"MEASURING & COPING WITH THE COSTS OF SPRAWL"
A SUMMARY OF THE NATIONAL LITERATURE ON COSTS OF SPRAWL

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THE COSTS OF SPRAWL
SUMMARY OF NATIONAL LITERATURE REVIEW

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Introduction

This report summarizes Clarion Associates' review and synthesis of the leading national literature on the costs of sprawl, including the well-known studies performed for the states of Maryland and New Jersey. This syntheses is organized around five areas of inquiry:

1. Public-private operating and capital costs,

2. Transportation and travel costs,

3. Land and natural habitat preservation,

4. Quality of life, and

5. Social issues.

Several of the leading studies on the costs of sprawls couch their findings in a comparison of sprawl or trend (status quo) development patterns versus an alternative planned or compact development pattern. Many of the findings are thus presented as "savings" gained from choosing a planned growth approach rather than continuing the status quo. Obviously, identified "savings" are simply the inverse of the "costs" of sprawl. This report does not attempt to convert such findings regarding the economies of planned growth into the diseconomies or costs of sprawl.

I. Public & Private Capital and Operating Costs

Among the five categories of sprawl impacts reviewed in this report, the category of public and private capital and operating costs contained the most "hard" data. The national literature includes several respected comprehensive studies--including some at the state level and others targeted at more specific regions or metropolitan areas--that provide quantitative data from a variety of research methods. Many of the infrastructure cost studies were based on simulation/modeling or empirical/case study methods.

Quantitative data does exist to support a strong relationship between sprawl patterns of development and increased private and public capital and operating costs. These costs include:

1. Higher infrastructure capital costs (the cost of building things),

2. Higher operating costs for municipalities and school districts (the costs of operating things after they have been built),

3. More adverse public fiscal impacts (they cost more to serve than they generate in revenue to the government), **and**

4. Higher aggregate land costs (the costs of buying the land to accommodate them).

The literature reveals that the relatively higher capital and operating costs associated with sprawl versus more compact development patterns stem primarily from three distinct characteristics of "sprawl": (1) low-density, (2) unlimited outward extension, and (3) leapfrog development patterns. This confirms a common-sense understanding that as residential and non-residential development is located far from the core and from each other, it becomes more expensive and less efficient to serve them (at least in the near-term).

The following summarizes the key quantitative findings culled from our review of the national literature on sprawl.

FINDING: Generally, patterns of sprawl characterized by large-lot, single-family developments far from the "core" of a metropolitan area, will result in greater public capital and operating costs for local roads, schools, and utility infrastructure.

FINDING: Economies in capital costs are possible under a planned approach, particularly respecting roads and utility extensions, while more modest savings may be gained for schools.

The following is a synthesis of key findings from three major research investigations on this topic completed by Frank (Literature Synthesis 1989); Duncan (Florida Community Case Studies 1989); and Burchell (NJ, Michigan, City of Lexington, Delaware Estuary, South Carolina Studies 1992-1997):

Relative Capital Costs of Public Infrastructure
Under Sprawl versus Planned/Compact Development
[From Three Major Studies]

Infrastructure Cost Category	Sprawl Development	Planned Development Findings from Major Studies (% Relative to Sprawl)			Planned Development Synthesis from Major Studies (% Relative to Sprawl)
		Duncan	Burchell Studies	Frank	
Roads (Local)	100%	40%	74-88%	73%	75%
Schools	100%	93%	97%	99%	95%
Utilities (Sewer/Water)	100%	60%	86-93%	66%	80%
Other*	100%	102%	n/a	100%	100%

*Other includes such capital outlays necessitated by growth as police, fire, and rescue stations.

Sources: *Economic and Fiscal Costs (and Benefits) of Sprawl*, Robert W. Burchell, 29 Urban Lawyer 2, p. 159 (Spring 1997); Robert W. Burchell studies (1992-1997).

Overall Capital and Operating Infrastructure Cost Savings From Sprawl vs. Planned/Compact Development			
Study	**Place Studied**	**Infrastructure Cost Savings**	
		% Relative to Sprawl	**Measurement Unit**
Burchell (1992)	New Jersey	9.2%	Statewide Total Savings
Duncan (1989)	Several Cases Studies of Specific Florida Communities	36.7%	Savings per Dwelling Unit
Peiser (1984)	Model Community of 80,000 Residents + 72,000 Workers	5%	Community-Wide Savings
Governor's Commission on Growth in the Chesapeake Bay Region (1991)	Maryland	15%	Statewide Savings (Roads and Utilities Only)
American Farmland Trust (1986)	Loudoun County, Virginia	63%	County-wide Savings Under a "Medium-Density" versus "Rural Sprawl" Scenario (Water and Sewer Service Only)

Source: Clarion Associates

FINDING: Annual savings in public operating costs are possible under a planned approach, including savings in the operations of school districts. At a statewide application level, much of the savings is realized by redirecting more growth to communities with excess service capacity and gaining service delivery efficiencies and redirecting growth away from more rural areas with less public service infrastructure.

Annual Savings in Municipal and School District Operating Costs (% Savings Planned Development vs. Sprawl Development)		
Study	**Place Studied**	**Annual Cost Savings**
Burchell (1992)	New Jersey	2%
Burchell (1997)	Michigan	5-6%
American Farmland Trust (1986)	Loudoun County, Virginia	40.5%

Source: Clarion Associates

Other findings from the literature on the subject of adverse public fiscal impacts of sprawl development versus planned/compact growth include the following:

1. A 1990 study of the fiscal impacts of various residential development densities found that, on average, residential house lots that were one acre or larger resulted in an average annual public revenue deficit of $490 versus $114 for house lot that were one-quarter acre or smaller in size. (Propst/Schmid)

FINDING: Generally, at a statewide level of analysis, patterns of sprawl development will result in greater private capital costs (development costs for housing) than under a planned growth scenario.

The Burchell New Jersey and Michigan studies, employing housing cost models, are the only studies to look at overall housing costs in a larger area governed by managed growth (at the state or regional level), where development would be restricted in certain locations (e.g., areas with fragile lands) while encouraged in others (areas with existing or excess infrastructure capacity, such as centers or crossroads). These large-scale studies were able to account for both the likely housing price increases in the more restricted outlying areas, and the likely housing price decreases in centers and other targeted growth areas (due to their inherent higher densities and the proposed housing type mix--e.g., more attached housing). Since, under the statewide planned development scenarios set up in Burchell's studies, more housing would be built in centers/core areas than housing in more rural, outlying areas, overall private housing costs under the planned growth scenario would be somewhat less than under the trend, sprawl development scenario.

Private Housing Costs Savings--Compact/Planned Growth vs. Sprawl Development

Study	Place of Study	Savings (% Relative to Sprawl)
Burchell (1992)	New Jersey	6.1%
Burchell (1997)	Michigan	6.8%
Burchell (1997)	South Carolina	7%
Burchell (1995)	City of Lexington, KY	2.5%
Burchell (1995)	Delaware Estuary Region	8.4%

Source: Clarion Associates

Burchell's large-scale studies contrast with several other growth control studies reviewed that deal only with the housing price effects of growth controls in a specific, given community. The latter have found that the imposition of residential growth controls, such as annual building permit caps, does have an adverse impact on housing prices compared to homes located in similar communities without such controls. For example, an 1981 study of housing costs in Petaluma, California, were 8% higher than a neighboring city's housing costs. A similar

comparison study found that housing costs in growth-controlled Davis, California were 9% higher than in other cities' non-regulated markets. For studies seeking to quantify statewide costs of sprawl, however, it may be more appropriate to use Burchell's larger-scale studies as the basis for the above-stated finding that managed or planned growth can moderate rather than increase the cost of housing.

II. Transportation & Travel Costs

Because transportation and travel information is routinely studied and counted, much of the literature on the transportation and travel costs of sprawl is based on empirical research--i.e., typically case studies or Census/survey data. In addition, several large-scale studies employ simulation modeling to determine travel behavior and the impacts of urban form on transportation and travel.

Quantitative data does exist to show a strong relationship or linkage between sprawl patterns of development and increased transportation and travel costs. These costs include:

1. Increased vehicle miles traveled (VMT),

2. More frequent automobile trips, and

3. Less cost-efficient and effective public transit.

The literature reveals that relatively higher transportation/travel costs associated with sprawl versus more compact development patterns stem primarily from the following characteristics of "sprawl": (1) low-density development, (2) unlimited outward extension, (3) leapfrog development, (4) dominance of the automobile as transport mode, and (5) widespread strip development. Again, this makes common sense because development under sprawl conditions is distant, spread out, and typically expensive to access.

Countering the above costs is data from the literature that tend to support a linkage between sprawl patterns of development and at least one positive transportation and travel benefit, namely dependence on the automobile, which has been shown in studies to be the most efficient mode of transportation for the majority of trips between dispersed, low-density destinations or multi-purpose shopping trips within a city. (Parsons Brinckerhoff Quade and Douglas 1996--City of Boulder, CO study.) The following summarizes the key findings culled from our review of the national literature on sprawl.

FINDING: Sprawl generates more vehicle miles traveled (VMT) than more compact forms of development. Sprawl creates longer distance traveled and increases dependence on the automobile--two of the three primary factors behind the trend of increased VMT nationally (the third is changing demographics). Thus, sprawl is a major source of increased VMT.

Specific findings from empirical research contained in the literature include:

1. Based on a 1994 study of 28 California communities, controlling for levels of transit service and vehicle ownership, a 100% (doubling) of residential densities is associated with 16% fewer vehicle miles of travel. (Holtclaw 1994)

2. A simulation comparing Portland, Oregon future growth patterns found that a "growing out" pattern (with new development continuing at current types and densities) resulted in an estimated 15% higher average daily VMT than in a "growing up" pattern that kept all growth within the existing urban growth boundary by reducing lot sizes and introducing more MF housing. (Portland Metro 1994)

3. Between 1970 and 1994, under the prevailing trend/sprawl patterns of development, the Chesapeake Bay area population grew by 26% while vehicle miles traveled increased by 105%. In the next 10 yrs, under trend conditions, vehicle miles traveled is expected to increase another 39% while the population is expected to increase by only 10%. (Chesapeake Bay Commission 1996)

FINDING: The literature supports a link between sprawl development and a greater share of trips by automobile versus other modes such as transit, bike, or walking. Sprawl, with its more spread out uses and greater segregation of uses, makes automobile use a way of life for most residents.

The literature overwhelming supports the finding that when development is more compact and contains a mix of land uses, transit and walking modes of transport increase relative to automobile usage.

An interesting comparison case study of rates of growth in central, inner, and outer neighborhoods in the United States (where those with higher income tend to move to the edge) and in Australia (where those with lower incomes tend to move to the edge), found that automobile usage in both countries grew most rapidly in the outer areas of the cities. Thus, automobile usage was not simply a function of how wealthy people were, but also heavily dependent on the structure of the city and whether transport options are available other than the automobile. "[A]s cities become more dispersed and lower in density towards the edges, the levels of compulsory automobile use rises markedly, regardless of income level." (Kenworthy and Newman 1993)

FINDING: Sprawl makes the use of transit as an alternative transportation mode less cost-efficient and effective. This is due to the low-density and spread-out characteristic of sprawl development, since transit ridership is boosted by density and by increased employment in the "core" or central business district.

For example, research has shown that as residential densities in a rail corridor increased from 1 to 4 persons per acre throughout the length of the line, the cost per vehicle mile declines by about 5%, and the effectiveness (passenger-miles per line mile) increases by about 26%. A related finding showed that adding 50,000 jobs to the central business district (at the inner end of the rail

line) and increasing employment densities would lower costs per vehicle mile by about 9% and increase effectiveness by 44%. (Parsons Brinckerhoff Quade and Douglas 1996)

FINDING: Sprawl, and the resulting travel patterns, results in higher social costs such as increased air pollution, lost worker productivity, and constrained family time.

Our literature review revealed the following information in support of higher social costs related to sprawl/dispersed patterns of development:

1. 16 to 17% of the cost per passenger mile for single-occupant vehicles (SOV) are social costs (including air/water pollution, waste, barrier effects, noise, and costs of parking and accidents not paid by the transportation user), versus only 1-7% of the total costs for transit use and a negligible share of the costs for walking and bicycling are social costs. (Other numerous studies have shown that the dominant mode of travel under sprawl conditions is the SOV). (Apogee Research 1994)

2. Children have lost approximately 12 hours per week of parental time over the last 30 years due to commuting. (Chesapeake Bay Commission 1997)

3. Air quality could be significantly improved by a 10% per year reduction in the growth rate of vehicle miles traveled. This could result in a reduction of 19.2 tons /day for ozone and oxides of nitrogen as well as a 287 ton /day decrease in carbon monoxide by the year 2020. (Chesapeake Bay Commission 1997)

Caveat re. Applicability of National Findings. Much of the empirical transportation/travel data set forth in the national literature are based on case-studies, many of which are located in fast-growing Sunbelt locations such as California and Florida. This is particularly true in regard to studies of travel behavior as it relates to different urban forms. This raises the issue of applicability of the results to other states, particularly "slow-growth" states in the Northeast and Midwest. Moreover, much of the quantitative transportation/travel research is cross-sectional in nature, which raises questions on whether the findings truly establish firm causal relationships since often there are other contributing factors that could account for, or at least affect, the result. Thus, evidence of the transportation/travel costs of sprawl in other, specific communities or states should probably be further investigated, particularly in terms of finding more state-specific or regional data and studies.

III. Land/Natural Habitat Preservation

Much of the literature investigating the impacts of sprawl on land and natural habitat preservation is relatively "soft" compared to the research undertaken in the infrastructure and transportation areas of concern. Nonetheless, some sophisticated modeling of the impact of sprawl on the consumption of agricultural and fragile environmental lands such as wetlands has been done, and this research supports a strong relationship or linkage between sprawl and

relatively greater consumption or losses of such lands, compared to more compact or planned growth patterns.

The literature reveals that the relatively higher greater land consumption costs associated with sprawl versus more compact development patterns stem primarily from the following three distinct characteristics of "sprawl": (1) low-density, (2) unlimited outward extension, and (3) leapfrog development patterns. Again, this reflects a common-sense understanding that as residential and non-residential development is increasingly spread out far from the core, sprawl inherently consumes more land. The following summarizes the key quantitative findings culled from our review of the national literature.

FINDING: Sprawl patterns of development result in a greater loss of agricultural lands, including prime agricultural lands.

Loss of Agricultural Land From Sprawl Patterns of Development		
Study	**Place of Study**	**Savings in the Consumption of Agricultural Acreage under Compact Growth Versus Sprawl Development**
Burchell (1992)	New Jersey	39%*
Burchell (1995)	Lexington, KY	18%
Burchell (1997)	Michigan	17.4%
Burchell (1997)	South Carolina	18%
Burchell (1997)	Delaware Estuary Region	29%
Landis (1995)	San Francisco Bay Area	50% (Farmland plus step-sloped areas)

*Notes:

1. Agricultural lands include cropland that is harvested, lands in permanent pasture, and woodlands that could be used for agricultural purposes.

2. Burchell's New Jersey study also found that under sprawl development patterns, loss of farmland would tend to be comprised of prime or marginal lands (in a ranking from best to worst of "prime," "marginal," and "poor") because these tend to be the best/easiest to develop (flatter, better drainage, etc.).

Source: Clarion Associates

Other data from the literature review in support of the above finding include the following:

1. In Maryland where agricultural production accounts for 14% of the state's gross product, 147,400 acres of agricultural land were lost between 1971-1988. If the current trends persist, the state will lose another 333,000 acres (13%) by 2020. (Technical Studies Prepared for the Governor's Commission on Growth Management in the Chesapeake Bay Region 1991)

FINDING: Sprawl patterns of development result in a greater loss of sensitive environmental lands, including wetlands, flood plains, critical habitat, aquifer recharge areas, stream corridors, and steep slopes.

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Loss of Sensitive Lands From Sprawl Patterns of Development		
Study	**Place of Study**	**Savings in the Consumption of Sensitive Land Acreage under Compact Growth Versus Sprawl Development**
Burchell (1992)	New Jersey	17%
Burchell (1995)	Lexington, KY	20%
Burchell (1997)	Michigan	21%
Burchell (1997)	South Carolina	22%
Burchell (1997)	Delaware Estuary Region	27%
Landis (1995)	San Francisco Bay Area	Savings of 10,500 acres of wetlands and 8,000 acres of steep slopes

Source: Clarion Associates

Other data from the literature review in support of the above finding include the following:

1. Sprawl development seriously fragments wildlife habitats of bobcats, hawks, owls, and birds. This has diminished nesting sites for endangered birds. In 1985, 85% of Maine's wetlands were visible from a road or within 2,000 feet of a road, and thus of limited habitat value. Of Maine's 2,700 lakes, 200 have been harmed by development, and 300 are at risk. (*Cost of Sprawl*, Maine State Planning Office 1997)

2. Pennsylvania lost an average of 1,200 acres of wetlands per year from 1956 to 1979. Wetlands now only constitute 2% of the state. The loss of wetlands in the mid-1950s to the late 1970s was 24,000 acres in Maryland, 63,000 acres for Virginia, and 28,000 acres for Pennsylvania. (*Priorities for Action: A Paper by the Chesapeake Bay Commission* post-1996)

On the benefit side of the equation, there appears to be some limited support for the position that sprawl results in enhanced personal open space. Most of the support comes from surveys undertaken by the Federal National Mortgage Agency (*Fannie Mae Survey of Residential Satisfaction of Housing Occupants*) during the mid 1990's that reveal that personal open space continues to be high on the list of the desires of most Americans. In addition, in terms of buying preference, single-family detached housing was more popular during the mid-1990's than it was a decade ago.

IV. Quality of Life

The literature on sprawl is much richer in addressing quality of life issues than one may initially assume. Given the subjective nature of "quality of life" issues, however, much more of the research and study is descriptive (containing little or no "hard" analysis) and/or empirical based on analysis of Census data.

Overall, the literature survey reveals that there is generally agreement that quality of life impacts exist, including--on the cost side--negative impacts such as lessened sense of community, greater stress, more air pollution, and lessened historic preservation, and on the positive side impacts such as lower crime rates, realized preference for low-density living, and fostered greater economic well-being. However, unlike the "harder" areas such as infrastructure, transportation, and land consumption, there is relatively fewer substantive findings that link these impacts to sprawl patterns of development. Some of the findings that tend to show more of a linkage with sprawl are presented below.

FINDING: There appears to be greater stress associated with a lifestyle that includes commuting, which, it may be inferred, is more likely a characteristic of sprawl, with its leapfrog development patterns and segregated land uses.

Literature reviewed in support of this finding includes the following:

1. Increased travel impedance, as measured by commuting distance and time, is associated with increased measures of stress. Travel impedance was found to have statistically significant effects on job satisfaction, work absences due to illness, and overall incidence of colds or flus. The literature, however, does not rigorously address the link between commuting stress and the density of development or urban form. The closest is a finding from this same study that stress effects are strongly associated with freeway travel and with road exchanges. (Novaco 1990)

FINDING: There appears to be some linkage between sprawl patterns of development and increased amounts of water pollution.

Technical studies undertaken by Burchell, et al., for the Governor's Commission on Growth in the Chesapeake Bay Region (1991) looked at the likely water pollution impacts of alternative development patterns on the Chesapeake Bay and its watershed from 1990-2020. The results are shown in the following table:

Key Impacts of Alternative Development Patterns on the Chesapeake Bay & Watershed		
	Dispersed/Sprawl Pattern	**Concentrated Pattern**
Increase in Sedimentation	5.7 million tons	3.4 million tons
Increase in Nitrous Oxides	1.6 million pounds	.08 million pounds
Increase in Water Consumption	108.8 billion gallons	70.7 billion gallons

FINDING: Sprawl patterns of development, characterized by movement away from older cores, commercial strip development, and leapfrog development appear to put historic preservation efforts and preservation of historic places at more risk than compact development patterns.

Although the literature review reveals little consensus or agreement on whether lessened historic preservation is directly linked to sprawl, there is some support in the literature indicating community economic loss.

For instance, *Dollars and Cents of Battlefield Preservation* (Conservation Foundation 1994), presents evidence of the economic benefits from the preservation of historic resources, particularly historic battlefields, versus the development of such resources for residential or nonresidential uses. The study notes the following findings and facts in favor of its argument for preservation:

1. Secondary expenditures of visitors to historic places is significant. The National Park Service uses an average multiplier of 2.0--meaning a community that supports a historic site and that enjoys direct visitor spending can expect that up to about two times the amount of direct expenditures will flow into their local economy.

2. Compared to residential development, and even commercial or industrial development to some degree, preservation of a historic open space resource such as a battlefield is a fiscal winner--i.e., generates more revenue than it demands public services in return. A 1992 study of for Straban Township in Adams County, Pennsylvania, found that the costs of services provided per dollar of tax revenue was only $0.12 for open land versus $1.10 for land developed for residential uses. This same study concluded that "farm and open land provide clear economic benefits to all residents of the township by providing more in revenue than they require in local expenditures."

There appears to be support in the literature for several of the alleged **positive quality of life impacts** from sprawl, including responsiveness to consumer preferences for low-density living and a fostering of greater economic well-being.

FINDING: The type of low-density residential pattern of growth characteristic of sprawl appears to have the positive benefit of responding to consumer preferences.

1. Surveys tend to show that prevailing U.S. consumer preference is for single-detached housing surrounded on all sides with yards (Fannie Mae 1996). There generally is no disagreement that the recent choice of American households has been for lower-density suburban-style development over higher-density developments. However, there is some disagreement whether, if presented with more choice of alternative density developments, some portion of Americans would choose a higher-density or more neo-traditional style development.

FINDING: Limiting the distributional patterns of growth and encouraging more density may result in increased land costs or fewer available sites to accommodate desired economic growth and interferes with the individual welfare-maximizing choices of individual households and firms.

Although there is literature and studies that find that growth controls often increase the price of land, especially for residential development, there is no little documentation in the literature that addresses the impact of sprawl, or measures to control sprawl, on commercial land markets, the level of employment growth, or wage incomes. Moreover, in his New Jersey study, Burchell found that the same amount of projected population and employment growth could be accommodated by both the "sprawl" and the "planned" development scenarios, only the distributional patterns would be changed with the latter. While directing or planning growth may foreclose some residential locations preferred by individuals, the choice to live in such locations generally does not factor in the negative externalities they create, such as the public fiscal impacts or the loss of farmland or open space.

V. Social Issues

Like quality of life issues, studies of the social impacts of sprawl is relatively "soft" compared to studies done on the costs of sprawl related to infrastructure and transportation impacts. Research on potential social costs of sprawl tends, like that on quality of life, to be primarily descriptive or based on empirical Census data and observations.

The literature does tend to support a linkage between sprawl and some negative social costs, such as spatial mismatch (a mismatch between jobs/opportunities in the suburbs and labor availability in the core areas), aggravation of the core city's fiscal stress, and inner-city deterioration. On the other hand, sprawl's supporters can also point to findings in the literature that tend to support a linkage between sprawl and alleged positive impacts, such as stronger home rule and enhanced municipal diversity and choice. Some of the literature findings that tend to show more of a linkage with sprawl are presented below.

FINDING: Sprawl and the relatively more expensive housing it tends to foster through exclusionary zoning encourage the concentration of poor households in central cities and older inner-ring suburbs.

The literature supports a linkage between sprawl and suburban exclusivity through research on what happens when affordable housing is made available in formerly exclusive suburbs, typically through government-mandated housing programs like New Jersey's *Mt. Laurel* "fair share" requirements. The point of this research is to show that "place" matters, and that households that would otherwise be shut out of suburban housing markets because of price do prosper and assimilate if given the opportunity to "break in." Literature reviewed in support of this finding includes the following:

1. Studies indicate that those who occupy affordable housing in more suburban locations (opportunities typically made available through deliberate inclusionary programs) take on the employment characteristics, ambition levels, and success rates of the population of those jurisdictions. These studies tend to support the claim that suburban exclusionary zoning is responsible for poverty concentrations in core-area neighborhoods. In other words, "place" appears to matter, and the attitudes and expectations of residents appear to be

transmitted/communicated to newcomers who wish to improve their current economic and social positions. (Wish & Eisdorfer 1996; Davis 1993; Fischer 1991)

2. In New Jersey (Wish & Eisdorfer 1996), close to 15,000 affordable housing units have been built and occupied as a result of legislation emanating from the series of *Mt. Laurel* cases in that state. Occupants of these housing units are employed, doing well at local schools, and integrated without incident in neighborhoods.

3. The Gautreaux (Chicago) and Cincinnati program studies show that residents moving from the central city to the suburbs using housing vouchers have higher rates of employment and higher salaries and their children have better school attendance and grades than families who chose not to move. However, self-selection issues (the successful and ambitious tend to choose to participate in the first place) cloud these findings to some degree.

FINDING: There is some agreement that sprawl is related to growing incidences of "spatial mismatch," wherein newly-created suburban jobs are inaccessible to central-city located low-skilled labor pools, which aggravates inner-city unemployment and suburban labor shortages.

While studies in this area are consistent in their finding and agreement that there is a spacial mismatch between newly-created suburban jobs and central-city located low-skilled workers, there is little hard evidence or research that sprawl plays a major role in the mix of factors that create this mismatch. For example, spatial mismatch is fueled by a host of factors including inadequate skills or education, race, and limited transportation or access to transportation. In addition, many unfilled jobs in the suburbs are low status/low-pay jobs that are not worth accessing by public transit if the prospective employee must also pay for child care services to retain the job. However, the national movement from welfare to workfare will likely fuel spatial mismatch into a major issue in many cities/metropolitan area across the nation.

FINDING: Sprawl appears to worsen city fiscal stress and inner-city deterioration.

Literature reviewed in support of this finding include:

1. While there is limited agreement that sprawl is a major cause of central-city fiscal stress (because other causal factors unrelated to development patterns contribute to it), many of the forces that contribute to fiscal deterioration need the characteristics of sprawl to operate. Fragmented suburban governments, all competing for the "best" land uses (e.g., high-income residential and nonresidential properties) do create stress for those local city governments that cannot compete because of already strained resources. (Downs 1994)

2. While there appears to be no scientifically valid way to determine the degree of sprawl's responsibility for worsening inner-city deterioration, there are studies that indicate a link between the two. For example, a study of residential abandonment in cities nationwide found that the most statistically 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)

3. 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 lower than, existing housing, this new housing will be sought in preference to closer-in housing. (Schafer 1975)

On the benefit side of the social impacts of sprawl, there appears to be agreement that suburbs do foster "small government" responsiveness to their constituents/residents much better than larger cities or regionally governed areas, particularly in the area of schools. In addition, there is little growth nationally in the number of regional governments, which might support arguments that local government structures are preferred. Moreover, according to national statistics, the number of regional school districts desiring to split apart in 1996 was greater than the number of school districts desiring to join together.

There is also little disagreement that consumer locational decisions are influenced by housing cost, housing appreciation, property tax levels, and public services (primarily schools), and other local amenities. Sprawl does contribute to the choice of community forums by contributing a massive amount of reasonable alternatives (not best or worst) to the consumer. Moreover, housing cost and housing appreciation have been found, in combination, to be maximized in locations more distant from the urban core.

Note re. General Applicability of Studies' Findings. Much of the inquiry into the social costs of sprawl is generalized research and not specific to any particular state or region. Therefore, the generalized findings from the literature would appear to be generally applicable to most states and could probably be used in citing and substantiating costs or benefits of sprawl. However, wherever possible, attempts should be made to expand on the national findings with state- or regional-specific information through further study.

Conclusion

Our survey of national literature on the costs of sprawl has unearthed some useful data and information in all five substantive areas of inquiry:

1. Public/private capital and operating costs;
2. Transportation and travel costs;
3. Land/natural habitat preservation;
4. Quality of life; and
5. Social issues.

As shown in the various findings, however, the most "hard" data is concentrated in areas (1) and (2), simply because more quantitative data is available on such physical costs. Less quantitative data is available in area (3), and far less in areas (4) and (5). In all five areas, much of the information may be generally applicable to most states.

It is important to recognize that research into costs of sprawl is not perfect by any means; experts recognize that gaps and deficiencies exist in both the breadth of subject matter covered and the

analytical methodologies employed. According to Burchell, the preeminent academic researcher on this subject, most of the existing studies do not even agree upon or incorporate an adequate definition of "sprawl."

BIBLIOGRAPHY

"*Measuring Transportation Performance*" in Transportation Quarterly 49 (1995), Reid Ewing

The Search for Efficient Urban Growth Patterns, James Duncan et al. (Florida Department of Community Affairs, July 1989)

Impact Assessment of the New Jersey Interim State Development & Redevelopment Plan, Robert W. Burchell et al. (February 1992)

The Costs of Alternative Development Patterns: A Review of the Literature, James E. Frank (ULI 1989)

Fiscal Impacts of Alternative Land Development Patterns in Michigan: The Costs of Current Development Versus Compact Growth, Robert W. Burchell, et al. (1997)

South Carolina Infrastructure Study: Projections of Statewide Infrastructure Costs 1995-2015, Robert W. Burchell, et al. (1997)

The Economic Impacts of Trend Versus Vision Growth in the Lexington Metropolitan Area, Robert W. Burchell, et al. (1995)

Does it Pay to Plan Suburban Growth? in Journal of the American Planning Association 50, Richard B. Peiser (1984)

Cost of Sprawl, Maine State Planning Office (1997)

Priorities for Action: A Paper by the Chesapeake Bay Commission (post 1996)

Growing Greener: A Conservation and Responsible Land Use Investment Initiative for the 21 Century, (June 1998)

Managing Community Growth: Policies, Techniques, and Impacts, Eric Damian Kelly (date unknown)

The Fiscal and Economic Impacts of Local Conservation and Community Development Measures, Luther Propst and Mary Schmid (1993)

Density Related Public Costs in Loudoun County, Virginia, American Farmland Trust (1986)

Cost of Services Study, Broadwater and Gallatin County, Montana, Mark Haggerty (1997)

Fiscal Impact of Different Land Uses on County Government and School Districts in Gallatin County, Montana, Mark Haggerty (1996)

Fostering Rural Cooperation and Improving Quality of Life, Dr. James Dunn and Dr. Frank Pogue (July 1997)

Improving Land Use Futures: Applying the California Urban Futures Model, John D. Landis (1995)

"*Suburban Growth Controls and the Price of New Housing*" in Journal of Environmental Economics and Management 8 (December 1981), Seymour I. Schwartz, David E. Hansen, and Richard Green

"*Research Design Issues and Pitfalls in Growth Control Studies*" in Land Economics 62 (August 1989), Seymour I. Schwartz, Peter M. Zorn, and David E. Hansen.

"The Interjurisdictional Effects of Growth Controls on Housing Prices" in Journal of Law and Economics 30 (April 1987), Lawrence Katz and Kenneth Rosen

Moving Beyond Gridlock: Traffic and Development, (ULI 1997), R. T. Dunphy, D.L. Brett,, S. Rosenbloom and A. Bald

Using Residential Patterns and Transit to Decrease Automobile Dependence and Costs (1994 NRDC), J. Holtzclaw

"*Subcentering and Commuting: Evidence from the San Francisco Bay Area, 1980-1990*" from a paper presented at the 1996 TRED Conference on Transportation and Land Use (Lincoln Institute), Robert Cervero and Kang-Li Wu

Region 2040: Recommended Alternative Decision Kit, (1994 Portland, OR), Metro

Changes in Regional Travel Characteristics and Travel Time Budgets in the San Francisco Bay Area 1960-1990 from paper presented at the Transportation Research Board 73rd Annual Meeting, (January 1994), C. L. Purvis

The Costs of Sprawl, RERC (1974)

Moving Beyond Gridlock: Traffic and Development, (ULI 1997), R. T. Dunphy, D.L. Brett, S. Rosenbloom and A. Bald

Beyond Sprawl: New Patterns of Growth to Fit the New California, author and date unknown, survey by Contra Costa Times

"Automobile Dependence: The Irresistible Force" (1993), J. Kenworthy and P. Newman

"*Transit, Urban Form, and the Built Environment: A Summary of Knowledge*" in Transit and Urban Form, Vol. I., (1996 Transit Cooperative Research Program), Parsons Brinckerhoff Quade and Douglas

The Relationship Between Land Use and Travel Behavior in the Puget Sound Region, (1994, Washington State DOT), L. D. Frank and Gary Pivo

The Costs of Transportation: Final Report (1994 Conservation Law Foundation), Apogee Research

"*The Rational Locator: Why Travel Times Have Remained Stable*" in Journal of the American Planning Association (1994), D. M. Levinson and A. Kumar

New Perspectives in Commuting, (1992 U.S. DOT), Alan E. Pisarski

NPTS Urban Travel Patterns: 1990 NPTS (1994 Federal Highway Administration), Mary Jayne Vincent, et al.

Cost of Travel in Boulder (Colorado), (1996 City of Boulder), Parsons Brinckerhoff Quade and Douglas

Impact Assessment of the DELOP CCMP versus STATUS QUO on the Twelve Municipalities in the DELEP Region; Robert W. Burchell, et al. (1995)

Redefining Progress: Recommendations from the Pennsylvania 21st Century Environment Commission, (June 1998)

Economic and Fiscal Costs (and Benefits) of Sprawl in 29 Urban Lawyer 159, R. Burchell (1997)

Survey of Residential Satisfaction of Housing Occupants, Federal National Mortgage Agency, 1996

"*Objective and Subjective Dimensions of Travel Impedance as Determinants of Commuting Stress*" in American Journal of Community Psychology 18 (1990), Raymond W. Novaco, et al.

Dollars and Cents of Battlefield Preservation, Frances H. Kennedy and Douglas R. Porter (1994 Conservation Foundation)

Pittsburgh Metropolitics: A Regional Agenda for Community and Stability, Myron Orfield (January 1997)

"*The Gautreaux Assisted Housing Program*" in Housing Markets and Residential Mobility, Mary Davis, (1993 Urban Institute Press).

"*Is Housing Mobility an Effective Anti-Poverty Strategy? An Examination of the Cincinnati Experience*," Paul B. Fischer (1991 Stephen H. Wilder Foundation)

"*The Impact of Mount Laurel Initiatives: An Analysis of the Characteristics of Applicants and Occupants*," Naomi Wish and Stephen Eisdorfer (1996 Seton Hall University)

"*The Spatial Mismatch Hypothesis: Three Decades Later*," in Housing Polity Debate 3 (1992), John Kain

"*City Jobs and Residents on a Collision Course: The Urban Underclass Dilemma*," in Economic Development Quarterly 4 (1990), John D. Kasarda

"*Discrimination in Space: Suburbanization and Black Unemployment in Cities*," in Patterns of Racial Discrimination, Vol. 1: Housing, Bennett Harrison (1974)

"The Impact of Mount Laurel Initiatives: An Analysis of the Characteristics of Applicants and Occupants," Naomi Wish and Stephen Eisdorfer (1996 Seton Hall University)

New Visions for Metropolitan America, Anthony Downs (1994: Lincoln Institute of Land Policy)

Residential Abandonment: The Tenement Landlord Revisited, George Sternlieb and Robert W. Burchell (1977)

Exclusionary Land Use Controls: Conceptual and Empirical Problems in measuring the Invisible Wall, Robert Schafer (1975)