has been alleged that commuting through the aesthetically unattractive environments provided by the commercial strip development typical of sprawl produces more psychological stress on commuters than does commuting through environments dominated by trees and open space. Very little literature pertaining to this allegation exists. One study, however, claims to have tested commuters psychologically and arrived at a finding that supports this claim (Ulrich et al. 1991).

Other sections of this report comment in more detail on the evidence regarding sprawl and travel time. No conclusion is made here. The professional literature suggests, however, that commuting can be shown statistically to contribute to stress—a happy coincidence of science and common sense.

**Literature Synthesis Matrix**

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**The Costs and Benefits of Sprawl: Alleged Negative Quality of Life Impact**

**Topic:** More Air Pollution

**Allegation/Basis**

*Society consumes more scarce energy under sprawl, especially imported oil. Sprawl requires more travel overall and more of this travel is by energy-inefficient automobiles instead of more efficient modes of transit.*

**Literature Synthesis**

Ewing (1997) and many other researchers, contend that the evidence consistently demonstrates that automobile use, and hence energy use, is higher with sprawl. Yet, Gordon and Richardson (1997) are not convinced that the link between vehicle miles of travel, energy use, and density is firmly established.

Coloring this argument is the perspective on energy scarcity and availability. Gordon and Richardson speak of an energy glut and an OPEC cartel that has lost its clout (Gordon and Richardson 1997, 97) while Ewing cautions that energy sources are not unlimited and reliance on foreign energy supplies is a continued concern for the United States foreign policy (Ewing 1997, 114).
occur in some very high-density portions of more compact regions.

Literature Synthesis

Most, but far from all, observers agree that low-density settlements generate more total automotive travel than more compact settlements, other things being equal (see prior discussion); therefore, low-density settlements generate more auto-oriented emissions per 100,000 residents. However, the intensity of air pollution in each metropolitan area is affected by many other factors, such as locations of major urban centers, prevailing winds, mountain barriers, temperature inversions, and general climate. Hence there is substantive disagreement whether sprawl is a key factor determining the degree of air pollution in each metropolitan area.

Burchell in the New Jersey Impact Assessment of the State Development and Redevelopment Plan found that air pollution would be very similarly reduced in both future alternative development scenarios (Burchell et al. 1992a). Most of the reduction would be due to more stringent emission controls that would affect the entire motor vehicle fleet of New Jersey as opposed to differing locations of wherein a region this fleet would be replaced. In other words, development pattern, at least in this instance, did not significantly influence air pollution levels. (The New Jersey Impact Assessment also considered effects on water pollution under trend and plan conditions. Plan was found to generate about one-third less water pollution than trend, although heavy metals in urban stormwater runoff were increased under the plan development scenario.)

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The Costs and Benefits of Sprawl: Alleged Negative Quality of Life Impact

Topic: Lessened Historic Preservation

Allegation/Basis

*Sprawl makes it more difficult to preserve historically significant older structures than would otherwise be the case.* Sprawl encourages economically viable firms and households to leave inner-city neighborhoods by permitting them to move to the suburbs without paying the full marginal costs of their doing so. In particular, those who move are not required to compensate those who are excluded from suburban communities for losses the residents that remain behind suffer. Therefore, the economic base supporting older structures of historical significance is weakened. Neighborhood conditions in the vicinity of such structures also worsen because of the increased concentration of poverty and historic structures located there are consumed by these forces.

Literature Synthesis

This allegation has been put forward mainly by the National Trust for Historic Preservation in its various publications attacking sprawl.

The following argument (Beaumont 1996) summarizes the reasoning behind the professed association between sprawl and preservation. Not many other
observers of sprawl have commented on whether or not this association is valid.

Sprawl affects historic preservation in five major ways (Beaumont 1996, 264):

- Sprawl adversely affects older downtown and neighborhoods, where historic buildings are concentrated. When the economic vitality of a historic area suffers, the buildings in it often become underused or empty. Over time, many of them are "demolished by neglect" or torn down to make way for surface parking lots.
- Sprawl destroys community character and the countryside. Cohesive Main Streets, old stone fences, historic trees, country roads—these and other features of the American landscape are rapidly being destroyed by sprawl development and the vast expanses of asphalt required to accommodate it.
- Sprawl reduces opportunities for face-to-face interaction among people, thereby making it more difficult to create, or retain, a sense of community. By scattering the elements of a community across the landscape in a haphazard way, sprawl provides no town centers and reduces the sense of ownership—and therefore also the commitment—that people have toward their community.
- Sprawl forecloses alternatives to the automobile as a means of transport, thereby adding to pressures to create or widen roads that often result in the demolition of historic resources or the degradation of their settings.
- Sprawl leaves older cities and towns with excessively high concentrations of poor people with social problems, making these places a very difficult environment in which to revitalize communities.

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The Costs and Benefits of Sprawl: Alleged Positive Quality Of Life Impact

**Topic:** Preference for Low-Density Living

**Allegation/Basis**

*Many households prefer low-density residential living.* Many consumer preference surveys reveal that a key part of the “American dream” is ownership of a detached, single-family home with attached private open space in the form of a backyard. More important than the stated preference, however, is the revealed preference: for the last 50 years, suburban development has been the primary form of metropolitan residential growth, and single-family housing units have been the dominant residential form. Consumers clearly choose low-density suburban living given existing alternatives and prices. Most housing developers consistently build low-density subdivisions because they are easier to market than higher-density developments. If low-density, single-family, detached housing is what many people want, lower land prices at the urban fringe make it affordable to most people (Downs 1994).

**Literature Synthesis**

The suburbanization of population and jobs in the United States has been well documented. In 1950, almost 70 percent of the population of 168 metropolitan areas lived in central cities; by 1990 over 60 percent of the population of 320 metropolitan areas lived in the suburbs and a majority of jobs in metropolitan areas were in the suburbs as well (Rusk 1993). The process of suburbanization has lowered average population densities in urban areas. Between 1950 and 1990, the number of residents in urbanized areas with population over one million in...
1990 increased 92 percent, while average population density decreased 44 percent (Wendell Cox Consultancy 1996). The fact that Americans choose to live in low-density areas has been cited as strong evidence that Americans prefer that lifestyle.

A preference for suburban living has also been shown in other studies. The most recent annual survey by Fannie Mae (1996) shows that home ownership is a top priority for 69 percent of Americans, and that 73 percent desire a single-family detached house with a yard on all sides.

Another study that generated quality-of-life rankings for the fifty U.S. states over the period 1981–1990 found that sparsely populated, mountainous western states such as Montana and Wyoming had a higher quality of life ranking than more densely populated midwestern and eastern states (Gabriel et al. 1996). Urban congestion has been cited by “lone eagles” (individuals who are able to live anywhere and telecommute to work) as a factor influencing their decision to move (Salant et al. 1996).

The most recent Journal of the American Planning Association (Winter 1997) has two articles dealing with alternative views on sprawl that summarize many of these arguments. Gordon and Richardson (1997) revisit several issues relevant to the compact cities discussion, including residential density preferences. They maintain that consumers, given the choice between low-density suburban living and high-density urban living, overwhelmingly choose the former: “But that suburbanization itself should be an object of attack is amazing, given the expressed preferences of the majority of Americans for suburban lifestyles and the supposed sanctity of consumer sovereignty” (p. 99). Drawing on the literature, they attempt to dispel the belief that the choice for low-density residential living is a constrained choice, strongly influenced by government policies that promote suburbanization, including subsidized automobile use and zoning laws that restrict high-density development. Gordon and Richardson argue that more subsidies are given to public transit than to auto travel, and hence, government policies do not necessarily promote low-density living over high-density living. In response to the argument that developers are prevented by zoning and land-use regulations from building at higher densities, Gordon and Richardson maintain that developers are just offering what the market demands: “The risks of building an unacceptable product are very high, and builders are well aware of the strong consumer preference for the single-family detached home. ... “ (p. 97).

Though Ewing (1997) agrees with Gordon and Richardson (1997) that the recent choice of U.S. households has been for low-density suburban living over high-density urban living, he contends that given a larger set of residential living choices, consumers do not necessarily favor the former: “There is strong consumer preference for new single-family detached housing—a housing type concentrated in the suburbs. But most people could do without the rest of the suburban package” (Ewing 1997, 111). Ewing maintains that compact development is capable of holding its own in the marketplace. He cites evidence from the literature on consumer preferences. According to Ewing, the literature reveals several things: (1) the suburbs often rank below small towns, villages, and rural settings; (2) home buyers, given a choice, are evenly divided between low and medium-to-high density residential settings; (3) home buyers in high-priced housing markets often prefer small-lot houses; and (4) the
public, given a choice, is almost evenly divided between mixed- and single-use areas (Ewing 1997, 111).

In his earlier "Characteristics, Causes, and Effects of Sprawl: A Literature Review" Ewing (1994) offers additional evidence to bolster his contention that consumer preference surveys do not clearly support low-density living over more compact forms of settlement. Surveys where people are shown images of sprawl and traditional communities reveal that, for the most part, the latter are favored by wide margins (Neuman 1991, 74). Some surveys, however, have found that people favor homogeneous neighborhoods over mixed-use neighborhoods by a margin of about two to one (Bookout 1992, 128), and that people prefer low-density suburban or exurban living (Audirac and Zifou 1989).

Other surveys of consumer preferences have also shown mixed results. A September 1995 survey of people who shopped and ultimately bought in planned communities indicated that 57 percent of the respondents agreed with the statement "I'm tired of living in the sterile uniformity of most suburbs." Yet, more than three-fourths of the respondents believed in the American dream of a big yard and a house set back from the street (Bradford 1996).

There may be something approaching universal agreement that U.S. residential patterns in metropolitan areas have become increasingly suburbanized (i.e., have lower density or sprawl). There is probably close to general agreement that many, if not a majority, of U.S. households prefer single-family detached housing given current options and prices—allbeit observers raise the issue whether households would move in significant numbers to other options if they were available.

The question about whether sprawl is strongly linked to these residential choices is a matter of interpretation. At one extreme, the choice of low-density housing is, in essence, the definition of sprawl, so the question of whether it is caused by sprawl is circular. Another interpretation is that the mere existence of the pattern (sprawl) and its accompanying low-density housing influences peoples' preferences, like the advertising of any product.

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**The Costs and Benefits of Sprawl: Alleged Positive Quality Of Life Impact**

**Topic:** Low Concentrations -- Associated Crime  

**Allegation/Basis**

*Low-density development patterns have lower crime rates.* Households move out of central cities to escape the high rates of crime they have encountered there. Relatively high crime rates are statistically associated with very low-income areas, especially within large cities. Such areas also often have much higher population densities than the neighborhoods typical in sprawl development.

**Literature Synthesis**

Statistics appear to indicate that urban residents experience higher rates of crime than their suburban or rural counterparts. In 1994, the estimated rate (per 1,000
persons aged 12 and older) of personal victimization, which includes robbery, assault, rape, and personal theft, was highest for inhabitants of urban areas at 67.6. Suburban areas experienced a rate of personal victimization of 51.8 and rural areas had a rate of 39.8 (Pastore and Maguire 1996). 1995 crime statistics released by the Federal Bureau of Investigation (FBI) indicate that the Crime Index (comprised of selected violent and property offenses) was higher in Metropolitan Statistical Areas (MSAs) (5,761 per 100,000 inhabitants) than cities outside MSAs (5,315 per 100,000). Rural counties had the lowest index number of 2,083 per 100,000 inhabitants (Federal Bureau of Investigation 1996).

Research does not strongly indicate that the higher-density living commonly found in urban areas is associated with higher crime rates. Using 1974 census data, Newman and Kentworthy (1989a) correlate density with crime statistics for 26 major U.S. cities. Simple linear correlations suggest that there is no significant relationship between crime and density. Similarly, correlational studies within the environmental psychology literature find no consistent relationship between population density and social pathologies (Sherrod and Cohen 1979).

Several studies indicate that communities with high quality-of-life rankings exhibit low crime rates (Roback 1982, 1988; Rosca 1979). The amount of crime in a community may also affect migration patterns for both workers and firms. Salant et al. (1996) and von Reichert and Rudzitis (1992) found that crime was a factor that influenced individuals' decisions to migrate to a community that they perceived would provide a better quality of life.

Results from the Salant et al. study also indicated that individuals were attracted to locations that provide a safe place to live. A study using data from the 1983 Annual Housing Survey, however, found that few individuals moved to a particular neighborhood for greater safety (Spain 1988). The main reasons for moving that survey respondents reported were to find a less expensive place to live and to reduce their commuting times.

A study by Gottlieb (1995) concludes that firms in the high-tech sector are less willing to locate in areas characterized by high levels of violent crime.

Studies have found that perceptions of personal safety differ between residents of high-density urban areas and low-density suburban areas. A 1995 nationwide telephone survey of over 1,400 adults attempted to discern how safe individuals felt in their communities. When asked, "In the past year do you feel safer, not as safe or about the same on the streets in your neighborhood?" 14 percent of suburban residents felt less safe compared to 22 percent of urban residents. On the other hand, 12 percent of urban residents compared to 9 percent of suburban residents felt their safety had increased over the past year (Pastore and Maguire 1996). Through interviews, Hummon (1990) determined that rural residents view danger as both an integral part of city life and an indicator of social problems. Urban residents, however, considered crime and danger to be more a factor of socioeconomic conditions and location than an integral part of city life.

Using surveys of low-income, single-parent women, Cook (1988) found that urban women were two times more likely than suburban women to indicate they felt unsafe in their apartments and neighborhoods.

Researchers within the criminal justice field conclude that perceptions of crime and security vary with site characteristics
and socioeconomic conditions and thus, fear of crime does not always accurately reflect actual crime rates. Instead, fear of crime is often derived from incomplete knowledge of crime rates, observable evidence of disorder, and prejudices arising from neighborhood change (Skogan 1986). Other studies conclude that the direct effects of the physical environment on crime rates range from small to moderate (Taylor and Gottfredson 1986).

Within the popular literature, there appears to be agreement that crime reduces a community's overall quality of life. Studies from popular literature commonly use crime as one measure of a community's quality of life. For example, quality-of-life rankings of cities in the popular literature, including the Places Rated Almanac (Savageau and Boyer 1993), Money magazine's "Best Places to Live in America" (Fried et al. 1996), and Fortune magazine's "Best Cities: Where the Living is Easy" (Precourt and Faircloth 1996), all include some measure of crime as a component of a community's overall quality of life. In particular, Fried et al. found that a low crime rate is one of the top 10 quality-of-life characteristics desired by Money magazine subscribers.

Selected crime statistics obtained from the Federal Bureau of Investigation (FBI) indicate that lower-density developments, such as suburban and rural areas, have lower crime rates than high-density urban areas. Empirical studies that have examined the relationship between crime and density, however, have found mixed results—increased density does not necessarily result in higher crime rates. The mixed results may be a factor of how individual studies define and measure crime and crime rates. There appears to be agreement that suburban residents perceive themselves to be more safe than their urban counterparts.

Although the literature appears to demonstrate, at best, correlation between density and crime, it does not demonstrate causality between sprawl and low crime rates. Studies have found that the effect of physical environment on crime rates ranges from minimal to moderate and that crime is more a factor of socioeconomic conditions than density. An argument might be made that sprawl reduces crime rates in a round-about way—sprawl is correlated with higher incomes which, in turn, are often correlated with spending more on home protection and public safety. This argument, however, does not demonstrate that sprawl causes lower crime rates.

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**The Costs and Benefits of Sprawl: Alleged Positive Quality Of Life Impact**

**Topic:** Reduces Costs Of Goods And Services

**Allegation/Basis**

*Many households find the cost of public services and other goods and services in suburban locations a better value.* Retail development in suburban, lower-density locations reduces the costs of many goods for consumers. For the public sector, suburban locations often provide better services (especially schools) for an equivalent or lower tax burden.
private sector goods and services, particularly retail sales, the lower land values in suburban areas allow land-intensive development formats, which include expansive ("big box") floor space and parking. The formats in turn attract high-volume, low-cost retailers. The parking is necessary because of the type of goods being purchased (electronics, appliances, home improvements) and the volumes of the purchases (super sizes and quantities for super discounts).

**Literature Synthesis**

The alleged benefit for public services substantially overlaps the alleged benefits reviewed under the heading Social Issues in this literature review. Two of the alleged benefits discussed there are germane here:

- The ability of jurisdictions to define a relatively homogeneous population with relatively similar service needs (which also provides opportunities for both economies of scale and concentration, and for dropping services not needed by the homogeneous population (e.g., social services for low-income households).

- The ability to have different tax levels and service qualities.

There is an on-going professional debate about the institutional structures by which public services are most efficiently and fairly provided, and a large body of literature on the subject. Not surprisingly, the poles of the debate are occupied by those who believe in the efficiency of markets, and those who believe such markets operate imperfectly without government intervention. In the 1950s, Tiebout (1956) laid out the basic arguments for market choice (which, when applied to government is sometimes referred to as "public choice"). He argued in favor of multiple small governments that allow households to "vote with their feet," choosing to live where the combination of public services, quality, and cost best met their preferences.

In contrast are those who argue (see, for example, Foster (1996) that typical market failures in the provision of public goods require larger units of government so that external costs can be internalized, increasing the odds that sufficient public goods will be provided. Arguments are made for the improvement of both efficiency and equity.

Because this topic is being treated elsewhere in this report, it is simply noted here that there is an extensive literature arguing both positions. There is certainly no agreement on this subject, nor is any likely, since to come to a conclusion would require, among other things, agreement on two issues where people's opinions derive as much from underlying philosophies as from the results of social science: the proper scope of government intervention, and the tradeoffs between efficiency and equity.

On the private side, there is ample anecdotal evidence that big box retailers make their money by high volumes on low margins, which for consumers means low cost. The growth of these retailers (e.g., Wal-Mart, Home Depot, Costco) is evidence of demand, which suggests that they are giving consumers more of what they want. Additional anecdotal evidence suggests that many people who would oppose such retailers in their neighborhoods are some of the same ones who drive, often substantial distances, to shop at these stores in other parts of a region.

The next question for this research, however, is: To what extent are low-
density development patterns essential for those cost savings? Recent work done to help evaluate the impacts of plans for metropolitan Portland, Oregon (ECONorthwest 1996) sheds some light on this issue. After quantifying vacant land supply, researchers conducted focus groups and work sessions with retail developers and brokers. Their opinions were that to satisfy today's consumers most retail development had to accommodate the automobile, and that vacant, low-priced land in sizable parcels was critical to development that accommodated the automobile, especially big box retail. High density areas are likely to have higher land values, less vacant land, smaller parcels, and more existing residents to oppose the new retail development.

A few central cities have seen new discount retailing. In most cases, however, the development has occurred on underutilized industrial parcels whose zoning either defines the retail uses as compatible or makes variances easy to receive. In that case, low value land is still the primary factor allowing the development to proceed.

There is reasonable evidence to conclude that people want are to be had at lower prices in lower-density parts of metropolitan areas. As with other effects, whether sprawl causes this effect is a matter of interpretation. On one hand, sprawl is the effect: the low-density retail pattern is what enables retailers to reduce prices. On the other hand, a pattern of sprawl may be causal if it implies more retail of the same type is desirable and allowable, and if it creates a pattern that allows more low-cost land to be developed more easily. Sprawl probably does both.

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### The Costs and Benefits of Sprawl: Alleged Positive Quality Of Life Impact

**Topic:** Fosters Greater Economic Well-Being

**Allegation/Basis**

*As an outcome of a free market, sprawl benefits from the market decisions made by individual household and firms to maximize their welfare* (as measured by utility or profit). By restricting these individual choices, efforts to limit sprawl will reduce the overall standard of living.

A central tenet of free-market economics is that individual households and firms act in ways to maximize their welfare, and the result of these individual decisions is to maximize welfare for society as a whole. In this context, sprawl is considered to maximize welfare for society because it represents the outcome of individual choices by households and firms about where to locate and how to build homes and businesses.

Critics of free-market economics point out that decisions are based solely on the costs and benefits faced by the individual household or firm, and so do not consider the costs or benefits to others that may result from their decision (the costs and benefits to others are referred to as externalities). Critics of sprawl point out the negative externalities—traffic...
congestion, increased public infrastructure costs, and accelerated development of farm land and open space, for example—and argue that these externalities reduce social welfare. Critics of sprawl often suggest policies to address the negative externalities of sprawl. It is the debate over these policies that the alleged impact on economic well-being is most often discussed.

There is also extensive debate about the level of negative externalities; whether these externalities are caused by sprawl, and the effectiveness of policies to address these externalities. This debate occasionally touches on whether the policies will affect the costs and benefits faced by individual households and firms.

A primary concern is whether policies to limit sprawl will increase the cost of housing—this impact is addressed elsewhere in this study. An argument that is also occasionally brought up is whether policies to limit sprawl will in turn limit job growth in an area, and thereby reduce income for area residents and limit economic development opportunities. These are the impacts that are focused on in this section.

**Literature Synthesis**

In the New Jersey impact assessment Burchell et al. (1992a) found that New Jersey could accommodate similar magnitudes of population and employment growth under both trend and plan development patterns. Distributional patterns would differ, however; plan development would direct more jobs to urban and rural centers and fewer to suburban areas than trend (Burchell 1992a, 19).

Sheppard (1988) relates sprawl to the economic well-being of residents. Sheppard found that an increase in space available to a particular class of residents results in lower rents at all locations, increased “suburbanization” for all classes, and increased utility for all classes. Sheppard cautions the reader, however, that the results consider neither externalities nor the public good associated with the exercise of development controls.

Most authors argue simply that sprawl must maximize welfare because it results from free-market decisions; Gordon and Richardson (1997, 99). The economic well-being benefits of sprawl are most often addressed in arguments against policies to limit sprawl. These arguments are based on the considerable literature that shows that measures that increase density increase the cost of land. It is argued that an increase in density will reduce job growth and economic development opportunity by increasing the cost or limiting the number of sites available for commercial development, and by increasing the cost of housing which in turn will limit the supply of labor (ECONorthwest 1994).

There is considerable evidence that measures to control growth cause the price of land to increase. Shilling et al. (1991) found that state land-use controls both restrict the supply and increase demand for residential land, driving up its price. Brueckner (1990) cites a large empirical literature documenting the effects of growth controls on housing and land markets. His evidence conclusively establishes that growth controls raise housing prices in communities where they are established (Dowall and Landis 1982; Elliot 1981; Katz and Rosen 1987; Schwartz et al. 1981; Schwartz et al. 1989).

Most of the literature that addresses the impact of growth controls on land prices
focuses on the residential land market. There appear to be very few articles that address the impact of sprawl, or measures to control sprawl, on commercial land markets, the level of employment growth, or wage income. While there are logical reasons to suspect that uninhibited growth fosters more employment and wage growth than limited growth, the literature does not document this at all.

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**The Costs and Benefits of Sprawl: Alleged Negative Social Impact**

**Topic:** Fosters Suburban Exclusion

**Allegation/Basis**

*Suburban exclusionary zoning increases the concentration of low-income households in certain neighborhoods.* Most low- and moderate-income households cannot afford to live in suburbs where exclusionary zoning raises housing costs; thus, such households become disproportionately concentrated within central cities and older inner-ring suburbs. Housing in many parts of these communities is generally older, smaller, more functionally obsolete, less well-maintained, and much less costly to occupy than housing in newer suburbs. Moreover, subsidized housing units—especially those in public housing projects—are heavily concentrated within older neighborhoods in central cities and inner-ring suburbs, because residents of other areas—including most suburbs—refuse to permit them within their boundaries. This further concentrates very low-income households both within central cities and older suburbs, and within particular inner-city neighborhoods. The concentration of high proportions of very poor residents within older, deteriorated neighborhoods fosters conditions that are adverse to the welfare of residents. These include high rates of crime, drug abuse, delinquency, births out of wedlock, welfare dependency, unemployment, alcoholism, and mental illness. In addition, the quality of education received in public schools in these areas or where children from such areas dominate, is very low.

**Literature Synthesis**

There is some disagreement about the degree to which suburban exclusionary zoning is responsible for poverty concentrations in core-area neighborhoods. Some observers believe other factors are more important in producing such neighborhoods. These other factors include negative behavior patterns among the residents that make them unwelcome elsewhere; the concentration of deteriorated, very low-cost housing in such neighborhoods which attracts people who cannot afford better accommodations; the concentration of public housing units in such neighborhoods; the lack of public transportation in suburban areas that makes it difficult for poor persons without cars to live there; and the desire of poor households to live together in neighborhoods where public services aiding the poor are more easily accessible.

In contradiction, recent findings in New Jersey from the New Jersey Council on Affordable Housing (COAH) and similar findings from the Gautreaux (Chicago) and Special Mobility Program (SMP) (Cincinnati) studies indicate that those
who occupy affordable housing in more suburban locations take on the employment characteristics, ambition levels, and success rates of the population of those jurisdictions (Wish and Eisdorfer 1996; Davis 1993; Fischer 1991). In New Jersey, close to 15,000 affordable housing units have been built and occupied as a result of legislation emanating from the series of Mt. Laurel, New Jersey Supreme Court cases in that state. Occupants of this housing are employed, doing well at local schools, and integrated without incident in neighborhoods they would not have had access to without these court decisions.

In the Gautreaux and Special Mobility Program studies, residents moving from the central city to the suburbs using housing vouchers have higher rates of employment, higher salaries, and children with better school attendance and higher grades than families who did not choose to move. While the confounding issue of self-selection is clearly present here, i.e., the successful and ambitious families are the ones that opted to participate in the moves, there is a growing body of literature that indicates that "place" matters. There is a "rub-off" effect of place wherein success patterns can be communicated by residents to newcomers who specifically wish to improve their current economic and social positions. (Poismann and Botein 1993).

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### The Costs and Benefits of Sprawl: Alleged Negative Social Impact

**Topic:** Fosters Spatial Mismatch

**Allegation/Basis**

The resulting "spatial mismatch" between where most new jobs are being created (far-out suburbs) and where many low-skilled workers must live (inner-city neighborhoods) aggravates high rates of unemployment in those neighborhoods. The unlimited expansion of urbanized uses on the periphery of the metropolitan area permits many employers to move to locations that are very far from inner-city neighborhoods. Consequently, unemployed workers living in those neighborhoods cannot either readily learn about job opportunities in far-out locations or afford to commute to such jobs even if they learned about and qualified for them. This aggravates both high rates of unemployment in inner-city neighborhoods and suburban shortages of unskilled labor.

**Literature Synthesis**

John Kain was one of the first to examine the evidence that a mismatch exists between lower skilled and otherwise attainable jobs that are increasing in the suburbs and high levels of unemployment of residents who live in central cities should be able to access these jobs (Kain 1992).

Spatial mismatch has also been examined by sociologist John Kasarda (1990) and William Wilson (1987) and economists Keith Ihlanfeldt and David Sjoquist (1990). Although the original literature related the mismatch to black workers of all ages, later studies focused on the spatial mismatch as it affected young black workers. Race as the causative agent is the main focus of inquiry.
throughout most of the studies mentioned above. In other studies by Bennett Harrison (1974a) and John Kasarda (1990), causes of the mismatch (which according to them may not be spatial) are extended to inadequate skills and education, and limited transportation or access to transportation. Findings on spatial mismatch, while not always consistent in unearthing a spatial component [see Bennett Harrison (1974a), David Ellwood (1986), and Jonathan Leonard (1987)], are persistent in their specification of a mismatch of some type.

The reality of “mismatch” is a population desiring to be employed in one location and available jobs going unfilled in another. Often, the unfilled jobs are lower order jobs that are not worth accessing by public transit if the prospective worker must also pay for child daycare services in order to access the job.

Other jobs similarly located in the suburbs may require skills that applicants, even after training, cannot meet. Or that casual workers available during the summer or during college breaks can easily meet without training. This is such a complex area that sprawl versus more compact development patterns probably play only a small role here. This will grow to be a big issue with significant consequences as workfare replaces welfare. The relationship between sprawl and central city unemployment rates, the bottomline issue of the above discussion, is even more complex than relationships between sprawl and spatial mismatch.

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The Costs and Benefits of Sprawl: Alleged Negative Social Impact

**Topic:** Fosters Residential Segregation

**Allegation/Basis**

*Residential segregation by race and income is greater under sprawl than where less fragmented governance over land uses exists.* Exclusionary zoning by many outlying suburban communities inhibits the construction of relatively low-cost housing for low- and moderate-income households. This occurs because residents of each community control land-use decisions therein. They usually take into account only their own interests in making such decisions—not the interests of the region as a whole or of citizens in other parts of it. They have major economic motives for trying to minimize the number of low-cost housing units within their own communities. These include maintaining housing prices as high as possible and excluding households whose need for public services—especially schools—will cost the community more than the taxes these households will contribute to the community. Because blacks and Hispanics have much lower incomes, on average, than other major groups in American society, such income segregation is also an effective means of achieving ethnic segregation in many areas.

**Literature Synthesis**

There is only partial agreement about this allegation, partly because it is difficult to find American metropolitan areas without fragmented governance over land uses, and partly because such a small number of them exist in the United States that statistical testing of conditions in them versus conditions elsewhere probably are not valid.
Yet coming at this issue from another direction, those states and regions that have made overt efforts to provide affordable housing in locations where it has not before existed are achieving integration in those locations. In New Jersey, where a municipality must provide its fair share of affordable housing or lose its right to zone, racial and ethnic integration is taking place in what were predominantly white outer-ring neighborhoods. New Jersey’s affordable housing program requires that those who fill municipal quotas come from outside the municipality’s boundaries but inside its commuting region. There are strict advertising and queuing requirements that ensure that minority households in central cities have an equal chance of occupying affordable housing in the suburbs. With these kinds of mandates, integration of neighborhoods moves quickly and directly (Wish and Eisdorfer 1996).

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The Costs and Benefits of Sprawl: Alleged Negative Social Impact

Topic: Worsens City Fiscal Stress

Allegation/Basis

Central city governments become fiscally strapped or “squeezed,” because they must provide costly services to large numbers of very poor households, while the properties owned, occupied, or patronized by such households produce relatively low tax revenues. Low-income neighborhoods in particular have higher costs of crime and fire prevention, street cleaning, and public health and welfare services than middle- and upper-income neighborhoods. Yet the former produce lower property and sales tax revenues per capita than the latter. This forces city governments serving such communities either to raise taxes above those in surrounding communities or to provide lower quality and quantities of key public services to their residents, or both.

Literature Synthesis

Only limited agreement exists on the extent to which sprawl is regarded as a major cause of fiscal stress. The concentration of very poor households within inner-city neighborhoods is not caused solely by suburban sprawl; other causal factors largely unrelated to the specific form of growth within a metropolitan areas also contribute to this result. Unfortunately, it is probably impossible to decide scientifically how to allocate “responsibility” for this outcome among these causal factors; a fact which presents an obstacle to “proving” that sprawl contributes significantly to this outcome.

The ability of households and employment to shift locations in a metropolitan area is virtually unrestrained. To the degree that households and employers seek safer and more aesthetically pleasing locations, and these are found distant from the core, they will move there. And if tax es are lower or there are tax incentives to relocate, core to peripheral relocation will take place. If high income residential and nonresidential properties are either footloose locationally or are being bid out of central locations to more distant locations, only those who choose not to be or are not bid-out will remain. These are often poorer households and
businesses which demand higher services and provide less revenues and, in so doing, place a strain on public service districts. Via this process, they impose fiscal stress in the form of higher service costs and reduced revenue receipts. When this happens, property taxes rise contributing to yet another wave of residential and nonresidential exodus (Sternlieb and Burchell 1977).

Most of the forces described above, while largely independent of development patterns, certainly need the defining characteristics of sprawl to operate. Fragmented governments in competition with each other for the better land uses create fiscal stress for those governments that cannot compete (Downs 1994).

(See also Public-Private Capital Quality Costs—Negative Impacts—Worse Fiscal Impacts).

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**The Costs and Benefits of Sprawl: Alleged Negative Social Impact**

**Topic:** Worsens Inner-City Deterioration

**Allegation/Basis**

A self-aggravating downward spiral of negative conditions and the consequent withdrawal of viable resources occurs in inner-city neighborhoods, making them continually worse off. The presence of areas with deteriorating conditions in central cities tends to motivate many economically viable families and business firms to move elsewhere. The same conditions also discourage viable households and firms from moving into those cities in general, and into high-poverty neighborhoods in particular. As a result, the economic and social viability of the households and firms left residing in such communities deteriorates.

**Literature Synthesis**

There is only some agreement on the extent to which sprawl is a major cause of this downward spiral. The concentration of very poor households within inner-city neighborhoods is obviously caused by other factors largely unrelated to the specific form of growth within a metropolitan area.

A study of residential abandonment in cities nationally, which investigated numerous causal relationships such as: 1) other abandoned structures on the block, 2) race of tenant and owner, 3) commercial use of part of the property, and 4) racial and economic characteristics of neighborhood and city, found that the most significant causal relationship to central city abandonment was the amount of housing built outside the central city yet inside the city’s metropolitan area (Sternlieb and Burchell 1977).

To the degree that significant amounts of housing are built farther out in the metropolitan area and the occupancy costs of this housing are comparable to or cheaper than existing housing, this housing will be sought in preference to closer-in housing (Schafer 1975).

Unfortunately, as with fiscal stress, it is probably impossible to decide scientifically how to allocate "responsibility" for this outcome among multiple causal factors. See also Quality of Life—Positive Impacts Foster Free-Market-Making).
The Cost and Benefits of Sprawl: Alleged Positive Social Impact

Topic: Fosters Home Rule

Allegation/Basis

Sprawl keeps government decisions about land use at the local level, where individual citizens have much more chance of influencing the results than they do where regional decision making predominates. Because sprawl involves fragmentation of government powers among many relatively small localities, it keeps land-use decision making closer to the people most directly affected by it. This satisfies the strong American desire for local sovereignty. Like-minded citizens can then pass zoning and other regulations that exclude types of development from their communities they do not like. This in turn allows them to prevent "socially undesirable" influences in their neighborhoods and schools. Such negative influences include potentially dangerous households with characteristics markedly different from their own, as well as region-serving land uses with negative local spillovers, like airports or incinerator plants.

Literature Synthesis

The literature dealing with the merit of home rule praises its "small government" democratic responsiveness, as is illustrated in the following quotations:

Others came to suburbs for better schools. This has been due, at least in part, to the responsiveness of these schools to parental expectations, rooted in turn in the smaller size of many suburban school districts.

Indeed, in an age primarily given over to state centralization, the suburbs have encouraged a countervailing decentralization governance, forcing a healthy kind of competitiveness onto local governments (Carlson 1996, 34-5).

The trend in many places has been for cities to incorporate their surrounding suburbs, creating mega-jurisdictions without local identity and administrative nimbleness. This is a bad idea. Instead, cities ought to be breaking themselves into smaller political units that enjoy a degree of social consensus where governing can be done flexibly and with less impersonality (Kotkin 1996, 7, 60).

Obviously, the literature is badly divided on this point. One statistic beyond refute is that there is little growth in regional governments on a national basis, and although municipalities or counties may be willing to join together to distribute one or another carefully selected public services, they appear unwilling to join together for common governance.

Further, on a national basis, the number of regional school districts currently desiring to split apart is multiples of those school districts currently desiring to join together (Petersen, 1996).
The Cost and Benefits of Sprawl: Alleged Positive Social Impact

**Topic:** Enhanced Diversity and Choice

**Allegation/Basis:**

_Sprawl provides citizens with a great variety of localities with differing tax levels, public service qualities, and housing costs, thereby increasing the range of choices available. The many individual localities in a metropolitan area function like suppliers of "bundles" of tax levels, public services, and local amenities in a market. Competition among them provides households with many more choices of living environments than would exist if all key fiscal and land-use decisions were made centrally and applied similarly throughout the metropolitan area. This process, first conceptualized by Charles Tiebout, (1956) is widely praised by economists for bringing many of the virtues of a free market to the public sector, thereby benefiting potential residents of suburban communities by expanding their choices._

**Literature Synthesis**

There is reasonable agreement that housing costs, public services (primarily education), tax levels, and housing stock/aesthetics of community form the bundle of goods that is bid for in community selection. Within a metropolitan area, citizens have significant choices of communities, and within a fragmented metropolitan area, they have even more choices.

Those who "shop" for communities take all of the above into account before making a locational decision. Sprawl's contribution to the above is the massive amount of reasonable alternatives (not best or worst) that it offers the locational consumer.

Fragmented governments, primarily supporting residential housing, offer infinite variations of the bundles of housing, public services, and tax structure described above. Most of the variations found at the periphery of metropolitan areas are superior in housing value, school systems, property tax levels, and housing amenities to locations found closer in. As such, these are the locations most often sought; the closer-in communities, the locations most often left behind. The most significant variable appears to be housing cost and housing appreciation. The combination of the two seems to be maximized in locations more distant from, as opposed to closer to, the urban core (Downs 1994).

(See also Home Rule section.)

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**Literature Review**

Fragmented governments, primarily supporting residential housing, offer infinite variations of the bundles of housing, public services, and tax structure described above. Most of the variations found at the periphery of metropolitan areas are superior in housing value, school systems, property tax levels, and housing amenities to locations found closer in. As such, these are the locations most often sought; the closer-in communities, the locations most often left behind. The most significant variable appears to be housing cost and housing appreciation. The combination of the two seems to be maximized in locations more distant from, as opposed to closer to, the urban core (Downs 1994).

(See also Home Rule section.)
Part Three
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Appendix

ANNOTATION OF KEY STUDIES
AND
RESEARCH BIBLIOGRAPHY
Annotation of Key Studies

1. Public–Private Capital and Operating Costs
2. Transportation and Travel Costs
3. Land/Natural Habitat Preservation
4. Quality of Life
5. Social Effects
1.

Annotation of Key Studies on

PUBLIC-PRIVATE CAPITAL
AND OPERATING COSTS

This is a short review article of the RERC study, published about two years after the study itself. For purposes of simplicity, Altshuler focuses on the two extreme cases analyzed by RERC—high-density housing and low-density single-family housing. He begins by summarizing the major findings of the RERC study. He then asks three questions: (1) Have the results of the theoretical analysis been calibrated against actual community experiences? (2) Does the report itself fully support the conclusions stated in its summary? and (3) Are the reported advantages of high density over low density mainly due to differences in density or to the fact that the high density community is more fully planned? His answer to all three questions: “No.”

One key issue he raises is: Does density per se affect the demand for community services? RERC explicitly assumed it did not, but he questions that assumption. Low-density areas often have no sidewalks, above-ground utility lines, and infrequent street lights, compared to high-density areas. There is also likely to be lower demand for professional security services. And RERC did not include any estimates of mass transit spending in its study, though such spending would surely be higher in high-density communities that relied more on mass transit. Therefore, high-density settlements are likely to have higher community service costs than low-density ones, which would offset much of any savings in private costs.

The savings for high-density living versus low-density living are only $238 per year in operating costs, for a density rise from 3.5 to 19.0 units per acre plus more intensive planning. Four-fifths of the savings are attributed to density alone. He believes, given the omissions mentioned above, that this amount is so small it may vanish if the analysis is done correctly.

He also makes the point that the dwelling units in the high-density settlement are 34 percent smaller than those in the low-density settlement, and this accounts for a large part of the differences in capital costs and in energy costs. Also, the report examines energy components of settlements that account for only about 20 percent of urban energy consumption, omitting the other 80 percent. Five-sixths of the heating and air conditioning savings from high density are attributable to smaller housing unit sizes.

RERC also assumes that average travel per household in high density would be 9,891 miles versus 19,673 miles per household in low density. Only local trips would vary by density, but RERC attributes costs savings to the entire travel mileage—which is an error. According to Altshuler, correcting this error eliminates four-fifths of the claimed savings in auto energy consumption. With proper analysis, the total energy savings of high density versus low density is about 3 percent, of which only 1 percent is attributable to density alone.

Another issue is whether higher residential density would lead to higher density in other types of land uses. He thinks not. Since he claims residential land uses account for only 30 percent of all urban land use, changing residential densities would leave most of the density of a region unaffected.

Altshuler therefore claims that “The case that low-density living is a highly expensive luxury remains to be made” (p. 209).
Even so, the author commends RERC for having put forth a systematic analysis that can serve as a starting point for other studies that do not contain this study’s errors.


The central issues and themes of this text relate to government-mandated exactions paid by real estate developers. Exactions may be in-kind or financial. The legal theory underlying development exactions is that governments, having reasonably determined that certain public needs are “attributable” to new development, may require that their costs be “internalized” as part of the development process. A key premise of the argument for exactions is that land development is a major cause of escalating local infrastructure demands and costs. The costs of growth are then studied in already built-up communities. Alternative estimates of revenues and expenditures for the city of San Francisco are discussed, as are approaches for allocating Montgomery County, Maryland, study expenses and revenues among county businesses and residents.

In this text, the Real Estate Research Corporation’s Costs of Sprawl study is critiqued. According to Altshuler and Gomez-Ibanez, the principal problem with the RERC study is the meaning associated with the cost differences. They argue that the degree of variation between the quality of housing units from one community to another does not allow costs to be compared. Therefore, if the same conditions are not replicated in later studies, community estimates will be difficult to compare meaningfully.


This study estimates the net fiscal impact (the difference between public costs and revenues) of new residential development in Loudoun County and determines whether these impacts vary significantly with the density of development (from one unit per acre to 4.5 units per acre). It found that public costs were highest and the net fiscal impacts the lowest for dwelling units at the lowest densities.


This report summarizes the American Farmland Trust’s findings in a study of three Pioneer Valley, Connecticut towns (Agawan, Deerfield, and Gill). It is organized into four main sections: methodology, town reports, findings, and discussions. Five basic steps were taken for the cost of community services studies discussed in the report: 1) discussions with local sponsors to define land use categories (residential, industrial, commercial, and farm/forest/open land); 2) data was collected for each town; 3) public revenues were reviewed and allocated by land use; 4) public expenditures were allocated by land use; 5) the data was analyzed and ratios were calculated. The study found farmland to be greatly desirable—in contradistinction to other land use.

This paper attempts to determine the extent to which population affects single-family residential property taxes and the mechanisms through which such impacts are transmitted. This paper extends the population-local fiscal behavior model in several ways. For instance, it broadens the scope of such models. Whereas previous studies have generally focused on the determinants of local government expenditure behavior, this paper develops a model of the tax-levying and assessment behavior of local governments.


This analysis compared the impacts of development in New Jersey over the period 1990 to 2010 under two development scenarios—trend versus plan. A series of models was developed to examine the relative effects.

The analysis found that there was more than enough land statewide to accommodate the projected twenty-year development (1990-2010) of persons (520,000), households (431,000), and employees (654,000) under both traditional (TREND) and managed (PLAN) growth. Development between 1990 and 2010 under TREND would consume 292,079 acres, whereas PLAN would accommodate the same level of growth as TREND in terms of persons, households, and jobs indicated earlier yet would consume only 117,607 acres—175,000 fewer acres than TREND (Burchell et al. 1992b). Thus, PLAN’s overall land drawdown was 60 percent less than TREND. The impact assessment further found that managed growth would have the environmental advantages of preserving greater levels of frail and agricultural lands. Reflecting historical rates of loss, under TREND 36,482 acres of frail lands would be consumed for development. By contrast, under PLAN the consumption of these lands would drop to 7,150 acres, or 20 percent. Thus, managed growth in New Jersey could accommodate future development without spoiling more than 30,000 acres of frail environmental lands. In a similar vein, while 1990-2010 development under TREND would consume 108,000 agricultural acres, under PLAN, 66,000 agricultural acres would be drawn down, representing a savings of 42,000, or 40 percent of prime agricultural land.

Findings in this report also indicated that the state of New Jersey could save $1.3 billion in infrastructure costs for roads, utilities, and schools over a twenty-year period if a state plan managing growth were followed, as opposed to the sprawl patterns of development at that time. Other advantages of planned development were also indicated with respect to the environmental quality of life and so on.

Burchell, Robert W., et al.

These three studies extend and broaden the application Burchell's New Jersey modeling of development alternatives (sprawl versus compact growth) to different geographic settings. This enables refinement and testing of the models under different taxing structures, means of providing and funding infrastructure, and geographic levels of investigation.

Each of the studies—Lexington, Kentucky, the Delaware Estuary, and the State of Michigan—looked at the land, infrastructure, housing, and fiscal costs of sprawl versus compact development. Compact development was differently defined in each study; sprawl which was historical development, varied only marginally from place to place. There was much more consistency in the definition of sprawl across these studies than there was in the alternative to sprawl. Findings from the studies are as follows:

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<th>Compact Growth Versus Sprawl Development: Findings of Multiple Studies</th>
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<td>Area of Impact</td>
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<td>Fiscal Impacts</td>
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This report analyzes the impact of alternative municipal service pricing policies on urban structure and finance.

A pricing policy is basically a method of allocating the cost of a service to various components of the community (e.g., new residents, service users, the entire community). Primary attention is paid to pricing policies for the capital recovery of services delivered to new development.

The pricing structures estimated in this report were developed from case examples in San Jose and Gilroy California. San Jose, a fairly large city that had already experienced much of its growth, and Gilroy, a city that could yet undergo explosive growth, are prototypical of a large number of American cities.


This book is based on the argument that when urban users are charged an average price for services such as water supply, sanitary sewage, storm sewage, and refuse disposal, the inner city effectively subsidizes the suburbs and encourages urban “sprawl,” or “leapfrog” development. Part of the argument or discussion suggests charging users the full marginal costs of providing the services in question and thereby encourages a more efficient density and distribution of urban development.


This study, conducted in Florida, encompassed detailed case studies of the actual costs (and revenues) incurred by several completed residential and nonresidential projects throughout the state. The projects were chosen as representative of five different development patterns ranging from “scattered” to “compact.”


This study applies an econometric regression analysis to examine the relationship between types of development in DuPage County from 1974 to 1989 and property tax levies over this time period. Property tax increases were associated with residential and nonresidential growth.


This report is one of several prepared as part of Metro’s (a Northwest-based planning agency) Region 2040—a regional planning process to evaluate future development patterns and policies for the Northwest region. The report is to provide information pertinent to the question of whether the region could and should adopt policies to reduce the amount of growth anticipated over the next half century.


Fodor estimates public infrastructure costs associated with the construction of a “typical” single-family house. The estimate includes costs for public facilities for schools, sewer, storm drainage, roads, water service, parks and recreation, and fire protection. A total capital expenditure of about $20,000 is estimated for a “typical” three-bedroom, single-family detached house on a 5,500-square-foot lot, in a “typical” Oregon city. It is assumed that the house is part of a larger development or subdivision.
that is located in an urban area on previously undeveloped land with nearby utilities.


This study reviewed the national literature conducted over roughly a four-decade period concerning development costs. Frank ordered the findings of the various reports and expressed them in equivalent dollar terms (1987 dollars). He concluded from the national literature that multiple factors affected development costs including density, contiguity of development, distance to central public facilities (i.e., sewage and water plants), as well as other characteristics, such as municipal improvement standards. In brief, capital costs are highest in situations of low density, sprawl, and for development located a considerable distance from central facilities. By contrast, costs can be dramatically reduced in situations of higher-density development that is centrally and contiguously located. As described by Frank:

When all capital costs are totaled
... the total cost for low-density
... sprawl ... is slightly more than $35,000 per dwelling unit. Further, if that development is located 10 miles from the sewage treatment plant, the central water source, the receiving body of water, and the major concentration of employment, almost $15,000 per dwelling unit is added to the cost, for a total of $48,000 per dwelling unit. ... The cost can be reduced to less than $18,000 ... by choosing a central location, using a mix of housing types in which single-family units constitute 30 percent of the total and apartments 70 percent, and by planning contiguous development instead of leapfrogging. (Frank 1989, 39).

To the extent that planned or managed growth fosters the more efficient patterns described above—centrally located, contiguous development that includes units at somewhat higher density—it can achieve infrastructure savings relative to traditional development.


Katz and Rosen analyzed 1,600 sales transactions of single-family houses during 1979 in 64 communities in the San Francisco Bay Area. Of these transactions, 179 involved houses that were located in communities where a building permit moratorium or binding rationing system was in effect. Findings show that the price of houses sold in the growth-controlled communities was higher than those sold in other communities without controls.


Polycentricity in monocentric theory is the theme of this article, which discusses why urban form is changing and what the attendant effects are. Are cities composed of a single center, a continuous sprawl of individual firms, or some degree of polycentricity between these extremes?
A wide variety of models exist seeking to explain variation in the level of suburban government activity. Alternative models stress concepts of local stratification and discrimination, the structure of local decision making, ecological position, and public choice—each of which suggests varying hypotheses about which suburbs spend more and which spend less. In this paper, the relative strength of each of these alternative models is summarized and evaluated.


Various types of urban sprawl are defined. Sprawl’s causes are discussed with an analysis of effects on urban agglomerations, people, and the economy in general. The causes and effects of sprawl are part of a discussion on the development of suitable policy recommendations for dealing with problems in the area of suburban expansion.


This document summarizes how growth in Montgomery County will affect congestion, affordability, policy, and management.


Mills presents an economic theory of sprawl in a growing, monocentric city. Where decision makers have perfect knowledge, leapfrog development and discontinuous land-rent functions may occur and be efficient in both an ex-post and ex-ante sense. Where the extent of future growth is uncertain, decision makers become speculators, and the spatial pattern of development is more complicated. Ex post inefficiency generally occurs.

In the context of a formal monocentric-city model, there are three land-use patterns that qualify as examples of sprawl. Leapfrog development occurs when a von Thunen ring of undeveloped land separates rings of developed land. This form of sprawl involves radical discontinuity. Scattered development, the second form of sprawl, occurs when there are annuli with both developed (homogeneously) and undeveloped land in them. Mixed development occurs when there are annuli with more than one developed use. Scattered development and mixed development forms of sprawl involve circumferential discontinuity.

Mills gives theoretical explanations for each form of sprawl. Leapfrog development can be explained by intertemporal planning on the part of decision makers who anticipate future growth with certainty. The essential idea here is similar to Ohls and Pines (1975), that is, that land inside of the urban fringe is sometimes withheld from early development and preserved for more remunerative future options. Theoretical explanations for scattered and mixed development forms require that decision makers are uncertain about future growth and make speculative decisions.
Several criticisms of sprawl are cited and addressed with evidence generated from the monocentric city model constructed for this analysis.


Many observers argue that discontinuous development (land closer to urban centers is skipped over in favor of land further away) is inefficient for several reasons. First, it fails to make use of the most accessible land. Second, the expense of providing public services, such as roads and sewage systems, to new development is high. In contradiction, Ohls and Pines argue that discontinuous development may be desirable and efficient in certain cases. For instance, the development of retail and commercial services near the urban fringe must often wait for the maturation of critical scale. In rapidly expanding urban areas, there are contexts in which it may thus be efficient to skip over land for a period of time in order to reserve it for commercial uses after market scale increases.

This strategy has been implemented in some planned communities. In Columbia, Maryland, for example, the planners of this "new town" have explicitly reserved vacant land in residential areas for development of shopping clusters in the future—and increased residential densities make such shopping enterprises economically feasible.

In 1986, the Critical Areas Commission of the state of Maryland established a set of land-use restrictions that limits residential development on land abutting the Chesapeake Bay. In this paper, Parsons estimates the effect of these restrictions on housing prices in one county on the Bay. Parsons uses a repeat-sale analysis to infer the effect of restrictions by observing price changes on houses that sold both before and after the restrictions were enacted. He found that housing prices in the Critical Areas with water frontage increased by 46-62 percent due to restrictions. Housing prices in the Critical Areas without frontage increased by 14-27 percent, and prices near but not in the Critical Areas increased by 13-21 percent.


This article compares the economic results of planned community development with those of unplanned development for a 7,500-acre site in Houston, Texas. The comparison indicates that planned development produces higher net benefits than unplanned development for all three cost areas investigated—land development costs, transportation costs, and social costs—and that the difference in benefits is greatest in the area of transportation costs. The magnitude of the difference is small, however—on the order of 1 percent to 3 percent of total costs.


Peiser empirically tests several theoretical arguments related to density and urban sprawl. Lot sizes and residential densities...
are examined over time along major growth corridors emanating from central Washington, D.C. and central Dallas.

This discussion suggests that lots should be smaller (i.e., densities should increase) the later they are developed—after controlling for house size and distance from the central business district (CBD). The discussion notes that if higher densities closer to the CBD are desired, then cities should avoid policies that require sequential development. Furthermore, they should let the land market seek its natural level of densities, at least within the limits that existing road, utilities, and other infrastructure will support. The findings also assume that a competitive land market will achieve the desired result of higher density succeeding urban sprawl, that is, discontinuous development followed by later infill.


This is a summary of a report on the fiscal and economic impacts of local conservation and community development measures. Approximately 200 articles and other publications were reviewed, with an emphasis on studies of actual experiences in real communities. This literature includes economic studies of: the impacts on town and county budgets of alternative forms of development (e.g., compact development versus linear sprawl); the economic impacts of zoning and other land use regulations; and the economic impacts of a community’s appearance, architecture, and natural environment.

Taken collectively, these studies support the premise that environmentally sensitive land use planning need not have a detrimental effect on real estate values, economic vitality, or the local tax base; in fact, the opposite is often the case.


The effect of Petaluma, California’s growth control program on new house prices is examined by a comparative (quasi-experimental) design, using statistical controls. The difference in price increases between Petaluma and two comparison cities is calculated for houses of model-standard quality and for average actual houses in each city. It was found that prices of standard-quality houses increased significantly more in Petaluma than in one of the comparison cities but not the other. A similar pattern was observed for actual houses. Reasons for the observed results and specific causes of the growth control effect are analyzed.


Schwartz, Zorn, and Hansen conducted a study of growth controls in Davis, California, comparing house prices in Davis to those in a control sample of other Sacramento suburbs. They found that growth controls caused house prices in Davis to be 9 percent higher in 1980 than they would have been without them.


This study, commissioned by the King County Growth Management Planning Council (GMPC), evaluated options for future development, focusing on projected public costs for roads, transit, water and sewage utilities, and general government. It identifies marginal costs of new development for each of five alternative land-use scenarios as well as revenues. The study found that the alternatives with greater development in the urban centers and cities are more fiscally beneficial when roads, utilities, and general fund activities are analyzed. However, this did not consider the impacts of transit, for which more analysis is needed.


This article is a critical review of the RERC study on sprawl. The first part of the article summarizes the findings from the RERC study. The author then criticizes RERC for not disentangling density from other factors. One criticism is that RERC uses different average-sized units for different densities, with smaller units for higher densities. Because smaller units have lower areas, they are less costly to build. This is a major reason why low-density, single-family units are considered more costly than higher-density units. It also affects utility costs. Total floor area is 44% lower in high-rise than single-family neighborhoods. Windsor recomputes, costs assuming all housing units are the same size of 1,200 square feet. This greatly reduces the cost advantage of high density, though it still exists. However, it is believed that this is equally unrealistic. In reality, higher-density units are indeed smaller, on the average, so RERC is not entirely wrong. Probably the only way to avoid this problem is to do it both ways and compare results.

Another criticism is that RERC assumes structure costs are highest for single-family homes, with high-rises in the middle, and walk-ups the lowest. Windsor believes high-rise costs should be the highest per square foot. RERC also assumes that developers will have to contribute more land to the public sector under single-family settlements than under high-rise settlements.

RERC assumes that clustering in higher-density patterns results in the saving of vacant land. This is a source of savings, RERC claims. A given amount of population consumes more land under low-density than high density. But if the model assumes a given amount of land is fully developed at different densities, then different total populations are accommodated. This is another case where more than one alternative must be analyzed.

The author criticizes RERC for “the underlying assumption that cost minimization is an appropriate principle for the planning and coordination of development patterns. . . . Cost minimization is not a planning principle unless benefits are constant. . . . [RERC] ignores the benefit side and is thus not necessarily an example of improving economic efficiency.” Yet the author thinks it is not necessary to measure benefits. He claims the prevalence of low-density settlements reflects the benefit side because that is what consumer have wanted. “Consumers choose to live at high densities only where land costs are very high, as in central cities.” But where land costs are lower, as in suburbs, they prefer low density.
The author claims that suburbs resist high density on several grounds, not just costs. "Voters are opposed to rapid population growth, the possible characteristics of new residents, the fiscal implications, and the loss of suburban amenities like open space, semi-rural ambience, low densities, etc. Exclusionary land-use controls are intended, in part, to force low-density development; they function as a form of growth management." (p. 291)

By ignoring these facets, says the author, RERC "does not properly evaluate the relative efficiency of alternative development patterns." (p. 291)


York analyzes three areas: growth management programs from around the country (Maine, Massachusetts, New Jersey, Oregon, Vermont); innovative strategies by region; and problems with redevelopment. The analysis of the statewide programs consists of descriptive summaries of state policies designed to address increasing growth management problems and the situations that prompted the development of these policies.

The innovative strategies section of this document examines urban growth boundaries (UGBs)—proactive growth management tools used to contain, control, direct, or phase growth to promote more compact, contiguous urban development. Basic to this strategy is the delineation of perimeter around urban development areas, effective for a specified period of time, within which urban densities are normally encouraged, while outside the perimeter urban uses and densities are discouraged.

A secondary analysis of several state studies is effected to identify the impact of UGSs on land prices. However, the data are neither complete or consistent enough to draw firm conclusions concerning land price impacts.
2.

Annotation of Key Studies on

TRANSPORTATION AND TRAVEL COSTS
1. CHANGES IN AUTOMOBILE TRAVEL

These descriptive, aggregate studies reach inconsistent conclusions on whether commuting times have become, on average, longer or shorter. The studies do show that commuting travel times have been fairly stable, even though commuting distances have often increased. In addition, the studies show an increase in the amount of travel for non-work purposes. The authors who find evidence of stable or shorter commuting times suggest that this is a result of more decentralized employment and residences that allow people to travel on less congested highways. Likewise, authors attribute increase in non-work travel to more dispersed shopping opportunities. Although it is true that dispersion of jobs and residences has been the rule during the periods studied, these descriptive studies do not provide clear evidence that changes noted in automobile travel are due to this dispersion.


A comparison of mean commuting times of residents of core counties in the 20 largest metropolitan areas shows that average trips times declined or remained the same between 1980 and 1985 even as population increased in most areas. The authors hypothesize that constant or declining trip times were the result of commuters changing residences or jobs so that their origins and destinations were closer to each other or so they could travel faster on less congested routes. However, the American Housing Survey data they use does not have the information needed to confirm or disprove this hypothesis.


The authors compare travel diary data from the Washington, D.C., metropolitan areas for 1968 and 1987-88 and conclude that greater dispersion of activities has helped keep travel times constant. During this 20-year period the metropolitan area became more dispersed, population grew by 30 percent, employment grew by 85 percent, and the number of daily motorized trips per person increased from 2.3 to 2.8. Yet, average times for home-to-work and work-to-home trips remained stable. Differences of means test show that for most modes and purposes, average trip times were the same at the beginning and end of the period. They conclude the “locators”—households and firms—act rationally and relocate to keep travel times constant.


Pisarski identifies trends in commuting using data from the 1990 census and the 1990 Nationwide Personal Transportation Study. The proportion of all trips that were for work purposes declined slightly, from 20.4 percent in 1983 to 20.1 percent in 1990. Although the miles of travel for work increased, average travel times for work trips increased on average by only 40 seconds. This is partly due to a 35 percent increase in the number of work trips made in single-occupant vehicles, usually the fastest mode of travel. The 22 million additional people who drove alone exceeded the number of workers added to the labor force. The absolute number of people using transit remained at about 6 million, but the share of users declined due to population growth.

One recent phenomenon has been the growth in non-work travel, both during and off-peak. Using data from the Nationwide Personal Transportation Study for 1977 and 1983, the authors find that the numbers of non-work trips increased three to four times faster than work trips in all sizes of SMSAs. Non-work travel even increased faster than work travel in the peak periods. They contend that suburbanization, especially in the largest metropolitan areas, was a principal cause of the increase in non-work travel although acknowledging that demographic and work force changes are probably also involved. Suburbanization of businesses means the suburbanites have more close-by shopping and recreational opportunities and, therefore, may make more trips to satisfy immediate needs rather than wait until they have a list of needs. The study, however, does not demonstrate either that shopping and recreational opportunities have increased in suburbia or that households take more trips because of such an increase. Nor does the study rule out the effects of other factors such as rising incomes, greater participation of women in the workforce, and changes in leisure activities on non-work travel choices.


The authors compare mean commuting times in 1980 and 1990 for the 39 metropolitan areas with populations in excess of a million in 1990. They find that commuting times increased in 35 of the metropolitan areas. Increases ranged from 0.47 percent in Philadelphia to 13.69 percent in San Diego. All four of the metropolitan areas with commuting time increases of more than 10 percent are Sunbelt cities: Los Angeles, San Diego, Sacramento, and Orlando. The only cities where commuting time declined were New York (-7.70 percent), Pittsburgh (-1.05 percent), New Orleans (-0.57 percent), and Salt Lake City (-1.92 percent).

2. THE EFFECTS OF DENSITY ON TRAVEL CHOICES

Residential and employment densities have long been studied for their effects on trip length, mode choice, automobile ownership, and other transportation decisions. A number of authors have investigated the effects of densities at the regional level on transportation, showing that in more dense regions people make greater use of transit and less use of automobiles. However, densities vary widely within regions, and the real question is: How does the density of the specific places where people live and work affect their travel choices? The densities of these places may be substantially different from region-wide averages. On balance, research shows density to be one of the most important determinants of modal choice.

A major issue, that is not fully resolved, is whether density affects transportation choices directly or is a factor that sorts out people by life cycle stage, income, and other characteristics that determine their travel behavior. This issue is critical for the debate about whether developing more densely will reduce automobile dependency. Recent studies control for average income levels of the areas studied, but few studies use disaggregate analysis to control for household income, number of children, number of workers, and other factors that influence travel.
Studies on density take a variety of forms: simulations for hypothetical patterns of growth for specific regions, simulations of alternate patterns of growth for specific regions, and empirical analysis of regions, activity centers, and neighborhoods. Empirical studies tend to be cross-sectional, showing relationships between density and travel behavior, but unable to show how changes in density would change travel behavior.

2.1 Simulations

Simulations may be of entirely hypothetical places or of specific regions. Many regions have evaluated the transportation outcomes of potential urban forms using their travel demand models. Only one, using one of the most advanced travel demand models, is described here. For a review, see R. Cervero and S. Seskin, "An Evaluation of the Relationship Between Transit and Urban Form," Transit Cooperative Research Program, Research Results Digest, No. 7 (June 1995).


Downs developed a hypothetical urban area model to test how much changes in the location and density of development would change average commuting distances. The basic model uses values for the proportion of jobs in the CBD, central city, and suburbs and exurbs and commuting distances similar to the averages for large metropolitan areas. Different densities are created by varying the size of the suburbs and exurbs (and adjusting the proportion of population and jobs in each area, as needed to match the size). The density of growth at the urban fringe has a significant impact on commuting distances, with a move from very low to medium densities having the greatest impact. Increasing exurban densities from 886 persons per square mile to 2,800 reduces commuting distances by 8 percent. An increase from 886 persons to 4,363 persons per square miles decreases commuting trip lengths by 14 percent. Beyond that, large increases in density only shorten trips by a small amount.


This analysis of alternative urban forms of growth for the Portland, Oregon metropolitan area showed that more concentrated development, in conjunction with expansion of transit service, would reduce vehicle miles of travel and use of the automobile. This study used one of the most advanced travel demand models in the United States to simulate the transportation outcomes. The study considered a base case that continues current development patterns. This alternative requires that the urban area expand by more than half of its current size over the next 50 years.

The study also tested three different scenarios that concentrate various amounts of growth in transit corridors, centers, or in neighboring cities. “Growing Out” builds a larger share of single-family housing than the region has at present, with more than one-fourth of growth outside the current urban growth boundary. “Growing Up” keeps all urban growth inside the urban growth boundary by increasing densities and building a higher share of multifamily housing. “Neighboring Cities” moves about one-third of expected growth to cities within commuting distance of the urban area. The most concentrated development of the Growing Up scenario produces the highest transit use (6 percent of all trips) and greatest reduction in VMT over base case levels (16.7 percent). The more
dispersed patterns have lower levels of congestion, however.

Like other simulations, this study had limited ability to change travel behavior because much of the built environment for the next 50 years is already in place. Some of the proposed changes in the way the regions develop also may not be politically or economically feasible.

2.2 Empirical Studies


This report analyzes the effects of density, land-use mix, and parking characteristics on commuting behavior in suburban activity centers. The study uses data on 83 randomly selected buildings in six suburban activity centers. The data was collected as part of the National Cooperative Highway Research Program project called Travel Characteristics of Large-Scale Suburban Activity Centers. The strongest relationship was between density (measured as height of building) and transit use. Having retail in the building has only modest effects on mode choice, primarily increasing transit and walking mode shares. Parking supply also has little effect, probably because most of the office building have generous supplies. Because the analysis uses buildings as the unit of analysis, it fails to consider center characteristics, such as distances between buildings and opportunities to shop and conduct personal business at other locations within the center.


Using data on urbanized areas from Highway Statistics, 1990, the authors investigate the relationships (using graphs) between density and vehicle miles of travel and travel use. They find some correlation between urbanized area population density and transit use (26 percent), but little between vehicle miles of travel and density (8 percent). Then, using data from the 1990 Nationwide Personal Transportation Survey, they find that people in denser areas make nearly the same number of daily trips as people at lower densities, but drive less. At most densities the average number of person trips per day is just below 4.0; only at 30,000 persons/square mile or more do trip numbers dip to 3.4 trips per day. However, the average number of trips by car drops from about 3.5 at densities below 30,000 persons/square mile to 1.9 at 30,000 persons/square mile. People living at lower densities drive less because both transit and walking/biking become more viable options. The authors, however, also find a strong correlation between density and life cycle stage. They contend that demographics, rather than density, may be a primary reason for differences in travel behavior.

This study is descriptive, suggesting relationships that need further analysis with multi-variate techniques to sort out the relative effects of household characteristics versus land-use density. The data analyzed in this study are aggregate, comparing whole regions rather than the specific places within regions where people live and work.

This article cites nine important studies dealing with transportation costs and sprawl. These include the classic RERC study, reviews by Altshuler and Windsor, and several others. The first part of the article cites a 1960s study of sprawl—"The Nature and Economics of Urban Sprawl" by Harvey and Clark (1965). That study defines three types of sprawl: low-density development, ribbon development, and leapfrog development. Transportation is seen as a catalyst for urban sprawl. John Kain later argues that any savings from developing high-density areas may be offset by higher construction costs per unit.

RERC's report is cited extensively. It estimated that a low-density sprawl community would require more than six times the amount of minor streets in a planned high-density community. But only road length costs are considered as direct costs in the analysis of transportation variations among these communities. Two indirect costs are considered: travel time and air pollution. The report assumes twice as much VMT in a low-density community, and that causes the differences in such costs. This article then cites Altshuler's criticisms of the RERC report.

Altshuler's book The Urban Transportation System (1979) argues that the American public has strong preferences for auto transportation and low-density settlements. Therefore, Americans will refuse to live in densities high enough to bring about any changes in the problems associated with sprawl, which he believes have been exaggerated anyway. Bowler did a 1977 study showing that "user-operated transportation" accounted for about one-seventh of consumer spending and was roughly constant from 1950 through 1973. He argues that suburban living results in higher use of energy and land resources for transportation than higher-density living would.

When the urban environment is modeled as polycentric, then it is no longer true that a rising percentage of suburban dwellers increases travel distances for journeys to work, since work places also become decentralized. Yet many models assume that rising commuting costs are a major transportation cost of suburbanization. Gordon also argues that because work trips are declining as a percentage of all trips, accessibility to workplaces is falling as a motive for choosing both places to work and places to live. Gordon and Richardson argue that decentralization is an antidote to traffic congestion by scattering both origin and destination points and making suburb-to-suburb trips shorter than any other types.

BART failed to replace the auto as the preferred means of commuting in the Bay Area, in spite of its enormous cost. Where light rail systems have been created, cities experienced small gains in public transit ridership over pure bus systems, plus major cost increases. Light rail tended to replace bus travel more than auto travel.

The argument over compact development is discussed. One advantage it is supposed to have is the use of excess capacity in existing infrastructures, rather than the need to build new infrastructures. This is not always the case, but it was a major source of the economies found in the New Jersey sprawl studies.

There is a discussion of how much subsidy from local governments goes into highways and mass transit. In Milwaukee, Wisconsin, the local burden of
highway costs equals 59 percent of the local property tax levy. User fees do not pay the entire cost of auto travel, and that causes more sprawl than would otherwise occur.

This study claims that the transportation costs associated with urban sprawl have not been studied in quantitative terms. Therefore, most questions about this issue are unanswered. The article cites 12 unfavorable views of sprawl’s transportation costs in different articles and studies, with one-sentence summaries of their major complaints. Nothing very new is stated in this analysis.

This article contains almost no quantitative analysis, cites studies expressing all types of viewpoints—many contradictory—and arrives at no conclusions. It is not very useful, though it does mention some of the key issues involved.


The authors use data from the 1989 transportation panel survey for the central Puget Sound region, along with household characteristics from the census, employment data from the state employment agency, and land use data from the county assessor to identify the factors affecting travel behavior. They find that density, mix, and jobs/housing balance are all related to travel behavior, with employment density and jobs/housing balance having the strongest relationships. At higher densities, trips are shorter but take more time. More trips are by alternatives to the single-occupant vehicle. As land use mix increases, trip distances, times, and auto-mode shares decrease. As jobs and housing are more balanced, trips distance and travel time go down. The relationships between density and mode split are not linear. The authors identify thresholds at which there is a substantial increase in transit use. These are 50-75 employees and 9-13 persons per gross acre for work trips, and 75 employees and 18 persons per gross acre for shopping trips. The use of carpooling, however, seems unrelated to urban densities or other land use attributes. The study controls for household characteristics, such as income and vehicle availability.


The authors combined data on residential and employment densities (residents or workers per acre of land zoned for that purpose) for 82 SMSAs from twelve states (from the U.S. Geological Survey LANDSAT file) with census data to identify factors that influence commuting times by auto and transit. Lower residential densities are associated with shorter commuting times either by car or transit. For auto trips, concentration of industrial employment leads to shorter times, whereas concentration of commercial employment increases trip times. The clustering of manufacturing produces economies in driving, but the clustering of commercial activities (such as in the CBD) produces congestion that reduces times. Other variables (land area, income, economic structure) have the expected signs, and the equations are fairly robust, explaining 61 to 87 percent of the variability in mean travel times. The authors conclude that polycentric or dispersed spatial structures reduce commuting times.
The authors' use of SMSAs as the unit of analysis raises questions about what density means. No SMSA has uniform density throughout. Perhaps lower regional density is a proxy for age of development, city size, or some other factor that influences transit use.


Holtzclaw compared the annual vehicle miles of travel of five communities with various densities in San Francisco Bay Area to test whether higher residential densities combined with better transit service and neighborhood shopping result in less driving. The study found that doubling residential density reduced annual vehicle miles by 20 to 30 percent. Better transit access also reduced vehicle travel.

This was a cross-sectional study that demonstrated only correlation between density and vehicle miles of travel. It did not show that increasing density in a particular neighborhood would reduce vehicle miles of travel. The study did not control for income levels or other characteristics of households that influence vehicle miles of travel.


Holtzclaw used smog check odometer readings for 28 communities in San Francisco, Los Angeles, San Diego, and Sacramento with at least 20,000 residents each to evaluate the relationship between density and land use. The study found that neighborhood density is negatively related to automobile ownership rates and vehicle miles of travel, controlling for household income and size. When household densities double, vehicle miles of travel decline by 16 percent, controlling for factors such as transit service intensities and vehicle ownership. Better access to transit also reduced vehicle miles of travel. Shopping opportunities and the pedestrian environment were not statistically significant in explaining travel behavior. Income was controlled in this study, but residents could still vary number of children, number of workers, and other characteristics that influence travel behavior.

This cross-sectional analysis shows a relationship between density and automotive use in existing communities but does not demonstrate that if low-density communities became denser fewer trips would be made by automobile.


Newman and Kenworthy assembled a set of data on the transportation and land-use characteristics of ten large U.S., five Australian, twelve Western Europe, three Asian, one Canadian, and one Russian city for 1950 to 1980. Using gasoline consumption per capita as their primary measure of automobile dependence (other measures such as transit mode share are highly correlated with this measure), they identify the relationship between automobile dependence and urban density. Low densities are associated with high automobile dependence and high densities with less dependence on the automobile. This relationship holds for regions as a whole, for inner areas (pre-World War II parts of the city), and for outer areas.
From this the authors conclude that more compact cities would reduce automobile use.

Reviewers have questioned the validity of using gasoline consumption as the measure of automobile dependence, noting that many factors, such as gas prices and fleet characteristics, influence gasoline consumption. The analysis of automobile dependence also fails to make full use of the data collected, using only a single variable—urban density—to explain automobile use, when other factors are clearly involved. This may overstate the role of density.


This study updates the work of Pushkarev and Zupan by analyzing the effects of residential densities and CBD employment sizes and densities on light rail and commuter rail boardings. The data is from eleven light rail cities in the United States with nineteen lines and six commuter rail cities with forty-seven lines. Boardings and transit service characteristics data were provided by transit agencies. Employment and population characteristics are from the 1990 Census. The data is used to develop models of light rail and commuter rail boardings and costs. The empirical results are then used to estimate boardings and costs for hypothetical light rail and commuter rail corridors.

Residential densities have a significant influence on light rail boardings. A 10 percent increase in residential density within two miles of stations increases station area boardings by 5.9 percent, holding constant other factors affecting ridership, such as income. Residential densities matter less for commuter rail because it is a high fare mode, and many of its high-income riders come from low-density suburban areas some distance from the city center. Both the size and density of the CBD influence light rail ridership. A 10 percent increase in CBD employment density raises light rail boardings per station by about 4.0 percent, holding constant the number of CBD employees, the residential density of stations, and other factors affecting ridership. For commuter rail, a 10 percent increase in CBD employment densities increases station boardings outside the CBD by 7.1 percent.

The study concludes that light rail is most cost-effective and efficient in cities with larger CBDs and denser corridors. Commuter rail works best with dense CBDs. Other factors within the control of transit agencies, such as the availability of feeder bus service and park-and-ride lots, also influence ridership and costs.


From census data, the authors estimated the effects of population density on transit use using areawide population densities and transit use data from 105 urbanized areas. Population density explained 55 percent of the variation in transit use in 1960 and 66 percent in 1970. They also estimated the effects of residential density, downtown floor space, and the presence or absence of rail transit for 27 urbanized areas. This increased the explanatory power of the equations, but the new variables were more significant than residential density in explaining
transit use. They attribute this result to greater variability in office floor space than in residential densities among the areas studied.

3. UNLIMITED OUTWARD EXPANSION

Although sprawl is characterized by unlimited outward expansion and leapfrog development, there are few studies that specifically address the transportation effects of this sort of development. The authors in Part 1 who attributed stable commuting times and increasing nonwork travel to dispersed activities within metropolitan areas seem to assume unlimited expansion. The simulations discussed in Part 2 generally include an option of unlimited outward expansion at lower densities. They generally find that this type of development encourages greater use of the automobile but may be less congested than denser development. The following study finds that households who move outside a contained urban area generally have longer commutes, measured in time, than their counterparts in the suburbs.


A comparison of the commuting times of workers who bought home in the suburbs and exurbs of Portland, Oregon, shows that the average exurban home buyer had a commuting trip six to seven minutes longer than his counterpart in suburbia, controlling for occupation, income, and other household and job characteristics. Data are from a survey conducted by the author of about 750 households that bought and occupied homes in 1987. Although some exurban households had commutes similar to those of suburban households, the average exurbanite appeared to trade off longer travel times for more space, a rural environment, lower housing prices, or better places to raise their children. At least in this metropolitan area, where there is an urban growth boundary to limit the outward expansion of the urban area, most people who move to rural residences outside this boundary spend more time commuting. However, exurban residents seem to sort themselves out so that those who live close to the urban area have central city and suburban jobs, whereas those who live farthest out most likely work in exurban towns.

4. SPATIAL SEGREGATION OF USES (LAND-USE MIX AND URBAN DESIGN)

Land-use mix and urban designs that encourage walking increase local accessibility. That is, they offer more options for places to go that are close to home or work. Theoretically, this could shorten trips and encourage use of nonautomotive modes of travel, or increase the number of trips made. Employment center studies compare a large number of centers while neighborhood studies nearly always compare selected neighborhoods. Most of the neighborhood studies were done in California, leaving open the question of whether the same results would be found in other areas, especially older cities in other parts of country.

All of these studies have struggled with the issues of how to define mix of use and urban design, and how to separate the effects of these characteristics from those of density.

Many researchers are interested in whether a greater mix of uses combined with neo-traditional design features will result in travel behavior different from
that in typical suburban development. To date, there has been too little experience with these new types of suburban development to answer the question. Therefore, studies look at older neighborhoods that have a finer-grain mix of uses and a more pedestrian-friendly environment. But it is not clear whether behavior of residents of long-standing older neighborhoods accurately predicts the behavior of residents of new neighborhoods, who in all likelihood are more accustomed to using cars.

The studies are organized from the most general to the most specific. The first section compares two patterns of development with the same densities in a suburban county. The second has studies on mixes of uses in employment centers. The third discusses studies that compare neighborhoods with different mixes of uses and designs. Overall, the studies find that mixing uses results in more trips by transit, walking, and bicycling, but the evidence is inconclusive on whether this actually results in fewer vehicle miles of travel.

4.1 Suburbs (Employment and Residential Areas)


This study compares auto-oriented versus transit-oriented patterns of land use and transportation in suburban Washington County, in the Portland, Oregon metropolitan area. The alternatives utilize the same land area and have the same overall densities. In the auto-oriented alternatives, most new multifamily housing and jobs are at the urban fringe. The “no build” version includes fewer transportation improvements, whereas the “highways” version includes a bypass freeway and other highway improvements. With transit-oriented development, the majority of new multifamily housing and jobs occurs on vacant land near transit routes. This alternative also includes transit investments, retrofitting of pedestrian improvements, selected highway improvements, and a demand management program that includes parking charges for work trips. The region’s travel demand model, which was enhanced to increase its sensitivity to density and design, was used to stimulate the transportation outcomes in 2010 of each of the alternatives.

A package of transit-oriented development and transportation improvements that focus on non-automotive modes has the following effects within the study area:

- Reduces auto ownership rates by 5 percent from auto-oriented rates.
- Reduces single-occupant auto use for work trips to 58 percent compared to 76 percent in auto-oriented alternatives.
- More than doubles share of work trips by transit over auto-oriented alternatives (18.2 percent vs. 8.8 percent).
- Reduces daily vehicle trips per household from 7.5 to 7.2 trips.
- Reduces vehicle hours of delay over “no build” levels more than highway building alternative (53 percent reduction versus 43 percent reduction).
- Reduces peak period vehicle hours of travel by three times the rate of highway building alternative (15.7 percent reduction versus 5.6 percent).
- Reduces daily vehicle miles of travel by 6.4 percent, whereas the highway alternative increases them by 1.6 percent.

The results apply to the study area, the fastest-growing part of the Portland metropolitan area. Impacts would likely be less if transit-oriented land uses and transportation improvements were built...
throughout the metropolitan area, as the remainder of the region has less growth to focus in transit-oriented developments.

4.2 Activity Centers

The following studies examine the effects of mixed use on travel behavior. Cervero (1996) takes a broad view of mixed use (community jobs-housing balance), whereas the others examine a fine-grained mix of uses within centers.


This study tested the influence of employment site design characteristics on commuting mode choice at suburban work sites in the Los Angeles area. The research involved on-site data collection of specific urban design and land use attributes to ensure a careful calibration of the independent variables. The results indicate that the presence of land-use mix and urban design features, such as shade trees and sidewalks, in coordination with demand management programs, are responsible for increasing the percentage of work trips made by transit by three to four percentage points. An attractive urban environment was the only factor that influenced mode choice in the absence of a travel demand program. Thus, mixed uses and access to services within the employment center were not strong enough by themselves to generate more commuting by transit. This study did not control for factors such as the level of transit service to the site.


Cervero compares the commuting characteristics of workers in 57 Suburban Employment Centers. These centers have at least one million square of office space, 2,000 or more workers, and are at least five miles from the CBD. He uses cluster analysis to identify six types of centers--office park, office center, large mixed-use center, moderate mixed-use center, subcity, and large corridor. He uses analysis of variance techniques to determine whether the center types differ in commuting characteristics. He concludes that the higher densities and greater land use mix do result in more commuting by transit, ride-sharing, and walking. Ride-sharing is greatest in the centers, whereas walking is greatest in centers with significant retail and nearby multifamily housing. These denser, more mixed centers also have slower speeds of travel because of greater congestion within the centers. This study did not control for transit availability and the quality of the pedestrian environment.


Using data from the 1980 and 1990 censuses, Cervero compares the jobs-housing balance of the 23 largest cities in the San Francisco Bay Area. The evidence shows that the jobs-housing balance generally improved, particularly as jobs increased in formerly housing-rich areas. However, housing did not grow significantly in job-rich areas largely because zoning and growth controls prevented housing growth. Fifteen of the communities showed small increases in the ratio of internal commuting to external commuting. None-
theless, about twice as many people commute in and out of the average community as commute within it. Thus, despite less segregation of uses (measured at a gross city-wide scale), many people continue to commute considerable distances in part because of mismatches between the jobs available in the community and the type of housing available there.

This descriptive study demonstrates that considerations of the transportation consequences of the spatial segregation of uses need to look more closely than just at numbers of residences and jobs. The mismatches between the income of employees and housing prices and between new jobs and housing availability also must be considered.

4.3 Neighborhoods

Studies in this section are organized around the types of trips analyzed. Collectively, the studies find that a greater mix of use and urban environments that are more friendly to the pedestrian encourage more walking and transit use. The non-work trips by walking and transit may, however, be additions to automobile travel, not substitutes for it.


This study compares work trip mode shares and trip generation rates between matched pairs of the transit-oriented and auto-oriented neighborhoods. Seven of the pairs are in the San Francisco Bay area, and six are in Los Angeles. Transit-oriented neighborhoods were built around streetcars or rail stations prior to 1945 and have a grid street pattern. Auto-oriented neighborhoods were built after 1945, with little orientation to transit, and more curving streets and cul-de-sacs. Neighborhood pairs had similar incomes and, as far as possible, similar levels of transit service. Six of the seven San Francisco pairs showed the expected results of lower auto ownership and more use of transit and walking for work trips. (In one pair with a large university in the transit neighborhood, the transit neighborhood had less driving alone but walking substituted for transit.) The difference in the share of drive-alone rates ranged from 2.0 to 17.5 percent of trips. The results were more mixed in Los Angeles. The authors conclude that neighborhood design matters little in the Los Angeles area because of the overwhelming dominance of the automobile in this region. The results may also be muddled because transit service levels were less closely matched in the Los Angeles pairs.


The authors compared six communities in Palm Beach County, Florida, on work accessibility, neighborhood shopping opportunities, and pedestrian accessibility. They found little evidence that accessibility to retail affected mode choice or vehicle hours of travel per person. The shortest shopping and recreational trips occurred in a classic 1970s planned-unit development (i.e. a suburban auto-oriented place) because of ample stores and recreational facilities within the community. This suggests that the mix of uses is as important as the layout of streets and other design features in determining travel behavior.

Handy compared the shopping trip modes of residents of traditional and suburban neighborhoods in the San Francisco Bay Area. She found that residents of traditional neighborhoods, where shopping opportunities were located nearby, made 2.75 to 5.5 times as many shopping trips by walking as residents of more auto-oriented neighborhoods. Residents of both types of neighborhoods made about the same number of auto trips to regional shopping malls, suggesting that neighborhood shopping trips may have supplemented rather than replaced longer trips.


Handy makes detailed comparisons of non-work trips in four suburban neighborhoods in the San Francisco Bay Area. A “traditional” and a “typical” suburban neighborhood were identified in the Silicon Valley, where there are good connections to the rest of the region. Another pair was selected in Santa Rosa on the fringe of the metropolitan area. Data is from original surveys. An analysis of variance shows that differences in travel behavior occur because of urban form, controlling for household type (number of adults and number of workers). People make more shopping trips on foot in the “traditional” neighborhoods where downtowns are connected to residential neighborhoods and offer services to those residents. It is not clear that these trips replace auto trips, however. Secondly, people value choices and on average visit more than one grocery store and regional mall in a month, if they are available. Having choice adds to travel since trips are made to places more distant from home.


The authors studied the travel behavior of several hundred families in five San Francisco Bay area neighborhoods. The areas were selected because they had similar median incomes but were either high or low in density, and varied in mix of use and access to rail transit. Three-day travel diaries were collected, and site surveys were made to identify urban design characteristics. Models estimated individual travel behavior and, therefore, controlled for individual characteristics such as income, occupation, education, and vehicle ownership. Differences in travel were explained both by individual characteristics and by land-use measures, especially residential density, public transit accessibility, and the presence of sidewalks. Density was most important in explaining the share of non-motorized trips. Access to transit influenced the number of non-motorized trips and the share of transit trips. The mix of uses was not very powerful at explaining travel behavior, but a dummy variable for place (combining all the land use attributes) was significant.

Overall, the models developed had limited explanatory power, explaining only about 15 percent of the variability in the number or share of trips by various modes.
Three separate studies examined the effects of neighborhood land-use mix and urban design on the demand for transit and other alternatives to the automobile.

One study used *Annual Housing Survey* data for 1985 for 11 large metropolitan areas to compare mode choices for work trips of residents in areas with and without proximity to a “corner store” or other commercial activities. A second study of the greater Chicago area used transit and land-use data to identify the factors influencing transit trips per person. The third study compared the mode choice for work and non-work trips in “traditional” and “suburban” neighborhoods in the San Francisco Bay Area using original survey data. All of the studies use multi-linear regression techniques to control for income and other household characteristics.

Overall, the studies show that the types and mix of land uses influence the demand for transit as well as the use of non-motorized modes. People who live in mixed-used neighborhoods have a lower probability of commuting by car (3 to 4 percentage points), a slightly higher probability of using transit (1 to 2 percentage points), and a much higher probability of walking or bicycling (10 to 15 percentage points) for work trips. In the Chicago area, a 10 percent increase in residential density is associated with an 11 percent increase in the number of trips by transit. Residents of “traditional” neighborhoods are more likely to use non-automotive modes for non-work trips than residents of “suburban” neighborhoods. The neighborhood comparison study did not find statistically significant differences in mode choice for work trips between the two types of neighborhoods.

These studies found it difficult to sort out the effects of land-use mix and urban design because these characteristics are strongly correlated with density. When density is included in an equation, mix and design variables generally explain little about mode choice. Each of the studies controlled for residential characteristics such as income and auto ownership. Because the studies are cross-sectional, they show only correlation between land-use characteristics and mode choice, not causality.

5. DISPERSED EMPLOYMENT

In the studies reviewed in the first section, Gordon, Richardson, and their colleagues argued that dispersed employment has helped to keep work trip times stable even though distances have increased. The following study finds that a polycentric pattern of development in the San Francisco Bay area has resulted in longer commutes.


This paper examines the growth of dispersed subcenters in the San Francisco Bay area and the effects of this growth on commuting. Cervero identified 22 employment centers with 7 or more workers per gross acre and 9,500 or more
employees in 1990. Downtown San Francisco was the largest and most dense. Other centers were in Silicon Valley, the east Bay core area (Oakland, Berkeley, and Emeryville), and 16 were further out in suburbs. Two did not exist in 1980. Employment in these centers grew on average by 23.6 percent in the 1990s, increasing the regional share of employment in centers from 47.5 percent to 48.2 percent.

The growth of centers produced an increase in vehicle miles of travel (VMT) for commuting trips. On average, one-way VMT increased from 7.1 to 8.7 miles, a 23 percent increase, with the largest growth in suburban centers. This increase in vehicle miles of travel is due to both longer distances and to greater use of single-occupant vehicles. Longer distances between home and work had the most influence on VMT since outside of downtown San Francisco and the eastern Bay Area, the vast majority of commuters used cars in both 1980 and 1990. Cervero estimates that more than four-fifths of the growth in VMT is due to longer distances between home and work. Longer distances were especially important in increasing VMT in the more peripheral centers. Cervero attributes these longer distances both to regional growth and to mismatches in the jobs and housing market that necessitate long commutes.

6. THE COST OF TRAVEL

The previous sections discussed the consequences of various aspects of sprawl on travel times, distances, trip making, and modes. The literature on the cost of travel is also relevant for converting these travel behaviors into costs for individuals and society.

The Cost of Travel
(An Addition to the Transportation Outcomes of Sprawl Literature Review)

A number of recent studies have estimated the cost of travel using nationwide, average, or location-specific data. All the studies agree that automobile use is subsidized because of the significant share of costs borne by society at large. There are also significant costs that travelers may not consider when they decide whether to make a trip or what mode to use.

This body of literature is relevant to an analysis of the costs of sprawl for several reasons. First, it makes use of a "full cost" framework, in which the researchers attempt to quantify and account for a much wider range of costs than may be typically included in discussions of public policies or private activities. These include user costs, governmental costs, and costs to society at large. Regarding the social costs, many are dealt with elsewhere in this literature review.

Second, the research indicates the magnitude of many of these costs. The estimates, particularly for social costs, vary widely.

Third, the research indicates the incidence of the costs. It introduces the need to consider both public and private costs, for example, into the debate about the costs of sprawl.

Fourth, it deals with the costs of different modes of travel. Evidence presented in the previous section of this literature review makes clear that travel behavior varies in different built environments, both with regard to the modes of travel and the distances traveled. In order to estimate the costs of the set of travel behavior associated with these different spatial patterns of settlement, it is
necessary to introduce the findings of the research described below regarding the cost of different modes.

Several of the authors mentioned below assert that sprawl is a consequence of transportation investments. Elsewhere, the literature review summarizes how researchers assert that travel behavior is a consequence of sprawl. Both assertions seem true; the relationship between transportation and land use is interactive. In the context of this literature review, however, it is the costs and consequences of sprawl that need to hold our attention.


This report reviews the literature on the cost of transportation and estimates the per-mile costs of several modes for Boston, Massachusetts, and Portland, Maine. They divide costs into three types: user costs, governmental costs, and societal costs. Extensive data were collected for the case study regions to accurately reflect the cost of travel in these specific places. Some costs—land loss, water pollution, solid and hazardous waste pollution, and sprawl and social isolation—could not be quantified and are not included in the analysis.

The report estimates costs for a variety of modes and in different kinds of environments. For example, they estimate that a peak-period trip in a dense part of Boston using a single-occupant vehicle (SOV) on an expressway would cost $1.05 per mile. Of the $1.05, $0.88 is user costs (including $0.24 for travel time), $0.05 goes for governmental costs not paid by the user, and $0.12 for societal costs. In the off-peak period, the same trip costs $0.89 per mile, with $0.73 for user costs ($0.10 for travel time), $0.05 for governmental costs, and $0.11 for societal costs. In a low-density setting the peak and off-peak SOV trips both cost $0.71. For the SOV mode, user costs, including time, vary the most among different settings.

A high-occupancy vehicle (HOV) expressway trip in high-density Boston at the peak costs $0.58 per mile, a commuter rail trip $0.58, a rail transit trip $1.04, a bus trip $1.09, a bicycle trip $0.73, and a walking trip $2.56. Travel time costs add significantly to the costs of rail transit, bus, and walking. Costs in the smaller city of Portland are generally lower for all modes and densities.

The authors believe that transportation does influence sprawl, and this should be considered a societal cost of the transportation system. They do not, however, measure this cost since studies neither identify the full range of the costs of sprawl nor the proportion of these costs that are due to the transportation system.

This report documents the ways that travel costs differ with the physical environment and the modes available. As far as possible, costs are based on actual data for the locations studied, although societal costs are generally from national studies.


In a 20-volume study, Delucchi and his colleagues estimate the total social cost of automobile use in the United States for 1991. The study shows that many cost functions are non-linear and dependent upon location. Therefore, the studies’ estimates cannot be divided by total automobile mileage or some other
measure of use and produce an accurate average price for use in a particular study or analysis, although the methods may be applied in other studies.

Delucchi divides costs into six categories:

1) personal non-monetary costs, such as travel time
2) motor vehicle goods and services priced in the private sector, such as vehicle ownership, maintenance, and use costs
3) motor vehicle goods and services bundled with other goods and services in the private sector, such as employer- or business-provided parking
4) publicly provided motor vehicle goods and services such as roads
5) monetary externalities of motor vehicle use, such as accident costs not paid by the responsible party
6) nonmonetary externalities of motor vehicle use, such as air pollution and global warming

This report estimates that the total social cost of motor vehicle use is between $1,880 billion and $2,839 billion per year. Of these costs, 38 to 50 percent of the costs are for private-sector goods and services, 21 to 22 percent of costs are for personal non-monetary purposes, 13 to 21 percent of costs are for non-monetary externalities, 4 to 5 percent of costs are for monetary externalities, 4 to 8 percent are for bundled private-sector costs, and about 7 percent of costs are for public infrastructure and services. Delucchi also estimates that payments by motor vehicle users total $109 billion to $173 billion dollars a year, which is less that the $125 to $207 billion estimates of public infrastructure and services. He argues that it is not necessary for user payments to match government expenditures for efficient provision of resources. The difference between taxes paid by users and the provision of public goods and services related to motor-vehicle use must be judged on other grounds.

Delucchi does not include urban sprawl as a cost of automobile use. He says sprawl is a result of locational decisions, not motor vehicle use. Although it is true that transportation systems and cost influence location decisions, he contends that the costs of different patterns of development are not directly a result of driving motor vehicles. Furthermore, the proper corrective action would be to correctly charge for infrastructure and other aspects of urban form, not change automobile prices.


This paper estimates the subsidies of automobile use in a medium-sized city (Madison, Wisconsin) in 1983. He uses data of highway costs and taxes for the city to determine that direct subsidies for highway infrastructure, maintenance, and policing were equivalent to $0.024 per passenger-mile or $105 per person. Indirect subsidies for air and water pollution, petroleum subsidies, land use opportunity costs, and personal injury are estimated from national data, and are therefore less precise than the highway data. Indirect subsidies equal $0.034 per passenger-mile or $257 per person. In this estimation of costs, the largest subsidies are for personal injury (36 percent), highways (23 percent), and air pollution (15 percent).

Hanson contends that subsidization of the automobile produces more dispersed patterns of development than would occur otherwise. Furthermore, sprawled development limits transportation options by making the automobile the only viable source of travel.
The size of cost estimates for some externalities, such as accident costs, is large compared to those reported by others.


Based on a review of existing studies, Litman estimates the cost per mile for the average car, fuel-efficient car, electric car, van, rideshare passenger, diesel bus, electric bus/trolley, motorcycle, bicycle, walk, and telecommute. The report includes cost estimates for 20 different factors that affect travel choice. These range from the costs of operating a vehicle to the cost of lack of transportation options.

Litman estimates that for urban travel during peak periods, a mile of travel by automobile costs $1.33 with $0.16 costs due to variable vehicle costs, $0.25 fixed vehicle costs, $0.31 user time and risk, and $0.61 to external or societal costs such as pollution and land use impacts. The same mile of travel in an urban area during the off-peak hours costs $1.06, with $0.14 attributable to various vehicle costs, $0.25 to fixed vehicle costs, $0.33 to user time and risks, and $0.34 to external or social costs.

Litman does not separate out governmental costs of travel. Those costs paid by users, such as roads built with gasoline taxes, are considered user costs, and those paid through general taxes, such as policing, are lumped in external costs. The largest external costs in Litman’s scheme are for air pollution, accident costs not paid by the user, the opportunity costs of land used for roads, and external costs of energy consumption such as tax subsidies, energy security, and environmental damage.

Litman contends that land-use costs are a legitimate cost of automobile use because auto use encourages sprawl by using large amounts of land for transportation facilities and facilitating development of the urban fringe. The effects include loss of prime farmland and wetlands, aesthetic degradation, loss of community, and higher transportation costs. Litman estimates that land-use effects cost about 7 cents per mile compared to 33 to 35 cents for owning and operating the vehicle and 17 to 23 cents for travel time.

This study provides relative measures of the various costs of using the automobile and other modes of travel based on estimates made by others. The data used rarely cover the full range of modes for which the author estimates costs. Thus simplifications are often used to complete the tables. The author attempts to monetize all costs despite the lack of hard data on many costs. The numbers are average estimates and do not consider location-specific factors such as differences in urban and rural road building or congestion. The types of outcomes that the author counts as land-use impacts of transportation would already be counted elsewhere in an analysis of the costs of the sprawl and should not be counted again.


This report estimates the amount of subsidization of the automobile in the United States. Subsidy is defined as costs not paid directly by the user. The study estimates that road users pay only about 60 percent of the $53.3 billion annual governmental costs of building and maintaining roads. They also pay only 25 percent of the $91.0 billion in police, fire, and other municipal costs associated with
automobile use. The largest subsidy is for free employer-provided parking. The authors estimate that 85 percent of $100 billion cost of employee parking is not paid by the user. The report also estimates that users pay none of the air pollution costs (estimated to be $37 billion), security costs of oil ($25 billion), petroleum subsidy ($0.3 billion), and noise ($9 billion). Also, about 15 percent of accident costs, or $55 billion worth, are estimated to be paid by someone other than the responsible party. The authors were unable to estimate some costs, such as the opportunity costs of land devoted to roads.

Estimates are based on data from previous studies. Estimates of eternality costs are more speculative than other costs.


This study uses the methods of the Apogee study, local data for governmental and some user costs, and national data for societal and some user costs to estimate the cost of typical trips by various modes within the built environment of Boulder. The study utilizes actual travel times to and from specific locations.

The study estimates the cost of commuting to Denver (25.5 miles) to be $24.61 by single-occupancy vehicle (SOV) and $15.79 by transit. The SOV trips breaks down into $19.40 for user costs, $1.16 for governmental costs, and $4.04 for societal costs. The transit trip includes $10.68 of user costs (mostly time), $4.70 of governmental costs (mostly for transit provision), and $0.41 of societal costs. In this case, transit is a cheaper trip. In contrast, for a multipurpose shopping trip of 9.75 miles within the city of Boulder, an SOV trip costs $11.66, whereas transit costs $29.17. Transit is more expensive because of the time involved and the governmental expenses for off-peak transit travel. For a short 2-mile trip to downtown Boulder, more options are available. An SOV trip costs $4.02, a transit trip $3.43, a bike trip $1.74, and a pedestrian trip $5.59 (largely because of the longer time).

This study shows that travel costs vary with the environment and type of travel. Transit costs less for long commutes, walking and bicycling are viable alternatives for short trips in a compact city, and the car is best for linked trips.


This study estimates the total annual cost of automobile use in the United States in 1990. The author divides costs into two main categories: 1) direct expenses of automobile ownership and use, and the cost of highways; and 2) three categories of external costs: direct monetary costs such as for emergency medical care, lost economic gain due to air pollution and other externalities, and the opportunity costs of using land for roads and parking. Using data from other studies, he estimates that in 1990 the total cost of the automobile system was $1,152 billion. The largest costs are direct expenditures for the automobile ($440 billion, or 38 percent), land use opportunity costs ($246 billion, or 21 percent), congestion costs ($146 billion, or 13 percent), air pollution costs ($100 billion, or 9 percent), and highway costs ($80 billion, or 7 percent).

Voorhees argues that the automobile has had two land-use impacts: consuming

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large amounts of land for roads and parking and encouraging sprawl. He estimates the opportunity costs of all the land devoted to roads. He does not estimate the costs of sprawl because he lacks data and because these costs already are calculated in the amount of fuel consumed and other costs of using the automobile that result from a more dispersed pattern of development.

The external cost estimates are quite subjective and would easily be changed by making different assumptions. The cost estimate for land opportunity costs is quite large compared to those reported in other studies.
3.

Annotation of Key Studies on

LAND/NATURAL HABITAT
PRESERVATION

This is a short summary paper covering the topics listed in its title, mainly by reviewing the major studies of those topics in the past. It draws heavily upon the research done by the authors for the State of New Jersey and reported on elsewhere in this overall study. The paper examines the implications of planned development versus more traditional decentralized development in the areas of land consumption, infrastructure costs, housing costs, and fiscal impacts.

Most of the studies covered have analyzed at least two different development patterns. One is the currently dominant pattern, or sprawl. "Development of this type typically includes subdivision-style residential development and strip nonresidential development consisting of skipped-over, noncontiguous land development, including residential, in the form of 0.33 to 1.0 acre lots, and nonresidential using floor-area ratios of 0.20 or less" (p. 1). In contrast, planned development seeks "to contain most new growth around existing centers and limit development in rural and sensitive environmental areas. This is done by increasing the share and density of development close in to existing development."

The growth analyzed is assumed to consist of population growth leading job growth, with the former consisting of both immigration and natural increase. Ideally, these trends and the provision of facilities accommodating them are handled in a timely, harmonious manner.

Traditional growth departs from the most harmonious possible path by locating residential and other development "to a new outer ring of the metropolitan area with access from this new outer ring oriented increasingly to beltway or interstate rather than central core job locations." This results in an increasing underutilization of core land and infrastructures. This process is associated with the development of new "edge cities." That, in turn, generates a new farther-out ring of bedroom residential subdivisions. "The core of the metropolitan area, absent redevelopment, becomes relatively abandoned by a variety of necessary and blue-chip economic activities and a home by default for poor residents who cannot follow . . . or are not allowed to follow upper-income residents to the suburbs (because of zoning). Even with redevelopment, the central core is a struggling entity with no soft-goods retail anchors, no quality supermarkets or movie theaters, a declining upwardly mobile population, public school systems being replaced by private, and increasingly higher property taxes to pay for rising public service costs" (p. 3).

Traditional development is costly because of providing new infrastructure for those located far out, and maintaining the old infrastructure for those left behind. Yet in the short run, this process is not bad for the region. It distributes firms and households to localities that minimize individual out-of-pocket costs. But no consideration is given to the larger societal costs or impacts of these individual choices.

The planned alternative channels growth to more efficient locations over the long run. Most of the far-out growth in traditional development is contained closer to existing infrastructures and built-up areas. Thus, "In the final equation . . . there is a more orderly and less wasteful relationship between old and new development" (p. 5).
Another goal of planned development is conservation of open space in the forms of agricultural land, forests, and environmentally-sensitive areas. In the New Jersey study, there was enough land to accommodate a 20-year projection of population and firm growth under both basic growth schemes. But the PLAN consumption of land over 20 years was 60 percent lower than the TREND consumption of land. This would enable preservation of greater levels of both farmland and frail lands.

Concerning infrastructure costs, the New Jersey study showed that the state could save $1.3 billion in infrastructure costs over 20 years for roads, utilities, and schools, if it followed the PLAN scheme instead of the TREND scheme. This savings occurs mainly through more intensive use of existing infrastructure capacity, as opposed to building more new infrastructure. The PLAN approach directs new growth to where such excess capacity is found, rather than directing new growth to virgin territories. Also, the PLAN scheme is more compact than the TREND scheme, therefore requiring accommodation of shorter distances of movement. This also applies to sewer and water systems. In addition, bringing together larger numbers of people in more compact areas may provide for some economies of scale, such as larger educational facilities, with lower costs per student. Earlier studies have suggested that road costs per unit might be lower because persons in compact settlements travel less and use roads more efficiently—that is, closer to capacity. Both RAND and the state of Florida had conducted studies arriving at that conclusion. An Urban Land Institute study by James Frank had concluded that low-density development was far costlier in terms of all capital costs than a mixture of 30 percent single-family and 70 percent apartments, plus using contiguous development rather than leapfrogging.

This shift cut costs per unit from $35,000 to less than $18,000.

The Rutgers New Jersey study, using the same increases in population (520,000 persons in 20 years), jobs, and households, found that PLAN would save:

- $699 million in roads, a 24 percent savings.
- $561 million in water and sewer costs, a 7.6 percent savings.
- $173 million in school capital costs, a 3.3 percent savings.
- An overall savings of $1.4 billion, or just under 10 percent.

In the James Duncan study, Search for Efficient Growth Patterns (1989), PLAN achieved savings of 60 percent for roads, 7 percent for schools, 40 percent for utilities, and -2 percent for other capital facilities. In the James Frank study The Costs of Alternative Growth Patterns: A Review of the Literature (1989), PLAN achieved savings of 27 percent for roads, 1 percent for school capital spending, and 33 percent for utility capital extensions. In the Burchell studies, PLAN achieved savings of 24 percent for roads, 3 percent for schools, and 8 percent for utilities.

Thus, all three major quantified studies of this topic show significant savings through planning and contiguous development for roads and utilities, and smaller ones for schools. The authors of this paper synthesize these studies by concluding that PLAN achieves savings of about 25 percent for roads, 5 percent for schools, 15 percent for utilities, and zero for other capital spending.

Concerning housing costs, only the New Jersey study has looked at them at a comprehensive scale such as that used for the above analysis of public costs. It found that land prices per acre and housing prices per unit would rise in areas where low-density units were
permitted under the PLAN approach. But housing prices would decline (compared to their existing average) in more central locations because higher-density units would be built there. Since more added housing would be built in close-in locations than far-out ones, the net effect was a reduction in housing prices of about 6 percent.

Concerning fiscal impacts upon governments, the ability of PLAN growth to use existing excess infrastructure capacity would reduce net fiscal impacts, compared to TREND. The savings would be $112 per year, or 2 percent.

An overall summary chart is presented at the end synthesized the above findings.


Dahl documents wetland losses from the colonial period to the 1980s. In colonial America about 400 million acres of wetland existed; as of the 1980s, the wetlands inventory is down to 250 million acres.

Wetlands occur in every state in the nation in varying size, shape, and type. Variation occurs around differences in climate, vegetation, soils, and hydrologic conditions.

Until recently, wetlands have been considered a hindrance. Swamps, bogs, sloughs, and other wetland areas were considered wastelands to be drained, filled, or manipulated to "produce" other than natural services and commodities. Recently, though, wetlands have come to be seen as vital areas that constitute a productive and invaluable public resource.


Ewing addresses the need for change in development policy and practice given expected rapid Florida growth rates (approximately 5 million people during the next 20 years) in Florida's dominant development pattern of urban sprawl. Ewing argues that increasing social and economic costs will occur as a result. In an attempt to minimize these costs, the author advocates community development in which public purposes are weighted against market considerations. Such public purposes are listed as affordable housing, energy efficiency, and the preservation of natural areas, among others.

Discouraging urban sprawl by creating vibrant communities means an emphasis on population diversity (age and class), the establishment of street life, creating a sense of place, and other features contributing to "livability." Recommendations to realize these goals are presented. They are meant to be used as a basis for establishing comprehensive plans for new communities and redevelopment projects, land development regulations or for the evaluation of development proposals. The use of seven new communities (smaller planned communities within the 300-to 500-acre range) as case study illustrates the "best" development practices.
4.

Annotation of Key Studies on

QUALITY OF LIFE
1. POPULAR LITERATURE


*Money* magazine publishes an annual article on “the best places to live” that ranks the 300 largest metropolitan areas in the United States. To rank the metropolitan areas, *Money* first surveys its subscribers to rate 41 quality of life factors. They then collect data on specific measures for the 300 cities and assign the data to nine broad categories: crime, economy, health, housing, education, weather, leisure, arts and culture, and transportation. The data is then weighted according to readers’ preferences to produce the final ranking.

The top 10 quality of life characteristics, as rated by *Money* subscribers, are: low crime rate, clean water, clear air, plentiful doctors, many hospitals, housing appreciation, good schools, low property taxes, low income taxes, and strong state government. *Money* points out that the rating of quality of life characteristics differed by gender and type of household.

This article is one of several annual or semiannual rankings of places in the popular literature. Although *Money* does survey readers to determine which characteristics of quality of life are important, it does not reveal enough about its specific measures or scoring method to assess whether its ranking accurately reflect the survey results. In addition, the survey asks *Money* subscribers to rate 41 characteristics, and so it is probably not representative of the U.S. population in general, and it may not include every characteristic that readers think are important. Overall, however, this article provides insight into how the topic of quality of life is typically treated in the popular literature.


Drawing from a variety of private and public data sources, the *Green Index* uses 256 indicators to measure and rank each state’s environmental health. The indicators of encompass a broad range of environmental conditions and are grouped into eight major categories: (1) air sickness; (2) water pollution; (3) energy use and auto abuse; (4) toxic, hazardous, and solid waste; (5) community and workplace health; (6) farms, forests, fish and fun; (7) congressional leadership; and (8) state policy initiatives. Based on the indicators, the authors identify the best and worst states overall.


This 1988 critique of the *Places Rated Almanac* (1985 edition) is relevant to both the 1993 edition and other popular rankings of places. The authors point out that the essential problem with the component measures used to rank places is that they have not been tested against the stated opinions of migrants or observed migration behavior. The authors cite a 1985 study (Pierce 1985) that surveyed a random sample of New York state residents on the importance of the categories used in *Places Rated*. Respondents ranked categories in order of importance: personal economics (jobs), housing, crime, climate, health, education, recreation, transportation, and arts and culture. An article that compared overall metropolitan scores (not rankings) in *Places Rated Almanac* with a
nonrandom sample of households found only four of the nine categories statistically significant to migration decisions: housing costs, crime, education, and recreation. The authors also compared category rankings for 51 metropolitan areas in Places Rated Almanac with migration between 1975 and 1980; this comparison found rankings of housing cost and economic opportunity significantly correlated with rates of immigration.

Landis and Sawicki point out that Places Rated Almanac assumes that a person's quality of life is critically related to the qualities of the place in which they live or work. Research, however, indicates that most individuals rank personal causes of satisfaction and dissatisfaction as much more important determinants of their quality of life than geographically based factors.


This article identifies the 15 best U.S. and 5 best international cities for work and family. Much of the article is devoted to qualitative descriptions of the best cities, with little explanation of the methods used to rank cities. Among the variables considered were the crime rate, quality of schools, availability of culture, traffic congestion, number of doctors, tax rates, price of real estate, and costs of a martini and a first-run movie. The article contains a table showing attributes of the cities in six categories. These categories, and the specific measures shown, are:

Demographics: 1996 population, % change in population 1996-2001, median household income, and % of population with bachelor's degree
Cost of living: cost of living index, high-end housing price, low-end housing rent, and the cost of a loaf of french bread and a martini
Business: % employed in managerial positions, class A office rental rate, best business hotel, recommended restaurant, and average commute time
Leisure: number of art museums, public libraries, and 18-hole golf courses, and the most-visited attraction
Climate: days below 32 degrees, above 90 degrees, and poor air quality
Quality of Life: violent crime rate and doctors per capita

Overall, this article shows how the topic of quality of life is typically treated in the popular literature.


The authors use an extensive set of criteria to rank 343 U.S. and Canadian metropolitan areas by ten categories. These categories, with their specific component measures are:

Costs of Living: average house price, utilities, property taxes, college tuition, food at home, health care, and transportation, all indexed relative to the U.S. average.
Jobs: the number and percent increase in new jobs.
Housing: annual payment on average-priced home.
Transportation: commute time, mass transit, national highways, airline service, and passenger rail service.
Education: number of students enrolled in community or two-year colleges and private and public four-year or graduate-level institutions.
Health Care: number of general/family practitioners, specialists, general short-term hospital beds, and hospitals.

Crime: violent crime and property crime rates.

The Arts: number of concert or classical-format radio stations, touring artists bookings (classical music, dance, professional theatre), resident arts companies (classical music, ballet, professional theatre), non-profit art museums/galleries, and public library collections.

Recreation: public golf, good restaurants, movie theatre screens, zoos, aquariums, family these parks, pari-mutual betting, professional and college sports, ocean or Great Lakes coastline, national forests, national parks, national wildlife refuges, and state parks.

Climate: number of very hot and cold months, seasonal temperature variation, heating- and cooling-degree days, freezing days, zero-degree days, 90-degree days.

The scoring system uses a variety of methods to convert each measures into a score, which is then summed to rank metropolitan areas in each category. The scoring method implicitly weight the specific measures and describe the relationship between the measure and quality of life. The ranks in each category are summed for an overall score that is used to rank metropolitan areas; each category has equal weight in the overall ranking. The authors discuss how the reader can use his or her personal preferences to weight the categories for a personalized overall ranking of metropolitan areas.

This book is popular literature; it has a common sense or anecdotal notion of quality of life, with no theoretical underpinning or review of relevant literature. The authors' scoring system implicitly weights the various measures with no apparent basis other than the authors' opinion. Although the book acknowledges that individuals will have different preferences, their suggested method for the reader to apply weights to the rank by category will not yield a ranking based on preference because it does not change the weighting of specific measures that went into the ranks by category, nor will it address measures that were not considered. Overall, however, this book provides insight into how the topic of quality of life is typically treated in the popular literature.

2. INDICATORS, REPORT CARDS, AND BENCHMARKS


Many states, cities, and hamlets use indicators to measure their own economic and social health, and to set future goals. Indicators are also called benchmarks or vital signs. Local government often creates the measures, but they have also been created by community groups. All indicator projects discussed in this article have used public process to identify specific measures. Some indicator projects have a specific focus, such as government performance or the environment, whereas others are comprehensive.

Jacksonville, Florida developed a Quality of Life index in 1985 and updates the report annually. A 1991 community review of the index revealed education as the community's top priority. The other categories in the index are the economy, public safety, natural environment, health, social environment, government and politics, culture and recreation, and mobility. Specific measures include the number of outdoor sign permits issued, cost of 1,000 kwh of electricity, student
fitness test scores in 50th percentile or better, and people reporting commute times of less than 25 minutes. Jacksonville has recently developed an equity index that provides a neighborhood-level looks at measures from the Quality of Life index related to delivery of public services, such as police response times.

“Sustainable Seattle” is an indicator project focused on the regional long-term cultural, economic, environmental, and social health and vitality. The project has developed a set of indicators with the headings environment, population and resources, economy, youth and education, and health and community. Specific measures include wild salmon, VMT and fuel consumption, work required for basic needs, ethnic diversity of teachers, and asthma hospitalization rate for children.

The Upper Valley 2001 project in the upper Connecticut River valley has developed a list of indicators with 15 categories, such as citizenship, community, communications, education, recreation, health care, personal and public safety, human services, the arts, transportation, businesses, farms and forests, resource use, and the natural environment.

The goal indicators is to change policy to move the measures in positive directions. This change does happen, but on an ad-hoc basis.


Quality of life is recognized as an important factor in economic development, but its exact role and the methods for measuring it are poorly understood. The author identifies four major limita-

ions to developing quality of life measures to compare cities or regions: (1) poor availability of comparable objective data, (2) lack of subjective data necessary for addressing this inherently subjective topic, (3) inability to address unique local features, and (4) difficulties in choosing commonly valued weights for combining different components in overall indexes. This article argues for the monitoring of quality of life within a city or region as an important substitute to external comparisons. Internal monitoring can measure changes in local quality of life over time to guard against deterioration of competitive advantages in the future.

The author uses Austin, Texas as an example, because the city has used quality of life to attract high-technology firms, and locals are now concerned that rapid development, particularly suburban "silicon strips," will cause quality of life and thus the city's attractiveness to high-tech firms to decline.

Austin's quality of life was a major factor in the location decision of a high-tech firm. Quality of life was an explicit element of a formal offer to the firm to locate in Austin. Nine quality of life advantages were itemized in the executive summary of the offer: excellent schools, parks and playgrounds; ease of mobility around the city; close-by lakes for water recreation; other opportunities for hunting, fishing, and camping; access within two-hours flying to Colorado skiing and Mexican vacations; abundant cultural and entertainment possibilities; general cleanliness of the city; attractive topography and mild year-round climate; and "open receptive social structure, a population long noted for friendliness, and a reputation as a desirable place to live and raise children."

Accelerated growth triggered by the firm's location produce negative consequences for quality of life, including
housing affordability, traffic congestion, threats to the area's water quality and natural environment, and the perception that downtown office development threatened the city's music scene. The local perception was that these consequences were caused by unmanaged development.

In reaction to these consequences, the Austin Chamber of Commerce began a research program to measure trends in the area's quality of life. This program interviewed leaders of interest groups to identify significant aspects of Austin's quality of life, developed measures for those aspects, and surveyed residents about the important of these measures in their perceived quality of life. Residents placed most importance on concerns such as crime, cost of living, schools, traffic, and jobs, and less importance on amenities such as shopping, restaurants, and entertainment. Sixty-two percent of recent migrants identified quality of life as an important factor in attracting them to Austin.


The Oregon Progress Board is a part of the State of Oregon Economic Development Department. Oregon Benchmarks are measurable indicators that Oregon uses at the statewide level to assess its progress toward broad strategic goals. Categories and subcategories of benchmark measures under the heading Benchmarks for Quality of Life are:

Unspoiled Natural Environment: air, water, land, plants/fish/wildlife, and outdoor recreation.

Developed Communities That Are Convenient, Affordable, Accessible, and Environmentally Sensitive: community design, transportation, housing, access for persons with disabilities, access between communities, and emergency preparedness.

Communities That Are Safe, Enriching, and Civic Minded, With Access to Essential Services: public safety, justice, access to cultural enrichment, sense of community, access to health care, and access to child care.

The other headings are Benchmarks for People and Benchmarks for the Economy.

3. ECONOMICS LITERATURE


This recent examination of the nation's manufacturing industries illustrates the potential importance of amenities and their impact on migration patterns. Duffy observed that, "One of the most noticeable economic phenomena of this century has been the change in the regional distribution of manufacturing." Duffy examined the factors related to interstate differences in the growth of employment in 19 manufacturing industries between 1954 and 1987. He found that for four of the 19 industries, the pattern of employment growth was directly related to amenities, with the latter being represented by two variables: one that distinguishes states with a warm climate from those with a cold climate; and another that identifies 19 states that exhibit both a high population of retirees and high in-migration rates. More important, Duffy found that 18 of the industries had shifted closer to their product markets and 16 had shifted closer to workers.
This article extends the existing “static” literature on regional differences in quality of life by examining how changes in the quality and quantity of amenities can contribute to the evolution of quality of life over time and across places. The article provides estimates of quality of life rankings for U.S. states over the period 1981-1990.

Results indicate that sparsely populated mountainous western states such as Montana and Wyoming are highly ranked in the estimated quality of life throughout the decade, whereas densely populated midwestern and eastern states consistently ranked near the bottom in terms of quality of life. Reduced state and local government spending on highways, increased traffic congestion, and air pollution, were found to be the most important contributors to the deterioration of quality of life in states that declined in the rankings. States that ascended in the quality of life rankings did so for a variety of reasons including improved air quality, increased highway spending, reduced commuting times, and reduced state and local taxes.


In this article, Gottlieb investigates whether residential amenities can influence the location decisions of high-tech firms in New Jersey. In order to determine whether firms evaluate amenities on behalf of potential employees, Gottlieb measures a variety of amenities at both the potential location of the firm and the residential area where potential employees are likely to live. Results of the study suggest that firms in the high-tech sector are repelled by disamenities like violent crime and high municipal expenditures at the work site. Gottlieb finds weak evidence to support his hypothesis that residential amenities such as recreation, low traffic congestion, and public education affect the locational decisions of high tech firms.


This study examines the patterns of migration across the fifty states and attempts to determine the relative strengths of two primary motives workers and households have for moving: (1) to earn a higher wage (adjusted for differences among the states in the costs of living); and (2) to have access to the particular amenities of the individual states. Based on migration patterns for 1971-87, Greenwood and others estimate the amenity-related differential in wages for each state, relative to a national average.


Roback investigates the role of wages and rents in allocating workers to locations with varying quantities of amenities, both theoretically and empirically. Roback finds that regional differences in wages and land rents are largely explained by regional differences in amenities. Results of her empirical work indicate that crime, pollution, and cold weather are
disamenities and that clear days and population density are amenities. Amenities will decrease wages and increase land rents, whereas disamenities will increase wages and decrease land rents.


Rosen examines the determinants of intercity wage differentials for 19 SMSAs. Rosen finds that particulates, rain, crime, population growth, and unemployment are disamenities whereas sunny days are amenities. Using his regression estimates, Rosen computes an average quality of life ranking for the 19 SMSAs. He finds that the SMSAs with the highest average quality of life rankings in general exhibit less pollution, better climate, and lower crime rates than the SMSAs with the lowest rankings. He cautions the reader that the rankings of the SMSAs may be altered depending on the weight given to the various city attributes, especially population density.


The main objective of this study is to determine to what extent decisions about recent interstate migration to Washington state and subsequent employment are influenced by the availability and the use of information technology at the new location. However, the study also investigates the push and pull factors that contribute to a migrant’s decision to move to Washington.

The study estimates that 2,600 so-called lone eagles—individuals who are able to live anywhere and telecommute to work—moved to Washington in 1995 and that many of them did so for quality of life reasons. The most important pull factors that lone eagles cited as influencing their decision to move included the quality of the natural environment, outdoor recreational opportunities, a desirable climate, and a safe place to live. Important push factors that influenced the decision to move included urban congestion, undesirable climate, and fear of crime.


This article uses a survey of migrants to, and residents of, 15 high-amenity wilderness counties to determine what factors explain the willingness of migrants to accept or not accept declines in income after moving. Survey respondents were asked about their dissatisfaction or satisfaction with the previous location (push factors) and the importance the attributes of the destination county in the migration decision (pull factors). On the push side, factors such as environmental quality, pace of life, crime, scenery, and outdoor recreation had higher levels of dissatisfaction than employment opportunities and cost of living. In a similar manner, survey respondents placed importance on pull factors such as environmental quality, scenery, outdoor recreation, and other natural resource amenities and less importance on employment opportunities and cost of living.

Results of the study indicate that approximately half of the surveyed migrants received lower incomes and that
quality of life and amenities were more important factors in attracting migrants to the counties than employment opportunities.

4. SOCIOLOGICAL LITERATURE


Urban sprawl is defined by the author as signifying very low-density urban development, oriented to the automobile, with detached single-family houses on relatively large lots. Urban sprawl implies a scattering of jobs, shops, and services, often in the form of strip commercial development; a scarcity of large open or green spaces; and a lack of community focus in both the physical and social sense. Despite its negative image, most Americans live in environments characterized by urban sprawl.

Many Americans, including some sociologists, see urban sprawl as desirable when compared to crowded, noisy, violent, and corrupt cities. Urban sprawl gives the individual more space, increased safety, more privacy, and a piece of land to call one's own. Urban sprawl, however, has recently been attacked as expensive and an exorbitant user of natural resources, especially land and gasoline. While most of the attack from sociologists has focused on the impacts to society, this article examines the effects on residents of living in low-density, suburban residential environments. Since the positive consequences of suburban living are reasonably well known, this article is devoted to the negative consequences.

Most of the work of sociologists focuses on negative consequences for the metropolitan area as a whole and its social, economic, and political functioning. Four negative consequences have been fairly well-documented:

1. Low-density suburban development has led to an intensification of residential segregation by race and social class.
2. The benefits of urban sprawl are distributed regessively with respect to wealth.
3. Of all the alternative forms of urban expansion, urban sprawl is the one that is most destructive of the center city.
4. Although not an inherent consequence of low density development, urban sprawl on the American scene, when linked up with small scale, semi-autonomous local governments, has led to the proliferation of fragmented and overlapping governmental units.

Negative consequences of urban sprawl appear most tangible when considering the lives of five groups: women, teenagers, the poor, elderly, and the handicapped. The author states that “it is hard to escape the conclusion that urban sprawl is an urban development form designed by and for men, especially middle class men,” because urban sprawl functions best when a resident has regular and direct access to an automobile. Middle-class men have more access to an automobile than people in the five groups listed above. A major negative consequence of urban sprawl is deprivation of access; even where community facilities and services are present and people can afford to use them, a large percentage of the population is disenfranchised from their use due to inadequate transportation.

A closely related negative consequence is environmental deprivation from a deficiency of local elements that provide activity, stimulation, and well-being. This
is particularly a consequence for teenagers. The walking environment of the low-density American suburb is virtually the sole environment for the teenage resident, yet it typically consists of little else than homes placed far enough apart that even access to local friends is difficult. There is little diversity or variety of activities: the best that usually is offered is a shopping center where teenagers are made to feel unwelcome if they are just hanging out, and perhaps a fast-food restaurant.

Other potential negative consequences are "sensory underload" and the "fall of public man." The suburban trend of differentiation of residential areas by stages of the life cycle—with families, single adults, and the elderly inhabiting entirely separate neighborhoods—breaks up the "round of life" and may have negative consequences for young people.

6. Collective Self-actualization—
cultural heritage and consensus on values.

7. Personal Self-actualization—
moral perfection.

It is generally accepted that there is a direct positive relationship between quality of life and quality of the person; that a higher quality of life improves the quality of the person in a self-reinforcing manner. Yet, there is ample evidence of the possibility of an inverse relationship: that a higher quality of life may reduce the quality of the person (i.e. moral decay) or that a lower quality of life may increase the quality of the person (i.e. "adversity builds character").

5. PSYCHOLOGICAL LITERATURE


This article relates Maslow's (1970) hierarchy of needs to components of quality of life. These needs and quality of life components are:

1. Physical—safety of natural habitat.
2. Peace—security.
3. Physiological—material well-being.
5. Independence—freedom, human rights, and dignity.
5.
Annotation of Key Studies on
SOCIAL EFFECTS

This article presents a model of how poverty concentrations within cities are related to city growth rates. “The central theme of this article hold that the logic of meritocracy creates class divisions in the urban labor market which may undermine the very conditions that make rapid economic growth possible” (p. 53). The need for high-skilled workers in a modern high-tech economy creates two classes of workers: those with the requisite skills, and unskilled workers. But schools in many large cities are failing to provide their students with the skills needed to be in the first class. This creates a caste-like result, because the primary determinant of the school performance of children is the educational level of their parents.

The basic dynamic is as follows:

- The “underclass” within the cities strives to attain the standard of living and jobs suitable for high-skilled workers, but are frustrated by their inability to do so because of the poor quality of city schools. The life styles of the middle class have a demonstration effect upon the underclass, encouraging them to want to consume more.

- The resulting frustration leads to criminal behavior and violence on the part of the underclass. This results because members of this class have only two sources of income in the model—transfer payments and crime.

- That behavior drives middle-class (upper-tier) workers and households out of the city into the suburbs where they can escape from crime and violence.

- The departure of the middle-class weakens the fiscal position of the city government, thereby reducing its ability to provide good quality schooling to the underclass. This creates a negative downward spiral—a “vicious circle.

A key variable in this dynamic system is the “middle-class ratio”—that is, the percentage of the total population consisting of middle-class residents.

Another key variable is the attitude of students towards academic achievement. The author argues that membership in the underclass causes anti-academic attitudes among students.

There is a “critical failure ratio” among city students which determines whether the middle class will grow or decline within the city. If the actual failure rate among students (which determines whether they will become middle-class or under-class members) rises above this critical rate, that causes the middle class ratio to decline because the behavior of the underclass, then larger, drives middle-class residents out. If the actual failure rate is below the critical level, then more students graduate into the middle-class, and the incentives for middle-class residents to leave is reduced—even though greater competition in the labor market among the larger numbers of middle-class workers may cause the unemployment rate to rise.

The author regards this entire situation as a negative externality—an unintended consequence of technological change that has raised the skill requirements for high-wage workers, where society provides unequal access to learning among its young people. Thus, “the increasing importance of knowledge capital in economic growth contributes to the problem of urban poverty.” (p. 63)

The future of the city, and particularly its ability to change the way it grows, may
ultimately depend upon the willingness of the middle class to remain in the city despite the difficulties of caste division and crime that are the underside of the role of knowledge capital in economic life. In turn, a national government policy that encourages the exodus of middle-class citizens from the city may make significant urban reform and reconstruction impossible. (p. 63)

The Federal Government must recognize the role of knowledge capital in unwittingly exacerbating the urban crisis. In particular any urban policy that intends to make cities into virtuous circles must recognize the folly of forcing local governments to deal with the negative aspects of knowledge capital with diminishing economic resources. Further, a macroeconomic growth strategy that emphasizes human capital must carefully address the inequality, poverty, violence, and crime that result from educational failure. (p. 63)


This is a strictly narrative analysis of metropolitan area trends advancing the thesis that U.S. metropolitan settlements are splitting apart into "old cities" and "new cities." It covers much of the same ground as Anthony Downs's New Visions for Metropolitan America but in a much less systematized, totally non-quantified way. He proposes redirecting a lot of future growth into older cities where they have been "emptied out," and integrating new and old cities with strong public transit networks.

Barnett's analysis is heavily skewed towards physical design, since he is an architect and urban planner. He attacks strip commercial development in suburbs and advances many of the ideas of the "new urbanism." He favors compact development over continued sprawl. He favors tree preservation ordinances and other environmentally-sensitive regulations over trying to do away with regulations altogether.

A second major section of his book deals with older core areas. He traces their historic development and shows why the desire of the rich to live away from the poor, combined with transportation improvements, caused a withdrawal of resources from the center of our metropolitan areas.

Attracting new investment to the bypassed areas of the older city is also the other side of the coin of policies to restrict growth at the urban fringe. One will not work without the other. (p. 118)

He argues that downtowns have been growing, but the rest of older cities has been shrinking.

The current market for a new suburb in derelict parts of an old city is likely to consist of people from nearby areas who have started to make a little money, plus people whose other housing choice is a small house or a mobile-home way out on the urban fringe. (p. 146)

The minimum requirements [of successful inner-city revival] are to foster a community: affordable housing, public safety, and effective schools. (p. 163)

The future of older cities depends ultimately on public policy initiatives that they cannot control directly. Older centers and neighborhoods need rapid-transit links to the new centers in formerly suburban areas so that the metropolitan area can function as one economy and not split into two. Metropolitan services have to be supported by an equalized tax base; there need to be limits to growth at the metropolitan fringe accompanied by major new investment in bypassed residential neighborhoods and derelict industrial districts.
Reintegrating the metropolitan area is necessary for the survival of cities, suburbs, and the regional eco-system. (p. 175)

Barnett's weakness is that he does not indicate how to do this, or grapple with the political forces involved.

He claims there have been major changes in the environment for metropolitan development, including the following:

- The addition of design methods to the practice of planning.
- Community participation in planning.
- The rise of the conservation ethic and the concept of sustainability.
- Environmental conservatism.

We need positive planning about how to grow in the future. But:

[Local governments are not accustomed to making affirmative decisions about which areas of the natural landscape ought to be preserve and which areas should be built up. (p. 191)

The basic components of any city design are the organization of public open space—including streets, plazas, and parks or gardens—the architectural relationships among buildings, and the composition of building mass in relation to the landscape or the skyline. (p. 193)

The most difficult and central problems of urban design today are reconciling tall buildings with lower structures, or the need to incorporate parking and highway viaducts within a physical fabric defined by streets and buildings. (p. 196)

Experience has led city designers to seek to reestablish the primacy of the street in urban settings and go back to a mix of uses in central areas, rather than create the separate tower zones for office buildings that characterized many urban renewal plans.” (p. 196)

His national action agenda includes the following:

- Creating urban growth boundaries around all metropolitan areas.
- Adopting state planning laws in all 50 states.
- Creating regional revenue sharing based upon state-mandated revenue equalization formulas.
- Restoring natural ecosystems in urban areas.
- Having local plans that encourage compact neighborhoods with a mix of housing types and dense commercial centers.
- Expanding public transit systems, beginning with more buses.
- Renovating public housing.
- Helping some low-income households move out of areas of concentrated poverty.
- Spending more on inner-city schools, rather than industrial subsidies.

The environmental movement could be a strong political constituency for the maintenance and restoration of the old city. (p. 236)

This book has a correct analysis of basic trends, but totally lacks quantified contents or political savvy about how its broad recommendations might be accomplished in real-world settings.

This book presents definitions of the concept of “urban decline” and related variables that could be used in our sprawl study. Since this book presents by far the most systematic analysis of urban decline ever done, its methods of thinking about decline may be useful in our own sprawl study. We will need some measure of decline to compare statistically with measures of sprawl to determine what relationships exist between them, if any. The following material is taken mainly from chapter 3.

The definitions used in this book are based upon the concept that every city has certain specific social functions (set forth in the book), and therefore changes in its ability to perform those functions constitutes urban decline. In contrast, a low level of ability to perform those same functions—a static concept—constitutes urban distress. Some cities with high urban distress are not declining but may even be growing rapidly—such as cities with high poverty rates but high immigration.

The specific index of city urban decline used in this study is based upon changes in four variables. They are the unemployment rate, per capita income, the violent crime rate, and the government debt burden. Since there are changes between two dates, values of these variables must be compiled for two dates. In the present study, this would probably be 1980 and 1990. The index of city urban decline was based upon ranking all cities for each of these variables, and assigning points to each city based upon its relative position in the ranking for each variable. Cities in the lowest third (in terms of desirability) received a -1 for that variable; cities in the highest third, a +1, and cities in the middle third, zero. Then the scores of each city for all four variables were added up. The highest possible index score was thus +4 and the lowest was -4. A similar index was computed for city urban distress. This index used was based upon five variables, each for a single date. They were the unemployment rate, the incidence of poverty, the violent crime rate, the percent of housing considered old, and the city’s tax effort relative to that of its metropolitan area.

It is notable that neither city population change nor city employment change was used as part of the decline measure. This was done because not all population declines are bad (if the city is overcrowded to start), and because the authors used declining population as a separate measure that they related to the index of decline thus constructed. The unemployment rate captured some aspect of employment change anyway.

Two other measures were computed in this study. City disparity was a measure of the difference between each central city’s scores for these variables and the score of its suburban areas. City divergence was a measure of the rate of change in city disparity over time.

This book contains a relevant discussion of the future of large cities. It points out that there are both self-reinforcing and self-limiting factors involved in urban decline, but that the former seem to be much more powerful than the latter. Hence the concept of a self-reinforcing downward spiral of decline is validated by its analysis. Therefore, in reviewing the impact of sprawl upon core areas, the chapters of this book on the future of cities and possible policies to be followed to make that future better should be reviewed.

This is a book by an architect and urban planner about the spirit of American communities, and the "new urbanism" approach to altering that spirit. The primary approach is through urban design rather than quantified analysis, though there is some of the latter too. As the author says, "Social integration, economic efficiency, political equity, and environmental sustainability are the imperatives which order my thinking about the form of community" (p. 11). He contrasts those themes to the excessive privatization and individualism he believes have been embodied in the suburban development process in the post-1945 period. "The scale of our environment is now set in proportion to large institutions and bureaucracies rather than community and neighborhood" (p. 11). "The suburb was the . . . physical expression of the privatization of life and specialization of place which marks our time" (p. 9).

The alternative to sprawl is simple and timely: neighborhoods of housing, parks, and schools placed within walking distance of shops, civic services, jobs, and transit—a modern version of the traditional town. (p. 16)

At the core of this alternative, philosophically and practically, is the pedestrian. . . . Pedestrians are the lost measure of a community, they set the scale for both center and edge of our neighborhoods.

Two complementary strategies are needed. A tough regional plan which limits sprawl and channels development back to the city or around suburban transit stations; and a matching greenbelt strategy to preserve open space at the edge of the region. We cannot revitalize inner cities without changing the patterns of growth at the periphery of metropolitan regions; it is a simple matter of the finite distribution of resources. (p. 20)

Like most planners, he dislikes the automobile and the scaling of the urban landscape to accommodate it. He wants to change the scale to base it on pedestrians walking to suburban transit stops and linked to downtowns by transit. He wants to make housing units and lots smaller, link them by walking, and encourage in-law accessory housing units. He strongly supports regional growth management channeling growth inward to infill sites and limiting outward extension.

This calls for regional policies and governance which can both educate and guide the complex interaction of economics, ecology, jurisdiction, and social equity. (p. 32)

Adding transit oriented new towns and new growth areas can reinforce the city's role as the region's cultural and economic center. (p. 32)

Three constituencies—environmentalists, enlightened developers, and inner-city advocates—can find common purpose in regional planning goals. They can form a powerful coalition." (p. 36)

Identifying rational infill and revitalization districts, New Growth Areas and potential New Town sites should be the work of an agency which spans the numerous cities and counties within a metropolitan area. Lacking such entities, counties, air quality boards, and regional transportation agencies often take on the tasks without legal power to fully implement the results. Regional governments are needed if growth is to be managed and directed in a sustainable manner. (p. 51)

One special element of the regional plan should be identification of potential transit corridors and sites for TODs. (p. 52)
Suburbs are built upon a fundamentally wrong spirit and orientation:

The rise of the modern suburb is in part a manifestation of a deep cultural and political shift away from public life. . . . Socially, the house fortress represents a self-fulfilling prophecy. The more isolated people become and the less they share with others unlike themselves, the more they do have to fear. . . . The private domain, whether in a car, a home, or a subdivision, sets the direction of the modern suburb. . . . In fact, one of the primary obstacles to innovations in community planning remains the impulse toward a more gated and private world. (p. 37)

His design strategy is based upon three major principles:

First . . . the regional structure of growth should be guided by the expansion of transit and a more compact urban form; second, . . . our ubiquitous single-use zoning should be replaced with standards for mixed-use, walkable neighborhoods; and third, . . . our urban design policies should create an architecture oriented toward the public domain and human dimension rather than the private domain and auto scale. (p. 41)

He advances the concept of the TOD, or Transit Oriented Development—a basic building block in his regional development scheme. It features "pedestrian pockets" around transit stops, within one-quarter of a mile—an easy walkable distance. These pockets contain mixed uses including commercial centers and public services. Farther out from the stations are secondary areas containing mostly housing. He believes automobile usage in such communities would be much lower than it is now, because more people would walk to things. There would be both Urban TODs and Neighborhood TODs (for lower-density areas). Average residential densities of 10 units per acre should be maintained to support bus service, with higher densities to support rail transit. In another spot, he recommends net densities of 18 units per acre.

He would like a 40-60% split between transit and autos, but that still implies a majority of travel by autos.

His larger regional scheme shows transit stops one mile apart. Each TOD around such a stop contains 288.5 acres—a circle of 2,500 feet in radius. A key is what fraction of the land should be used for housing. At 40%, that would be 115.4 acres; at 65%, it would be 187.5 acres. Then what average density of housing would prevail? He suggests a range from 10 to 25 units per acre. In another place, Calthorpe says Neighborhood TODs should have minimum densities of 7 units per net acre (5,600 persons per square mile) and a minimum average of 10 units (8,000 persons per square mile—just a bit higher than the city of Los Angeles). In Urban TODs, the minimum should be 12 and the minimum average 15, with maximums set by local plans. At 15 units per net acre, the gross density would be 15,600 persons per square mile with a residential land coverage of 65 percent, and 12,000 with coverage of 50 percent—the coverage used for the other statistics earlier in this paragraph.

Secondary areas should have a minimum average density of 6 units per net acre, or 4,800 persons per square mile with 50 percent residential land coverage. This is therefore the minimum permissible density anywhere in the developed region.

Much of the book sets forth design guidelines for parks, commercial areas, transit stops, and a set of specific projects done by Calthorpe embodying
his ideas.

This is an analysis of whether regional planning and other arrangements are necessary ingredients in any effective strategy to halt the decline of many large cities. It is a broad overview of the issues involved in a few pages. The analysis begins with a description of how out-migration to the suburbs is occurring in large cities, partly in response to much higher crime rates there. This is a potpourri of quotations on all sides of the issue, rather than a clear or straightforward analysis leading in any one direction. Persons on both sides of each major aspect are quoted with little conclusive results. Studies showing linkages between suburban and city prosperity are cited. Proponents of regionalism like David Rusk and Anthony Downs are quoted, and cities like Portland and the Twin Cities cited. Yet "In all of U.S. history, voters have approved only 20 city-county consolidations while a hundred have been voted down, according to . . . HUD." (p. 904) Selling regionalism as a way to help the poor is considered "the kiss of death" politically. The best way to proceed is to develop practical approaches to regional relationships and try to sell them in individual areas.

This article is indecisive; it essentially reaches no conclusions.


Cities were expanded by means of transportation in the nineteenth century that enabled people to move to centralized locations so as to work together. But now it is cheaper and more convenient to move information to where people are. Nevertheless, big corporations will still want their top people together. And all people like to work in groups. But these groups no longer need be gathered in downtown office clusters. Work will be outsourced to specialized firms that are not necessarily located downtown. We are probably at the end of the big boom in office construction in major city downtowns that began in 1860 in Paris.

This short essay is really no more than a fragment on the overall subject, without much depth of analysis and with no data whatsoever.


This book presents two different views of suburbia as phases in the historic development of modern urban life. They involve the original suburb, and the post-industrial "technoburb."

The original suburb, as defined by Fishman, was a retreat from the diversity of the city into an exclusively residential community located outside of the complexity of industry and commerce and high-density residences that had previously been the modern industrial city. It first appeared in the London area in the late eighteenth century, but became more prominent in the nineteenth and twentieth centuries, both in England and in America. Suburbs of this type were exclusively residential areas occupied almost entirely by the middle-class elite, excluding all industry and commerce, and all lower-income households. They were a retreat from the ills of city life into a more utopian scene linked to nature through
the use of single-family homes with their own yards. Suburban life was directly family-centered, and separated middle-class women from the world of work into a world exclusively focused on the family. The suburb in this view was a specialized bedroom community, the employed residents of which commuted into the central city downtown or its industrial areas and never worked in suburbs themselves. Exclusion was at the heart of the suburbs as thus conceived. That means exclusion of industry, commerce, diversity, jobs for women, and low-income households—all conceived as potential threats to the primacy of the family-centered, nature-linked single-family home in a park-like setting.

This situation has gradually evolved into a completely different urban arrangement structured around what Fishman calls the technoburb, but this member of the research team prefers to call the urban network form. What most people conceive of as the suburbanization of America he considers a shift into a radically different form that totally undermines the suburbs—and the old central city—using the original definition of suburbs as given above. Although suburbs maintained their specialized roles as bedroom communities into the 1950s, after that the migration of all other types of activities besides housing into suburban areas changed the basic nature of those communities. As they acquired first shopping facilities, then warehouses, then industrial firms, and finally offices, they lost their exclusively residential character. They became transformed into fully urban communities but without any single center, and with very low densities. This transformation was made possible by automobiles, roadways, and communications innovations that made decentralization feasible.

Today the metropolitan community is a non-centered amorphous growth resembling an amoeba without a single nucleus. Although a regional downtown still exists, and the central city is still specialized in housing the poor and some central facilities and amenities, the vast majority of both residences and firms and workplaces are scattered throughout the area in no particular pattern. They are linked by a huge network of roads and electronic communications. The center of each person’s life is his or her own home, and the universe of each consists of the territory he or she can reach within one hour’s drive from home. Therefore, there is no single centralized form because each household essentially has its own unique network. The overall form is an amorphous, undefined massive overlapping of all these individual networks. The exclusivity of the old suburb has been destroyed, although poor people still seem most centralized with older core areas. But all types of activities are now found at all distances from any one spot. There is no single center that everyone relates to. The uncentered network has replaced the monocentric city of old and even the polycentric city of the 1960s and 1970s. This means that what most people conceive of as suburbanization involves the destruction of the former suburbs and their full urbanization in a totally decentralized form.

A key question concerning the future of this trend is: “Is the low density of the new city destructive to all cultural diversity?” (p. 200) Since there are almost no public spaces in this new network, and no set of places in which a large fraction of the community habitually gathers or interacts physically, there is no sense of community. Television greatly aggravates this outcome because it fosters passive, home-centered separation of each
household from all others, although it does provide some commonality of experience across multitudes (which may be undermined by the multiplication of channels). Fishman believes we are still working out the cultural implications of this new form, although it does seem to have the drawback of isolating the poorest people in older core areas with low fiscal resources. He says:

The new city will probably never able to compete culturally with the old centers. There will be for the foreseeable future a division founded on choice between those who seek out even at great cost the kind of cultural excitement that can only be found in the center, and those who choose the family-centered life of the outer city. (p. 202)

Fishman has underestimated the degree to which cultural activities can take place in the outer regions of such networks, because people with common cultural interests can still gather together in outlying locations in sufficient numbers to support cultural activities like symphonies, theaters, etc.

Seen in historical perspective, suburbia now appears as the point of transition between two decentralized eras: the preindustrial rural area and the postindustrial information society. . . . Suburbia kept alive the ideal of a balance between man and nature in a society that seemed dedicated to destroying it. That is its legacy. (pp. 206-207)


This article explores recent contributions to the theory of cities concerning how information flows and usage contributes to city growth or decline. He argues that simple capital and labor accumulation models fail to explain city growth. A variable relating to human capital and one relation to abstract intellectual capital should be included in the analysis to make it more related to cities and to explain certain failings in simpler models.

One aspect not often discussed is that the informational externalities which help explain why people and firms locate in cities, and why cities grow, also have negative impacts, such as the ability to spread rioting rapidly, and increases in crime.

Growth theory regards increases in the stock of human knowledge as a central aspect of economic progress over time. Because knowledge is more easily accessed by people living close together, “closeness contributes to the degree of appropriability.” (p. 11)

Growth theory based upon capital and labor accumulation had a problem: it could not explain why countries and cities did not converge on a steady state. Only an exogenous technological change variable could explain that. But increasing returns to scale from intellectual knowledge made it possible to explain continuous growth. On the other hand, increasing returns to scale are not compatible with an economy based upon perfect competition, because the former leads to monopolistic results. Also, marginal prices lie under average prices, which means firms are losing money.

Romer solved this problem by saying that private profits did not have increasing returns to scale, but social benefits produced by general increases in knowledge did have increasing returns to scale. This made perfect competition among private firms possible in theory, but also allowed growth to continue over time because of...
the social benefits of accumulated knowledge. Lucas focused this idea on returns to human (private) capital, but the truth must be that both private capital and general social knowledge gain from innovations in the long run.

These ideas are related to cities because people living and working close together can more easily tap into the store of accumulated knowledge, and exchange ideas with each other. The externalities of knowledge exchange are clearly facilitated by urban proximity, as opposed to its alternatives.

Barro regressed growth in per capita GDP against a whole lot of other variables across countries, and discovered that poor governmental qualities are negatively correlated with rapid growth. His basic findings were that education and absence of regulation were positively correlated with rapid growth.

Rauch found that SMSA cities with high levels of human capital had both higher property costs and higher wages than other cities, holding individual traits constant.

Glaeser and others arrived at the following findings: (1) initial concentration in an industry does NOT seem to foster later creativity, therefore scale economies in a local industry do not really create growth, (2) urban diversity is positively related to later growth, and (3) more competitive industries grow more quickly.

In general equilibrium theory, real differences in incomes among cities should be quickly eliminated by migration of workers and capital—any remaining differences should reflect negative amenities in the higher-income cities that must be offset by higher incomes.

A strong finding from census data is that cities that grew fast from 1950 to 1970 also grew fast from 1970 to 1990. This establishes the best single predictor of city growth in the second period—its growth in the first period. Thus, growth begets further growth in spite of congestion problems. At least that is one interpretation of the data, though others are possible. This finding implies that the history of a city is a key factor influencing its future growth rate.

Another finding is that areas with highly educated work forces at the outset of a period tend to have higher levels of education at the end. The well-educated are either born or move to areas where other well-educated people are already located.

High—and low—unemployment rates among cities also tend to persist over time. There is no convergence such as that which might be predicted by general equilibrium theory. This may reflect permanent maladies in the structure of those cities with high rates. Similarly, high crime rates are persistent over time among cities.

Rioting is a phenomenon found mainly in cities, because of contagion and other effects. Almost every city has a potential for rioting if some spark pushes it over the edge.

Neighborhoods play key roles in the accumulation of human capital. Both skills and behavioral xz habits are learned from peers and neighbors and mentors. Stability of occupancy in neighborhoods may be important, because length of relationships influences the types of behavior one is willing to carry out. This is a finding from game theory. If you will have a long-term relationship with other players (neighbors), you are more likely to take the impacts of your actions upon them
into account, because they can retaliate against you in the future, and you must live with them for a long time. This enables residents in stable neighborhoods to more strongly reinforce good behavior than residents in unstable areas. It is also an argument for subsidizing homeownership, which creates greater residential stability.

Cities also foster proximity to political power, which is concentrated there. That may influence people to undertake actions to change the behavior of key authorities located in cities. Political agitation is much more likely to work in cities than in rural areas for that reason—also there are more people to get agitated per erg of effort than in rural areas.

One of the most critical challenges in the future is reducing informational barriers between ghettos and downtown power centers.

Suburbanization provides many of the benefits of urban agglomeration while avoiding many of the negative impacts thereof, such as high rates of crime and greater probability of rioting and less residential stability in local neighborhoods to inhibit negative behaviors.


This article reviews most of the literature on the linkages between central cities and suburbs. The author cites five basic linkages as follows: (1) outsiders’ perceptions of the attraction of an entire metropolitan area are influenced by conditions prevailing within its central city, (2) cities contain many amenities valued throughout their regions, (3) individual cities may provide a “sense of place” valued by both their residents and outsiders, (4) fiscal problems in central cities may eventually raise taxes on suburbanites and thereby reduce suburban economic development, and (5) agglomeration economies create special roles for central cities in their regional economies.

The author does not cite two other linkages that are believed to be important: cities provide low-cost housing for low-wage workers employed in—and necessary for—activities in suburbs where those workers cannot afford to live, and cities provide many jobs held by suburban residents that increase suburban incomes.

The author claims that there is no empirical evidence either supporting or denying the first four factors he cites; therefore he deals with them in two pages. He does not deny that these linkages exist, but says that no one knows how strong or important they are because there have been no studies measuring them. So he devotes most of his article to agglomeration economies, which have been studied at length and by many persons.

Agglomeration economies are essentially increasing returns to scale in processing activities they are “the economies of large-scale production, commonly considered, [and] the cumulative advantages accruing from the growth of industry itself—the development of skill and no-how; the opportunities for easy communication of ideas and experience; the opportunity of ever-increasing differentiation of processes and of specialization in human activities.” (P. 128, quoted from Nicholas Kaldor—1970)
Agglomeration economies are divided into two types. Localization economies arise from the concentration of similar activities (such as a single industry) in one place or near each other. Urbanization economies arise from the location of an activity in an area that has a wide diversity of activities—so production costs decline as the size of the area concerned rises. Urbanization economies generate benefits for all types of firms located in an area; whereas localization economies generate benefits only for those firms in industries that are highly concentrated in the area. Central cities are considered to have advantages over their suburbs concerning both types of economies.

Both types of agglomeration economies have three major causes: (1) labor market economies, (2) scale economies in the production of intermediate inputs, and (3) communication economies. Labor market economies cause localization economies because the concentration of many similar firms together creates a large pool of workers skilled in that industry, reducing search and training costs for such firms. Urbanization economies also arise from large diversified labor pools. However, these labor pool economies do not favor central cities much over suburbs in large metropolitan areas.

But the other two causes of agglomeration economies clearly favor central cities. That is true mainly because both types involve face-to-face contacts, which occur most efficiently in or around downtown areas. The importance of communications economies has been increased by the shift from goods-producing to information-producing activities. On the other hand, innovations in communications technology have made face-to-face contacts less necessary for the sharing of information.

The author reviews numerous empirical studies of these economies. One of the more interesting shows that both suburban firms and central city firms rely heavily on central-city suppliers for certain corporate services, such as investment banking, legal, auditing, actuarial services, and banking. Also, suburban companies tend to be smaller and more likely to be in manufacturing than city companies. This was a 1991 study by Stanbeck dealing with 14 large metro areas.

Several studies have correlated conditions in cities and their suburbs, such as levels of per capita income. These studies all show positive linkages between cities and suburbs, but must be regarded as weak confirmation of a linkage hypothesis. Voith (1994) showed that positive city income growth is highly correlated with positive suburban income growth.

The author's conclusions are:

- Significant linkages clearly exist.
- The maturation of the suburbs has weakened these linkages over time.
- Telecommunications changes will NOT greatly weaken the importance of central cities.
- "The hypothesis that cities make an important contribution to regional and national economic growth is attractive," (p. 139), though he does not say it is proven.


This book contains five very short essays on "the new urbanism," plus copious illustrated examples of projects carried out under that rubric. The authors include "all the usual suspects" in this field: Peter Calthorpe, Andres Duany and Elizabeth Plater-Zyberk, etc.
Calthorpe’s essay is a very condensed version of his book, discussed earlier.

Andres Duany and Elizabeth Plater-Zyberk have an essay about the neighborhood, the district, and the corridor. It is only a few pages long and is not relevant to this study.

Elizabeth Moule and Stefanos Polyzoides have an essay about the street, the block and the building. This scale is too micro for this study.

Todd W. Bressi has an essay entitled “Planning the American Dream” (pp. xxv-xlili). It discusses the overall approach of the “new urbanism” practitioners, repeating much of what is in Calthorpe’s book. He claims that the suburban explosion after World Wars I and II achieved certain desirable outcomes, at heavy costs. It “reinforced the Victorian notion that a neighborhood was a protective enclave requiring insulation from commerce, work, and traffic, and held that the functional and literal center of a neighborhood should be an elementary school.” (p. Xxvii) The suburbanization movement “liberated many people from crowded, unhealthy living conditions.” But it created the following problems: (1) raising the cost of homeownership and decent housing too high for many households, (2) forcing people to spend more and more time commuting [this point is false], (3) undermining the mobility of people who cannot afford cars or cannot drive them, (4) creating air pollution, (5) absorbing attractive rural landscape into urban uses, and—most important of all but most problematic—(6) undermining civic life.

The main principles of the new urbanism as he describes them are as follows:

- The center of each neighborhood should be defined by a public space and activated by locally oriented civic and commercial facilities.
- Each neighborhood should accommodate a range of household types and land uses.
- Cars should be kept in perspective.
- Architecture should respond to the surrounding fabric of buildings and spaces and to local traditions.

New urbanists draw upon several past traditions, including the City Beautiful and Town Planning movements.

Calthorpe has written that in theory 2,000 homes, a million square feet of commercial space, parks, schools and day care could fit within a quarter-mile walk of the station, or about 120 acres. (p. xxxi)

Calthorpe introduced the secondary residential district only when others complained about the lack of space for single-family housing in his other TODs.

The strategy of the new urbanists is to change local codes in detail to compel the following of their principles, or at least to permit it.

It has in fact been difficult to integrate TODs with transit, since most areas do not have rail transit systems. Some critics claim that the new urbanists emphasize visual style over planning substance. Their large-scale proposals seem to continue sprawl, rather than changing it. And the impact of this approach at a large scale will be minimal unless some type of regional governance is more widely adopted. Finally, the new urbanists have largely ignored the growing divisions of wealth and power among households.

The New Urbanism is a welcome step forward, but it is only a step. (p. xliii)
The rest of the book is a series of illustrated case studies that are too detailed to go into in these notes.


Kunstler has written a polemic—a true "exagger-book"—about the aesthetic and other qualities of metropolitan development in the United States, especially during the post World War II era. The tone of this book can be conveyed by the following quotations from chapter 1:

More and more we appear to be a nation of overfed clowns living in a hostile cartoon environment.

Eighty percent of everything ever built in America has been built in the last fifty years, and most of it is depressing, brutal, ugly, unhealthy, and spiritually degrading.

To me, it is a landscape of scary places, the geography of nowhere, that has simply ceased to be a credible human habitat.

These are not objective or even believable statements about reality, but they convey the spirit in which Kunstler denounces everything American. In fact, there is nothing about American life that appeals to Kunstler. He attacks individualism, low-density development, business, you name it, he hates it.

Another quotation:

Riverside seems a template for all the ghastly automobile suburbs of the postwar era—individual houses on big blobs of land along curvy streets. (p. 49)

Yet, for all their artificiality and impermanence, the early railroad suburbs were lovely places to live.

He decries architectural modernism and the art-deco style, and high-rise office buildings generally. But his greatest enemy is the automobile and highways. Yet he admits that:

The suburban subdivision was unquestionably a successful product. For many, it was a vast improvement over what they were used to. . . . The main problem with it was that it dispensed with all the traditional connections and continuities of community life, and replaced them with little more than cars and television. (p. 105)

The development of suburbs drained activity out of cities: "The cities, of course, went completely to hell. The new superhighways . . . drained them of their few remaining taxpaying residents." (p. 107)

The separation of households and activities inherent in low-density suburbs has ruined any sense of community life, according to Kunstler. Also, by spending all public money on highways, all other aspects of public life became impoverished.

The motive force behind suburbia has been the exaltation of privacy and the elimination of the public realm. (p. 189)

This book contains no statistics, no quantitative analysis whatsoever, and no databases. It is an endless polemic expressing the author's contempt for modern suburban and auto-oriented life. He claims we can no longer live this type of life because it has become too costly, both in economic and social terms—the latter by destroying community and family life. In the last chapter, his policy suggestions include the following:

- We must rebuild our cities and towns.
- We shall have to give up mass automobile use. (p. 248)
• We should adopt the approach of the new urbanism in designing small towns. He specifically discusses seaside and Peter Calthorpe’s pedestrian pockets as cures for all the ills he has been blasting. Mandatory open space zoning is also praised.
• Until we do these things, “the standard of living in the United States is apt to decline sharply, and as it does the probability of political trouble will rise.” (p. 274)
• We’ll have to give up our fetish for extreme individualism and rediscover public life. . . . We will have to down-scale our gigantic enterprises and institutions—corporations, governments, banks, schools, hospitals, markets, farms—and learn to live locally, hence responsibly.

He offers no guidance concerning how to go about doing these things.


This is a statistical study of the relationship between income disparities between central cities and their suburbs on the one hand, and metropolitan area growth rates on the other. The basic conclusion is that “During the period 1988-1991, metropolitan areas with greater internal disparities tended to perform less well economically than metropolitan areas with lesser disparities” (p. 1).

Overall, central city per capita income as a percentage of suburban per capita income has declined from 105% in 1960 to 96% in 1973, 89% in 1980, and 59% in 1987. Much of this article aims at justifying a substantial federal aid package to cities, especially cities in distress. Data on children being raised in poverty, by race, are presented. In 1990, 45% of all black children under the age of 4 were being raised in poverty, compared to 38% of Hispanics and 20.6% of all children. These proportions were higher in central cities, and lower in suburbs.


The author criticizes New York’s schools because they are run by a top-heavy bureaucracy that makes all decisions centrally, and leaves almost no authority within individual schools themselves. The results are terrible—only about 50% of all students who enter high school graduate, even within 5 years. We are now demanding that our schools educate all young people, something that was never done in the past, but must be done in order to prepare them for life in a high-tech world. To do this, we must abandon centralized control and change to a system in which “each school must be managed by a group of adults who have direct, personal, and professional responsibility—and accountability—for the success of their students.” (p. 81)

It may be that the best direction for reforming the schools is to seek a diversity of providers that are publicly monitored, rather than a bureaucratic system controlled by the mandates of a single government agency. What would a system look like in which a government did the steering and let many others do the rowing? (p. 82)

She advocates three major principles for radical reform:
Autonomy—Each school should control its own budget and hire (and fire) its own teachers and other personnel. Each should be told how much money it has (based upon enrollments, plus allowances for disadvantaged students) and allowed to allocate that money as it saw fit—knowing that it would be rigorously audited by public officials.

Choice—Teachers should be able to freely decide where they will work, and students and parents should be able to decide where they want to send their children to school.

Quality—The centralized authorities will set standards for performance, periodically assess performances of every school, and constantly inform parents and the public of the results. Central authorities would also oversee large capital improvements, negotiate union contracts (without inhibiting schools from hiring whomever they wish), approve the creation of new schools, and audit performance and finances.

Schools that want to manage their own affairs should be allowed to conduct elections among staff and parents to become chartered schools, and immediately be given autonomy. This would permit successful schools to become self-governing right away. A second element of the strategy would be contracting of the management of several or many schools by specific organizations. A basic idea is encouraging as many new schools to be formed as possible. A third element in the strategy is to provide means-tested scholarships to poor students who could then choose to use them in whatever schools they wanted. These would essentially be vouchers paid to the students or their parents, and therefore not to the institutions themselves—thereby finessing the religious school issue, as is now done in many other programs.


This reviewer believes that this is the most comprehensive intellectual attack on sprawl yet launched. Henry Richmond, one of the architects of the Oregon state planning system, has collected every known argument against sprawl into one long polemic—but a relatively sensible one, not a totally irrational one. Among the arguments he marshalls against sprawl are the following:

- Sprawl concentrates poverty in inner-city areas, undermining their fiscal viability. This concentration also produces a host of other negative conditions.
- It undermines the transition of the inner-city unskilled workforce to a high-tech workforce.
- It thereby weakens the international competitive positions of U.S. metropolitan areas.
- It reduces the efficiency of businesses and the productivity of agricultural land.
- It undermines equality of opportunity within metropolitan areas, thereby raising inner-city unemployment with all the resulting pernicious effects.
- It destroys the viability of inner-city schools, which contributes to the failure to make the proper labor-force transition.
- It breeds crime that drives viable firms and households out of cities, and weakens the ability of young people raised there to sustain themselves economically.
- Sprawl undermines middle-class security, especially of working-class households whose investments in home equities are jeopardized by racial transition.
• Sprawl damages the environment in terms of air pollution, water pollution, ruining historic buildings, and wrecking environmentally sensitive sites.

• Sprawl undermines the community of life in suburban areas, and the solidarity of our entire society by separating suburban residents from city ones.

• Sprawl makes urban development inefficient by generating indecisive governments, disputes, delays that add to costs, etc.

Richmond believes that a huge number of public policies at all levels have generated sprawl, and maintain it in existence. He catalogs these at length. He then presents a political analysis of why these forces are not likely to change.

After having set forth all these points in general, he applies the argument to the Chicago region in detail. He then sets forth his recommendations for how to attack sprawl and the many institutional supports underlying it. Here he has also comes up with a more comprehensive set of ideas than anyone else.

This document is an invaluable reference for both arguments against sprawl and possible tactics to remedy it. It has not been given widespread publicity, but is one of the most important documents in the entire field.


This book is a detailed and comprehensive look at sprawl and at least one of its alternatives by the former mayor of Albuquerque, New Mexico. Its basic thesis is that cities which have elastic boundaries—that is, they can annex surrounding territories—are much healthier than cities which have inelastic boundaries—that is, their boundaries are frozen because they are surrounded by incorporated suburban municipalities. The elastic cities can expand outward as their metropolitan areas grow, thereby retaining access to the new taxable bases created outside the original boundaries of those cities by such growth. In contrast, inelastic cities cannot reach out to new taxable resources as growth expands beyond their borders. Both elastic and inelastic cities have disproportionate shares of poor people within their original boundaries, but the former can counteract this by expanding boundaries. Inelastic cities are stuck with rising percentage of poor residents and falling tax bases. This causes them to have falling taxable resources per capita at the same time that they need more such resources to cope with rising percentage of poor residents.

Rusk presents a great deal of statistical information to support his claim that elastic cities are healthier economically and socially than inelastic ones. He does not use regression analysis, but rather presents paired city comparisons and compares averages of groups of cities with different degrees of elasticity, as he measures it.

This book is one of the most comprehensive and intelligent analyses of the sprawl problem and other urban problems yet written. However, it has one serious flaw. Its author believes that unified metropolitan government is the best solution for inelasticity, whereas I believe that there is no political support for that arrangement whatever. Even so, Rusk’s analysis is definitely one of the best studies of urban problems—especially concerning three aspects.

The first is Rusk’s fearless confrontation of racial aspects of these
problems. The second consists of the four ingredients he recommends to solving the problems that he describes. They are (1) regional governance of land-use planning, (2) regional tax-base sharing, (3) a regional program of creating desegregated affordable housing for the poor throughout each region, and (4) promotion of region-wide economic development. The third is his analysis of the "point of no return" concerning three variables for central cities: (1) a low ratio of per capita income in them to that in their suburbs (70 percent or less), (2) a high fraction of minority-groups in total population (30 percent or more), and (3) substantial and sustained population loss (of 20 percent or more). He claims that no city that has passed beyond all three of these thresholds has ever even begun to recover.


This is the lead article in a volume of essays presented at the 82nd American Assembly held at Arden House, in Harriman New York, in April 1993. The authors clearly regard central cities as vital center of production in the American economy. They complain that most policy analysts in recent decades have viewed cities mainly as homes for the poor. They cite the following facts as support for their view on the importance of central cities:

- Central city jobs constitute the higher paying jobs in most metro areas. Such jobs form 32.2% of all jobs nationally, but garner 37.7% of nationwide earnings (no source for this datum is cited). Wages of central city jobs average 20% higher than those of suburban jobs, and this gap has been widening.
- Many suburban residents have jobs in central cities. A survey by Arthur Goldberg of the suburban areas of the nation's 100 largest cities showed that half of suburban families had at least one worker in the central city.
- The same survey showed heavy suburban dependence on central city services. 67% of suburban residents depend on the city for major medical care, 43% have family members attending or planning to attend an institution of higher learning in the city, 46% believed their property values would be hurt by a serious decline in their central city.
- The top 24 counties accounted for 39% of all jobs in information-intensive industries but had only 27 percent of total jobs. Downtown job pay for jobs in the same categories as the suburbs was 3.55 times higher in Boston and 2.37 times higher in New York City.
- The production advantages of central cities include (1) transportation and communications cost for both workers and customers are minimized in central location, (2) the best analysis is conducted in diverse environments where experts have easy face-to-face contact with one another, (3) central locations facilitate international transactions because of superior telecommunications infrastructures, and (4) more specialized producer services can be located where the size of the market is greatest.

One reason suburban locations continue to grow faster is that the costs of moving are not fully borne by the moving firms, but by their employees and public taxpayers. If suburbanization were so efficient, we would see more of
it in our international competitor nations.
U.S. urban policy was more concerned with stimulating demands for consumer products—such as housing and autos—than with productive efficiency.

Suburbanization has been encouraged by biased public policies, such as home tax deductions and federal highway finance—not reflected in public transit aids until very recently. The nature of pricing of telephone and other services allowed higher-cost suburban service to be priced at the same rates as lower-cost city services.

Continued dispersal has major costs to society, especially on the inputs of private firms. One is the need for employees to own automobiles, which increases wage demands. Auto dependence also increases our trade deficit because we must import so much oil. We spend more on travel and telecommunications that rival nations do. The Japanese spend far less on transportation than we do—9.4% vs. 15-22%. Traffic congestion imposes high costs on production. These authors claim that most metropolitan areas devote over half of their available land to road infrastructure (I doubt it). By undermining the tax base of central cities, our society has been unable to invest properly in the education and training of the labor force, or in the infrastructures outside the downtown that are critical to productive efficiency. U.S. investment in education through the high school level is the lowest among the seven most industrialized nations—4.1% of GNP compared to 4.6% in West Germany and 4.7% in Japan. We need much more investment in the labor force and infrastructures in central cities to remain competitive.

This author discusses the status of poverty and its relationship to race in inner-city areas, with main reference to New York City. He points out that the middle-class is still dominant in most large American cities, but it has become a minority-group middle class as whites leave the city. In six of the nation’s eight largest cities, a majority of the population in 1990 consisted of minority-group members—only Philadelphia (48% minority) and San Diego (42%) are exceptions. In New York, the number of persons with incomes above the median remained about the same in the 1980s, but changed ethnic composition to become minority-dominated because the white group in this category fell by 432,000.

He reviews various theories of why poverty persists in inner-city neighborhoods.

- The cultural deprivation theory stresses that some families are less intelligent than others, and a deprived culture is partly a genetic phenomenon. A newer view is that poor families are stuck in poor communities, where conditions are ripe for a negative subculture to develop around excessive teenage sexual promiscuity, a separate street language, and a depreciation of academic achievement. Thus both views stress deviancy and immorality of behavior among many poor people, with the newer theory attributing it to spatial isolation of the poor and especially of poor blacks from white culture. Christopher Jencks claims that centuries of racial subordination and prejudice have
created a black unwillingness to do certain types of work or to work in white cultural environments. Black alienation from certain types of jobs is rarely discussed in analyses of poverty.

- The racial discrimination theory says that black poverty in particular is caused primarily by continued racial discrimination and resulting spatial segregation. Massey and Denton are advocates of this view, since housing discrimination isolates poor blacks with each other in concentrated poverty neighborhoods. But discrimination itself is not new; so how can it explain rising crime rates or family instability, which are recent developments? Massey and Denton claim that cultural deprivation results from spatial isolation, which in turn is caused by white prejudice and discrimination.

- The structural transformation theory claims that black unemployment results from a change in labor markets and industry that shifted jobs to higher-skill requirements and moved industrial jobs out of big cities where racial minorities lived. William Julius Wilson is a leading proponent of this view. But unemployment does not explain many of the other pathologies of inner-city poverty areas. Wilson claims the departure of middle-class blacks from poverty areas removes good examples, and the resulting negative culture comes from economic deprivation and lack of jobs. But is it not clear that cultural traits of blacks, rather than discrimination by whites, causes whites not to hire black workers.

- The social breakdown theory claims that poverty itself does not cause a cultural shift to negative values. Many poor neighborhoods do not exhibit such traits—especially poor areas occupied by immigrants. There are a variety of cultures in poor neighborhoods, and only in those where family networks break down does the culture of poverty arise.

What remedies to poverty might be used? Cultural deprivation theorists stress the personal responsibility of the poor themselves, and claim they need to change their behavior. Their remedies involve orphanages for children of misbehaving mothers, forcing all poor people to work—including mothers, forcing fathers to pay for support for children, and making all government benefits temporary. (It appears that these arguments were embodied in the recent welfare "reform" bill.)

A major problem with this approach is that it assumes job opportunities exist for the poor with wages high enough to support decent living standards. This is not the case; public jobs programs would be necessary if all poor people were forced to work. Also, making all mothers work would reduce supervision over children and might worsen their behavior. Cultural deprivation theorists do not study or care about the internal dynamics of poor communities, and pay too little attention to the results of adopting their remedies.

Racial discrimination theorists want strong anti-discrimination measures, and a big effort to spatially integrate society racially. This would require immense movements of people that are politically opposed by the vast majority, including Congress.

Structuralist theorists want labor market changes, such as a public jobs "Marshall plan" for inner cities, job travel and information center programs to link inner-city workers to suburban jobs, provision of day-care and job training and drug treatment programs for inner-city residents. These remedies are quite expensive.
Local-oriented strategies include enterprise and empowerment zones to improve conditions where the poor live now. The purpose is to create "vibrant" businesses where poor unemployed people already live. Community-based efforts fit into this view, and many such efforts are now underway across the nation. Building local housing is one of their major activities. A whole host of questions is raised by the author that might be answered by more careful study of community activities now underway.

The author then explores why the election of black mayors and city officials has not improved conditions in inner-city neighborhoods very much, if at all. And black political participation in politics has not been raised by black leadership. Why not? Among the reasons he cites are (1) black mayors have no control over national trends for decentralization of jobs, (2) the shift of population to the suburbs has reduced the national political power of big-city mayors of all types in Congress and in state legislature, reducing their willingness to aid cities, (3) city needs to maintain favorable tax rates and bond ratings prevent mayors from engaging in redistributive activities—as observed by Paul Peterson in *City Limits*, (4) fear of being charged with racism has prevented criticism of black local leadership by either whites or blacks, and (5) the civil rights movement has become conservative and did not shift from national issues to local ones to support black local leaders.

HUD's rules against building public housing in poor communities have blocked the efforts of black mayors to put new low-rise public housing units in inner-city poverty areas, thereby upgrading those areas. In New York City, court actions have prevented giving preference in public housing projects to persons living in nearby communities, thereby strengthening those communities. Voting district formation has reduced representation by minorities on city councils and in Congress. Struggles over crime rates pit civil rights advocates—who want less incarceration of blacks—against local residents who want more secure neighborhoods. Similar struggles have occurred concerning schools, where those wanting better schools have tried to shift disruptive students into separate "academies" that are opposed by traditional civil rights advocates.

The problems of inner-city poverty demanded an agenda from black mayors dealing with neighborhood economic development, reform of education, police, human services, public housing bureaucracies, and relations with Latinos and Asians. Such an agenda might have required alteration of traditional liberal coalitions that elect black mayors, with possible fallout from municipal and teachers' unions, civil rights organizations, and fellow black politicians. Few black mayors have pursued such a politically risky and administratively arduous course. (p. 31)

He recommends supporting community-building strategies, because little help will come from the federal government. These strategies cannot end poverty, but they may improve the quality of life in inner-city areas.
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