Conventional Development Versus Managed Growth: The Costs of Sprawl

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Land conversion involves the use of previously undeveloped land to accommodate development. Infrastructure includes the capital improvements necessitated by growth encompassing both roads and water/sewer facilities. Real estate development costs typically are considered on a cost-per-unit basis for a variety of types of residential and nonresidential units (e.g., single-family detached and attached homes, retail and office space). In terms of public service fiscal effects, development is directed toward areas of excess service capacity, as opposed to locations that would have to expand their public services and infrastructure. Thus, fiscal impacts involve long-term savings in operating costs in locations where development is currently taking place as opposed to locations where it could take place.[1–13]

The research summarized here contrasted 2 alternative development futures for the United States. One alternative is current development trends—labeled conventional development, or sprawl—extended into the future. Development of this type typically includes subdivision-style residential development and strip nonresidential development. The focus is on noncontiguous land development, including residential development in the form of 0.33- to 1.0-acre lots and nonresidential strip development involving floor-to-area ratios of 0.20 or less.[3] Such land development patterns would continue earlier trends of consumption of agricultural and sensitive environmental land, significant road/pavement construction, and high amounts of water and sewer infrastructure provision. Conventional development has been reported as contributing to both high real estate development costs for new development and negative fiscal effects on host public service jurisdictions.[2]

However, sprawl development also has benefits. For example, people have access to less expensive, single-family homes on large

Objectives. We examined the effects of sprawl, or conventional development, versus managed (or "smart") growth on land and infrastructure consumption as well as on real estate development and public service costs in the United States.

Methods. Mathematical impact models were used to produce US estimates of differences in resources consumed according to each growth scenario over the period 2000–2025.

Results. Sprawl produces a 21% increase in amount of undeveloped land converted to developed land (2.4 million acres) and approximately a 10% increase in local road lane-miles (188 300). Furthermore, sprawl causes about 10% more annual public service (fiscal) deficits ($4.2 billion) and 8% higher housing occupancy costs ($13 000 per dwelling unit).

Conclusions. Managed growth can save significant amounts of human and natural resources with limited effects on traditional development procedures. (*Am J Public Health.* 2003;93:1534–1540)

lots situated away from urban centers and a greater opportunity for participation in governance owing to the high number of small jurisdictions found in these peripheral areas. In addition, public service costs are lower in such areas as a result of the reduced need for a deep public service base.[4–13]

In the analyses described here these benefits were taken into account (i.e., both single-family purchase costs and public service expenditures are lower in areas away from urban centers), although increased participation in governance was not measured. However, managed growth remains more cost-efficient in the various cost comparisons undertaken. This observation is true in the first case because a greater array of housing is offered in areas close to urban centers, resulting in overall housing costs being lower in these areas in spite of lower peripheral single-family housing costs. The observation is true in the second case because tax rates in urban center areas are higher, generating even more revenues than are compensated for through reduced expenditures on a more limited array of services in areas farther out. In other words, the analyses described here encompassed and even validated the supposed benefits of sprawl, but managed growth, in spite of sprawl's benefits, remains more advantageous.

The second alternative is a more compact form of growth. Managed or "smart" growth seeks to contain most new growth around existing urban centers and to limit development in peripheral rural and sensitive environmental areas. It further seeks to reduce road construction and water/sewer infrastructure provision through higher-density development and, in some cases, mixed-use development. This goal is accomplished through increasing the share and density of development in areas closer to existing development and decreasing the share and density of development in the outer, more rural and undeveloped sections of a metropolitan area.

The research discussed here also involved a recognition that there are disadvantages associated with managed growth in the resource areas under investigation, including (1) increased housing costs owing to the land development limitations posed by managed growth, (2) extra governmental costs stemming from the administrative requirements of imposing a growth management regimen, and (3) the thwarting or driving away of development potential because of an overcontrolled real estate market. Again, these disadvantages were taken into account in the analyses.

All future development was accommodated within the assumptions of the present analysis—no development was denied—and real es-

tate development costs were found to be lower under managed growth. Thus, even after price increases in areas where development would be limited were accounted for, overall real estate development prices would be lower. Furthermore, encouraging development in areas where government is established decreases the costs of servicing this development. The excess capacity of public services found in these locations allows public services to be extended without the hiring of new personnel.

Finally, development incentives in the form of increased density were included in the managed growth scenario. These incentives provide an impetus for developers to build in areas closer to existing development. Reduced competition between developers building farther out ensures that many of those buying houses will continue to go there. These 2 benefits support the claims of equal development in a metropolitan area under each scenario. Development is not driven away.

Before examining the benefits of managed growth versus conventional development, it is necessary to ask, "Why is conventional development, with its resource consumption excesses, so popular?" The answer involves 3 considerations: market, policy, and personal. From a *market* perspective, as long as society is willing to provide adequate public services at a great distance from where these services currently exist at less than full cost to the recipient, single-family housing on large lots will be less expensive at greater distances from the center of a metropolitan area. To the degree that this development form continues to be desired, people will purchase in these locations. As this question relates to *policy,* if mortgage interest costs and real estate taxes continue to be tax deductible, and gasoline prices are maintained at low levels because the provision and upkeep of roads are not adequately represented in this tax, there will be a continued quest for unrestrained development in the United States.

Finally, from a *personal* perspective, if public safety is enhanced in peripheral locations and property taxes are lower because the social safety net need not be cast as wide, again the quest for peripheral development will continue. Market, policy, and personal choices support conventional development or sprawl

because resources are relatively plentiful and no one is advocating for society's needs. Individual maximization is not societal maximization, and in the short run individual maximization involves bearable negative societal costs. However, these societal costs will increase as resources become scarce, and a different public mood will result.

METHODS

Models Used to Measure Resource Differences

The present analysis sought to determine 25-year (2000–2025) growth projections under the alternatives of conventional development and managed growth. The models used in the analysis create growth simulations and their effects on the basis of empirical relationships. Most of these are simple mathematical relationships that have been assembled through knowledge about how growth affects required resource supplies. These relationships are explained in more detail within each resource category.

The models begin with 2 identical projections of population and employment levels for a given US economic area made by Woods & Poole Economics Inc, a commercial vendor whose projection accuracy rates have been shown to be equivalent to those of the US census. Under alternative scenarios, different growth projections are made for different counties (the geographic unit of analysis in this study): rural and undeveloped counties are expected to experience more growth under conventional development, and urban and suburban counties are expected to experience more growth under managed growth. These projections are subjected to a housing model that changes them to different types of residential and nonresidential space and ultimately to land conversion, infrastructure, real estate development, and fiscal impact models that project land, road, and water/sewer infrastructure demands and housing/public service costs.

The resource requirements for nationwide growth over 25 years are large; thus, differences in resource consumption caused by alternative growth patterns are also large. Numbers are presented as they appear in terms of their mathematical extensions. As a result,

they are both large and detailed. The accuracy rate that surrounds these numbers is generally about 10%. Projections of effects are not rounded; one can verify the mathematical extensions produced by the impact of each development scenario.

The County as the Geographic Unit of Analysis

Although the county is not a perfectly satisfactory geographic unit owing to size variations and the impossibility of controlling for intracounty development differences, the county used in this study to identify and analyze locations of residential and nonresidential development. The county was selected because (1) it is the smallest consistent noneducational unit of US government for which a large number of the demographic variables required for this analysis are consistently available; (2) a reasonable number of subdivisions of the United States as a whole are represented within this designation (approximately 3100 individual subjurisdictions); (3) projections of major demographic variables are available at this level; and (4) the problems of rapid growth and the economic and political incentives needed to redirect this growth increasingly require responses from governments of geographic areas that are larger than municipalities yet more accountable than regions with limited governance powers.

The limitations of using the county as a basic unit of analysis relate to size. We compensated for size differences by using county subunits (urbanized areas) to divide counties into smaller and different parts. Thus, even though the county is the basic unit of analysis, in about 1000 of the 3100 counties, subunits in the form of urbanized areas exist and are used as a centralized development area to redirect within-county growth. Intracounty growth is targeted toward urbanized areas and away from rural areas in the same way that intercounty growth is targeted to suburban and urban counties and away from rural and undeveloped counties. Thus, although the county is the focus of most projections, these projections actually incorporate subcounty areas in instances in which these areas were found to exist.

Any plausible redirection in growth from 1 area to another must account for existing eco-

nomic interrelationships among counties.[1] In other words, if households and jobs are to be directed elsewhere to control sprawl, those locations must fall within the commuting patterns that link households and jobs in a given area. The economic area aggregation developed by the Bureau of Economic Analysis fulfills this requirement. The economic area is one of the few data aggregations that merges metropolitan and nonmetropolitan locations into an economically related geographic area. It can be viewed as similar to an extended metropolitan area.

Within a given economic area, counties are classified according to their existing levels of development. The 6 land use development classifications are urban center, urban, suburban, rural center, rural, and undeveloped. These classifications, which are based on gross population density (population divided by surface area), identify a county as more or less developed relative to the other counties of its region and are an important consideration in determining where populations are to be redirected under the controlled growth scenario.[2] The gross density thresholds for the classifications vary according to state gross density groupings, which in turn differ by region of the country; for example, an urban location in New Jersey would have a gross density 10 times that of an urban location in Wyoming.

Defining Sprawl Generically and Empirically in US Counties

One of the most difficult tasks of this research was, in fact, to identify and characterize the development of sprawl. These difficulties are compounded if an attempt is made to define sprawl empirically. Sprawl is low-density, leapfrog development characterized by strip form along major thoroughfares and tributaries at the periphery of a metropolitan area. In other words, sprawl is significant residential or nonresidential development in a relatively pristine setting. In nearly every instance, this development is low density, it has leapt over other development to become established in an outlying area, and its very location indicates that it is unbounded. This definition of sprawl is well documented in the planning literature.[4–13] The definition of sprawl used in the present analysis was based on rapid and significant residential or nonresi-

dential growth, or both, in rural and undeveloped counties. Numerous analyses of statistical population growth rates have defined the upper growth quartile as an indicator of significant growth or at least as separating significant and average growth. Here the upper quartile within an economic area was used to define significant growth.

All analyses of growth must contain both a relative and an absolute dimension. If absolute growth is taking place in a rural or undeveloped location at a multiple of the level of normal growth (in the present case, 160% of the national average absolute level), the location is defined as "sprawling," regardless of its relative rate of growth within the overall economic area. Therefore, sprawl is taking place in nonurban locations (rural and undeveloped counties)[1] if either of the following sets of criteria are met: (1) the county's growth rate is in the upper quartile of the economic area's annual county household and employment growth rates, the county's growth rate exceeds the national average annual absolute growth rate, and the county's absolute level of growth exceeds 40% of the national average annual absolute growth, or (2) the county's absolute level of growth exceeds 160% of the national average annual absolute growth. Given this definition of when and where sprawl takes place, sprawl will occur in 742 of 3091 counties during the 25-year projection period (2000–2025), or 24% of all counties in the United States. In addition, although sprawl development may be present in a significant sense in only 24% of counties, it will affect about 13.1 million of the 23.5 million new households projected for the period 2000 to 2025.

The Alternative Growth Scenario: Managed Growth

Managed growth is defined as limiting a significant share of development to already-developed counties or to areas as close to already-developed locations as possible. This limiting process takes place in 2 ways. The first method limits the amount of growth taking place in the outer counties of an economic area by redirecting it to inner counties. This is accomplished by establishing an urban growth boundary around the developed (urban and suburban) counties and allowing

only a portion of the growth to occur in the less developed (rural and undeveloped) counties (intercounty sprawl control).

A second method of limiting sprawl curtails the outward movement of growth in a single county (intracounty sprawl control). This is accomplished by establishing an urban service area in a county and containing most of the growth within that area. A boundary is established around the existing concentration of growth (the urbanized area), and the remainder of the county is "protected" from significant development owing to the unavailability of adequate public services. These 2 methods of limiting sprawl combine to form the managed growth scenario. Over the 25-year projection period 2000 to 2025, the United States will grow under either scenario by 23.5 million households and 49 million jobs.

Table 1 summarizes redirections of households and jobs under the controlled growth scenario. Overall, 11% of new households and 6% of new jobs are directed away from counties that are sprawling (rural and developing counties experiencing significant residential or nonresidential growth). These percentages may seem relatively low, but they represent 2.6 million households and 3.1 million jobs. Redirection allows reductions in sprawl in a significant number of counties while basically maintaining market-driven preferences in terms of locations of households (see Table 1).[1]

RESULTS AND DISCUSSION

Land Conversion

Given projections under the conventional development scenario, over the next 25 years, the United States will convert 18.8 million acres of land to build 26.5 million new housing units and 26.5 billion square feet of new nonresidential space. Land will be converted at a rate of approximately 0.6 acres per residential unit and 0.2 acres per 1000 square feet of nonresidential space.

Land conversion requirements were determined by translating household and employment projections into demands for residential and nonresidential land. The model uses different housing types, development locations, and densities for conventional (sprawl) development and managed growth to calculate the

TABLE 1—Managed Growth: Household and Employment Redirection Summary, by Region, United States, 2000–2025

	Northeast	South	Midwest	West	Total
Households					
Projected growth (thousands)	1 476	10 664	3 450	7 865	23 454
Redirected growth (thousands)	2 102	1 138	298	915	2 561
Redirected growth, %	14.2	10.7	8.6	11.6	10.9
Percentage of US total	8.2	44.5	11.6	35.7	100.0
Jobs					
Projected growth (thousands)	6 049	19 022	10 457	13 890	49 418
Redirected growth (thousands)	422	915	462	1 338	3 137
Redirected growth, %	7.0	4.8	4.4	9.6	6.3
Percentage of US total	13.5	29.2	14.7	42.6	100.0

Note. Data were derived from the Center for Urban Policy Research, Rutgers University.

TABLE 2—Projected Land Savings Under the Managed Growth Scenario: Intercounty and Intracounty Redirections of Growth, by Region, United States, 2000–2025

Region	Total Savings (acres)	Intercounty Savings (acres), No. (%)	Intracounty Savings (acres), No. (%)
Northeast	282 853	172 276 (60.8)	110 985 (39.2)
Midwest	439 446	199 308 (45.4)	240 134 (54.6)
South	2 139 017	1 249 296 (58.4)	889 721 (41.6)
West	1 140 915	786 809 (69.0)	354 107 (31.0)
Total	4 002 231	2 407 688 (60.1)	1 594 947 (39.9)

Note. Data were derived from the Center for Urban Policy Research, Rutgers University.

total amount of land converted under each development alternative.[2,4–18] The process also accounts for both vacancy and additional land development requirements (e.g., roads/utilities, open spaces) that consume extra land. The model determines land conversion numbers by multiplying the prevailing density in each location by the number of development units destined for that location.

More than one fifth of this land conversion (21.3%) could be avoided through simple managed growth techniques without compromising types or location of growth or altering housing markets. About 2.4 million acres are projected to be saved by employing the equivalent of an urban growth boundary in economic areas to direct growth away from rural and undeveloped counties to more highly developed urban and suburban counties (Table 2). An additional 1.6 million acres are projected to be saved through the use of within-county urban service areas to direct development away from undeveloped to developed areas.

Water and Sewer Infrastructure

Water and sewer infrastructure demand calculations involve mathematical relationships between the number of units produced by type and their service through water and sewer laterals. Multifamily units are served by fewer laterals and require fewer outdoor sprinklers and less water use than single-family units. To the degree that types of units vary according to development scenario, so too do water/sewer demand and lateral use.

During the period 2000 to 2025, under conventional development, the United States is projected to expend just under $190 billion in providing necessary water and sewer infrastructure to primarily single-family detached subdivisions and associated single-use nonresidential developments (Table 3). Water and sewer systems will have to be expanded to accommodate the more than 18 billion gallons of additional water and sewer capacity needed. These delivery and collection systems under traditional development will require in excess of 45 million laterals (or equivalents) to service new residential and nonresidential structures. Much of this projected infrastructure requirement and its attending costs can be avoided through the more-compact growth patterns resulting from a managed growth regimen.[2,4–13,18,19]

With both intercounty and intracounty managed growth measures in place, more than 150 million gallons of water and sewer demand per day are projected to be saved without residential or nonresidential users being deprived of this fundamental utility. No

TABLE 3—Projected Water and Sewer Infrastructure Under Conventional Development and Managed Growth Scenarios, by Region: United States, 2000–2025

Region	Total Water and Sewer Demand, gal/d (Millions)			Total Water and Sewer Laterals (Thousands)			Total Infrastructure Costs, $ (Millions)		
	Conventional Development	Managed Growth	Demand Savings	Conventional Development	Managed Growth	Lateral Savings	Conventional Development	Managed Growth	Cost Savings
Northeast	1 451	1 444	7	3 406	3 068	338	16 015	14 751	1 264
Midwest	2 935	2 915	21	7 110	6 604	505	30 393	28 839	1 556
South	7 942	7 870	72	21 243	19 116	2 126	84 573	79 026	5 547
West	5 794	5 737	56	14 108	12 456	1 652	58 786	54 544	4 242
Total	18 121	17 965	156	45 867	41 245	4 621	189 767	177 160	12 609

Note. Data were derived from the Center for Urban Policy Research, Rutgers University.

domestic water use is curtailed; instead, buildings are situated in greater mass, and lawn sprinkling becomes less necessary or more efficient. The new development pattern, with more single-family attached and multifamily units, also allows for a less extensive delivery and collection system (street mains), resulting in lower tap-in fees. This reduced delivery system is determined by the mix of development and units served per water/sewer lateral in one location versus another. The combined cost savings of lower tap-in fees and 4.6 million fewer laterals project to an infrastructure savings of $12.6 billion, or 6.6%, over the observation period (Table 3).

Local Road Infrastructure

The demand for additional lane-mile local road capacity is related to population distribution and density. The present model relates road density to population density on the basis of within-county historical incidence figures. Projected population density in 2025 and the derived relationship between lane-mile density and population density were used to establish an ideal lane-mile level for each area of a given county. The model then predicts the need for new road construction by comparing ideal lane-mile levels and existing levels found in a county. This comparison is made for each alternative, and a road cost per lane mile is applied to estimate future road costs. The model does not project the costs associated with land acquisition, bridge upkeep, or repair or upkeep of roads.[2,4–13,19,20]

Under conventional development, the United States is projected to spend more than

$927 billion during the period 2000 to 2025 to provide necessary road infrastructure, amounting to an additional 2 million lane-miles of local roads (Table 4). Under managed growth, 1.9 million new lane-miles are projected, amounting to $817 billion in local road costs.

Overall, a savings of 188 300 lane-miles and $110 billion could be achieved via managed growth patterns, which equates to a savings of 9.2% in terms of local lane-miles and 11.8% in terms of local road costs. Why are the savings not greater? Under either scenario, some development takes place in the outer and near-outer reaches of metropolitan areas, and local roads must be built. Even in the close-in areas where growth is directed under the managed growth scenario, local roads must often be widened by a lane in one or both directions to accommodate development, resulting in additional lane-miles.

Local Public Service Costs

Fiscal impact models measure the revenues versus costs of development by tallying property tax, nontax, and intergovernmental revenues and pairing them against the per capita, per pupil, and per worker costs associated with development. Though development usually does not pay for itself (i.e., costs exceed revenues), costs are lower in areas close to urban centers owing to economies of scale, and revenues from new development are higher as a result of the price differential relative to existing units. Under conventional development in peripheral areas, the nation is projected to expend $143.2 billion annu-

ally for public services during the period 2000 to 2025 and will collect annual revenues in the amount of $99.4 billion, resulting in an annual fiscal impact deficit of $43.8 billion by 2025 (Table 5).[2,4–13,21]

Under managed growth, emphasizing development locations closer to urban centers, the nation is projected to expend $139.2 billion annually in local public service costs, a decrease of $4 billion (Table 5). Such a decrease in costs is possible because, under managed growth, more development will take place in already-developed areas where public services may be more expensive but the demand for such services can be absorbed more readily owing to the excess service capacity found there. This $4 billion annual decrease can be paired against a similar aggregate annual revenue amount of approximately $99.5 billion. Thus, in 2025, projections indicate a positive fiscal impact of $4.2 billion (9.7%) annually under the managed growth versus the traditional development scenario. Thus, more-compact development or managed growth reduces the fiscal deficits traditionally associated with development.

Sprawl and Real Estate Development Costs

Real estate costs in a particular location reflect the costs of accommodations. If there is only single-family development, costs tend to be higher. If there are multiple types of development, costs are often lower because there is better pairing of space with household size needs. Real estate development models monitor the number of households of various sizes being established in different locations and the array of housing choices found in those locations.

The average residential housing cost in the United States is projected to decrease from $167 038 to $154 035 (in constant 2000 dollars) under the managed growth scenario, lowering the average housing cost nationwide for new housing occupants under conventional development by $13 003, or 7.8% (Table 6). This decrease is largely the result of a proportionately greater mix of housing units and their costs in locations close to urban centers versus the mix found farther out. Ideally, the purchase prices paid by individual home buyers will reflect these savings.[2,4–13,22]

TABLE 4—Projected Local Road Infrastructure Under Conventional Development and Managed Growth Scenarios, by Region: United States, 2000–2025

Region	Total Lane-Miles Required			Total Road Costs, $ (Billions)		
	Conventional Development	Managed Growth	Savings	Conventional Development	Managed Growth	Savings
Northeast	288 059	281 251	6 809	135.77	129.57	6.20
Midwest	4 164	266 614	17 550	130.76	122.15	8.61
South	885 944	806 955	78 989	376.99	338.07	38.92
West	586 011	501 055	84 957	283.49	227.52	55.98
Total	2 044 179	1 855 874	188 305	927.01	817.31	109.70

Note. Data were derived from the Center for Urban Policy Research, Rutgers University. Alaska is not included in the West region.

TABLE 5—Projected Fiscal Impact Under Conventional Development and Managed Growth Scenarios, by Region: United States, 2000–2025

Region	Conventional Development Scenario, $ (Millions)			Managed Growth Scenario, $ (Millions)			Difference: Conventional Minus Managed, $ (Millions)
	Costs	Revenues	Impact	Costs	Revenues	Impact	
Northeast	9 329	11 170	1 841	9 252	12 928	3 676	1 835
Midwest	18 914	15 352	−3 562	18 340	16 339	−2 001	1 561
South	58 441	38 845	−19 532	57 655	39 062	−18 531	1 001
West	56 558	34 023	−22 535	53 942	31 215	−22 728	−192
Total	143 242	99 389	−43 788	139 190	99 544	−39 583	4 205

Note. Data were derived from the Center for Urban Policy Research, Rutgers University.

TABLE 6—Projected Property Development Costs per Unit Under Conventional Development and Managed Growth Scenarios, by Region: United States, 2000–2025

Region	Conventional Development Growth		Managed Growth		Residential Savings		Nonresidential Savings	
	Residential	Nonresidential	Residential	Nonresidential	Units	%	Units	%
Northeast	246 418	85 705	228 329	84 277	18 089	7.3	1 428	1.7
Midwest	150 377	73 643	140 907	72 789	9 470	6.3	854	1.2
South	140 118	71 945	128 381	71 033	11 737	8.4	912	1.3
West	196 747	77 695	181 793	77 119	14 954	7.6	576	0.7
Total	167 038	75 463	154 035	74 598	13 003	7.8	865	1.1

Note. Data were derived from the Center for Urban Policy Research, Rutgers University.

CONCLUSIONS

What is found after a significant effort to study sprawl and its effects? First, conventional development or sprawl is the dominant form of growth occurring in major metropolitan areas. Even in metropolitan areas where there is no net new growth, transferred growth (i.e., growth that shifts from one area to another) is of a sprawl type. Thus, in the United States as of 2000, there existed 3 basic conditions, and these conditions continue in many cases.

First, there are rural or undeveloped counties (approximately 2100) in which a small amount of growth, or no growth, is occurring. Growth is too inconsequential in these counties to be classified as sprawl, although its characteristics are clearly sprawl-like. Second, there are urban centers and urban or developed suburban counties (approximately 250) that are declining or growing slowly and, accordingly, are not sprawling. In these counties, growth is negative or marginal. Also included in this group are a few urban counties that are growing. However, most of the development occurring in these locations is not of the sprawl type. Finally, there are rural, undeveloped, or developing suburban counties (approximately 740) where nearly all growth is sprawl. In our effort to document the magnitude of sprawl and analyze its effects, we focused on this last group of counties.

There appear to be significant costs of sprawl growth, and some of these costs are measurable. Conventional development or sprawl is projected to consume land and various types of infrastructure to a level that managed growth will not. Conventional development also is projected to result in fewer positive fiscal effects (more costs and somewhat less revenue) than managed growth. Furthermore, conventional development does not come in a form that provides for significant amounts of attached or multifamily housing. Because a mix of housing types is often not provided, primarily single-family units on larger lots at the periphery of metropolitan

areas are chosen, and lower priced urban housing markets are not. Overall, housing costs are projected to be greater under conventional development.[23]

However, it is possible to accommodate growth in another way: a more centrally focused development pattern requiring fewer resources. This is managed growth.[24] Managed growth allows all development that would have taken place under conventional development to occur but directs that development to locations where public services can be provided more efficiently. This scenario results in appreciable savings in a relatively short period of time. Resources need not be as aggressively consumed, yet the amount of residential and nonresidential development is not altered. That is the message of this research.

Conventional development produces costs in dollar outlays and in resources consumed, and these costs are deceptively bearable in the short run. The benefits of unrestricted freedom of choice in regard to neighborhoods and lower housing costs seem worth the cost. In fact, they probably are. However, many of these benefits can be achieved through managed growth with little loss of freedom of choice or housing value and with significant savings of artificial and natural resources.

What is the importance of these findings to the public health community? The basis of the land use system in the United States is "police power"; everyone gives up a small portion of their property rights without compensation for the overall advancement of local public health safety and welfare. Current land use regulations promote public health by ensuring that there is enough air and light in structures and that ingress and egress are unencumbered. A new generation of land use regulations would promote public health, safety, and welfare by reducing the amount of land consumed, and this in turn would reduce the public dollars required for roads and infrastructure.

Rebuilding cities through redirecting growth would produce more-homogeneous resident populations in cities and suburbs, and thus a significantly lower amount of public funding would be required for either special needs or augmented public services in these areas. Future land use regulations promoting public health, safety, and welfare will

move from a focus on lot, light, and air considerations to a focus on development patterns and whether they achieve resource conservation in regard to land consumption, infrastructure provision, housing occupancy costs, and public service costs.

How will the present findings be received by those who would seek to promote the extension of public health, safety, and welfare described here? There may be apprehension that savings would be relatively small in comparison with opting for a development future that would require reigning in of the ability to build anywhere. That is, the public savings may not be significant enough to make it attractive to opt for broad-based regulatory changes in land use patterns. Such a view is shortsighted, however, because this scenario, applied to all development taking place in the United States, would result in large human and natural resource savings that could never accrue if the government were to tax or charge citizens to achieve them. ■

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Contributors

R.W. Burchell conceptualized the study and had primary responsibility for writing the article. S. Mukherji contributed to the writing of the article and to analysis of data.

Human Participant Protection

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